THE

JOURNALS, DETAILED REPORTS, AND OBSERVATIONS

RELATIVE TO

THE EXPLORATION,

BY CAPTAIN PALLISER,

OF

THAT PORTION OF BRITISH NORTH AMERICA

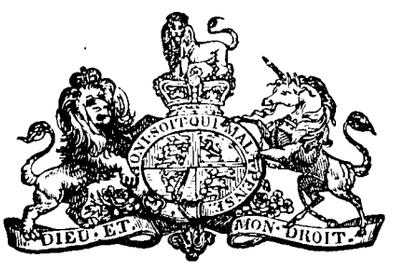
The Map illustrating these Explorations will be delivered when ready.

AND

IN LONGITUDE, BETWEEN THE WESTERN SHORE OF LAKE SUPERIOR AND THE PACIFIC OCEAN

During the Years 1857, 1858, 1859, and 1860.

Presented to both Houses of Parliament by Command of Her Majesty,
19*th May* 1863.



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4844. 1863.

THE

JOURNALS, DETAILED REPORTS, AND OBSERVATIONS

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THE EXPLORATION,

BY CAPTAIN PALLISER,

OF

THAT PORTION OF BRITISH NORTH AMERICA,

WHICH,

IN LATITUDE, LIES BETWEEN THE BRITISH BOUNDARY LINE AND THE HEIGHT OF LAND OR WATERSHED OF THE NORTHERN OR FROZEN OCEAN RESPECTIVELY,

AND

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During the Years 1857, 1858, 1859, and 1860.

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JOURNALS, DETAILED REPORTS, AND OBSERVATIONS

RELATIVE TO

CAPTAIN PALLISER'S EXPLORATION

OF

A PORTION OF BRITISH NORTH AMERICA.

THE GENERAL REPORT.

13, Gate Street, Lincoln's Inn, London,
4th April 1862.

My Lord Duke,

Having heard from the Colonial Office that the Government have expressed their willingness to print "in extenso" the journals containing the details of my expedition for the exploration of British North America during the years 1857, 1858, 1859, and 1860, some extracts from which have been already presented to both Houses of Parliament by Her Majesty's command, in 1859 and 1860, I have the honour of laying before your Grace these documents, which have been prepared by me, with the aid of my colleagues, Doctor Hector, Mons. Bourgeau, and Mr. Sullivan.

In them will be found a complete narrative, not only of those portions of the expedition which fell to my immediate share, but also of the branch expeditions which I organized from time to time under the charge respectively of Doctor Hector and Mr. Sullivan.

I have, &c.

To his Grace the Duke of Newcastle, K.G., (Signed) JOHN PALLISER.
Colonial Office, Downing Street, London.

Introduction.

I propose in the following remarks, which are introductory to the journals and other detailed papers relative to the Expedition recently under my command, to give a short sketch of the physical features of the country explored, with especial reference to its economic value. These remarks will be principally based upon the facts and observations to be found in detail in the body of the Report.

The portion of British North America examined by the Expedition is contained between the western shore of Lake Superior, in longitude 89° W., and the Okanagan Lakes, in longitude 119° W., and extends from the frontier of the United States, in latitude 49° N., northwards to the sources of the chief rivers that flow to the Arctic Ocean. In other words, it embraces 30° of longitude, and in some places 6° of latitude. Some portions of this large extent of British territory were well described previously to the organizing of this Expedition, especially the neighbourhood of Red River, where the Selkirk Settlement is situated.

The district stretching from thence to the north-west along the valley of the Assiniboine and the North Saskatchewan was also well known, from the Hudson Bay Company having for many years had a chain of trading posts or forts on that river at intervals of about 200 miles, established partly for the trading of furs, but mainly for the purpose of procuring provisions from the vast herds of buffalo, on which their more valuable trading posts in the northern districts depend for subsistence.

It is by the trail passing from fort to fort on this route along the North Saskatchewan river that the few emigrants have travelled, who, besides travellers connected with the fur company, have passed through the country on their way to cross the Rocky Mountains. The southern portion of the country along the South Saskatchewan remained, however, comparatively unknown.

Many years ago, indeed, the Hudson Bay Company had sent an expedition of a hundred men up that river and endeavoured to establish two trading posts; but after a very short trial the attempt was abandoned as too expensive and dangerous, owing to the menacing and often hostile tendencies of the Indian tribes who inhabit that district.

The information we possessed concerning the Rocky Mountains, and the extent to which they truly formed a barrier to the formation of a road across the continent in the most southern latitudes within the British territory, was extremely vague and unsatisfactory. The late Sir George Simpson had, indeed, described the crossing from the Saskatchewan to the source of the Columbia and several parties of emigrants from the Red River Settlement to Oregon, on the Pacific coast, were known to have crossed the Rocky Mountains, under the guidance of the late James Sinclair, by nearly the same route, taking with them not only horses, but also cattle. Nothing was, however, published as to the exact nature of the difficulties encountered by any of these parties, or whether or not these could be easily evaded or removed.

The United States' Government, since 1853, have sent a succession of exploring parties into different parts of the mountain country within their territory, with the immediate object of selecting the best route by which to carry a line of railway to connect the States on the Atlantic with those on the Pacific coast.

The reports and surveys of these expeditions already published fill twelve large quarto volumes, abounding with valuable information of every kind respecting the country, and embellished with views of the scenery.

No one of these surveys, however, offers a favourable prospect for the ultimate construction of a line of railway connecting the Atlantic with the Pacific, principally from the fact that in the central part of the continent there is a region, desert, or semi-desert in character, which can never be expected to become occupied by settlers.

It was, therefore, with considerable interest and anxiety that public attention was turned to our own territories, and the wish to have more exact information concerning their nature and resources induced Her Majesty's Government in 1857 to despatch the Expedition which I had the honour to command.

For my guidance in effecting these objects I received from Her Majesty's Secretary of State for the Colonies the following instructions:—

SIR, Downing Street, 31st March 1857.

With reference to the letter which, by my direction, was addressed to you on the 28th inst., I have now the honour to communicate to you special instructions for your guidance in the conduct of the Expedition for exploring that portion of British North America which lies between the northern branch of the River Saskatchewan and the frontier of the United States, and between the Red River and the Rocky Mountains.

Having completed all preliminary arrangements necessary for the future safety and success of the Expedition, it is the desire of Her Majesty's Government that you should proceed by the Soult St. Marie, on Lake Superior, to Fort William, and from thence by the Kaministaquoia as far as the Kakabeka falls, and that you should ascertain the precise geographical position of the point at which the White Fish River falls into the Kaministaquoia. From thence it is desired that a party should be detached to explore the country to the westward towards the height of land, and, as far as may be practicable without long delay, to determine the height and direction of the watershed for some distance on either side of the line due west from the White Fish River.

If this preliminary exploration should lead you to think such a measure practicable, it would be desirable that you should detach a small party, lightly equipped, and supplied with provisions for a few days' march, who should pursue a line directly to the westward, meeting the ordinary canoe route either at Cross Lake or Sturgeon Lake.

From the point at which this party shall rejoin the rest of the Expedition you will proceed by the ordinary route to Fort Garry on the Red River.

In regard to the entire region lying between Lake Superior and Lake Winnipeg, it is desirable that in addition to the ordinary observations upon the physical features and geology of the country, the attention of all the members of the Expedition should be directed, to ascertain the relative levels of all the points which can be recorded and laid down with topographical accuracy; as, for instance, the height of the falls and rapids on the streams which lie along the canoe route, and the relative height of the several points in the watershed between the above-mentioned lakes which may be visited by the Expedition. In case, as is probable, the botanical collector should not accompany the separate exploring party, information should, nevertheless, be obtained as to the nature and quantity of timber which may be found on the line of march.

From Fort Garry you will start, as soon as you have organized your party, in a west-

wardly direction, taking such a course as you shall consider most advisable for acquiring additional knowledge of the country on either side of the Bow River, or south branch of the Saskatchewan River, during the remainder of the season of 1857; and you will make arrangements in advance for wintering the Expedition at Carlton House, where you will meet Lieutenant Blakiston.

At the commencement of the season of 1858 you will start, as soon as the weather is sufficiently open and favourable, to explore the country between the two branches of the Saskatchewan River, and south of the southern branch, and thence proceeding westward to the head waters of that river, you will endeavour, from the best information you can collect, to ascertain whether one or more practicable passes exist over the Rocky Mountains within the British territory, and south of that known to exist between Mount Brown and Mount Hooker.

Great care must be taken that the Expedition shall return to Fort Garry in sufficient time to allow them to reach England, *viâ* Fort Pembina, and the United States, in the fall of 1858.

In the event of you yourself desiring to proceed westward from the Rocky Mountains to Vancouver's Island, Her Majesty's Government consent to your doing so, only under the express conditions that the homeward conduct of the Expedition can, with perfect prudence, be entrusted to the charge of Lieutenant Blakiston or Dr. Hector, and that the expenses of your travelling from Vancouver's Island are defrayed from your own resources; and further, that the Indian war now raging in the country west of the Rocky Mountains shall have terminated.

It being the desire of Her Majesty's Government that the Expedition should, as far as practicable, be made available for extending general as well as special scientific knowledge, I have to impress upon you the importance (in addition to maintaining a regular series of instrumental observations) of regularly recording the physical features of the country through which you will pass, noting its principal elevations, the nature of its soil, its capability for agriculture, the quantity and quality of its timber, and any indications of coal or other minerals.

Separate instructions will be furnished by Major General Sabine, Sir Roderick Murchison, and Sir William Hooker, for the guidance of the scientific gentlemen attached to the Expedition.

The result of your surveys and observations should be embodied in a journal of the Expedition, to be kept with the utmost practicable regularity. A duplicate of that journal, and of any special observations and reports on the geology and natural history of the country, should be completed at all convenient stations, and forwarded at every favourable opportunity to England, addressed to Her Majesty's Principal Secretary of State for the Colonies, Downing Street, London.

In full reliance upon your ability and discretion, Her Majesty's Government have not hesitated to entrust to you the conduct of the Expedition, with the express understanding that the scientific gentlemen of your party will consider themselves subject to your authority, and bound to be guided implicitly by the orders which your experience may suggest for the safety of the Expedition, and for the complete success of the objects for which it is undertaken.

In the event of any unforeseen accident which might deprive the Expedition of your services as leader, the command of the party may be entrusted by you either to Lieutenant Blakiston or to Dr. Hector, and you will furnish a duplicate copy of these instructions to whichever officer you may select for that purpose.

In conclusion, I cannot too earnestly impress upon you the necessity for the utmost caution in the selection of the line of route to be taken by the Expedition, and in avoiding all risk of hostile encounters with any native tribes who may inhabit the country through which you may pass.

I have to request that you will communicate to me, for the information of the Lords Commissioners of the Treasury, the mode in which the expenditure incurred by you while in the territories under the control of the Hudson's Bay Company is to be defrayed; and you will understand that the limits of expense prescribed for the Expedition cannot be exceeded, unless under circumstances of urgent necessity, which you will at once report for the information of Her Majesty's Government.

I have, &c.

H. LABOUCHERE.

In compliance with the foregoing instructions, when the Expedition commenced the journey at Fort William, on the north-west shore of Lake Superior, I made additional preparations, besides those requisite for the long canoe journey, having for their object the examination of the White Fish River; but this river was found to be only a very

small stream flowing into the Kaministaquoia, at a distance of about 12 miles, in a direct line from its mouth, and totally unfitted for any purpose of navigation.

The general aspect of the northern shore of Lake Superior is precipitous and rugged. Around Thunder Bay, however, and extending for some distance up the valley of the Kaministaquoia there is a considerable extent of rich alluvial land, heavily timbered. The rise to the crest of the rocky district that forms the height of land is almost abrupt, to an altitude of 800 feet above Lake Superior, or 1,400 feet above the sea level.

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, across which the traveller has to make tedious portages. 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.

As a line of communication with the Red River and the Saskatchewan prairies, the canoe route from Lake Superior to Lake Winnipeg, even if modified and greatly improved by a large outlay of capital, would, I consider, be always too arduous and expensive a route of transport for emigrants, and never could be used for the introduction of stock, both from the broken nature of the country passed through, and also from the very small extent of available pasture. I therefore cannot recommend the Imperial Government to countenance or lend support to any scheme for constructing or, it may be said, forcing a thoroughfare by this line of route either by land or water, as there would be no immediate advantage commensurate with the required sacrifice of capital; nor can I advise such heavy expenditure as would necessarily attend the construction of any exclusively British line of road between Canada and Red River Settlement.

As regards the fitness for settlement of the district traversed by the canoe route, I beg to state that there are only very few and isolated spots where agriculture could be carried on, and that only by the discovery of mineral wealth would this region be likely to attract settlers. At present the considerable number of Indians living in it subsist by hunting, fishing, trapping, and trading furs to the Hudson Bay Company; but the fitness of the country for these pursuits is by no means a proof of its being so for those of civilized man.

The winter experienced in this district is severe but steady. From the commencement of November till May the whole country is icebound, so that vegetation is perfectly dormant. The spring is very lingering, owing to the great extent of surface occupied by the large lakes to the south-east, and by Hudson Bay to the north-east, as the slow melting of the ice which accumulates during the winter on these sheets of water keeps the temperature depressed until far on in the summer season. Thus, when crossing Lake Superior in the second week of June 1857, the Expedition encountered much cold weather, and got entangled in icefloes that were still drifting on the lake.

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.

The whole territory explored may be naturally divided into three districts, marked by different physical features. Concerning the first of them, the canoe route, it is not necessary for me to enter into further particulars, as it has been made the subject of a minute and able report (already laid before Parliament) by a Canadian Expedition, which had much greater facilities for making an examination of this region than my Expedition possessed. I shall, therefore, pass to the consideration of the central prairie region, and as this is for the purpose of agricultural settlement by far the most valuable portion of the territory traversed by the Expedition, and is also somewhat diversified in its character, I shall be warranted in entering more into detail upon this portion of my subject.

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.

These steppes are three in number. The first may be said to spring from the southern shore of the 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 à 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° W.; thence passing in a north-westerly direction to near the elbow of the South Saskatchewan, and northwards 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 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, their lateral extent being rarely proportionate to their steep and lofty banks; consequently, these valleys do not afford a great extent of alluvial land, or land of first quality, for agricultural purposes; and this is more particularly true of the western plain country, where the rivers traverse the higher plateaus.

The existence of a general law regulating the distribution of the woods in this portion of the continent suggested itself to us during our first summer's explorations, and subsequent experience during the seasons of 1858-9 fully confirmed it.

The fertile savannahs and valuable woodlands of the Atlantic United States are succeeded, as has been previously alluded to, on the west by a more or less arid desert, occupying a region on both sides of the Rocky Mountains, which presents a barrier to the continuous growth of settlements between the Mississippi Valley and the States on the Pacific coast. This central desert extends, however, 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 forests, 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, and the habit which the Indian tribes have of burning the vegetation has, in fact, gradually improved the country for the purpose of settlement by clearing off the heavy timber, to remove which is generally the first and most arduous labour of the colonist.

All the rivers which intersect the plains traversed by the Expedition east of the Rocky Mountains, with the exception of the Athabasca, flow into Lake Winnipeg and thence into Hudson Bay. The Athabasca, on the other hand, joins the McKenzie, which flows to the Arctic Ocean.

In describing the prairie country I shall successively treat of the lands adjacent to the different large rivers, not however with a view to scientific classification, but merely for the greater facility of indicating where lands fit for settlement are to be met with.

The most easterly stream flowing into Lake Winnipeg is the river of the same name. It flows wholly within the eastern rocky belt of country, and was descended by the Expedition with canoes on the way from Lake Superior. The country on both sides of this river is so rocky and covered with swamp as to afford but little extent fit for agricultural development.

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.

Its rugged eastern shore is principally composed of primitive rocks, while along the west the headlands are formed of beds of limestone, and the country in their rear is low and marshy.

Lake Winnipeg communicates with several other sheets of water, of which Manitoba and Wimpegoors 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.

Fish abound in these lakes, and the sturgeon of Lake Winnipeg especially often reaches a large size without losing its rich and delicate flavour.

Next in order comes the Red River of the North, so called to distinguish it from a river of the same name in the state of Arkansas.

Although this is not the largest, it is by far the most important river in this portion of the British territories, on account of the great extent of arable land which the lower portion of its valley affords for agricultural development, and much of which is already under cultivation by the inhabitants of the Selkirk Settlement.

Red River has its source in the same district of marshes and lakes, from which flows also the Mississippi. This district is situated in about lat. 46½°, long. 95° W., and is elevated 860 feet above the sea level. The course of Red River is slightly west of north to where it falls into Lake Winnipeg, in lat. 50½° N. and long. 97° W. After crossing the frontier at Pembina, in lat. 49°, it flows with a very serpentine course for about 140 miles through British territory. At 8 or 10 miles from the lake the land on the banks of the river becomes 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.

Of the prairies along Red River only narrow strips on the top of the banks have been yet brought under cultivation by the colonist, as there the land is naturally rather higher and better drained than that lying further in the rear, both from its proximity to the river and also from the frequent gullies cut in the soft clay soil by the numerous small creeks that carry off the surface water. These gulleys at present reach but a very short distance back from the river, but were they artificially extended so as to serve as main drains, much land at present covered by swamps and marsh would be reclaimed. As it is, however, these marshes are of considerable value to the colonist from the abundant supply of natural hay which they yield. The channel of Red River is from 50 to 60 feet in depth, but occasionally the floods in spring are so high as to raise the river above that level, and to inundate the prairies to a great distance on either hand, devastating the property of the settlers. These floods seem to occur at intervals of 8 or 10 years, the last having occurred in 1852, previous to one which has again damaged the settlement this summer (1861).

It is not improbable that these floods could to a great extent be prevented by attention to the state of the river channel, especially towards its mouth. Both Red River and its large tributary the Assineboine, bring down an excessive quantity of fine sediment that gradually fills up the channels wherever the force of the current is checked.

From this cause these rivers apparently increase in size for a course of years, till at last a flood in the upper country towards their sources happens at the same time that Lake Winnipeg is at a high level, or that its south end is blocked by ice in early spring. The result of this is, that the river, from the sluggishness of its current at its mouth, overflows the lip-like ridges which bound the channel, and submerges the lower country in their rear on either hand. During the remainder of the season in which the overflow occurs, the great body of water which thus accumulates only slowly escapes to the lake, and by keeping the river in high flood for a much longer term than usual, and until the level of the lake has fallen with the advancing summer, the channel is thus scoured out and a second flood is averted, until the river-bed has again been blocked up by the accumulation of sediment. Were this cleansing of the river channel effected artificially, so that there should be always a sufficient depth to allow the flood water to escape with the requisite velocity under all circumstances, the great calamity of periodic floods might be averted from this settlement, especially if these labours were combined with works for raising the banks of the river in a few places where they are below the general level.

Full details and statistics of the Red River Settlement have been recently published, and from the study of these, as well as from my own more limited opportunities for examination, I can entirely coincide in the hopeful views which have been expressed regarding the future development of this settlement as a British Colony.

Its position is, however, too much isolated for it to progress rapidly, unless some arrangement be made to allow of a secure system of traffic through or with the north-western United States, for there can be no question that the natural line of ingress to the country is from the south, by way of St. Pauls, Crow Wing, and Pembina. There are two routes from Crow Wing to Pembina, which is a distance of 310 miles; one of which can only be used in winter when the swamps are frozen. The other is somewhat longer, but as it passes out into the plains along the border of the Sioux Indians' country, it is sometimes dangerous for travellers unless they form a strong party.

A few years ago these roads were in a very bad state, being nothing more than trails, without any attempt at grading or constructing bridges where necessary.

The Hudson Bay Company have however now commenced to bring their goods for the fur trade into the country by this route, and a steamer plies on Red River as high as Grahams Point, which is about 230 miles above Pembina, in connexion with stage waggons

that continue the route to St. Pauls. The road has doubtless been much improved since I traversed it, and soon no greater difficulty will exist in gaining access to the Red River Settlement than to any of the more western towns of the United States which are not yet reached by railways.

With regard to the climate of the district of Red River and the Assineboine, we are in need of more complete and careful observations than have yet been obtained to justify our speaking with confidence on the subject.

It would appear, however, that the winter is somewhat shorter in this region than in that about Lake Superior. The average time for its commencement is in the beginning of November, and by the middle of the month all the lakes and streams are completely frozen, and the ground covered with snow, which lasts throughout the season.

The winter really lasts till about the second week in April, although during the month of March there are many warm genial days, with hard frosts during the nights; but, in addition to this period of five months, there is a previous frost of two or three weeks, preceding the freezing over of the rivers, and sufficiently severe to stop agricultural operations, so that the winter may generally be estimated at six months' duration. The extreme cold is in the month of February, when the thermometer sometimes falls to about 45° below zero. The winter is the most favourable time for the transport of heavy materials, such as those required for building purposes. Thaws rarely occur before the month of March; but, at this time, the existence of horses and horned cattle becomes precarious, owing to the thaws by day being succeeded by frosts at night, causing a crust on the snow, in many cases, too hard for the animals to remove in order to feed. The inhabitants, however, by the exercise of a little forethought during the previous autumn, might, without any difficulty, provide abundance of the finest natural hay from the adjacent swamps. Horses and cattle, if provided with a sufficiency of hay for only six or seven weeks, will not only survive, but continue useful and serviceable during the whole of the winter and spring. Spring progresses with great rapidity; in a few days snow disappears, and the new grass has already commenced to grow up by the beginning of May. At the end of that month agricultural operations may be commenced. During the month of June, however, severe night frosts frequently occur, rendering the wheat crops very precarious; but the climate is well suited to the growth of barley, oats, potatoes, and garden vegetables.

The heat during summer is very great, ripening all fruits rapidly with some curious exceptions; among these are apples, which will not grow on standard trees either there or in the north of the State of Minesota.

The harvest for hay, which is very abundant, commences in the beginning of July, and that for the cereals about the tenth of August. Great damage often occurs at this time to the crops from thunder storms, and also from grasshoppers (*i.e.* locusts).

The soil is that of an ancient lake bottom, consisting of variously proportioned mixtures of clay, loam, and marl, with a remarkable deficiency of sand.

It is overlaid by a great thickness of vegetable mould, varying from two to four or five feet in depth.

The settlement at present occupies an area of about 50 square miles in extent, its centre is at the forks of the Assineboine and Red River, in lat. 49° 52′ N., long. 96° 53′ W., and at an elevation of 800 feet above the level of the sea.

The chief wealth of the agriculturist would be derived from the rearing of cattle, large quantities of very nutritious grasses abounding everywhere, together with hemp, flax, and hops, which grow admirably. Between the Red River and the Saskatchewan, no river of any great size enters on the west side of Lake Winnipeg. There are indeed several streams which are navigable for boats, but these are merely channels of communication between various lakes.

The Assineboine, which joins Red River from the west at Fort Garry, rises in lat. 52°, nearly. Its course, of nearly 300 miles, lies wholly within fertile and partially wooded country. The upper portion of the valley has only a small extent of alluvial land of the finest quality, as the banks are lofty and steep, enclosing alluvial bottom of rarely more than 1½ miles in width.

The land on the high level is, however, of considerable value in many places, with a prevalence of light sandy soil supporting bluffs of timber and rich pasture.

The lower part of the valley of the Assineboine, for 70 miles before it joins Red River, affords land of surpassing richness and fertility, to the extent of several hundred thousand acres.

The Assineboine is navigable to the Hudson Bay boats, which are 42 feet in length, and draw 3 feet of water, for a great distance, but the channel though deep is narrow and extremely tortuous.

During the spring floods, the channel of this river would be more direct, and then a steamer of light draught (I have been informed) might ply at least as far up as Fort Ellice.

The Saskatchewan enters Lake Winnipeg near its northern extremity, in lat. 53° N., nearly; and with the exception of two or three rapids, might be navigated by steamers in summer to within sight of the Rocky Mountains.

Its general width is about 300 yards; unfortunately a very serious impediment to navigation occurs at its mouth, where there is a very formidable rapid called "the Grand Rapid." Here the river makes a descent of 40 feet in less than 3 miles, and actually foams through a rocky channel. This rapid would form an obstacle to the ascent of steamers; how far surmountable by a reasonable outlay of capital I am not prepared to say, but I think it highly probable, since there is no want of depth of water in the channel of the river at the rapid, that steamers could be made to ascend it by the American plan of warping.*

A second small rapid occurs below Fort Carlton, where the difficulty to contend against would be an insufficiency of depth in the channel at that spot. The other rapids are but trifling obstacles, and, if removed to a sufficient extent, the river would be available for steam navigation during the greater part of the months of May, June, and July.

The lower or main Saskatchewan River, below the confluence of the north and south branches, (or North and South Saskatchewan, as I shall in preference term them,) flows entirely through thickwood country, which is often low and marshy, and does not properly fall within the prairie region explored by the Expedition.

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 latitude 52° 20′ at its "Elbow," where it changes its course again with a sudden bend, and flows to the N.E.

It is a singular phenomenon, which may be observed by a glance at the map, that all the large rivers of the plains, and many of the smaller streams also conform to these great and abrupt deflections from their general direction.

From the Rocky Mountain House to Fort 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 greater part of this width is occupied by alluvial flats, the river itself rarely exceeding 400 yards 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.

Wherever the banks of the valley slope gently back to the higher prairie level, as at Fort Carlton, there are to be found the most desirable spots for settlement. 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 merely confined to the neighbourhood 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 level, 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

* We have been on board American steamers while they have ascended rapids by means of an anchor at the head of the rapid, from which a rope is connected to a capstan on board, driven by the steamer's machinery, and were thus warped up the current.

level country can be obtained. The places which have been chosen for mission stations are all at a distance from the river, a preference having naturally been given to the borders of the large lakes which lie along the base of the hilly country for the sake of the fine fish which these yield in abundance. The quantity of fish of very fine quality obtained from some of these lakes is enormous. The best fishing season is just as the winter commences, and in the course of a few weeks, some years ago, there were taken in Lake St. Ann's alone 40,000 of these "white fish" (*coregonus albus*), having an average weight of 3 to 4 lbs. each. The fish are preserved during the winter simply by being frozen, and afford a cheap and nutritious article of food.

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 until 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, and partial thaws often occur long before the actual coming of spring and do great harm to the vegetation. 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. If proper roads were formed this facility would be greatly increased, and as a result there would be no season during which the country could be said to be closed for traffic.

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 South Saskatchewan, which in its upper part is called Bow River, resembles the North Saskatchewan in size, volume of water, and its general direction, but it passes through a very different description of country.

After leaving the eastern limit of the country that is within the influence of the mountains (which may be considered to commence about 20 miles below where it receives Ispasquehow River), the South Saskatchewan flows in a deep and narrow valley, through a region of arid plains, devoid of timber or pasture of good quality. Even on the alluvial points in the bottom of the valley trees and shrubs only occur in a few isolated patches. The steep and lofty sides of the valley are composed of calcareous marls and clays that are baked into a compact mass under the heat of the parching sun. The sage and the cactus abound, and the whole of the scanty vegetation bespeaks an arid climate. The course of its large tributaries, Red Deer River and Belly River, are through the same kind of country, except in the upper part of the former stream, where it flows through rich partially wooded country similar to that on the North Saskatchewan.

Towards the confluence of Red Deer River and the South Saskatchewan, there are extensive sandy wastes. For 60 miles to the east of this point the country was not examined by the Expedition, but at the elbow the same arid description of country was met with, and it seems certain that this prevails throughout the entire distance. Below the elbow the banks of the river and also the adjacent plains begin to improve rapidly as the river follows a north-east course and enters the fertile belt. From the Moose Woods to its confluence with the North Saskatchewan it in no way differs from that river, which indeed is nearly flowing parallel with it, only 30 or 40 miles distant.

In the midst of the arid plains traversed by the South Saskatchewan, there are isolated patches of table land, upon the surface of which the vegetation becomes luxuriant, and pasture of fair quality may be found. The Expedition spent two weeks at the Hand Hills, which form one of these patches, for the purpose of recruiting the horses.

To the south of the river also, in lat. 49° 40′ N., at the Cyprées Hills, there is abundance of water and pasture, and also a heavily timbered slope facing the north, where spruce firs, pines, maple, and many kinds of shrubs flourish in abundance, while for hundreds of miles around in every direction there is no appearance of the plains having ever supported a forest growth.

In the commencement of August 1858, and previous to any attempt to cross the Rocky Mountains, I determined to examine the whole line of country along their base to

the boundary line. Although the strip of fertile country lying between the central arid plains and the foot of the mountains is nowhere so wide as that its eastern limit is out of view of the Rocky Mountains, yet there is a considerable extent of valuable and fertile land reaching (with the exception of one slight break) the whole way to the international line, and following nearly the general direction of the Rocky Mountains, namely, from N.W. to S.E. The general direction of the eastern limit of fertile land is from north to a little east of south, so that as you approach the boundary line the breadth of fertile soil between the arid region and the base of Rocky Mountains considerably diminishes: thus, in lat. 52° the fertile belt extends over 2° of long.; in lat. 51° it is not more than 1° in width. South of this the fertile belt is encroached on by a tongue or spur of the sterile plains, about 15 miles in width. South of this, again, in about lat. 50°, the fertile land appears, extending from the mountains over about 1° in long., and continues gradually to diminish in breadth down to the international line, where it extends about 20 miles to the eastward of the "Cheif" Mountain.

The whole of this land, the position of which I have just described, may be compared to the similarly situated lands of Switzerland and the Tyrol, known to be fertile, and especially valuable for the very nutritious grasses which they produce. The whole region is well wooded and abundantly watered, and enjoys a climate far preferable to that of either Sweden or Norway.

The whole of this region of country would be valuable not only for agriculturists but also for mixed purposes of settlement. To the north it stretches considerably to the westward, enlarging in proportion as the Rocky Mountains recede to the westward, and comprising the upper portions of the Saskatchewan and their numerous lesser tributaries. In the first place, along this region of country, the first quality of land is not merely confined to the river valleys, but much of the third steppe is abundantly watered, and probably its greater elevation obtains for it increased moisture and consequently a superior class of soil. The snow here is not so deep as it is further to the eastward, the winters are more open and the springs are earlier.

The lands exhibit great diversity of surface and are rolling and well adapted for sheep; the timber is abundant and more substantial in bulk than that to the eastward, and therefore better suited for building purposes; lime-stone exists in great quantity, and the beds of some rivers afford argillaceous clay capable of being converted into bricks, and coal of a fair quality was found and possibly exists in considerable quantity.

Throughout the district are numerous lakes abounding in fish.

I now proceed to make some remarks upon the natural facilities offered to agricultural settlement.

Of these, the first is the facility for obtaining good fish for food during the transition state that a country must endure between the periods when its inhabitants live on wild animals alone, and that period when bread becomes the staff of life and animal food is produced by the care and forethought of civilized man.

All along the northern districts in the country above described occur very numerous lakes, supplying immense quantities of nutritious fish, among which are pike, sturgeon, cat-fish, gold-eyed carp, and white fish in greatest abundance. I have seen these obtained with the greatest ease even in winter where holes had to be chopped through the ice in order to catch them. None can so readily appreciate the advantage that a farmer would derive from a certainty of obtaining plenty of fish in the neighbourhood of his farm as those who know the difficulties attending the hunting of animal food, where the settler would have to compete for a bare existence against the Indian trained almost from his birth to the tracking and killing of thickwood animals, such as deer, elk, and moose.

Granting even that the colonist is a skilled hunter and able to compete with the man born in the forest, the greater portion of his time would be absorbed in the same pursuit as the Indian, and little time or energy would remain for agriculture.

Add to this the fact that the smoke and the noise attending the home of the white man frightens the game far and near, and so increases the labour necessary to obtain it.

The second advantage found by the settler is the abundance of good food for cattle growing throughout the region, such as goose-grass, pease-grass, vetches, astragalous and other plants, which preserve their nutritious quality through the winter season. Horses and horned cattle would resist the rigour of winter well and continue in good condition, if not poor when turned out at its commencement, and if provided with artificial food in the very early spring when the partial thaws during the day cause a coating of ice over the herbage, which the animals find very difficult to remove in order to feed. I have killed many fat buffaloes in the months of January and February; after which I have invariably found them lean, and sometimes seen the ground sprinkled with blood from the hardness of the surface, which the animal tries to shovel aside with its nose.

If even the buffalo, whose nose is formed by nature for this purpose, finds a difficulty in obtaining his food, how much more difficult must be the task of self-support to the domestic animals.

There would be no difficulty in providing and storing abundance of excellent hay before the fall of the year. Hay was cut for my horses at Carlton, at my request, in September 1857, which lasted them well into the middle of spring, although they began to use it shortly after Christmas. In September 1858, two of my men cut hay sufficient from the swamps around Edmonton to provide amply for 46 horses during the early spring of 1859.

A third inducement to settlement in the valley of the Saskatchewan is the fact that the settler has not to encounter the formidable labour of clearing the land from timber. The frequent fires which continually traverse the prairie have denuded the territory of large forest trees, indeed so much so as in some places to render their absence deplorable, and the result of these fires is that the agriculturist may at once commence with his plough without any more preliminary labour.

Although throughout the whole of the fertile region, as well as in the subarctic forests of the north and west, there is no timber fit for export, such as the white pine or the gross larch, so highly prized by the lumberer. Yet there is abundance which would serve the purpose of the settler, and suffice to construct houses and furnish him with fuel. Coal, available for smelting purposes, exists abundantly, and iron in very large quantities.

The capabilities of this country and its climate, for the success of the cereals, have hardly been sufficiently tested. But I have seen first-rate specimens of barley and oats grown at many of the forts. Wheat has not been so successful, but I am hardly prepared to say that this was because of the unfitness of the climate to produce it. I have much reason to believe that the seed has been bad, and the cultivation neglected, and the spots chosen not of a suitable aspect. I have not only seen excellent wheat, but also Indian corn (which will not succeed in England or Ireland) ripening on Mr. Pratt's farm, at the Qu'appelle Lakes, in 1857.

Harvest would commence early in September, and its operations would not be seriously interrupted by three or four wet days in that month, taking that as a fair average of the rain that falls at that period; more rain falls in the spring than in the autumn, but even then it is inconsiderable.

The only principal disadvantage accruing from the greater altitude of the region approaching the Rocky Mountains, is the almost continual night frosts during the summer, not severe during that season, but so frequent as to be almost of nightly occurrence; these would probably prove prejudicial to wheat; barley and oats, however, would do well.

The only objection to raising sheep and pigs would arise from the number of their natural enemies, the wolves, which roam everywhere through wood and plain, and this is probably the cause why the sheep of the country are prompted by their natural instinct to shelter in the inaccessible cliffs of the Rocky Mountains. The ewes and lambs are frequently seen feeding at a low altitude, and evince a preference for the grass below, which naturally grows in greater quantities.

The proceedings of the Expedition from the termination of the canoe route, to the period of its arrival at winter quarters in 1857, was directed to the examination of the country, from the forks of Red River and the Assineboine to the boundary line at Pembina, in longitude 97° W., nearly; and thence along the boundary line to the limit of the fertile belt, in longitude 105°, whence we started again from Fort Ellice, and reached the boundary line at the Roche Percée.

Starting again in September, the Expedition proceeded to the Qu'appelle Lakes, and to the elbow of the South Saskatchewan. Then crossing the South Saskatchewan proceeded northward to Fort Carlton, where the members of the Expedition established their winter quarters, and all further work for the horses ceased for that season. For the first season's explorations, I engaged 14 men and purchased about 30 horses.

The second season's explorations commenced about the termination of the month of May 1858, and were directed to the examination of the country between the two Saskatchewans, and subsequently the Expedition was divided into branch parties, in order to explore the mountains in several directions before the termination of the season.

Previous to crossing the mountains in 1858, I made a branch tour, accompanied by my Secretary, Mr. Sullivan, along that portion of the fertile belt skirting the base of the Rocky Mountains to the boundary line, which we crossed again in long. 113° W.

The branch expeditions into the Rocky Mountains were effected in August and September 1858. They proved very satisfactory, and established the fact that several

passes across these mountains which are available for horses, and by which, with a reasonable outlay, a road could be made, connecting the Kootanie and Columbia valleys with the plains of the Saskatchewan.

The four passes across the Rocky Mountains.

These passes are four in number:—The Kananaskis pass, the Vermilion pass, the British Kootanie pass, the Kicking-horse pass; all these passes traverse the watershed of the continent within British territory.

Besides these, there are three lesser passes connecting the waters of a transverse watershed, between the head waters of the Kootanie and those of the Columbia, both which rivers are on the western slope of the continent. A pass also was subsequently traversed by Dr. Hector between the head waters of the North and of the South Saskatchewan.

The passes between the Kootanie and Columbia rivers are the Lake pass and the Beaver-foot pass, and that from the head waters of the North to those of the South Saskatchewan is called the Little Fork pass.

The Kananaskis pass.

I undertook the exploration of the Kananaskis pass myself, accompanied by my secretary, Mr. Sullivan, and after traversing the mountains we returned to the eastern plains again by the British Kootanie pass.

Our journey across the Kananaskis pass, although arduous, was not formidable, on account of abrupt ascents and descents on the eastern slope of the mountains, and the principal difficulty to be overcome was the amount of timber to be cut in order to allow the horses to force their way through. On the western slope we found the descent very steep, and the obstructions from fallen timber so thick and so severe that on the 24th of August we were occupied 14 hours in accomplishing six miles, and hard work it was.

North Kootanie pass.

The North Kootanie pass, traversed by Captain Blakiston and subsequently by myself, is not encumbered by fallen timber; the track is well defined and kept clear from obstructions by the Kootanie Indians, who constantly travel that way to hunt buffaloes on the eastern plains. The natural facility which this pass affords for crossing the Rocky Mountains is not so great as that of the Kananaskis pass, which presents only one height of land to overcome.

Of all the passes traversed by our Expedition, the most favourable and inexpensive to render available for wheel conveyances would appear to be Vermilion pass, as the ascent along it to the height of land is the most gradual of them all. All these passes are defined in the map, and need no allusion here to their longitudes or latitudes.

The timber on the western slope of the mountains was somewhat finer than that which we found on the eastern side, and we saw several new pines, together with oak, ash, birch, and larch, but the lands in the valleys of the Columbia and Kootanie rivers, as far as I could judge, were neither valuable for their extent nor for their quality.

A ride from the Columbia Lakes to the boundary line sufficed to show me that the difficulties to be overcome in crossing the continent to the westward, without passing to the southward of that line, were far from being overcome. A formidable tract of country still remained to be traversed before a connexion with British Columbia could be effected. A cursory glance at a map of that country will show that the Columbia, which flows into the Pacific, takes its source from the Little Columbia Lakes, and that this large body of water is forced into a channel northwards for $2\frac{1}{2}$ degrees, when making an abrupt bend it is borne back again to the southward over the same latitudes before it can effect its escape to the westward.

The Kootanie River.

The Kootanie River, which, with its branches, derives its source north of the international line, descends over 40 miles into the American territory, and thence returns to the north to flow into Flat Bow Lake, and finally terminates into the Columbia. The irregular quadrilateral piece of country thus formed by these two rivers represents a most formidable tract where even the banks of the rivers are cloud-capped mountains. I determined, however, to penetrate it in order to endeavour to discover if the passage of the continent north of the boundary line could be effected: with what success will appear below when I shall discuss the proceedings of the Expedition in 1859. But on recrossing the mountains in September and October 1858 I left the Kootanie and Columbia valleys under the impression that although much had been effected, still a great deal more remained to be done. Early in September 1858 we recrossed the mountains, and reached Fort Edmonton at the termination of the second season; when all further work for the horses was terminated for that year, and the men all paid off with the exception of two or three engaged throughout the winter as attendants and to guard the horses. Twenty-four men were engaged for the second exploring season and 50 horses purchased, inclusive of those which remained over of those previously bought in 1857.

During the winter of 1858–9, Mr. Sullivan and Mons. Bourgeau were chiefly occupied with meteorological observations, while Dr. Hector employed himself in the various

winter journeys with dogs and sledges as detailed in the journal. He penetrated over the height of land to the northward whence the waters flow to the Frozen Ocean and down the Athabasca River, visiting Fort Assineboine and Jasper's House, and acquiring much valuable information concerning the winter temperature along the base of the mountains.

Temperature at the base of the Rocky Mountains.

Among other interesting phenomena, he discovered that the average temperature during the winter months at the base of the Rocky Mountains is higher by 15° than that of the western portions of Canada, and that the mean depth of snow at the same place is much less than in the prairie country.

During the winter I made two hunting trips to the south of Edmonton, visiting the Beaver Hills, and a considerable extent of country to the eastward. Subsequently I started with two dog sleighs to the Rocky Mountain House, where I made an extensive acquaintance among the principal chiefs and leading men of the Blackfeet and Piegans, and also hunted with them, sleeping in their tents. I adopted this course in anticipation of an assent from the Home Government to my proposal of exploring the Blackfoot country from Edmonton in the season of 1859.

On the breaking up of the ice in the spring of 1859 I left the Rocky Mountain House and descended the Saskatchewan in a skiff to Edmonton.

It was also at this period that I was obliged to say farewell to our friend and companion Monsieur Bourgeau, whose activity, sociability, and zeal in every way rendered his departure deeply regretted by all. In addition to his acquirements as a botanist, he showed the most untiring energy in superintending and saving the specimens, notwithstanding the numerous difficulties and fatigues so often to be encountered in such a country.*

We wait for instructions from the Home Government.

My intention had been to remain in my winter quarters at Edmonton, and there to await the decision of Her Majesty's Government as to whether the exploration should be renewed again at the commencement of the season of 1859, but owing to the great scarcity of provisions at Edmonton and the total absence of buffalo in that part of the country, I was obliged to quit the fort and take my party southward to the plains in search of buffalo as fast as possible, and to leave Dr. Hector to follow from Edmonton as soon as my instructions had arrived.

Our party consisted of 16 men, including my secretary and two friends, gentlemen from England, who joined me from Edmonton, where they had wintered along with us. We first proceeded to Buffalo Lake, and from thence to the Hand Hills, where I established a permanent camp which commanded an extensive view of the plains; thus enabling us to discern at a great distance any bands of buffalo which might be traversing this region of country, and thus I was in a position to await Dr. Hector's arrival from Edmonton with instructions to me from the Colonial Office to proceed on my exploration to the westward, returning by way of the Pacific. We then proceeded to carry out these objects for the season of 1859, travelling through a portion of country hitherto considered too dangerous to be accessible. We first proceeded in a south-easterly direction to the forks of the South Saskatchewan and Red Deer River, and from this point south to the Cyprés mountains and boundary line, thence westward again until we recrossed the mountains for the third time about the middle of August 1859.

Our route to Fort Colville.

My secretary and I, on this occasion, traversed by the North Kootanie pass, and followed the Indian trail along the Kootanie River to Colville.

This track led us through the United States territory, south of the boundary line. When about half the distance had been accomplished (between the western extremity of British Kootanie pass and Fort Colville), I left Mr. Sullivan to pursue the trail with the men and horses, and having engaged two Indians of the Paddler's tribe, sometimes called Flatbows, worked my way by canoe to the northward along Flat Bow Lake and down the Columbia to Fort Shepherd, a post of the Hudson Bay Company, situated a little to the north of the boundary line, in about the same longitude as Fort Colville, to which post I descended along the Columbia and met Mr. Sullivan, who had arrived by land the day before.

While we were thus engaged exploring the western slope in the neighbourhood of the boundary line, Dr. Hector with four men had crossed the mountains by the most northerly pass leading from the Saskatchewan River. This he found to be *Howe's pass*, a route that had at one time been used by the North-western Fur Company, for communicating with their posts on the Pacific. It had been abandoned, however, for such a long period, that he found hardly any trace of the trail that once existed, so that his progress was

* I did all in my power to persuade Mons. Bourgeau to remain, but a previous engagement for the Caucasus compelled him to depart.

much obstructed by fallen timber. The summit of this pass he considers to be less elevated than any other yet examined, but in approaching it from the east by the valley of the North Saskatchewan he had to travel over shingle flats that are flooded in spring, the channel being bounded on either hand by lofty and thickly-wooded precipices. No appreciable ascent was made, nor any decided ridge crossed, to reach the source of the stream, along which he descended, through a narrow and tortuous valley for about 20 miles, to reach the Columbia in lat. 51° 30′ N.

The Columbia at this point flows to the N.W., through a valley several miles in width, with rocky and mountainous country on either side. In that direction, however, the country appeared more open, and were it not for the dense woods might have been easily traversed. The river itself is already of large size, with a sluggish current, and continues so for the whole distance to its source at the Upper Columbia Lakes.

Not having succeeded in his attempt to proceed due west, Dr. Hector retraced his steps to the Kootanie River, and following down the ordinary trail rejoined us at Colville at the end of October.

At Fort Colville I had the means of provisioning men and procuring horses. I therefore determined that we should retrace our steps to the northward of the boundary line in order to carry out, if possible, the object of establishing a line of communication across the Rocky Mountains to the Pacific without crossing the boundary of the United States.

With this object in view I directed Mr. Sullivan to proceed with a small party of men and horses to Fort Shepherd, and thence pursue his way to the north-east in the hope of completing a junction with the Kananaskis pass, and I likewise started with a small party of men and horses to Fort Shepherd, intending thence to pursue my way to the westward.

These two branch explorations were finally successful, though only after very hard labour. Mr. Sullivan, who was obliged to send the horses back on account of the obstruction presented by fallen timber, proceeded on foot accompanied by Indians. All had to carry their provisions with them, for generally speaking there is very little game in the country, and consequently little or no food save on the lakes and rivers.

During my branch exploration by the westward, I was accompanied by an Indian and a half breed, and in addition to the fallen timber I encountered almost insuperable difficulties in the mountainous nature of the country westward of the Columbia River, and although I succeeded in forcing my way and taking the horses across from Fort Shepherd to the place where I met the American Commission upon the boundary line in long. 119°, yet I could not recommend that line of country as one through which it would be advisable to carry a road. Besides, the lateness of the season did not admit of my crossing the Cascade Range, otherwise I should myself have crossed the continent altogether in an unbroken line from Canada to the shores of the Pacific.

Here I met the gentlemen employed under the American Commissioners for laying down the boundary line from the Gulf of Georgia, near the Little Okanagan Lakes, from which point the Hudson Bay Company's trail passes north of the boundary line, altogether crossing the Cascade Range at Mansen's Mountain.

This Hudson Bay trail, which is used for bringing in supplies to Colville from Fort Langley (on the west coast) crosses the boundary line for the first time on the lesser Okanagan Lakes in long. 119° 10′ W. Being already aware of this fact, and being subsequently confirmed in this opinion by Lieut. Palmer, R.E., who made a reconnaissance of the Hudson Bay Company's trail all the way from Fraser River to Fort Colville, I did not think it necessary or justifiable to cross the Cascade Range so late in the season, and to run the risk of losing the horses without obtaining any further knowledge with regard to this old established trail beyond that already known to the Hudson Bay Company, and already supplied to Her Majesty's Government by Lieut. Palmer, R.E.

Objection to a line of railway across North America to the Pacific.

The connexion therefore of the Saskatchewan plains, east of the Rocky Mountains, with a known route through British Columbia, has been effected by the Expedition under my command, without our having been under the necessity of passing through any portion of United States Territory. Still the knowledge of the country on the whole would never lead me to advocate a line of communication from Canada across the continent to the Pacific, exclusively through British territory. The time has now for ever gone by for effecting such an object, and the unfortunate choice of an astronomical boundary line has completely isolated the Central American possessions of Great Britain from Canada in the east, and also almost debarred them from any eligible access from the Pacific coast on the west.

The settler, who will always adopt the shortest and least expensive route, will undoubtedly follow the line of traverse indicated by the formation of the country.

He will travel by steamer along the Canadian Lakes through Sault Ste. Marie to Superior City, situated at the extremity of the "Fond du Lac" or most western extremity of Lake Superior; and he will then be only 70 or 80 miles distant from Crow Wing, on the high road between Saint Pauls and the Red River Settlement.

Commercial and general prospects of the neighbourhood of the Red River.

American squatters and lumberers are rapidly settling up Red River, and the railway communication (now nearly complete to Saint Pauls), will soon be completed to Pembina, in which case the establishment of a branch line to Superior "Fond du Lac" would be a positive certainty, thus easy and rapid communication would be established between Lake Superior and the frontier of Red River Settlement.

Railway extension.

In the event of railway communication being extended as far as Pembina, it would not be unreasonable then to entertain the prospect that the Imperial Government might feel justified in encouraging the extension of such railway on the British side of the line to the northward and westward, through the southern portion of "the fertile belt" to the Rocky Mountains; at all events as soon as the country showed symptoms of becoming sufficiently populated to warrant such an effort.

As the case at present stands all communication with the Colony at Red River is through the States. Soon after the publication of my despatch, declaring the navigability of the Red River for steamers, American enterprise established one there; this, as I now understand, plies the whole way from Lake Winnipeg to Graham's Point, above the forks of the Shienne, and, now that the results of the Expedition lately under my command are known, even the Hudson Bay Company have adopted the route *viâ* St. Pauls and Pembina, for bringing their merchandise into this country. As for the importation of horses, cows, and any other species of live stock, all such traffic would be impossible either *viâ* Hudson Bay or by the canoe route. To the westward of the Rocky Mountains the communication is very arduous; no road fit for carts exists north of the boundary line, nor indeed is there a single portion of the territory that could be traversed by the roughest or strongest cart, from the plains at the entrance of the several Rocky Mountain passes in the east until you come to the western slope of the Cascade range. A road from the Kananaskis pass to the Columbia River, in the neighbourhood of the 49th degree, would not be a very arduous undertaking; from this point, however, there would be no further desirable road to the westward by land, without passing through American territory. The present track from Fort Shepherd to the westward follows the Ohailpitku (or Colville) river, crossing and recrossing the boundary line, until it passes the Okanagan Lakes: thence it bears away to the north of west by the valley of the Similkameen and crosses the Cascade range over Mansen's Mountain. This is the trail now used by the Hudson Bay Company for communicating between their posts on either side of the Cascade range. Any attempt to take a road between the Columbia River and Little Okanagan Lake exclusively in British territory, or otherwise than by the valley of the Ohailpitku or Colville River (although not impossible, for I have forced the traverse myself), would be a most formidable and expensive undertaking.

Another route to the Pacific.

There is, however, another means of proceeding from the Columbia to the westward, in a more northern latitude, which I can advocate upon excellent authority,* although I cannot describe it from personal observation.

The Columbia River, north of the boundary line, is navigable by steamers the whole way up the Great Columbia Lakes, and above the most northern one to an extensive plain or table land, along which my informant has taken heavily laden horses with ease round both the northern and the southern shores of the Great Okanagan Lake to the forks of Frasers and Thompsons rivers.

A steamer here would not only serve for effecting communication between the Saskatchewan plains and the west coast of British Columbia, but would also form an additional link to that chain of American steamers already along the Columbia from Astoria on the Pacific coast.

From Astoria, ocean steamers can ascend the Columbia River up to the point where it cuts the Cascade range, a distance of 135 miles; here a boarded portage and tramway, about two miles long, enables the traveller to reach a second steamer which runs up to the Dalles, distant about 48 miles. At this place a steep waggon road, which is kept in good order, takes the traveller on to the Des Chutes, a distance of 12 miles, whence a third steamer runs up as far as old Walla Walla, and when occasion requires up to Priests Rapids, distant from the Des Chutes 180 miles.

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* Namely, that of Mr. Angus McDonnell, one of the gentlemen in charge of Fort Hope, and subsequently of Fort Colville, where he had been long resident, and in the constant habit of travelling backwards and forwards through the country.

The navigation of the river is still unbroken as far as the Okanagan, where a rapid occurs 10 miles long. From the Okanagan to Colville, a distance of over 300 miles, it is said that there is but one rapid to interrupt the navigation of the river, but of this portion of the river we have no personal knowledge.

From the upper part of the Kettle Falls at Colville there are but two portages that would interrupt steam navigation to the mouth of Pendoreilles River in British territory, and from this point I am credibly informed that the river is available for steam navigation as far as and beyond the upper of the two great Columbian lakes, up to a point where a road might be resumed as I have suggested above.

'ossible ıtroduction f agricul- ıre among ıe Indians.

We do not apprehend that the Indians along the North Saskatchewan are likely to cause any serious difficulties to the settlement of the "fertile belt." The Salteans, Crees, and Thickwood Assineboines have been for many years on the best terms not only with the members and servants of the Hudson Bay Company, but with all the free traders, missionaries, visitors, &c., that have visited their country; this may be in some measure accounted for by the justice and good faith which characterize all the dealings of the Hudson Bay Company with them, and also by the number of the company's servants who have adopted their women, and have established with them relationships of which they feel proud.

If white men, or indeed if half-breeds were to settle as agriculturists in the country, I do not say that they would never have serious cause of complaint with the Indians of the North Saskatchewan; quarrels doubtless would arise sometimes out of horse stealing, at other times out of their harmless mischief; but I do not think that any organized system of aggression would be attempted against the settlers, and I even think that many Indians, provided they could obtain farming implements, would follow the examples they saw before them, and begin to till the soil themselves.

No doubt it would often happen that the Indians might carry off horses or oxen, and that the white man in pursuit of them would come into deadly collision with them, the result of which would be a regular system of reprisals. But if examples of practical agriculture, and facilities for obtaining agricultural implements were offered to the Thickwood Crees and Mountain Stoneys, I am certain that they would very rapidly commence planting potatoes, and so save themselves from much of the labour and hunger which they have to endure throughout the winter in providing the flesh of the elk, moose, and deer, as food for their large families. First-rate hunters have frequently told me that such hard and constant labour in pursuing thickwood animals for the support of themselves and their families left them neither courage nor time to devote to their traps, and that consequently they could not get furs wherewith to purchase blankets and other comforts for themselves from the company, adding that if they could be sure of a meal of potatoes sometimes they could follow the traps.*

Prospects and dangers of the settlers amongst them.

The settlers, however, would not find all the Indians with whom they came in contact so friendly as the generality of those that occupy the fertile belt. The country to the southward on both sides of the international line is that of the Blackfeet, Piegans, and Blood Indians, and I should apprehend that these Indians would form large war parties (against the Crees ostensibly), and these war parties, although first organized without any hostile intention against their agricultural neighbours, yet infallibly would end in attacks on the property of the settler and in loss of life to both Indians and settlers. When once the party goes forth to war, its individual members are not very nice in their distinctions who may be the owners of the horses they steal. Add to this the fact of the settler being a friend of their enemies, the Crees, will be accused of having furnished them with ammunition, which will render him liable to be ill-treated when he is in the power of these wilder and more uncertain tribes. In the exploring season of 1859 our Expedition traversed the whole of the British portion of the territory of the Blackfoot, Piegan, and Blood Indians, but such was the general terror of the half-breeds whom I had engaged, that it was with the utmost difficulty I could lead them on, and, indeed, if it had not been for the gentlemen and the Americans who had taken service under me, I do not think I could have gone forward at all.

The Hudson Bay Company have long given up the posts they once held in that country as too dangerous to maintain, and since my departure from the country even the Rocky Mountain House, the last of the Blackfoot posts, has been abandoned

Causes of our success among the Blackfoot tribes.

The successful preservation of our friendly relations with the Blackfoot tribes while travelling through their country was not so much owing to the strength of our party, although we were twenty-three in number, as to two other causes. In the first place, I

* Martens, fishers, beaver, &c., are caught by the Indians in traps, larger, but similarly constructed to our vermin traps made in England, supplied to them by the Hudson Bay Company.

had previously become acquainted with many of them while staying at the Rocky Mountain House during the preceding winter, when I had met them in several hunting excursions, and when they go about in small camps and have no opportunities of becoming excited by war or liquor.

The next cause was Dr. Hector's great success in his profession, especially among the women and children, which called forth their astonishment, and in many cases deep, though undemonstrative gratitude. Although we were always well armed and on the alert, and never in their power (save in the very large camps along with the head chiefs), yet I think it in a great measure owing to the causes above mentioned that we have succeeded in effecting the objects of the Expedition without experiencing any disastrous results from a single one of those tribes.

However, I do not consider that a total stranger to them would be equally safe, or that any one accompanied by a military force (unless that force was a very large one) could do so with impunity. In either case his horses would be stolen, and this, of course, would lead to fighting and loss of life; for these Indians traverse the plains together in very large camps of from 400 to 600 tents.

I have great pleasure in alluding severally to the members of the Expedition, from whom I have always received the most cordial and efficient support.

Dr. Hector, whose able assistance and exertions mainly contributed to the success of the Expedition, was most indefatigable not only during the general exploration seasons, but also during the several winter excursions, which he prosecuted in snow shoes, accompanied by dogs drawing provisions on sleighs, exposed to the hardships of an almost arctic temperature.

During the winter of 1857-8 Dr. Hector mapped the whole of the North Saskatchewan, from Carlton to Rocky Mountain House, a distance of nearly 9° of longitude.

Starting at the commencement of the second winter from Edmonton, he passed over to the glaciers of the South Saskatchewan, to the Assineboine, a tributary of the Arctic Ocean, and thence to Jasper House, through the Rocky Mountain forests, as far as 116° of longitude: besides such arduous journeys so ably accomplished, Dr. Hector had the charge of making the maps, both geographical as well as geological. I have also the pleasure of recording the efficient services of my secretary, Mr. Sullivan, a most able astronomical observer and surveyor, also a most accomplished mathematician; on him devolved the principal labours of computation. Besides his avocations of writing, observing, and computing, Mr. Sullivan, late in the season of 1859, accomplished successfully a most arduous branch expedition, *viz.*, the connexion of the western exit of the Kananaskis pass with the Columbia River, above that point where it intersects the boundary line, and a most important link in an exclusively British communication between the Saskatchewan and British Columbia.

Of Mons. Bourgeau, our botanist, I have also to speak with the highest praise. Ever intent on and devoted to his department of science, he not only prosecuted his researches indefatigably in the field, but also was most careful and successful in preserving his specimens in the evenings and during night under the most trying occasions, never allowing fatigue or any other adverse circumstances to interfere with the interests of his collections.

The men employed by the Expedition were chosen from the French and English half-breeds, most of whom had (more or less frequently) been in the employment of the Hudson Bay Company. These men were engaged generally for the summer, or exploring season, commencing in May and terminating in October, after which they became entitled to be sent back free of expense to where they came from, in addition to their wages.

At the termination of the season the men were discharged, with the exception of two or three employed continually during the winter guarding the horses, and one who attended on us when we resided at a Hudson Bay Company's post. When any of us started on a winter trip, a man, or, perhaps, two were engaged specially, and frequently we obtained the services of men in the employment of the Hudson Bay Company, by permission of the officer of the post from which we started.

Beyond the immediate neighbourhood of Red River Settlement no money of any coinage whatsoever is in use, and all payments are made in kind; the men, therefore, had to be paid in such articles as coats, trousers, blankets, guns, ammunition, tea, tobacco, axes, knives, &c., and as the Hudson Bay Company's stores never contained a sufficiency of such goods for the purposes of their own trade, I organized a further supply (in anticipation of the payments at the end of each season to men employed by the Expedition). These supplies were forwarded to me from Norway House up the Saskatchewan to Carlton in 1857 and to Edmonton in 1858, along with supplies of tea, sugar, and flour, for the use of the Expedition.

During our canoe route in the commencement of the summer of 1857, we were provided by Iroquois half-breeds, engaged for us by Sir G. Simpson, from La Chine in Canada. These men were only engaged up to the period of our arrival at Red River Settlement. Those engaged for our first season's journeys in the plains were English and French Red River half-breeds, about 12 in all, and their services terminated at our arrival at Carlton, whence they started again on foot to return to Red River, a journey of 600 miles. I paid them for the time consumed on the journey, and allowed them two carts and horses to carry their bedding and provisions.

During the second season's explorations, when we contemplated passing through a portion of the Blackfoot country, previous to crossing the mountains, I deemed it necessary to employ a greater number of men, and therefore engaged 12 from Red River, and directed Dr. Hector to procure the services of 12 others from the settlement of Lake St. Ann, about 40 miles west of Fort Edmonton. These men were directed to go down from Lake St. Ann to Carlton, where they met the men engaged by me, who also started for the same place in March 1858, from Red River Settlement.

During the third season's explorations, I had not only English and French half-breeds in the service of the Expedition, but also employed several Americans who had failed in crossing the mountains in search of the gold already reported to be abundant on Fraser River. Although these men were not experienced in the usages of prairie life, yet I found their assistance most valuable, as I could always rely on their siding with the gentlemen in supporting me, when I insisted on traversing the Blackfoot country, at the time when only one or two of my half-breeds were to be depended on, and had it not been for them, I should have found it impossible to coerce the rest. In alluding to this subject, however, I cannot omit to mention that the gentlemen of the Expedition (Dr. Hector and Mr. Sullivan) were ably seconded by my friends, the late Capt. Brisco and Mr. Mitchell, in staunch adhesion to my proposed plan of operations.

From among all the men engaged in the service of the Expedition, I feel great satisfaction in bringing forward for special notice the services of James Beads, a half-breed from Red River. In the year 1857 he was in the service of the late Sir George Simpson, who transferred him to me at the commencement of the Expedition, and he remained equally faithful and zealous to the last, always charged by me with the most trustworthy missions and the most arduous undertakings. James Beads finally accompanied me into California, where, by my advice and at the request of the gentlemen in charge of the boundary line commission from the Gulf of Georgia, he left us to remain still in the service of the Imperial Government under Colonel Hawkins.

Before concluding this Report I must avail myself of this opportunity to express my thanks to the officers of the Hudson Bay Company for the assistance they have always afforded in furthering the objects of the Expedition. At Red River Settlement we were most hospitably entertained by Mr. Swanston, who, according to directions sent by me to him before I left England in 1857, purchased horses and engaged men for our first season's explorations. In addition to this, Mr. Swanston most kindly undertook and carried on very valuable meteorological observations in connexion with those which the gentlemen under my command were conducting at Carlton.

Mr. McTavish, who succeeded Mr. Swanston in charge of Red River, was also most zealous in assisting to carry out the objects of the Expedition, and in furthering my views when engaging men during the winter of 1857, for the explorations of 1858.

On Mr. Hardisty, the officer in charge of Carlton, where the Expedition wintered in 1857-8, devolved the labour of increasing the accommodation for the Expedition; the winter was subsequently a very trying one, for many reasons, among which was the absence of buffalo from that part of the country; nevertheless Mr. Hardisty acquitted himself most ably and cheerfully, and obtained the good wishes of every member of the Expedition.

Mr. Christie, the gentleman in charge of Edmonton, during the wintering of the Expedition in 1858-9, did everything in his power to contribute, not only to the welfare of the Expedition, but also to our personal comforts He undertook for me also the organizing of my goods for payment, and paid the men, a most troublesome office, which I should have had the greatest difficulty in completing without his assistance.

Mr. Moberly, the officer in charge of Jasper House, entertained Dr. Hector with all the hospitality in his power, and also himself carried on meteorological observations at Jasper House, the furthest point of west longitude reached by the Expedition east of the mountains.

Of Mr. Brazeau, the gentleman in charge of the Rocky Mountain House,* I have to speak in terms of the highest praise.

* The only fort held by the Hudson Bay Company in the Blackfoot country, and since then abandoned.

It was at his trading post above mentioned that I myself resided during a considerable portion of the winter of 1858–9, and from whence I made several hunting excursions along Battle River and Red Deer River, in order ostensibly to hunt, but really to establish personal acquaintance with the chiefs and principal men among the Blackfeet and Piegan Indians. I was most hospitably received by Mr. Brazeau, who also did everything in his power to assist me in effecting interviews and establishing friendly feelings towards us among these Indians. Subsequently Mr. Brazeau was in charge of Fort Edmonton during the summer of 1859, and complied with some urgent requests of mine at considerable personal inconvenience to himself. And this timely assistance from Mr. Brazeau proved of great importance to the welfare of the Expedition.

On our arrival at Fort Colville, we found Mr. Blenkinsop in charge of that post, and to this gentleman I have to express my sincere thanks for aiding us most liberally under circumstances of great difficulty connected with the resources of the Expedition. Mr. Blenkinsop also assisted me in every way to furnish horses and provisions for the several branch expeditions undertaken from Colville, and likewise permitted one of the gentlemen under his command (Mr. Margary) to accompany Mr. Sullivan as interpreter, while the latter was conducting his explorations for the connection of the Kananaskis pass. In this service Mr. Margary displayed zeal and powers of endurance of no common order.

Before our final departure from Fort Colville, Mr. Angus McDonnell arrived there, and subsequently succeeded Mr. Blenkinsop in the charge of that fort. To Mr. McDonnell I am indebted for much valuable information concerning the country between the Rocky Mountain chain and the Cascade range.

Finally the thanks of the Expedition are due to Mr. Dallas, through whose courtesy the money matters of the Expedition were finally adjusted.

EXPLORATION OF BRITISH NORTH AMERICA.

Introduction.

The objects for which Government sent out the Expedition.

Her Majesty's Government being anxious to obtain correct information with respect to the facilities or difficulties of communication between the Canadas and the country west of Lake Superior and north of the 49th parallel, determined early in the year 1857 to send out an expedition to examine the present route of travel with a view to ascertain whether it could be either shortened or rendered less formidable by any reasonable outlay, and whether if such an expenditure of capital were devoted to that object there was any prospect of a result favourable to emigration or agriculture commensurate with the sacrifice.

Object 1st. Information relative to a route favourable for emigration or agricultural objects.

The Government was also desirous of obtaining information relative to a large belt of country until now almost unknown, namely, that comprised between long. 97° W. and the Rocky Mountains, and ranging from the 49th parallel of latitude to the North Saskatchewan.

2nd. To ascertain the nature of the country westward of Red River and elbow of Saskatchewan and north of boundary line.

In addition to both these motives, the Government wished to ascertain whether any practicable pass or passes available for horses* existed across the Rocky Mountains within the British territory and south of that known to exist between Mount Brown and Mount Hooker in latitude 54° 10′.

To find a pass or passes across the Rocky Mountains north of boundary line and south of the Boat Encampment.

Ever anxious to promote the interests of science, when that object can be obtained consistently with a just economy of public money, Her Majesty's Government attached to the Expedition Lieut. Blakiston, R.A., Dr. Hector, Mr. Sullivan, and M. Bourgeau, at the several recommendations of General Sabine, Sir Roderick Murchison, Doctor Purcell, and Sir William Hooker.

Gentlemen attached to the Expedition.

At the suggestion of General Sabine, Lieut. Blakiston did not take his passage by steamer along with myself and my other companions to New York, but remained with the many delicate instruments for magnetical observations under his charge together with some meteorological ones, and started about six weeks later by the Hudson Bay Company's ship "Prince of Wales" to York Factory, Hudson Bay, thence by boat route to Norway House, Lake Winnipeg, and up the Saskatchewan to Carlton, where he joined the Expedition before the commencement of winter.

Lieut. Blakiston.

My other companions, Doctor Hector, Mr. Sullivan, and Monsieur Bourgeau, started with me from Liverpool to New York on the 16th of May 1857, in the "Arabia," Capt. Stone.

Doctor Hector
Mr. Sullivan.
M. Bourgeau.

On the 28th of May we entered the Hudson, and experienced considerable difficulty with the Custom House authorities owing to our unwillingness to unpack the cases containing our barometers, thermometers, and other fragile instruments on account of the great difficulty of packing them again. Subsequently, however, through the kind assistance of Mr. Pompelly, a merchant of New York, who took an immensity of pains in the matter, our cases were not only unopened but passed duty free.

Difficulties with the Custom House authorities overcome.

On the 2nd of June we started from New York for Detroit on Lake Huron, there to await the American lake steamer "Illinois," in order to proceed to Sault Sainte Marie, where I expected my two canoes, which I had (by directions from England several mails previous to my departure) arranged to meet me from La Chine in Canada.

Start for Detroit.

* The only pass then known to be within British territory being that between Mount Brown and Mount Hooker, known as the Boat Encampment, and impassable for horses.

Journal of Expedition, 1857-8.

Start from Detroit. Steamer Illinois much damaged by ice.

June 6. This evening the steamer "Illinois" which plies between Lake Erie and Lake Huron arrived at Detroit, we got our luggage on board and obtained tickets for the passage. The steamer was much behind her usual time, owing to damage which she had received on this her first trip this season, in passing through the ice on Lake Superior, Mr. Trowbridge, a Detroit man to whom we had a letter from Mr. Pompelly of New York, showed us much attention and introduced us to the captain of the Illinois (Captain Wilson), who afterwards did everything in his power to further our views and assist our arrangements.

We found the steamer "Illinois," like all first-class American steamers, most comfortably fitted up for the accommodation of passengers, and the table and attendance excellent.

Fellow-passengers.

Among the passengers on board were many settlers, who with their wives and families were returning home to their farms, after spending the winter months either in amusement in the towns, or in the enjoyment of a summer climate in the south.

We had also on board several managers and people employed in the copper mines, who described a most prosperous state of things both as to the richness and the quantity of the ore taken up there, which they told us paid very well, notwithstanding the high rate of wages. Our course from Detroit was for the first seven hours northerly up the River Huron. This river averaged three hundred yards in breadth, and its banks assume an elevation of about thirty feet. The lands beyond are flat and densely wooded. There are a considerable number of comfortable looking dwellings on the banks of the river, but by far the greater number are on the American side. Towards evening we entered Lake Huron, and during the night we made 70 miles along the west shore, and striking across the wide funnel-shaped part of the lake, the next day found us quite out of sight of land.

River Huron.

More settled on the American side. Lake Huron.

Ste. Marie River.

June 9. Very cold during the greater portion of this day, and the thermometer as low as 42°: after nearing the north shore of Lake Huron at 5 p.m., we entered the beautiful River of Ste. Marie. For the first 10 miles it varies greatly in breadth, being in some places 2 or 3 miles across, and in others only 200 or 300 yards; in this part of its course it is thickly studded with islands, which add greatly to the beauty of the scene. From the entry to the Ste. Marie to the falls of that name the distance is 54 miles. As the river was shallow in many places and difficult to navigate, we stopped that night at Church's Settlement, and awaited the morning for our further progress up the river. The man who gives his name to this spot had frequently been a bankrupt in the mercantile world, and in order to escape from his creditors came to settle here, where he now realizes a fine income from the manufacture of raspberry jam and maple sugar. During the last year Mr. Church imported 1½ tons of white sugar for the manufacture of raspberry jam alone, and exported 7 tons of sugar procured from the maple. He possesses a store which contains almost every thing that a traveller can want. Besides his establishment, however, the houses are small and few in number. The mouth of Ste. Marie's River is in a bay, the shores of which are flat and thickly wooded. About 3 or 4 miles from its mouth it expands into a succession of lakes thickly studded with numerous rocky islets consisting of rounded bosses of granite and gneiss; further up the stream, where its banks again approach, they are composed of smoothed shining bosses of a deep red granite: as a rule these exposures of rock are confined to the north bank of the river, the south bank and the country beyond being much flatter and apparently swampy.

Navigation difficult. Church's Settlement.

Wild fruit and maple sugar.

Granitic rocks.

Sault Ste. Marie.

June 10. By daybreak this morning we started for the Sault, which we reached in about an hour. Here we were met by Mr. Simpson, the agent at the Hudson Bay Company's post at the Sault, who delivered over to us two north canoes, with their outfit and their crews of 16 men. The names of our voyageurs are here subjoined.

Our canoes.

1st Canoe.

*Jack Sakarontaketato	1st Guide.
Antoine Charlot	2nd Servant.
Michel Ochichagaron	Middle man.
Olivier Laderoute	do.
Louis Tekakowakii	do.
Jacques Kariwagoron	do.
Bazil Mentour	do.
Olivier Bourdeau	do.

2nd Canoe.

Ignace Mentour	2nd Guide.
†James Beads	1st Servant.
Michel Tisowanotow	Middle man.
Francois Atohareson	do.
Michel Kanosesari	do.
Michel Achiwatone	do.
Ignace Kantantne	do.
Henri Sorwanhantow	do.

Our canoes were of the old north-western voyageur sizes and model, differing considerably from the Indian shape, with 2 bows measuring 30 feet long and 5 feet in greatest breadth. Their cradles of cedar wood were only ½ inch in thickness, and the exterior or covering of the canoe was of birch bark. The seams are sewn with pine rootlets, and, like the crevices in the bark, are daubed over with the resin which is obtained from the red pine.

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* Old Jack Sakarontikitato had frequently served as guide and steersman to Sir George Simpson, and had not missed one season for 30 consecutive years in starting each spring, and performing the whole journey from La Chine to Norway House on Lake Winnipeg, and back again.

† James Beads was also very kindly transferred by Sir George Simpson from his service to ours, and ever afterwards proved the most valuable man in the Expedition, and followed us during the whole of our three years' work until we arrived at San Francisco, where, upon my recommendation, he still continues in Her Majesty's service in the Expedition from the Gulf of Georgia, under the command of Col. Hawkins.

At Sault Sainte Marie there is no settlement on the Canadian side, save the Hudson Bay Company's trading post. But on the American side houses are scattered in every direction, the land is plotted out as if in expectation of the sudden growth of a large city, and several hotels, bars, and billiard-rooms have already sprung up.

At Sault Sainte Marie I made an arrangement with Captain Wilson to take my two canoes and 16 voyageurs on board the "Illinois," and strike across the lake out of his course, and approach the western portion of the island as near as in the present knowledge of the soundings he could venture. I adopted this plan in preference to the course hitherto in practice, viz., that of coasting along the north shore of Lake Superior in the canoes. Thus I not only saved time but provisions, and calculated on shortening the voyage to Fort William on the Kaministaquoiah by eight days. The saving of time was an object, as the summer was progressing rapidly, and still the lake was full of floating ice. At the Hudson Bay Company's post at Sault Sainte Marie we obtained some more provisions and a few further necessaries for our future canoe voyage, and then returned to the "Illinois" steamer, along with our 16 voyageurs, and our canoes, which were now placed on board, and we ascended the grand canal which unites the Sainte Marie River with Lake Superior.

This canal was constructed to avoid the falls which occur here. It is cut through beds of calciferous sandstone belonging to the lower silurian period, and by it a rise of 30 feet is attained. The falls are more properly speaking a long rapid filled with boulders and loose fragments of rock. This rapid is two or three miles long, and presents very much the appearance of the St. Lawrence about three miles above the Canadian Fall at Niagara, though of course nothing like the gigantic scale of the latter. On the English side many large masses of granite, gneiss, and greenstone are strewn about, and above the falls where the river rapidly expands into an arm of the lake, the south shore becomes high, while the north shore, although low, is by no means flat.

Lake Superior. Ice on the lake.

On entering the lake the scene was almost arctic, and the cold intense. Floating ice pervaded the lake, but was easily broken when coming in contact with the sides of the vessel, and some curious phenomena resulted from the collision, which caused the floats generally to split into small prisms whose length was the thickness of the hummock, a structure induced by the thawing of the mass; and the cohesion of these with one another being very slight, no sooner did the vessel strike one than it flew into a multitude of needles: or, if the cohesion was not altogether overcome, then the mass floated like a brush with the hair uppermost, and in that state, from the absorption of water, assumed a black colour, which contrasted strongly with the glistening whiteness of the surrounding masses. Some were observed to be five or six feet thick.

Curious structure of the hummock.

South shore. Copper Harbour.

June 11. Early in the morning we regained the south shore of the lake, and during the day stopped at several places. One of them, Copper Harbour, is an excellent anchorage, being protected by a natural breakwater which extends across the mouth of the bay. The largest settlement along this portion of Superior is Outanagan, at which place, the navigation being very difficult, we waited till morning. The town is situated on a bay of that name.

Outanagan.

June 12. At daybreak came within sight of Isle Royale, bearing away to the N.E. The steamer stopped within four miles of its shore, and here our canoes were lowered into the water, and the loading commenced; this did not occupy much time, as the two cargoes had already been portioned to each. Considerable care is requisite in loading a canoe, and none but an experienced voyageur should be entrusted with it. No heavy solid article of any kind should be allowed to rest upon or against any part of the canoe. Long poles reaching fore and aft are placed along the bottom of the canoe, on which the hard and the heavy articles rest, thereby avoiding all thrust or undue pressure on any one point. These poles are kept separate by a light wooden grating in the centre of the canoe, and on which the bedding of the two passengers is placed as a kind of seat or lounge. Little more than half an hour's brisk paddling brought us into a small bay on the island, where we landed for breakfast. Notwithstanding the quantity of drift ice that filled up the eastern end of the lake, the temperature of the water was here 48° Fah. and that of the air 51°. While we were at breakfast a smart breeze arose, and we did not regret that our stay on the island was prolonged by the strong wind which had sprung up, which allowed us a little time for a partial examination of the island. Isle Royale is of considerable extent, measuring 160 miles in circuit. It presents a very rocky shore, and consists of alternate beds of trap, a dark green stone. Although the soil on the island is not deep, yet it supports very dense forests, and chiefly consists of decomposed vegetation. Its principal botanical productions are *Betula papyracea* (by far the most abundant tree), *Abies alba*, *Pinus Banksiana*, *Alnus* (two species of), *Larix Canadensis*, and *Thuya occidentalis*. The vegetation at this date was not in an advanced state, the trees not yet being in leaf, and the herbaceous plants had not appeared. The lynx is the largest animal on the island, and is said to be very common. At 1 P.M. we commenced preparing for our start, and the voyageurs gummed the canoes, an operation necessary at almost every encampment. The gum is first warmed at the fire and then rubbed into the seams of the canoes. After this a piece of burning wood split answers the purpose of a blow pipe, by which the crevices are all stopped up. We had about 17 or 18 miles to paddle across from our breakfasting place on the island to the nearest point on the main shore, and were hardly half way when we were threatened with a storm to windward of us, and the men worked hard to reach the opposite side, as these lake storms are very dangerous for canoes under any circumstances, but especially to one heavy laden as we were. The storm, however, passed over without reaching us, and in four hours after starting we arrived on the opposite shore of the lake, and landed on a small islet consisting of red trap rock in Hamishee (or Thunder) Bay.

Isle Royale. Geological structure.

Vegetation.

Gumming of canoes.

Thunder Ba

This small islet is one of a group called the Victoria Islands, laid down in a manuscript note on a copy of Captain Bayfield's map given to us by Professor Nicolay in London.

Victoria Islands.

When we first started from Isle Royale to cross to the lake shore, the men did not in the least know where they were, and were evidently uneasy until about half way across, when they recognized headlands in the north-west, which were familiar to them. After a short delay we pushed on again for Fort William, now distant about 16 or 17 miles. The evening was calm and lovely, the shores were thickly clothed with pines, through which occasionally peeped dark cliffs of basalt columns. In addition to the grandeur of the scene we could not avoid being impressed by a silence to which we were not yet accustomed, and broken only by the noise of our paddles. Thunder Mountain crowned the magnificence of the view, defining the eastern extremity of the bay, and rising 1,300 feet above the level of the lake.

Basalt cliffs

Thunder Mountain.

Pie Island.

We passed close under the cliffs of Pie Island, which stands at the entrance to Thunder Bay, and observed its conical summit 800 feet high, to be densely wooded. A group of low, well wooded islands lie further up the bay, called the "Welcome Islands," and on one of them the tents of a few Indian families were pitched for the sake of the fisheries. It was dark when we entered the Kaministaquoiah River, and at 10 P.M. we landed at Fort William, and were most hospitably received by Mr. McIntyre, the gentleman in charge. We learnt from this gentleman that Sir George Simpson had preceded us about eight or nine days on his annual inspection. Fort William was built in 1803, in the time of the North West Company, and came into the hands of its present owners, the Hudson Bay Company, in 1821, at the union of the two companies. It was of considerable importance to the former, being the place at which their annual general councils were held. At present its returns as a trading post are inconsiderable. The fort consists of a large dwelling-house of wood erected parallel to the banks of the river, in which the family of the Hudson Bay Company's officer resides; two large storehouses, built at right angles to the dwelling-house; and the whole enclosed by pickets five feet high.

Enter the Kaministaquoiah River and land at Fort William.

An old post of the North West Company.

June 13. Occupied all day in repacking our luggage, so as to render it in weight and bulk most convenient for the portages, which are very numerous on the route; the luggage is, as nearly as possible, portioned out in lots of about 90lbs. each, called "pieces." The voyageur carries two of these pieces at each trip backwards and forwards across the portage on his back; they are held by a long leather strap called a portage strap, the peculiarity of which is its being broad in the middle, where it is adjusted to the man's forehead, leaving him the free use of his arms in passing through the brush.

Adapt our luggage for the portages. How the voyageur carries his loads across the portage.

The country about Fort William is richly wooded with spruce, white cedar, birch, and scrubby pines, but, except strips along the river banks, its swampy nature will prevent its ever becoming valuable to the agriculturist; it is in fact a delta composed of the sediment brought down by seven or eight rivers which pour their waters into Thunder Bay. There is a Catholic mission two miles above the fort, under the guidance of two French priests, M. P. P. Chone and M. D. du Roquces, who have built a very pretty little chapel of pine wood. Two hundred of the Chippewa tribe were tenting about the mission, and also a few pagan families; one of the chiefs belonging to the pagan portion of the tribe possessed ten wives.

Nature of the country about Fort William.

Roman Catholic mission.

Indians live by fishing.

The occupation of these Indians is chiefly fishing, a fact of which even a passer-by on the river need not be informed, as the fish oil used by them for their hair and for culinary purposes taints the atmosphere around. A great deal of fish is bartered by them at Fort William, consisting chiefly of sturgeon, white fish, cat fish, trout, and gold eyes; from all accounts there are seven kinds of sturgeon in Lake Superior. The largest trout we saw weighed 30 lbs. In a letter received from Sir George Simpson at Sault Ste. Marie, we were advised to change the canoes at Fort William for others more suited for carrying over the portages. We are much indebted to Mr. McIntyre for his attention and hospitality, and for his kindness in assisting us to carry out our views in every way in his power. We were sorry to find here that one of the Kew thermometers and the max. reg. of Negretti and Zambra had been broken, also one of the mountain barometers. During the day Mr. Sullivan obtained the latitude and longitude of Fort William, also the variation of the compass: these results are calculated elsewhere. The chronometer rates have been very uniform since leaving England, as his longitude differs only a few seconds from Captain Bayfield's determination on the survey of Lake Superior. I was occupied the greater part of the day in making arrangements for a branch expedition up White Fish River, so that we made but a short distance from Fort William, and reached our evening encampment on the left bank of the Kaministaquoiah at 7.30 P.M. In this portion (12 miles) the river is not rapid, and winds through a kind of inland delta, as above stated. It is beautifully clothed with vegetation, having the same character as that on Isle Royale, but a great difference was observable in the more forward state of the trees here than at the former place, as here they were in full leaf. The spruce and birch attain a much greater size in the environs of Fort William than at Isle Royale. In the windings of its course, the river passes close under McKays Mount, which is elevated 1,060 feet above Lake Superior, and forms a conspicuous landmark.

Obtain smaller canoes.

Instruments broken.

Start from Fort William.

Vegetation on the Kaministaquoiah further advanced than on Isle Royale.

The Grand Rapid.

June 14. Rose a few minutes before sunrise and were off at 4 A.M., the barometer at starting 29·34, thermometer 49°; in less than an hour reached the Grand Rapid, where the men had to lay down their paddles, take their long poles, with which they had previously provided themselves, and punted up the river.

The vegetation on either side is less luxuriant than lower down, and the banks have a much greater elevation. When a long bend of the river allowed us to see over the tree-tops, we again obtained a glimpse of the high basalt cliffs of McKays Mount to the south of the valley.

Banks marked by terrace levels.

At 10 A.M. we stopped for breakfast, and landed on a part of the bank devoid of wood, and forming well-marked terrace levels. This terrace structure commences about 20 miles from the mouth of the river, rising to the height of from 60 to 80 feet above the level of a broad alluvial flat, through which the river has a comparatively straight course. These terraced banks are composed of a red sandy marl, from the summit of which the country is level, as far back as we could perceive, with little or no swamp. The clearing at this place is only partial, and had evidently been caused by fire. At 12.15 P.M. our canoes arrived at Lazy Portage.

Lazy Portage.

Here rocky ledges cross the river bed, causing a rapid, but no fall. Most of our baggage was landed, and two lines attached to the head of the canoes, while their crews "tracked" or towed them up the rapids, wading to their waists in water. After crossing the portage and reloading our canoes, we continued to ascend the stream. Above the rapids the river again becomes sluggish, the rocky obstruction acting as a dam to the descending waters. At this portion of its course numerous mud islands covered with a thick growth of willows rise in its centre. At 3.15 P.M. we encamped opposite the mouth of White Fish River. Soon after we had pitched our camp the rain came down in torrents, thus preventing any further work for the time. The Kaministaquoiah here cuts a channel for itself through a great thickness of reddish black alluvial deposit. We can easily imagine that the existence of such a tributary as the White Fish River might be overlooked, since, at its embouchure on the right bank of the Kaministaquoiah, it has much the appearance of a bay or indentation of the main river. On ascending the bank immediately behind our encampment, which attains an altitude of 70 feet, the country presents great irregularities in every direction, and, as a rule, is densely wooded. The light green tints of the cypress pine distinguishes the high dry lands from the low river margins, which are characterized by the sombre

"Tracking" the canoes.

Mouth of White Fish River.

Appearance of the surrounding country.

green of the spruce. From this place also we observed a line of hills stretching from the neighbourhood of Fort William to the south-west; the same range with rounded summits are seen to skirt the shore of Lake Superior, between Thunder Bay and Pigeon Point. The country to the west and north does not seem to possess any greater elevations than the range of heights to S.E.

June 15th.—A very wet day, every hour showed a descent of the barometer. Occupied all the forenoon in completing my preparations to ascend White Fish River, for this purpose I hired, while at Fort William, three Indians, and obtained three very small canoes, (in order to command the least possible draught of water), and were barely of sufficient size to hold three people, namely, a paddler fore and aft, and a passenger in the middle; much experience and practice is necessary to paddle or punt these small canoes without upsetting them, and even the passenger in the middle must remain perfectly quiet in order to preserve their equilibrium. Doctor Hector, with an Indian and one of our voyageurs, occupied one canoe, I took the second, accompanied by James Beads and another volunteer from among our voyageurs. The other two Indians took charge of the canoe containing our provisions; about 11 o'clock the day cleared up and Hector and I started on our branch expedition up White Fish River, and Mr. Sullivan and Mons. Bourgeau to camp, with directions that the former should ascertain the position of the mouth of White Fish River, make measurements of its breadth, and take soundings for about two or three miles up the stream. His results are, breadth at mouth, 55 yds.; depth at mouth, 4½ ft.; and for the distance which he proceeded up the stream, no considerable difference was observable in the breadth, but the depth of the river only averaged one foot.

Our three small canoes.

In my ascent of White Fish River we soon encountered rapids; at the first of which, 100 yards from its mouth, there is only 2 feet of water, and this is about the depth of most of them, while the intermediate pools are about 5 feet deep. Thus, for all purposes of navigation, the stream must be useless. During the first afternoon we passed in all 26 rapids at most of which the men, and sometimes ourselves, were forced to get into the water, in order to assist the canoe over the river bed. For the first half mile the direction of the White Fish River is parallel to the river into which it flows, and in this part of its course, a small section of clay schist was observed dipping at a high angle to S.E. Large gravel beds and a gravel island rises from the surface of the water, but the river banks are composed of mud deposits in regular strata, supporting a dense growth of willows. On its right bank aspen poplars occur in bluffs. About two miles up the stream there are several places where boulders have become imbedded in the stiff clay of the river deposit, and have very much the appearance of an artificial causeway. Three miles further up, the banks become elevated, and at the bends of the river immense sections of dark red marl earth are exposed, and at one spot, where the river seems to cut through a "drift" ridge running from S.E. to N.W., these sections have a thickness of 100 ft. at least.

Quite unnavigable.

Strata of clay schist.

Imbedded boulders.

Marl earth.

The woods are mostly young, as only a few clumps of old trees were observed to have escaped from the fires so frequent in this part of the world. Only a few pines are to be seen, and these are of inconsiderable size. We continued punting until 5.30 p.m. when we halted for the night on a point among a clump of tall pines, some of which were more than 2½ feet in diameter. I may mention here that at a place where we landed to allow our men a little rest in the course of our laborious ascent, we discovered the fresh tracks of a black bear, an animal not uncommon in this part of the country. I am told also that the reindeer (Caribou) is killed very often in this neighbourhood, especially during the winter, but that the moose are now very scarce. After supper, having constructed a shelter from the incessant rain, we were soon rolled in our blankets and slept soundly.

Reindeer.

June 16th.—The rain was still so heavy that in hopes of its clearing up a little we deferred our further advance till a little after noon, but as the river increased in rapidity and strength by the continued rain, we made but little progress; we were forced to walk in the water as on the previous day, and soon I found myself in advance of Dr. Hector, his canoe, in a rapid of considerable strength, having been whirled round and round and shot down the current, which it had taken him half an hour to ascend. In about two hours we came to a low section of dark-coloured slaty rock of 4 ft or 5 ft in height, and covered by about 50 ft. of dark sandy clay. There is a powerful rapid at this place but no fall. The stream still continues to make bends round alluvial points in a wide valley, but it is now crossed by ledges of rock, and enormous boulders are very common.

Canoe caught in a rapid.

About 5 p.m., finding that the men could no longer withstand the continual soaking, both from wading in the river and from the torrents of rain which still fell, I landed on the bank just above a more than usually strong rapid, to await the arrival of Dr. Hector. While here, an accident occurred which effectually put a stop to our further exploration of the river, and which at any rate had become obviously useless. The men, in order to warm themselves, set fire to a large dead pine, and then foolishly commenced to fell it; it fell, unexpectedly, right over the place where I was standing beside the canoe which I was unloading. By an effort I was fortunately enabled to escape beyond the reach of any but the smaller branches, which did me no injury, but the canoe was crushed to atoms. This was unfortunate, as we were obliged to stay here for the night, on a flat only 6 ft. broad, at the base of a high steep bank. Just as we were deliberating we nearly lost a second canoe, for the swollen stream was so violent that it detached it from the shore, and was carrying it towards the rapid below, when one of the voyageurs observing this at once plunged into the river, and with difficulty recovered the canoe at the risk of being swept down the rapid and lost. Our camp was certainly one of the most cheerless a traveller can well experience, being only 4 feet above the waters of the river, which, from its rapid rise, appeared likely to inundate us before morning; we were also entirely exposed to the torrents of rain which had been incessant throughout the day. Our three Chippeway Indians whom I engaged for this trip, at Fort William, displayed considerable ingenuity in their method of protecting themselves from the inclemency of the weather, by strips of bark which they rapidly stripped from pine trees.

Continued rain.

Burning tree smashes one of the canoes.

Dangerous plunge.

Indian bark shelter.

During the evening I examined the Indians carefully as to what was the nature of the river above as far as they knew: they informed me that at a distance which they could not specify, very high falls occur, to the foot of which at certain seasons Indians resort to fish for sturgeon. Also that the river, both below and above that place for some distance, was very rapid and enclosed by high banks. It emerges from a lake of considerable size, which, as far as I could make out from their confused statements, is not far from another which discharges its water into Sturgeon River flowing westward. This they call "White Fish Lake," but the falls upon the river they call the Sturgeon Falls. Seeing that even in the high state of the water the river was unnavigable, I determined that next morning I

Indian report of upper part of river.

Abandon further examination of White Fish River.

would despatch the two remaining canoes down the river to where I had left the rest of the party, with orders that they should push on to the Kakabeca Falls, to which place I intended to pass by crossing the country on foot along with Dr. Hector and the other two Indians.

June 17th.—The rain still continued as heavily as ever, and shortly after sunrise we got off from camp just in time to avoid being flooded by the river, which had now risen to its level. At the same time our two canoes started on their downward progress, and from the swollen state of the river, their passage was a speedy one, uninterrupted by any of the shallow rapids which caused our ascent to be so laborious.

Walk to the Kakabeca Falls.

Character of country.

We now commenced our walk to the Kakabeca Falls, by ascending a steep bank about 150 feet high, behind our now flooded camp. Keeping on the plateau thus gained, we threaded our way through dense forests of pine and larch. The country was undulating and intersected by deep ravines; the swampy bottoms of these latter are occupied by large black spruce firs, some of which are of an enormous size. Here the walking was very difficult owing to the fallen timber and dense undergrowth, and forming a great contrast to the summits of the ridges, where the dry soil supported fine open glades of the Banksian pine. This character was interrupted by tracks of wet mossy ground, from which sprung small streams, and such places are always occupied by groups of the yet leafless larch. On the whole the timber in this locality is very fine.

Crossing streams.

We were obliged to cross numerous streams, which, though of inconsiderable size at other times, were now deep and rapid, and now presented considerable obstacles to our advance; we crossed, however, by selecting places on the margin of the streams where two trees grew exactly opposite to one another on different sides, then cutting one down in such a manner that it should fall across the stream, one of the party crossed on it cutting off all the uppermost branches. After this the second tree was thrown across the stream with its branches locking into those of the first, and after lopping off its uppermost branches also, a very good bridge was formed. In the course of our walk we killed two grouse and a rabbit, which served us for dinner.

The direction we had travelled was mainly N.E., and we first reached the Kaministaquoiah at nearly a mile or two from the falls. The distance we had gone over was about 20 miles. That portion of country we passed along the banks of the main river led us through dense thickets of willows and cypress swamps, forming a marked contrast to the vegetation met with during the early part of the day. On reaching the lower end of the Mountain Portage we found that our party had already started. At this place a high rocky cliff appears on both sides of the river, running from N.E. to S.W., and through which the river has cut for itself a channel which extends as far back as the "Falls." By a winding path the summit of this cliff is gained at an elevation of 140 feet above the landing place. This

Mountain Portage.

constitutes what is called the Mountain Portage, but on reaching the plateau above, the canoes and baggage had still to be carried a distance of rather more than a mile before a part of the river was reached where they could again with safety be launched. At the upper end of the portage we found

Encamp above the falls.

our party encamped, having arrived there not many hours before us. I learnt from Mr. Sullivan that our small canoes had arrived in safety at 9.30 a.m., having taken only three hours in making the descent of the White Fish River. The party had immediately followed my directions and started for the place where we now found them encamped.

Description of Kaministaquoiah River below the falls.

Mr. Sullivan thus describes that portion of the Kaministaquoiah River between the mouth of White Fish River and the foot of Mountain Portage. The Kaministaquoiah in this part of its course resembles very much its character at the Long Rapid, but the late heavy and continuous rain has considerably increased its volume, the right bank being flooded for some distance. In ascending the current we kept close to this bank, where the overhanging branches of the trees aided us in the ascent, but after experiencing painful blows on the face from them as our crews grasped and let them go, M. Bourgeau and I disembarked and kept along the margin of the stream. Our progress was slow and tedious, owing to the density of the undergrowth of willows, and the fallen trees lying in every direction, which were frequently hidden from sight by a depth of two or three feet of water.

The following plants were in full flower at this time:—amelanchier, verbenum, ribes and cerasus.

From opposite the mouth of White Fish River the left bank of the Kaministaquoiah commences to increase in elevation until it attains its highest at the Kakabeca Falls, but its right bank preserves the low flat character up to the foot of the Mountain Portage, seldom being more than three feet above the surface of the river and often inundated. The Kakabeca Falls are about 7 miles from the mouth of White Fish River, and in this distance the river makes a bend at right angles from a south-east course.

Nature of the portage work.

On arriving at the Mountain Portage our canoes were emptied of their cargoes, and with the luggage were carried to our present encampment. It was here for the first time that we had an opportunity of witnessing what all travellers on this route have so justly admired, viz., that light spirit with which the voyageurs perform their hard tasks. They are mostly half-breeds of French and Iroquois extraction, and their cheerful French spirit is in happy harmony with the stern endurance of their Indian nature. The mode which they adopt for carrying their load is by means of a leather strap of about three inches in width, which they fasten round the load, leaving a loop which passes round the forehead. When all is ready away they run, and return until there is no more to carry, never resting on the road, and but rarely slackening their pace into a walk. Here, I regret to say, our last mountain barometer was broken.

June 18th.—The rain has been heavy occasionally, and only now and then the sun emerged from behind the clouds, but as all wished to see the grand falls, we started off a little after mid-day, and pushing our way through a forest of spruce and arbor vitæ, we reached a jutting eminence, which commanded an

The Kakabeca Falls.

excellent view of the Kakabeca Falls. From where we stood we beheld the whole volume of the river advancing on a level with the eye to plunge into a chasm bounded by precipitous walls of slate. At the base of the fall nothing could be seen but wreathing mist and dashing spray, while below us the river rushed with tumultuous eddies through the magnificent gorge it has hewn for itself in the solid

Height.

rock. We then measured their height by dropping a stone and noting the time of falling. A mean of seven observations of this kind gave us for result, 115 feet. After this we measured a base line, and

Breadth.

with a pocket sextant took angles and determined the breadth of the falls to be 335·8 feet. On the spot which we had chosen, a large quantity of ice and snow still rested. The vegetation in the neighbourhood of the falls was of a beautiful light green, resulting from the constant moisture of the ground by their spray. After returning to our camp, we measured also by a rough trigonometrical measurement

the breadth of the river at this point, and found it to be 770 feet. About one mile above the grand falls, and in sight of our encampment, where the river takes a bend to N.E., is a little fall, which has a very picturesque appearance from the small islands clothed with scrubby pines, contrasting with the foaming white of the river as it rolls rapidly by them. The weather still continues unfavourable, and the barometer very unsteady. No astronomical observations possible.

The country in this neighbourhood 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 to those before mentioned. High river terraces.

June 19th.—Still obliged to remain encamped in consequence of the continuance of bad weather. Great difficulty experienced by M. Bourgeau in preserving his botanical specimens.

June 20th.—At 9 a.m., the morning promising fair, our canoes were packed, and we left the Kakabeca camp, but not more than ten minutes passed when they had to be unpacked and carried with all the luggage over "Priest's Portage," or, as the voyageurs term it, "Portage du Prêtre." At this place granite knolls made their appearance, and in the spaces between berry-bearing bushes formed dense thickets. In the centre of the island over which the portage is made, there was a large sheet of water, the result of the late heavy rains, through which we had to wade on again embarking above the falls, avoided by crossing Priest's Portage, and pursuing our course we observed the river to widen considerably, and to become beautifully picturesque; its banks also assuming a much greater altitude. The same luxuriance of vegetation characterized the banks as was observed lower down the river. At 2 p.m. we arrived at Island Portage, at which place the canoes and baggage are carried over an island in the centre of the stream, while the river rushes past on either side with extreme violence. Our men had a very hard day of it, with constant carrying, paddling, and wading to their waists in water, and were not sorry when our evening camp fire was lighted. Altogether we crossed nine portages, the principal of which were "Portage of the lost one," "Plamchamp's Portage," and "Bad Portage." Priest's Portage. Island Portage. Portage of the lost one.

June 21st.—A fine day at last, the first since the 14th, and we commenced our start with a portage. The thermometer indicated 52° at sunrise. After making four portages we halted for breakfast 9.30 a.m. at "Trembling Portage." At this place observations for longitude and variation of the compass were obtained. The weather throughout the day has been delightful after the long continued rain, but our enjoyment was much interrupted by the myriads of musquitoes and bulldog flies which continually tormented us. A large branch above the "Discharge of the Plain Stones" joins the main river from N. 35° W. At 1.20 p.m. we halted for dinner, landing on a low wooded bank. The country through which we passed during the early part of the day has lost all its timber from the ravages of recent fires, and the woods on the banks opposite to our camp were quite bare, and nothing left but dead trunks. We met occasionally during the morning a few small canoes, each paddled by an Indian and his squaw. They were on their way to Fort William, and formed picturesque objects as they glided down the stream. After passing through the finest scenery, the enjoyment of which was greatly enhanced by the stillness of the evening, we reached the lower end of "Dog Portage" at 7 p.m., and encamped for the night. The river at this place is dilated to a considerable breadth, forming a basin, which receives the waters from above by a fall of great beauty. From its banks the land rises rapidly in every direction to the height of 500 to 600 feet, clothed with the rich green of pines, relieved by patches of the light yellowish tints of the young aspens. High hills, which have been skirting the river at a considerable distance, here converge and seem to offer an impassable barrier. As there still remained a few hours of daylight, we crossed over the hill by the portage trail, and made barometric measurements of the altitude. The weather having been so unsteady that little reliance can be placed on the results of the barometric measurements in our ascent hitherto, but by estimate our rise since leaving the upper end of "Mountain Portage" is about 115 feet, while to the observed height of the Kakabeca Falls 115 feet, 55 feet may be added for the rise of the river in the rapids below, thus making a total ascent of 285 feet from Lake Superior to the lower end of "Dog Portage." Destructive fires. Reach Dog Portage. Altitude of Dog Portage above Lake Superior.

June 22nd.—Long before sunrise this morning our voyageurs had commenced their portage work. With a view to ascertain more accurately the change of level, two trips were made over the portage, and thus we obtained three sets of observations, the means of which, with their results, are tabulated below. From the longitude at this place it will be seen that our course has been a little to the east of N.:—

TABLE (Means of three sets of observations.) Aneroid barom. 178·67. To determine the rise of the Dog Portage.

Length of portage path	4,407 yards.
True altitude of rest place above river below	406 feet.
Highest point of path above river below	440 ,,
True altitude of top level above Dog Lake	144 ,,
Altitude of upper above lower end of portage	296 ,,

Or in the following manner:—

Difference in level	297 ,,

Dog Lake and lower end of Portage.

Altitude of lower end of portage above Lake Superior	285 ,,
Altitude of upper end of portage above lower end	297 ,,
Height of Dog Lake above Superior	582 ,,
Extreme heigh of portage path	726 ,,

The point where the canoes were again launched on the lake was distant about 3½ miles to the east of the place where the river leaves it, and we regretted much not having had time to examine that portion of its course, which is avoided by theportage, as there must probably be a series of very fine waterfalls, where the difference of level is so great as 29 6 feet inthe short distance of from two to three miles. The view which we obtained across the lake was magnificent; its waters were as clear as crystal, with a pebbly bed. The shores are bounded everywhere by hills, having much the same elevation as that we had now crossed in making the portage; but while on the southern shores of the lake rich woods Dog Lake.

covered their slopes, these to the north and east were bare rounded masses of granite, with only a scanty vegetation clinging in the crevices and sheltered ravines. The longest direction of the lake is due north and south, and its breadth at some parts is very considerable. The whole morning was consumed in crossing the portage, so that we breakfasted before leaving the upper end. After a little delay caused by one of the canoes requiring repair, we started at 10 a.m., and at noon touched at a point on the west shore of the lake to take an observation for latitude.

Glacialization.

The ledges of rock close to the water are worn smooth, and marked most probably by the influence of the shore ice in spring; but Dr. Hector also observed parallel groovings and scratches on the rounded summits of the rocky masses at an elevation quite beyond the reach of any ice that could be formed upon the lake. These are doubtless true glacial markings, the effect of ancient icebergs, at a time when, from the depression of the land, the Arctic Seas extended much to the south of their present limits.

Dog River.

Drift.

Camp in burnt woods.

After reaching the upper end of Dog Lake we entered the river of that name, which winds through a low swampy flat, traversed by only slightly elevated ridges and rounded hills, which we saw by repeated sections to consist of nothing but coarse reddish sand, mixed with water-worn stones, some of great size. When entering the river we disturbed several large flocks of water-fowl, with their broods of young, from its sedgy margin. A short way up the river we went ashore for dinner at a well-wooded spot on its right bank, and took observations for longitude and also for variation of compass. During the afternoon we continued to ascend Dog River, which has a breadth of 150 yards, and here again found that the forest on either bank had been devastated by fire. The land is so little elevated above the river that it was not until after repeated trials that we were able to find a spot sufficiently dry on which to make our encampment, which was in a clump of tall dead pines, and the effect of the reverberation from their bare stems gave rise to a singular echo in the tone of the voice entirely wanting among the green woods.

June 23rd, Tuesday.—The morning broke cold and rawy, and started us at 5 a.m.; continued our course up Dog River. At 7.30 a.m. we breakfasted on a portion of the bank slightly more elevated than any lower down the river. The whole country was at this time flooded by the continued rains, so that we were not able to determine whether it is permanently as swampy as we found it. Observations for longitude and variation of the compass were also made at this point by Mr. Sullivan. A few miles beyond this place we emerged into a wide swampy lake, where, as there was no channel, the canoes had to be forced for some miles through a dense growth of sedge and willow. Above this the water is again confined to a channel. At 12.30 p.m. we halted for dinner at the point where the route leaves Dog River and follows up a small muddy tributary from the west. To the north of us a bluff rises out of the swampy flat to the height of 150 feet; it is abrupt towards the south and appears to be composed of rock. The stream which we now ascended was extremely narrow, and wound very much through fine meadow land, and finally expands into a series of small lakes, one of which is the "Viscon's Lake" of Franklin, through the waters of which there is said to exist some impediment to the progress of canoes; of this, however, we neither saw nor felt anything. In the stream one of our party shot a pike as it skimmed along near the surface of the water, which we found excellent for supper. At about 6 p.m. we arrived at Clear-water Lake, where the long Prairie Portage over the summit of the watershed commences. This lake is only a small sheet of water enclosed by sandy hills, which rise on all sides to the height of about 200 feet. It is interesting on account of the extreme purity and low temperature of its waters, which have attracted the attention of every traveller. About three-quarters of a mile further on one-fourth of the whole distance over which the canoes and baggage had to be carried for this portage, we encamped for the night, as time did not allow of the whole being accomplished this evening. Our encampment was beside a second small lake, which is as remarkable for the warmth and impurity of its waters as Clear-water Lake is for its purity and coldness. The remaining portion of the evening was devoted to the examination of this curious phenomenon, and with the following results:—The Upper or Warm-water Lake is fed by several small streams that run into it, but none issue out of it. Its depth in many places is as much as 27 feet, and the temperature of its waters is 67°, when the thermometer in air stood at 60°. Like Clear-water Lake, it lies in a deep hollow among sand-hills, with this difference, that its basin is unbroken at any point. It is separated from the former by two lofty ridges, with an intervening valley, in which, however, there is no water. The difference of level between the surfaces of the two lakes is 40 feet, the bottom of the valley between being at a higher level than the upper one. Clear-water Lake is uniformly the depth of two feet, and its bottom is composed of beautifully white diatomaceous mud; it partly derives its waters from springs issuing from the bottom, but receives by far the greater quantity from a stream which enters it at the end next the upper lake. This stream, when followed up for about 100 yards, disappears at an elevation of 20 feet above the level of the lake, at which place it is seen to boil violently out from the side of the hill. The temperature of Clear-water Lake was found to be 37°, that of the stream 34°, and of the air at the same time 60°. This, therefore, is nothing more than a filter on a large scale, the warm impure waters of the deep upper lake finding vent only by escaping through the porous sandy soil into the lower lake, which plays the part of a receiver. The waters in the course of their passage through the earth acquire their low temperature, and as they are far removed from the surface and the thickness through which they flow is great, we may assume their temperature to approximate closely to the mean annual temperature of the soil at the place.

Viscon's Lake.

Prairie Portage.

Phenomenon of coldand warm water lakes.

We are on the watershead dividing the waters of the Gulf of Mexico from Hudson Bay.

We were now on the watershed of the continent, which divides the waters flowing into the Gulf of Mexico from those which run into Hudson's Bay, and also the boundary between Canada and the Hudson Bay Company's territories. Doctor Hector ascended the highest hill in the neighbourhood and found himself 270 feet above Warm-water Lake, and * feet above Lake Superior. Lat. Observ. Polar., by Mr. Sullivan, 48° 56′ 3″ N.

Prairie Portage.

Indian traps.

June 24th, Wednesday.—Rose early and completed Prairie Portage, 3,200, this was the longest though not the worst portage on the route; its whole length is a little over 5,000 yards, and the path winds through a forest of tolerably large trees over a country which is nearly level. In our traverse of the portage we observed that the Indians had set a number of wooden traps for catching martens, fishers, lynx, and other fur-bearing animals found in this part of the country. At the west end of the portage

* *Sic* in original.

there is a small round swampy lake, and in the boggy ground in its neighbourhood M. Bourgeau obtained numerous specimens of a curious little pitcher plant (Nepenthis). Here we breakfasted and took an observation for latitude, then loading the canoes and having crossed the small lake, we again made another portage a quarter of a mile long, by which the Savannah Lake is reached. This lake is of inconsiderable size, shallow, and its low swampy shores being covered with a dense growth of spruce. Its foul waters swarm with leeches and other small aquatic animals. After crossing the Savannah Lake we had again to disembark in order to pass the Savannah Portage, considered to be the worst on the whole route between Lake Superior and Red Run Settlement Walk. The greater portion of this desperate portage is over a dreary swamp, through which the men, loaded as they are, (each with nearly 200lbs. on his back,) have the greatest difficulty in struggling. It is, perhaps, not quite so long as the Prairie Portage, but far more formidable; it would be impassable but for trees and logs of wood along which the men walk and so avoid sinking to their middle in the swamp; but in many places these planks were rotten, and the poor fellows had to use desperate exertions to extricate themselves. No accidents, however, occurred here to either men, or instruments, while carrying the baggage over this arduous portage, for the greatest labour, however, is the carrying the canoes, which is the severest test of strength and endurance.

Swampy Lake.

Savannah Lake.

Great Savannah Portage.

Great labour in carrying the canoes.

At the west end of the portage we reached the Savannah River, which is a stream of considerable size, having its source somewhere to S.E., and only receiving a very small tributary from the lake of that name. We were now about to commence our descent towards Lake Winnipeg, having quite crossed the watershed. With a view to determine which of the lakes through which we had passed was highest in level, the following observations were made with the aneroids: and, as the weather was favourable and steady throughout the day, the following measurements are tolerably worthy of reliance.

Savannah River.

Commence the descent to the basin of Lake Winnipeg.

TABLE OF MEASUREMENT.

Barom. 178·67.

From Warm Water Lake camp of 23rd June.

Altitude of highest point of Portage Path agreeing with altitude of Swampy Lake	58	feet.
Swampy Lake and Savannah Lake are on the same level.		
Descent of Savannah Portage - - - - - - -	14	,,

Table of the principal changes of level.

TABLE OF TOTAL ALTITUDES.

Dog Lake above Lake Superior - - - - - -	582	,,
Ascent to Cold Water Lake - - - - - - -	10	,,
Ascent to Warm Water Lake - - - - - - -	40	,,
Ascent to Swampy Lake - - - - - - -	58	,,
Total altitude of portage route - - - - - -	690	,,
Altitude of Warm Water Lake above Lake Superior - - - -	632	,,
Greatest altitude of watershed observed by Dr. H. above Warm Water Lake -	270	,,
Extreme observed altitude of watershed above Lake Superior - -	902	,,

The weather was excessively warm, and the musquito bites more virulent than usual, not only causing our hands and faces to swell very much, but leaving blueish marks that in some cases did not disappear till many months afterwards.

June 25th, Thursday.—Before starting to-day, took observations for longitude, and variation of compass.

At 10.30 a.m. we left camp, and commenced to descend the River Savannah. The heat was intense; a thermometer, lying in the canoe, and shaded from the direct rays of the sun, stood at 101, at noon. M. Bourgeau presented us with the first strawberries we had seen this season, which he had gathered while botanizing in the woods. The Savannah River is not above 30 yards wide, but is very swift and deep, and its waters have a very low temperature. Barriers of drift wood frequently arrested us in our course, through which a passage had to be cut by the axe. The banks are low, and clothed with fine woods, among which larch predominates, associated with the Banksian pine. At three o'clock we halted an hour for dinner on the right bank of the river, after which we started again, and entered the Lake of the "Thousand Isles" at five o'clock. The air was hot and sultry, and the dense clouds lowering to the south-west betokened a coming storm. We coasted along the south shore of the lake, which is low, with protruding rounded masses of rock, covered in some places with coarse red sandy gravel, till making for one of the many thickly wooded islands, we landed, and encamped for the night. Night brought with it a violent thunder-storm, accompanied by magnificent lightning; its flashes were repeated at intervals of only a few seconds, and its headed appearance resembled the discharges of a monster Leyden jar.

Intense heat.

Drift wood.

Lake of "Thousand Isles."

During the night we experienced great trouble with our luggage, having to shift it several times, in consequence of the violence of the storm driving the waters upon the low shores of the island.

June 26th.—Continued our journey along the lake, threading our way among its thousand islands. Observed several trees, which had been split by the lightning during the storm last night. As a strong breeze succeeded to the calm of the early morning, we were obliged to remain until 11 a.m. on another island, to await its moderating. Then starting again, we struck across to the western end of the lake, and arrived at the Barrier Portage, when we left the "Lake of the Thousand Isles." It has taken us in all six hours' paddling to traverse the beautiful sheet of water, so that its length may be estimated at 30 miles. The islands in its centre, as well as the surrounding shores, are composed of rounded masses of granite rock, but little elevated above the lake, and covered in many localities by a deposit of coarse sand mixed with boulders, some of which are of great size. Towards the western extremity of the lake the land becomes higher, perhaps more so than any part of the watershed, and finely wooded, some of the trees being of an enormous height (hard wood and pines).

Trees split by lightning.

Barrier Portage.

Fine timber.

The portage path, by which Bar Lake is reached, passes over a ridge 70 feet high, and by a double

set of barometric observations it was found that the lakes at either end are upon the same level. The length of this portage is rather under 400 yards. Took observations here for longitude, and at 6 30 p.m. we arrived at Ridge Portage, and encamped for the night at its western extremity.

There is here a slight change of level, as a small stream flows from Bar Lake into Ridge Lake, with a short rapid, the descent of which cannot be more than eight or ten feet. Our camp was at the lower end of this rapid, and our canoes were ready to be launched in the stream (which does not measure more than 12 or 14 feet across), and by which we were to reach Ridge Lake. High cliffs rise here, composed of a soft fine-grained granite. The length of this portage is about 500 yards, and the path passes through some of the finest timber-woods we have yet seen, except on the lower part of the Kaministaquoiah. One of these pines measured 110 feet in height.

Indians. Just after we had fixed our camp this evening, two Indians arrived in a canoe, travelling up stream on their way back from the trading post on Lac-la-Pline, where they had conveyed Mr. Murray, a gentleman in the Hudson Bay Company's service. There were originally four, but two had deserted that morning, taking with them all the provisions of their companions. We gave them a small quantity of provisions, although we had begun to feel the need of a supply ourselves, from having been detained so long at various places since we left Fort William. A steady drizzling rain fell during the night, which, however, did not preserve us from the incessant attacks of the musquitoes and sand-flies.

June 27th, Saturday.—This morning we were off again at 4 a.m., following down the small stream which, although so small as hardly to admit of our canoes, was, nevertheless, very deep; we then entered Bridge Lake. The scenery here entirely changes its character; high perpendicular cliffs rise everywhere at a short distance from the shore. As far as we could perceive, no other stream than that which we descended enters this lake.

French Portage. At 7.15 a.m. we reached the French Portage, and remained for breakfast at its eastern end. The whole forenoon was spent in crossing it. The portage is about 3,800 yards long, and traverses three distinct ridges, with intervening valleys; the highest point on the portage path is 70 feet above the lake to the east, and 108 feet above the point where we launched our canoes at its western extremity, showing an actual descent of, in the waters here, of 38 feet. At this place there is no communication between the two lakes. The country still continues to be well wooded, and M. Bourgeau is beginning to reap a rich harvest of the flowering plants. In the centre of the portage observations were made for longitude, and variation of the compass.

Perch Lake. One of our canoes having been broken, we were detained until 3.40 p.m. When crossing this lake we entered Perch Lake by a short and swift stream. It is small compared to the "Lake of the Thousand Isles," but like it is studded with numerous granitic islands. On one of these, not more than 50 yards across, we encamped for the night, and although seemingly it consisted of little else than naked rock, a considerable quantity of vegetation has secured a footing, drawing nourishment from the many crevices that intersect these rocky islands. The river by which we reached Perch Lake receives a large tributary from the north, which is not laid down in Franklin's map. The banks of the river, as well as the shores of the lake, are beautifully wooded, resembling much the country in the neighbourhood of the Dog Portage. Before leaving the south shore to strike for the island on which we encamped, Mr. Sullivan took observations for variation of the compass; the one taken in the morning he considered not to have given a reliable result owing to a derangement of the instrument.

June 28th, Sunday.—During last night a high wind prevailed from S.W., but it fell towards the morning, which broke misty and thick threatening rain. We broke up camp and started at 5.30 a.m., and at 6.45 a.m. reached the "Dead Man's Portage," so called from an accident which occurred long ago to one of the voyageurs, who was carrying the canoe across the portage, and who missed his footing and fell across a stone, where the canoe killed him on the spot, nearly severing his head from his body. The length of this portage (given incorrectly by a misprint in Franklin as 58 yards) is 575 yards. There is exceedingly fine timber at this place. At 7.45 a.m. we reached the "Portage of the Two Rivers," over which we passed and halted for breakfast at its western extremity.

The change of level of these two portages amounts to about 70 feet, but from some cause which I have not yet discovered, the aneroid barometer became unworthy of reliance.* Starting again at 9.45 a.m., we traversed several small lakes separated from one another by short rapids, the total descent of which is inconsiderable, and reached Sturgeon River at 10 minutes before noon. In hopes of getting a meridian altitude of the sun, we at once put ashore on a small island situated at its mouth, but the sun became obscured and the weather relapsed into the steady drizzle which had continued during the whole of the forenoon. Although this was by no means a favourable place, the main body encamped here for

Sturgeon River. the night, while a small party employed the afternoon in making a short ascent of Sturgeon River. On this service we started in one of the canoes with a crew of volunteers. "Old Jack" accompanied us, although he could now be of no use as guide, considering that he knew no more of whereabout we should proceed than ourselves. It had been all along our intention to devote several days to the examination of this river, and it was with considerable reluctance that we felt it necessary to alter the plans in consequence of the want of provisions, at which the men were discontented, and complained of the many

Explore the Sturgeon Lake. delays which had already taken place. Sturgeon River flows into Sturgeon Lake close to its eastern extremity, but the main body of the lake is not seen from its mouth in consequence of a long island which, lying at a short distance from the shore, causes here a narrow strait. The river at its mouth is about 100 yards wide, with an excessively swift current. After ascending it, however, for about 1½ miles in a south-easterly direction, to accomplish which our crew had to punt up a long shallow rapid, the river expands into a magnificent lake with several large islands of about 8 miles from E. to W. and not less than 10 miles long. Still keeping in the same direction we made for what appeared to us an inlet, in hopes of again meeting the continuation of the river. However it proved to be a communication with another lake, not quite so large as the first, and along the south and west shores of which we coasted, and after several fruitless attempts at length discovered the river, which flows into its south-

Sturgeon Falls. eastern angle. There are here a series of fine falls, up which it was impossible to take the canoe, and as there was no portage track, and none knew how far we would have to go, before we came to still

* This was found to be owing to the shifting of the dial plate, which is very imperfectly [*sic*] in most of these instruments.

water, we left the canoe and men at this place, and proceeded on foot to inspect the river further up. In the course of our ascent, Dr. Hector roughly calculated with a pocket level the rise at this place to be about 55 feet. After a walk of about a mile we again struck the river, and found it to emerge from another lake of almost equal dimensions with the first. Keeping on top of the high granite cliffs which form the southern shore, we continued our walk for several miles further, but at last seeing no prospect of adding more to our knowledge of this watercourse unless by reaching the further extremity of the lake, which our time would not permit of, we determined to return to the canoe. In doing so, however, we ascended the highest point we could find, in order to get a view of the surrounding country, and although the woods rendered this to be but a limited one, we saw enough to satisfy us, that we were in the heart of a wilderness of lakes, hardly separated from one another by narrow and irregular ridges. It occurred to us on the spot that winter would be the best season for the examination of a country like this, when the lakes would be frozen and travelling with dogs easy.

The short river which connects the upper lake with the one below is confined within high shelving cliffs of smooth water-worn granite, through which the stream gushes with great velocity, making a succession of small leaps, the last of which is about ten feet in height and crosses the whole width of the stream.

For finely grouped masses of water these falls surpass all we have yet seen on the route, and in spite of the incessant rain, we lingered to admire the beautiful wildness of the scene. Embarking again, we continued to make a circuit of the second lake which we had entered, leaving it by a narrow strait different to that by which we gained access to it. This strait led us into another lake, which we again left by a narrow opening to the west, and emerged upon the first lake not far from the point where we had entered it from Sturgeon River. The shores of all these lakes, which in fact may be looked upon as one divided into segments by barrier-shaped islands, are composed of bare rounded masses of granite rock, with much the same features as Perch Lake. The land, however, at some distance from the water's edge rises to a considerable height, and is densely wooded. The islands also, which are generally of considerable size and not very numerous, are covered by a dense forest growth.

From the hazy nature of the weather it was difficult to judge of distances correctly, but the extent of the first lake in a south-westerly direction seemed to be not less than 9 or 10 miles. Dr. Hector has made a map of our route as we threaded along among these previously unexplored lakes. (See first Parliamentary Blue Book of Explorations in British North America, among maps at the end.) **Extent of the lakes.**

Descending the short and rapid portion of Sturgeon River, we reached our camp about an hour after sunset. The distance we had penetrated in this direction was about 16 or 17 miles. Subjoined is a Table of the data, by which we estimate the altitude of Sturgeon Lake, and which, it will be observed, does not differ much from that of Dog Lake:—

Table of altitudes.

	Feet.
Estimated descent of Savannah River	15
Descent of Ridge Portage	8
„ French „	38
„ Portage of the Dead and of the Two Rivers	70
Descent of the rapids before reaching Sturgeon Lake	20
Estimated total descent	151
Altitude above Superior	539 ft.

From careful consideration of these levels, it is evident that any attempt to force a road in a direct line from the mouth of "White Fish River" to this lake will not diminish the difficulties which are to be met with on the ordinary route, in so far as they are dependent upon the altitudes to be overcome. For although we have been five days occupied in our descent from the summit level, while it cost us only four short days to gain the same, the distance travelled is by no means to be taken as a measure of the relative ascent and descent. Indeed, since reaching the highest point over which the canoe route passes, we have been rather keeping along the top of the ridge than making any decided descent of its western flank. The only advantage of such a route, therefore, would be its more direct course, and consequent shortness, which I fear would be quite overbalanced by the want of any water communication by which the height of land can be attained, unless the old portage route by Pigeon River were partially adopted, but in that case its course would be along the frontier. **General conclusions respecting a route by Sturgeon Lakes.**

As to the construction of a road, there might be perhaps no great difficulty in taking one as far as the eastern border of that tract of country, abounding in lakes, which we first entered upon about Dog Lake, and which we have traced as extending continuously to Sturgeon Lake at least, but it is hard to conceive how the obstacles which this tract of country itself would present to such a work could be overcome. In it there is neither continuous land nor continuous water; any attempt, therefore, to construct a road would be met by numberless lakes and straits, some of great width and depth; and the rocky structure of the country would preclude the possibility of rendering the water communication continuous. In any case the expense would be so great, that the requirements of a large traffic could alone justify such an undertaking.

June 29th, Monday.—Started from camp at 4 a.m.; the morning raw and cold. At 8.15 a.m. we arrived at Bad River, where our canoes, after having been emptied, were run down the rapid. There are several other rapids in this river where portages are made in ascending the current, but which can be run down with comparative safety. The whole descent of its waters cannot exceed 20 feet. Still continuing to descend Bad River, the rocky bed of which widens into a sluggish lake, we reached "Island Portage" at 12.30 p.m. After an hour's delay at this place, in a very short time we emerged upon the "Lake of the Cross." A fresh wind from the west created waves upon it, which, meeting the waters of the river that were flowing swiftly in an opposite direction, produced at its mouth a sea, which did not a little try the strength of our bark canoes. During the afternoon we coasted along the north shore of the lake, and left it by paddling over a tract of flooded land, pushing our way through the branches of submerged trees until we reached a group of lakes, at a little distance to the north. **Bad River.** **Lake of the Cross.**

Splendid water communication exists in this part of the country in almost every direction, for as we threaded our way through narrow sheets of water without any apparent current we obtained glimpses in **Water communication in all directions.**

succession of long narrow rock-bound vistas, the placid waters of which reflected the beautiful rich green of the overhanging woods. After a little distance, however, these scattered waters took the form of a river of great breadth, and soon we came to rapids succeeded by a fall, to avoid which a portage was necessary. This was most probably the River Nimican, in Franklin's map, and we were following it so as to cut off the long bend which occurs to the west of the "Lake of the Cross." On reaching the second portage we encamped for the night. Here the river dashes with violence between high perpendicular walls, while the portage track leads over the high cliff which forms a left bank. Our camp was chosen on the top of this cliff, preferring rather to sleep on the bed of hard rock than on the soft herbage, where our constant foes, the musquitoes, could carry on their unremitting attacks.

Namikan Falls.

Took observations for longitude and variation of the compass.

June 30th, Tuesday.—This morning was exceedingly beautiful, and we enjoyed the view of the "Great Sturgeon Falls," which occurred at the first portage we came to. They are about 20 feet high, the waters falling over a semi-circular ledge of rock at a sharp bend in the river. Passing a violent rapid, which on account of an acute angle which occurs in its course, requires great steadiness on the part of the steersman, we entered the Lower Sturgeon Lake at 9 a.m. We halted on the right bank of the river at one of the most lovely spots for agricultural purposes that we have seen on the whole route. There was something in the natural grouping of the trees and shrubs at this place which irresistibly called to mind rural scenes at home, and it was hard to realize the fact that the hand of man had taken no part in producing this effect. We found here the remains of an Indian camp, among which, in a secluded grove, were several coffins raised above the ground upon posts to the height of 5 or 6 feet. In one of these, which we had the curiosity to open, we found the skeleton of a child, which Dr. Hector was of opinion had died from disease of the bones of the skull, which was much enlarged and thickened. Upon a conspicuous point of land, we found a surveyor's post erected, probably in connexion with some survey of the American shore on the opposite side of the lake. Here were fine oaks and ash growing singly and in clumps, as if in grounds laid out by the landscape gardener, and a shrubby growth of underwood interspersed with large willows grew luxuriantly. The shores of this lake are low and rocky. At 10.45 a.m. we again started, and after passing a point on the north shore, which seemed to be continued by a chain of small islands to a similar point jutting from the south shore, we ran up to the head of a deep bay and made a portage to a small stream which runs in to the eastern extremity of Rainy Lake. The water communication is said to be quite continuous between Sturgeon Lake and Rainy Lake, and this portage is only made to shorten the distance by avoiding a great bend to the south, which the north shore of the former lake makes. I hardly think that this portage involves much, if any change of level. The descent which we made from the Lake of the Cross to Sturgeon Lake, we estimate at about 70 feet. I suspect that this latter lake is distinct from the one passed through by Sir J. Franklin and on a lower level, as he has marked several rapids at the exit of *his* Sturgeon Lake into Rainy Lake which do not occur between ours and the lake we have passed through, which are almost on the same level. Moreover, the lake which he lays down as Sturgeon Lake is of much greater size and more studded with islands than that which we have traversed.

Great Sturgeon Falls.

Lower Sturgeon Lake.

Indian coffins.

The stream we now reached was excessively small, being little other than a chain of grassy pools, none of which exceeded five or six yards in breadth. These were, in some cases, separated by narrow ledges of rock only a few yards across, and not rising more than a foot above the level of the water, but which, nevertheless, required all the ceremony of portaging before they could be crossed. This led us to a swampy arm of Rainy Lake, where a few ducks were rearing their young broods. We obtained a few, and putting ashore just before entering the main body of the lake we dined on them. At this place there are lofty rounded heights of granite, the northern declivities of which, as well as their summits, proved on inspection to be deeply furrowed and grooved with glacial markings. During the afternoon we kept along the south shore of Rainy Lake, and towards sunset made for a group of islands in its centre, on one of which we camped for the night.

Descend a small stream.

Reach "Rainy Lake."

July 1st, Wednesday.—Four hours' sailing before a fresh breeze this morning brought us to the commencement of Rainy River, where there is a rapid, on running which and descending the river for about two miles further, we arrived at the Hudson Bay Company's post, Fort Francis.

Arrive at Fort Francis.

At this place there are fine falls, to avoid which a portage is necessary. On the ridge over which the portage path passes, the establishment of the company is built; here our canoes were unloaded, and their freight put into the stores of the fort.

A large camp of about 200 Chippeways or Ojibeways were pitched in the neighbourhood, and we were amused while passing through their tents on our way to the fort with the number that pressed forward to shake hands with us, but with such a manner as to leave it doubtful whether the honour was done *to* us or *by* us.

Indian camp.

Mr. McDonald, who was in charge of the post, handed us a letter from Sir George Simpson, intimating that a supply of provisions had been prepared for us as far as the resources of the place admitted. In this, as well as in many other instances, the highest praise is due to my late lamented friend Sir George Simpson for all the assistance which we obtained from him in carrying out our instructions.

Letter from Sir George Simpson.

Fort Francis is built in much the same manner as Fort William, with the exception, that instead of being picketed like those posts which we had previously visited, Fort Francis is surrounded by stockades of about twelve feet in height.

We determined its geographical position as well as the variation of the compass. Colonel Lefroy had previously chosen this place for a magnetical station. Our observations, therefore, on the variation of the magnetic needle when compared with his will afford a good opportunity of observing the change in declination of the needle during the interval.

Observations.

Shortly after our arrival we observed a good deal of excitement and consultation among the Indians, and at once concluded that a begging deputation was in contemplation. Presently a loud beating of drums announced the signal of assembly to the tribe. Five long stools were arranged in a pentagon, and five chairs were placed in the centre of this enclosure. Here and there, at a very respectful distance, sat groups of women and children awaiting the commencement of the ceremony. The sound of the drum came nearer and nearer, and shortly the men of the tribe marched into the fort, in Indian file, with faces painted of every colour, heads decked with eagles' feathers, necks and fingers with brass

Indian deputation.

rings, and many wearing very elegantly beaded dresses. The men were all armed, with the exception of the old or principal chief, who bore the calumet or pipe of peace, thus indicating that a friendly parley was sought. The principal men of the tribe seated themselves on the stools, and the young men either sat or stood behind. The drum ceased, and the old chief entered the house and demanded an interview with us. We assented, and forthwith repaired to the seats which had been placed for us. For at least five minutes after we were seated a profound silence reigned—a silence generally preserved for some time previously to the commencement of all Indian ceremonial speeches. The palaver.

The chief commenced his harangue by assuring us that if we imagined that his tribe had assembled on this occasion for the purpose of begging we were mistaken; the reason of the present convocation was of a far greater moment than that. "Perhaps," said he, "you wonder who *I* am that *I* should "address you. My arms extend far back into time; my father and his father were the chiefs of this "once mighty tribe. Their graves are in our lands, and not far from here. If you further question "my authority for addressing you, look around me! These are my chiefs,—my soldiers,—my young "men. It is by their wish and desire that *I* address you." Here many voices grunted approbation. "All around me," continued he, "I see the smoke of the pale faces to ascend: but my territories I "will never part with; they shall be for my poor children's hunting fields when I am dead. But all "they are poor now! our woods were wont to teem with animals, and our rivers and lakes to abound in "fish; in those happy times our hearts were glad, but now my poor children often feel the pangs of "hunger, and at those moments *I think long*, (a favourite Indian expression,) and my heart bleeds "every noon to see my poor children nearer extermination. The Great Spirit causes the sun to give "you light and heat as well as to us; you are our equals, so do not deceive us, but inform us of the true "reason of your visit, and whither you are about to proceed to from here." I then replied to them, briefly pointing out the advantages of agricultural pursuits and fixed habitations over their mode of life, with the chase as their sole dependence, and told them how provident foresight is the main reason of the more comfortable circumstances of the white man. We quieted all his anxieties concerning their lands by telling them that we were going a long distance from this place, and were only passing through their country on our route to much further lands, and that our object was neither to take them by force or even bargain with them for the sale of their territories; and moreover, if any body of people should wrest their lands from them, our great Queen would send her soldiers to drive those people back, and would restore their lands to them again. The chief's account of their grievances. At this point an Indian of a different tribe, who had been trading with the Americans, stepped up and said aside to the old chief, "Make him put that on paper, I "say; make him put that on paper." "Oh!" replied the old chief, "there is no need of that, what he "says he will act up to, for no one who came from the great Queen ever lied." I was much interested in listening to this testimony, from the lips of a savage, in favour of English honesty and good faith, and which indeed is also quite characteristic of the dealings of the Hudson Bay Company towards them. His sceptical friend, however, not so easily satisfied, replied, "Ah, well, it is of course no business of "mine, but I know how my people have been treated by the Kitje Mohomans" (Big Knives, a word for the Americans). Their estimate of the American traders. The old chief concluded by asking us to speak to the great Queen on the subject of the poverty of himself and tribe, and to tell her that "they were very miserable and wretched, their "pipes often cold, and their tents melancholy." He requested also that M. Bourgeau should take no plants out of the country while travelling through his dominions, for fear that people far off should think the lands valuable and seize them. The assembly then broke up after having lasted 3¼ hours, during which time we were exposed to the intense heat of the sun, without shelter, so that after presenting the old man with a gun, at which he was delighted, and to the others a little tobacco, we gladly escaped from the throng. Presents. At 6.30 p.m. we started and paddled for an hour down the river, and encamped on the left or American bank. Leave Fort Francis. The river forms a large bay between the falls, sweeping round at the base of the bank upon which the fort is built, and from a little distance below the eye can embrace in one view the foaming cascade boiling over huge masses of grey rock, its white waters finely contrasting with the deep green of the surrounding woods, and to the left, the fort, surrounded by the picturesque wigwams of the Indians, all combining to form a most charming landscape. Picturesque scenery. The river below the fall is very wide, and from its great depth the waters look quite black, and are overhung by dense masses of foliage; indeed, the profusion of the vegetation is very remarkable for a country which has so rigorous a winter. Some of our men amused themselves this evening by fishing, and obtained several perch and gold-eyed carp. We all suffered greatly from the effects of a poisonous plant which grows among the sedgy grass on the margin of the stream, and which produces a most intense itching sensation, attended with considerable swelling and the breaking out of a rash, the small vesicles of which ultimately form scabs. These effects last for many days, and some of our voyageurs are continually suffering from them.

July 2nd, Thursday.—This morning we were off very early, and had not proceeded far when we met Mr. Kennedy, whose name has been prominently before the public in connexion with the Red River Settlement, and who was now on his way to Canada. Meet Mr. Kennedy. Without stopping we hailed him, and found that he had left Red River on the 15th ultimo, being the same day on which Sir G. Simpson had arrived there. During the remainder of to-day we continued to descend Rainy River, which maintains its beautiful character throughout. Rainy River. At noon we passed what are known as the falls of Rainy River, but which are nothing but a couple of violent rapids of limited extent. We ran them both, and drew near to the shore below them, as a number of Indian women came rushing down from a few tents which were pitched on the top of the right bank of the river. Their object was to sell sturgeon to us, a fish which they spear in great quantities at these falls. We observed several large rivers in the course of the day joining Rainy River from the south, and at one of these, which entered the main river by a beautiful fall, there was a large green meadow free from trees, on which an Indian village was situated. At nightfall we reached our camping place on the English side of the river, elevated about six feet above its surface, and covered with a rank vegetation, from which as night drew on clouds of fire-flies issued, illuminating the bushes as they flitted through them. This was the first time we had seen them on the route. The night was warm, and a light fog lay on the stream and the adjacent banks. Throughout the whole length of this river up to this point we have been in a constant fever from the unremitting attacks of musquitoes. The only time when we are not tormented from their bites, and

their horrid buzzing, is when moving swiftly over the waters far from the vegetation in which they shelter.

July 3rd, Friday.—Where we have seen sections of the bank of the river, they have been composed of a bright-coloured sandy marl, but a marked change took place as we approached the outlet of the river into the Lake of the Woods, which we reached at breakfast time this morning; for here the banks become higher, and are composed of pure sand, and the vegetation becomes gradually more and more spare as we neared the lake until it disappears, leaving nothing but extensive wastes of blown sand. Astronomical observations were made at this place. We found the mouth of the river swarming with young fish, probably the young of the white fish. Soon after entering the Lake of the Woods, we remained a short time at one of the sand islands which abound in its southern part to allow of M. Bourgeau's landing to botanize. These islands are formed by crescentic banks of sand heaped up to a considerable height, having a narrow opening towards the south, and enclosing a tract of flat marshy ground only slightly above the waters of the lake, and covered with a scanty vegetation, consisting principally of shrubs, among which are small cherry trees. The waters of the lake are very shallow here, and frequently the men were obliged to step out of the canoes in order to assist them over the sandy shoals. A pleasant breeze now sprung up, which enabled us to continue sailing across the lake during the whole of the forenoon. The shores were now rocky, as the sand accumulations seemed to be entirely confined to its southern border. The country is wooded, but the timber is by no means good, and there seems to be a great scarcity of soil. During the afternoon, as we still had fair wind, we continued sailing, but towards evening got behind the shelter of clusters of islands, which made us again take to the paddle. On one of these rocky islets we encamped for the night.

Lake of the Woods.

Its islands.

July 4th, Saturday.—We were off at sunrise and steered for a narrow strait, by means of which, with a small portage across a narrow neck of land, we cut off a large headland which projects from the eastern shore. In this strait we landed for breakfast at a place where the shore is composed of high shelving rock, on which are to be seen both the effects of the lake ice and also of true glacial markings. On coming to that portion of our route known as the Portage des Bois we found the lake waters so much above their usual level that we were able to sail right over it. We now continued threading our way among wooded islands during the remainder of the day, and at 5 p.m. reached the Rat Portage at the head of Winnipeg River. The fall at the Rat Portage is only one of several outlets, by which the waters of the Lake of the Woods escape, afterwards to unite in forming the larger river we were about to descend. The fall is of considerable height, and enclosed between high perpendicular walls of rock, and at a distance of four or five hundred yards further on the waters mingle with those of another stream, which, although of great width, we were surprised to find was spanned by a wooden bridge. The scenery here is very wild, having all the requisites for grandeur, such as dashing waters, rugged precipices, and variegated foliage. On the left bank of the river, opposite to where the portage path terminates, there is a small temporary trading post of the Hudson Bay Company. We did not land at this place, but we obtained from the person in charge a small supply of sturgeon and white fish. Sturgeon are caught in great numbers below the falls, principally by spearing, an operation which is performed with great dexterity by the Chippeway Indians. They stand on a projecting rock over some suitable eddy, until one of these large fish comes within reach, when they secure it by a skilful thrust with a barbed spear.

Paddled right across the portage.

How Indians obtain sturgeon.

For a short way below the fall the river runs with a swift current in a trough-like rocky bed, but soon after expands and ramifies in every direction, the current becoming imperceptible, and presenting much the same appearance as the first portion of the River Nemican, through which we passed after leaving the Lake of the Cross; with this difference however, viz., the inferiority of the surrounding wood. We encamped on an island in an expansion of the river which forms a lake of considerable size. We enjoyed a fine moonlight night, and sat for a long time on the rocks watching the surface of the lake, which every moment was broken into phosphorescent circles by the plunge of fish darting at the flies which hovered over the water.

Phospho-rescent appearances.

July 5th, Sunday.—Started at 4.30 a.m. and soon came to strong rapids, where the river, which is narrow, rushes down between shelving rocky banks, having much the appearance of a large gutter. The smallness of the stream we were following can only be accounted for by supposing that we were in one of many branches into which the river becomes broken up while passing through this district. Owing to the nature of the country this assumption is very probable, as we were constantly passing long vista-like expansions running off in every direction, sometimes forming a beautiful perspective of many miles in extent, and by these no doubt the waters inosculate freely at many points. In short, the whole country here, as well as many other parts of the route we have travelled, is a complete network of narrow lakes and swift streams. We required to make no portage till after breakfast to-day, and continued the far preferable enjoyment of running the rapids instead. At one of these, known as the Spout Fall, the river narrows gradually until it is not more than 10 yards across, when being thus compressed, the waters make a leap of about 4 feet, and with such force as to curve from the rocky ledge into the pool below. This dangerous looking rapid both of our canoes ran in perfect safety. The speed with which we rushed at this leap was almost that of a railway train. Immediately below this fall the river suddenly increases in size, receiving many branches from both sides. The scenery now became very grand, and lofty bluffs of granite overhung the river on both sides. On our arrival at the first rapid of Winnipeg River took astronomical observations for longitude and variation of the compass, and were surprised with the sudden increase in the amount of variation which the needle displayed in this locality. The river continued to make large bends during the rest of our course this day, and on turning one of these at about 5 p.m., we unexpectedly came in sight of a small settlement, beautifully situated high up on a green slope, which here forms the right bank of the river. We found it to be a mission under the guidance of the Rev. Mr. McDonald, of the Established Church, but that gentleman had gone for a few days to Red River Settlement. It consists of five small houses, a chapel, all of wood, and a large portion of land railed in for the purpose of cultivation. Many domestic animals, cows and pigs in good condition, were feeding about the place, and their little crops of wheat, potatoes, turnips, &c., had succeeded most satisfactorily.

Running the rapids.

Strange increase of the needle in declination.

A missionary settlement.

A distant echo.

We only remained here sufficient time to allow of one of the employés at the mission to write a letter, which he asked us to take for him to the Red River Settlement, and, after sailing till 8 p.m., we encamped

on an island in the centre of the river, at a place where it is much expanded. Here, from the woods and at this place, our men called our attention to a remarkably fine distant echo, and the reverberation of a shot which we fired sounded like the roll of distant thunder.

The following are some of the statistics we collected at the Dog Mission to-day:—

May 18. Wheat sown; at this time four inches high, and looking green and close.

October 15. Harvest spring wheat.

May (end of). Potatoes planted. They are now from three to four inches above the ground. Good crops are always obtained.

August (month of). Hay is cut. It grows in abundance. (The natural grass is very fine, but it forms no turf.)

October (middle of). Winter begins. During the winter months the employment is cutting wood. Frost goes to a great depth in the ground, but the soil being sandy, it soon thaws in the spring, and is then easily broken. Snow falls, on an average, to the depth of 3½ feet.

April (end of). Spring commences.

Prevalent winds. From north and south; south being the rainy wind.

The occupants of the establishment are continually taking in extra land, and find little difficulty in doing so, the slight low brush being almost the only obstacle to contend against.

There is a winter road to Red River Settlement, by which they take six days travelling in snow shoes after dog sledges.

July 6th, Monday.—We were off this morning between 3 and 4 a.m., and travelled a very long distance before breakfast. At the island rapids an Indian came off in a canoe begging for medicine for his wife, who was lying sick. Dr. Hector could not make out what was the matter with her, but he gave the poor fellow some simple medicine, which would at least do her no harm. We traded some sturgeon from him, which we found excellent. We stayed for breakfast on a long rocky point in a bend which the river makes to the north. The rock here was studded with garnets, and although some of them were of considerable size, yet none were pure enough to be of value as brilliants. Garnets. At this place astronomical observations were made, and the variation of the compass found to be still very considerable. Local declination of needle still remarkable. At noon we landed on the south shore for the purpose of obtaining a meridian altitude of the sun, after which we pushed on for two hours, when we landed at Jacob's Portage for dinner. The day was excessively hot, and we were amused at the manner in which the voyageurs flung themselves into the water without removing a single article of dress, and after spluttering about for a while resume their paddles, thoroughly soaked from head to foot. Voyageurs swam with their clothes on. While continuing our descent during the afternoon, the usual monotony of our voyage was broken by the appearance of two canoes rapidly advancing up the stream, their crews singing in full chorus. It turned out to be Sir G. Simpson, on his return from the annual meeting of council at Norway House, to attend which he every year makes this long and tedious voyage. Meeting Sir George Simpson on his way to Canada. Along with him was his secretary, Mr. Hopkins. The second canoe was occupied by three young ladies, daughters of a chief factor in the Hudson Bay Company's service, on their way to Canada.

Sir George had, as usual, made a very rapid journey, and was looking remarkably well. All the men as well as ourselves were delighted to see him.

Among other things the Governor informed me that the horses had been procured for the Expedition, and that they were feeding up rapidly at a fine pasture ground in the neighbourhood of Lower Fort Garry. The horses for the Expedition were purchased and at Red River.

Shortly after this the river became very broad and beset with many blocks of stone. On one of these one of our canoes ran with sufficient force to fracture the bark, but not so much, however, as to oblige us to unload it until we arrived at the "Three Woody Portages." We remained at the first of these portages in order to gum the canoe, and therefore went no further than the third portage that evening. Slightly broke our canoe. The falls here are very fine and of considerable height.

July 7th, Tuesday.—The river still continues to traverse a rocky bed, and its banks are well wooded. We soon came to the Seau Falls, at which place the river makes a bend from the south to the west over several ledges of rock of considerable height; the breadth of this fall, and the grouping of the rocks and woods all round, have rendered it deservedly admired by all travellers who have passed through the country. The Seau Falls. In the afternoon we reached the Seven Portages, where the river by a succession of separate falls makes a considerable descent. The Seven Portages. From the lowest of these falls the river begins to get broad and the current comparatively sluggish; the banks are low without any rock visible, and consisting of thick stratified deposits of thick calcareous marl mixed with light sand; the vegetation is luxuriant, and on the whole the aspect of that river resembles much that of Rainy River. At nightfall we reached Cap Lake, and here granite rocks reappear, forming rounded masses covered with scanty vegetation. Cap Lake. On an island of this formation we encamped for the night.

We had in the night rather a violent thunder-storm, attended with some phenomena which may not be unworthy of notice. An interesting thunder-storm. A remarkably dense cloud approached us from the S.E. with very great rapidity, at a speed far greater than the mild breeze we experienced could account for. As soon, however, as the cloud arrived over our heads, we were assailed with a violent storm of wind, which instantly levelled the tents; down, also, came the rain like a waterspout, peal followed peal of thunder in rapid succession, accompanied with painfully vivid flashes of forked lightning.

Some time after this, although the wind fell, the thunder and lightning continued with unabated violence; the rain also ceased, and, although it was midnight, the heat became intense almost beyond endurance. This state continued for about an hour, when a breeze sprang up now from N.W., gentle at first, but in the course of half an hour reaching a maximum fury, and again laying our tents flat, but this time in the opposite direction. The rain, thunder, and lightning were also as bad as ever. Its explanation and probable diameter. This continued but a short time, when, suddenly, the wind lulled, the rain ceased, the thunder was heard no more, and nothing was left of the storm but the dense cloud now to N.E., and from which the lightning continued to play. This was evidently a circular storm, bearing a column of heated air with great rapidity from the southern parts of the continent towards the north, attended with the consequent violent electric phenomena. Its diameter in time was equal to about 4½ hours.

July 8th, Wednesday.—Early this morning we arrived at Cap Portage, where the path traverses a beautiful plain, covered with a most luxuriant growth of high grass, mixed with vetches and flowering plants. The Cap Portage. This plain is the same terrace level through which we passed on the river yesterday, after

making the Seven Portages; and now, from this place, the river traverses a deep valley. By four falls the stream reaches this lower level; and from this place down to Fort Alexander there occur several falls, at only one of which, however, a portage is made. As we approached the lower part of the river the terraces are well marked on the banks, and consist of several levels. They, however, retire from the immediate margin of the stream at many points, and the space thus left is occupied by marshy ground, in which there grows abundance of wild rice. This rice forms an important article of diet among the Chippeway Indians, and is gathered in great quantities all along the rivers and lake borders. These terraced banks which occur here are evidently deposits, formed at a time when Lake Winnipeg covered a much larger area of country than it at present does, and sent ramifications into all the valleys, which are now occupied by the rivers which flow into it. These deposits are the exact counterparts of those which we saw lapping round the eastern flank of the watershed, and skirting the valley of the Kaministaquoiah for a considerable distance above the Kakabeca Falls; but there is this great difference which the eye at once remarks, viz., that while the deposits of Lake Superior consist of coarse sand, and strongly impregnated with red oxide of iron, and appearing to have little if any lime in their composition, those of Lake Winnipeg consist of light coloured sandy clay and mud, with a large proportion of limy matter, but without the trace of any ferruginous colouring matter that can be detected by the eye.

Wild rice.

Deposits here compared with those observed on the Kaministaquoiah.

Fort Alexander.

At 6.15 p.m. we arrived at Fort Alexander, which stands on the left bank of the River Winnipeg, about a mile and a half from its mouth. It is built of wood, and situated on a fine fertile flat, elevated 40 feet above the river, and a wooden pier is built out into the water for loading and discharging the boats. Here Dr. Hector found a great many patients, all suffering more or less from symptoms of intestinal worms, caused by exclusive fish diet. The cat-fish (*silurus felis*) is plentiful here, the liver of which abounds with an oil which might be successfully substituted for cod-liver oil in the treatment of consumption, cases which are very frequent among the half-breed population.

Cat-fish oil a substitute for cod-liver oil.

Lake Winnipeg.

July 10th.—Started from Fort Alexander, and soon got into Lake Winnipeg; had a fresh breeze, before which we sailed at a rapid rate; in time, however, it became a little too strong for our canoes (which crafts were not over well adapted for sailing), and we were glad to put in for shelter behind a projecting point forming a bay. Here we went ashore, drew up the canoes, lighted a fire, and waited for the wind to moderate. This portion of the lake shore is composed of sand-banks, enclosing swampy lakes, but having in its centre a high ridge covered with masses of rock. When Lake Winnipeg is high, canoes pass behind this point, as then a narrow strait exists, cutting it off from the main shore; and at present there is a long island separated from the extremity of the point, which, if the lake waters were depressed only a very few feet, would then make an addition of about six miles in length to this headland. The water here is very shallow; flocks of gulls were busily engaged on the sandy flats seeking for food, and from the great expanse of water horizon the scene had much the appearance of the sea shore. Small flocks of wild pigeons also continually passed over our heads, and afforded us excellent sport. Took astronomical observations for latitude, longitude, and variation of the compass. At 3.40 p.m., the wind having moderated, we continued coasting along, and at nightfall we landed and encamped on a sandy reach. Sand forms by far the most uncomfortable substance on which to encamp. Sleeping on it renders the body fatigued, and causes a sensation of having received many bruises, while the particles that get into the bedding and clothes are productive of great discomfort. The shores of the lake along which we have passed are not elevated more than six or eight feet above the water level, and are rolling and covered with bluffs of stunted wood.

Sand not desirable to make down the bed on.

July 11th.—This morning we made a very early start, in order to get to our journey's end by night. After striking across a bay, we landed for breakfast on a part of the shore composed of splintery fragments of limestone of a light buff colour. Here we were visited by a number of Indians that were encamped in the neighbourhood, and from them we obtained some fresh fish. Took observations for latitude, longitude, and variation of the compass.

Entered Red River.

At 12.15 p.m. we entered Red River, not by the regular channel, but by crossing a flooded marsh and pushing through a dense growth of bulrushes. On entering the stream itself we found it to possess a very swift current, considering the extremely level nature of the country through which it flowed, and we made slow progress against it. For a long distance there is nothing but swamp on either hand, and to it succeeds a narrow strip of land, being a sort of natural levée, higher than either the swamps beyond or the river which it hems in. This increases in extent and height very gradually as the ascent of the river is made, and at our dinner camp on the left bank of the river the swamps disappear, and are replaced by dry land covered with clumps of wood. The opposite side of the river, however, is still swampy. We were at this place about eight miles from the river's mouth. The stream here is pretty wide, and its waters are turbid and of a light chocolate colour. At 6 p.m. we reached the outskirts of the settlement, a few log huts appearing here and there among the trees. The banks now had acquired an elevation of 40 feet, and the country behind seems to be studded with fine clumps of wood, with natural clearings. At 7.30 p.m. we arrived at the Indian settlement, situated on the left bank of the river. A little higher up, and on the opposite side, we came to the Indian mission, formed of rows of whitewashed houses with gardens in front, presenting an appearance of comfort and neatness. These are inhabited by pure natives, who have certainly made a long stride ahead of their brethren on the other side. There is also a very tolerably built church surrounded by trees, to which also a clergyman's house is attached, all of which tended to remind us that we were returning once more into civilization. Continuing up the stream, we arrived at Lower Fort Garry after it was quite dark, and were most kindly welcomed by Mr. Lilly, the gentleman now in charge of that post.

Indian settlement at Red River.

Arrive at the Stone Fort.

Lower Fort Garry.

July 12th, Sunday.—Lower Fort Garry, or, as the inhabitants call it, the "Stone Fort," is a large establishment of the Hudson Bay Company, consisting of a good dwelling-house, together with its stores and other buildings connected with the fur trade, all enclosed within a high stone wall, in the form of a square. The space enclosed is ample, so that the buildings are not crowded, which gives to the fort a light, airy appearance, which contrasts favourably with the crowded wood-built forts which we have hitherto seen. This morning we learnt the destination of the canoes which had been our conveyance to this place. One is to return immediately to Canada, and the other is to proceed to Norway House, at the north end of Lake Winnipeg, with two gentlemen of the Company's service bound for McKenzie River district.

In the forenoon we attended church, situated about four miles up the settlement. On our arrival at the door we observed a great many horses tethered to the railing, all gaily equipped with the usual beaded Indian saddle, so much in use in the colony. On entering the church a very orderly congregation of about 300 attended public worship, and the Rev. Archdeacon Hunter, to whom much praise is due for the arrangement and translation of the Scriptures into the Cree language, officiated. Archdeacon Hunter's church.

In the afternoon we met Mr. Herriott, a retired gentleman from the Company's service, who had spent many years of his life in the Saskatchewan district, and who had been chosen by the Company to take charge of the post formerly established on the Bow River, and known as the old Bow Fort. Mr. Herriott very kindly gave us the benefit of his experience of the Blackfoot country and its resources, and also many hints and much useful information concerning the Blackfoot Indians. Mr. Herriott.

July 13th.—It was not without considerable interest that we watched the departure of our two frail bark canoes, now bravely starting on their return trips to Canada, after having conveyed us over 600 miles of lakes and rivers, and been carried sound and safely across scores of trying portages. Their crews had earned their money well, and by their docility, cheerfulness, and stern endurance had gained golden opinions, and elicited hearty cheers from us all. The canoes return.

I had also previously distributed to each the more substantial benefit of a pair of fustian trousers, and a red flannel shirt.

We found in the neighbourhood of the Stone Fort the band of 29 horses which I had sent out directions (previous to our departure from England) to be purchased for the Expedition; they were still in very bad condition, although greatly improved since they had been first purchased, owing to my protracted delay in England before starting. It had been impossible to procure very good horses, owing to an unusually unfavourable winter, which had caused great loss and consequent scarcity among the horses; and therefore those who were fortunate enough to have very good ones could not be induced to part with them, as they were now looked upon as almost the only means of subsistence in running buffalo at the approaching summer hunt. The horses. Their wretched condition.

After the departure of the canoes, we unpacked our bridles and saddles, mounted some of our horses, and started for Upper Fort Garry, situated at the forks of Red River and the Assineboine, distant about 18 or 19 miles. The road for the first six or eight miles lies through poplar woods, which skirt the back of the settlement, the houses of which are built more immediately upon the river's brink. About half-way we came to open country, which, on our left, was all fenced in, and giving promise of luxuriant crops. On a small creek here we passed a water-mill, which was busily at work. The country to the west is a dead flat, and the eye rests in that direction on nothing but extensive swamps. A heavy thunder-storm came on, from which we took refuge in the house of Mr. Murray, a remarkably fine old man, and one of Lord Selkirk's original settlers. He entertained us with a most interesting account of the troubles through which the colony has passed since its establishment, and from which it has not yet emerged. Start on horseback for the Upper Fort. An original Selkirk settler.

The storm occupied but a short time in passing, and after a half hour's further ride, we reached the Upper Fort, arriving just in time for dinner. We were very kindly received by Mr. Swanston, and invited to join the large party which daily assembled round the mess table. Among these we found Major Seaton, the officer in command of the troops who were then on their way to the settlement. Arrived at Fort Garry.

Mr. Swanston, the officer in charge of the principal post of Hudson Bay Company territory in Rupert's Land, received us with the greatest cordiality. He had been most zealous and unremitting in all his endeavours to forward my views, and had carried out the details of the arrangements which he had so kindly undertaken in the most able and efficient manner. Chief factor Swanston.

No. 2.

From Commencement of Journey on the Plains, 14th July 1857, to Termination of First Exploring Season on 8th October 1857.

July 14th.—Occupied in weighing and considering the best direction to take in order to traverse the country so as to fulfil the objects of the Expedition; also, on this and the several succeeding days, busily employed repairing carts, organizing harness, pack saddles, and various details necessary for a protracted journey across the plains. We did not expect to fall in with buffalo for a considerable time, and therefore, in addition to the luxuries of tea and sugar, were provided with pemican and flour. I learned from all experienced voyageurs in this country a confirmation of the ideas I had formed of it from old experience of my own when on the Missouri, namely, that the whole of Red River and Saskatchewan plains can be travelled in carts. The plan of operations I had now determined on was to push in a southerly direction along the west bank of Red River to the boundary line at Pembina, and thence along the country in the neighbourhood of the boundary line to the Turtle Mountains, well timbered and watered hills, reported of considerable extent, situated on the boundary line; from thence we intended to take a N.W. course for Fort Ellice, on the forks of the Assineboine and Qu'appelle rivers. With this circuitous route in contemplation, it was not necessary to take the whole party, and therefore we determined to detach 11 horses, together with the four heaviest-laden carts, with provisions and articles not wanted for immediate use, and send them under the charge of our second guide, Henry Hallet, directly along the ordinary route to Fort Ellice, with orders to await us there, and with a view also of recruiting the horses as much as possible on the excellent pasture in that neighbourhood. By this means we trusted that, by the time we had finished our more circuitous journey, and had reached Fort Ellice, Hallet's band of horses would be in condition to allow us to avail ourselves of another trip with them to the boundary line in that longitude, while the horses we had taken with us from Fort Garry *viâ* Pembina were in their turn recruiting. Prepare for the commencement of journey over the plains. Our plan of operations for remainder of the season.

Our party altogether amounted to 17 in number, consisting of myself and the three gentlemen who accompanied me, viz., Doctor Hector, Mr. Sullivan, and Mons. Bourgeau, our servant Beads, our guide or head man John Ferguson, and 11 men; we had in all 29 horses, 6 Red River carts, and 2 American waggons. Number of our party.

Red River carts.

The Red River cart is one admirably suited to the exigencies of the country; its peculiarity consists in the total absence of all iron or metal of any kind in its construction, consequently whenever a cart breaks down it can be mended again as long as any timber is to be found in the neighbourhood; even out in the plains, far from all timber, a breakdown is not an irremediable evil, as long as buffalo are not far off. The ever-ready expedient of killing a buffalo bull is then adopted; the broken shaft or wheel is then tightly lashed with green hide, which soon dries with an iron pressure, securing all splinters and other damages; indeed I might almost say that as long as the wood in the body or wheels is not rotten, the cart is never unrepairable. Besides the 6 Red River carts, I purchased 2 American waggons, which had not long since arrived at Red River Settlement from Fort Union on the Missouri; they had been the property of Mr. Denig, an old friend of mine with whom I wintered in 1848, when he was in charge of the establishment. We afterwards found great convenience attending these waggons, by apportioning for their loads such articles as we wanted for daily use, the broad inside area of the waggon enabling you to take and replace what you wanted without any of the unpacking and re-arranging required in disturbing the load in the narrow body of the cart. The average load for a cart is 4 cwt.; 6 cwt. is considered a very heavy load. Our waggons carried 11 cwt. drawn by 2 horses, and our carts, owing to the condition of the horses, also in consideration of the length of the trip, did not carry more than 4 cwt. each. Besides our pemican, flour, tea, and sugar we brought along with us abundance of ammunition, not only for ourselves, but for presents or barter for leather and many things which the casualties of a long journey might render it very necessary to have the means of obtaining from Indians.

Purchase two American waggons from Mr. Denig.

Description of and weight of the loads.

We remained in the settlement of Red River for more than a week previous to our start for the boundary line in that longitude.

Start both the brigades.

July 20th, Monday.—Occupied all day in getting the two brigades under weigh, viz., that under our second guide, Henry Hallet, direct to Fort Ellice, and that which we ourselves took with us to the southward to the boundary line, and thence to the westward to Turtle Mountains. Preparing for the start was a busy scene, and attended with all the innumerable delays which are sure to arise whenever a party leaves a fort. Hallet's departure, however, was more easily accomplished than that of our brigade, since we had to cross over to the right bank of the Assineboine our two waggons, two carts, and 10 horses. We had, however, an excellent ferry, got all the men, horses, and carts across the river before sunset, took them to camp about three miles off to the southward, and then we returned to pass our last night in civilized society at the fort, the last we were likely to enjoy in that manner for a long time.

We left directions with the men to start off the first thing in the morning, make a short spell, rest for three or four hours during the heat of the day, and make another short march to-morrow evening, we ourselves having determined to start before noon from the fort to-morrow morning, and could easily overtake them before camping-time that evening.

The Assineboine River.

The Assineboine is crossed by the road to Pembina quite close to its mouth; it is deep and rapid, with banks composed of soft tenacious clay. Our horses, carts, and waggons, as well as ourselves, were all ferried across on a bâteau, the property of one of the settlers, who makes a fair income from his ferry; there would, however, be no difficulty in erecting an excellent bridge at this place.

The ferry.

We start.

July 21st.—We crossed the Assineboine and commenced our journey, accompanied by Major Seton and Mr. Johnson (the recorder of Red River Settlement); they rode with us for the first ten miles, until we came to Rivière Sale, the first small tributary to Red River. Our course had been south, and we rode through dense thickets of poplars and small oaks.

Rivière Sale.

Rivière Sale joins the Red River from the west; its course being through the level plains long and tortuous; it keeps nearly parallel with the Assineboine, and rises from extensive swamps.

Come up with our brigade.

Nine miles' further ride through coarse rich grass and luxuriant vegetation over a low moist soil brought us up with our men as they were commencing to prepare a camp for the night. During the latter part of our ride the country has been clear of woods, a few clumps of trees only growing along the river banks, which are elevated above the water-level to 40 feet. The view to the west is still a dead flat, marshy and swampy. The spot which our men had chosen abounded in excellent grass for the horses, but the myriads of musquitoes and flies quite prevented their feeding or resting, until we were obliged to light fires, supplied with green wood, in the dense smoke of which they instinctively sought refuge from their tormentors.

Camping-time.

Nature of the country.

Light fires of green wood in order to protect the horses from musquitoes.

July 22nd, Wednesday.—This morning we were up at four o'clock and early on the march. Our party consisted of 13 men in all, two waggons and two carts. Five of our men were mounted, and four drove the waggons and carts, and six horses ran bare as reserves in case any should tire.

Our brigade.

Pralrie fowl.

This forenoon we passed through slightly wooded country with open glades, and we got pretty good shooting at coveys of pheasants, as they are called here, although in reality they are the sharp-tailed grouse of Richardson, and are also called prairie hens, but they are quite distinct from the bird of that name which is found so plentifully in the United States. We also obtained some ducks, but the young ones were very late as compared with them at the same season in England. At 9.30 a.m. we halted for breakfast, and to make up for the restless night passed by our horses delayed our start until 3 p.m.; took observations for latitude.

General sameness in the appearance of the country.

"Points."

The nature of the country is much the same as that passed over yesterday, open prairie to the west, while to the east the bends of the river are marked by clumps of wood, which are known in the country by the name of "points," which applies also to any projecting angle of wood whether it be caused by the bend of a river or not. This distribution of the wood is very uniform, and is as consistent on the Missouri as it is on the smaller rivers which traverse the plains in this part of the country. M. Bourgeau here noticed the following plants:—

Plants.

Lysimachia, Rudbekia, Amorphia, Lobelia, and two species of *Lupinus;* one of the latter is named *Lupinus tuberosus,* being the root which receives the name of the Prairie Turnip by the half-breeds, who, with Indians, use it as food, and sometimes crush it into a kind of flour and make bread from it.

The root is very dry and almost tasteless, and even when boiled for a great length of time does not become soft, and is at best but insipid unnutritious trash.

Scratching River.

At 5.30 p.m. we came to a small swift stream, known as "La Rivière qui grate," or "Scratching River," where we were surprised to find a ferry, kept by an intelligent half-breed, a new settler in this place. He was hard at work clearing land, and had not yet finished his log hut. He told us that he had come

from the American side, by the Lake of the Woods, and that he had crossed from that lake to Red River with a small canoe, passing, for the first 25 miles, through marshy country, over which he was obliged to drag his canoe, and then, having made only a slight rise, he reached Reed Grass River, which he descended without any portages for a distance of 70 miles to the point where its waters join those of Red River, about 9 miles below Pembina. He described Reed Grass river as being swift and small, suitable only for the smallest canoes. After crossing "La Rivière qui grate," we fixed our camp upon its opposite bank, having now travelled 38 miles from Fort Garry.

July 23rd, Thursday.—This morning I found it necessary to change our plans of early starting, as it is only between the hours of 3 and 7 a.m. that our horses can feed, when the flies ceased their attacks. Accordingly we were not on the march before 9.30 a.m. Our course during the early part of the day was through some splendid meadows of natural hay, and many mowers were busily engaged cutting and saving it. We also saw some newly-built houses. At 1.15 p.m. we stopped for dinner at a lake which has been, at one time, a bend of the river, but which is now converted into a lagoon; found ducks very plentiful, and killed nine brace for dinner. While here, we shot a brace of woodcocks in some alders which skirt the lake. This bird, although very common in Canada, is said to be only a rare visitor in this quarter. After again proceeding on the march we encountered irregular country with many hollows, and traversed by small creeks, thus rendering the road very bad. The heat throughout the day has been excessive, and, towards evening, a cloud of great density appeared in the north-west, and before we could erect our tents a heavy thunder-shower fell. Our encampment afforded excellent feeding for our horses, the grass for some miles around growing far above the knees. Since the shower, millions of insects have infested our tents. The interior of the canvass is literally black with musquitoes, and if we could preserve the many species of moths which our candles have attracted we should have a large collection. Travelling here is more like passing through a tropical country, so numerous and plentiful is insect life. From all accounts no snake, except the common Garter Snake, is met with in this locality. It is beautifully variegated, and, in full size, attains the length of 3 feet, and the thickness of $1\frac{1}{4}$ inches. Its haunts are generally the summits of stony mounds, or in the sides of creeks.

Saw some mowers from Red River Settlement cutting the natural hay.

Killed nine brace of ducks, and a brace of woodcocks.

Thunder-storm.

Musquitoes, flies, and moths more numerous and troublesome after rain.

Garter Snake.

July 24th, Friday.—The morning broke fair with the promise of a fine day. Notwithstanding the thunderstorm of last night, the heat at early morning was very great; our thermometer indicated 82°. From our last night's camp, where the river takes a great bend towards the east, we had an extensive view to the south, bounded by the woods in the neighbourhood of Pembina. At 1.15 p.m. we arrived at the small fort, and like all the Hudson Bay Company's trading establishments it is stockaded and possesses the usual stores, trade shop, and small houses for the resident families. It is the smallest we have met with, and is only important as being situated on the American frontier line. There is only a small hut besides the fort, standing on the north side of the boundary line, and the country around, although adapted for agriculture, is still a wild waste, and only awaits the hand of the settler to render it productive and valuable.

Fort Pembina on the boundary line

Good land.

On proceeding for about half a mile to the south of the fort we came to a post which marks the position of the boundary line, according to the observations of Mr. Nicolett and other American explorers. This is, however, not the original post, as the Indians had destroyed that many years since. The present one, however, was replanted with great care upon the same spot by some gentlemen connected with the Hudson Bay Company. A little further on we observed several groups of settlers' houses, with well situated enclosures of land; but the place seems at one time to have been of much greater size, if we might judge from the standing posts and other remains of former dwellings. We had the usual afternoon thunderstorm to-day.

July 25th, Saturday.—To-day, by observations, we found the boundary line post to be a few yards within the American territory, its latitude being 48° 59′ 46″ N. Observations for longitude and variation of the compass were also made during the afternoon. We also visited the American fort on the River Pembina, where it joins the Red River. It is an insignificant collection of a few wooden huts. It is here that the post-office for the Red River Settlement and other parts of the Hudson Bay Company's territories is established, as the further conveyance of letters from this place is entirely a private act at the expense of the company, and forms no part of any postal system. The arrangements for the safe and speedy delivery of letters did not seem at all suitable to the magnitude of the concerns which are committed to the care of the person in charge.*

Observed for the boundary line.

Post-office.

We found here a Mr. Iddings, surveyor to a land company at Saint Paul's. This gentleman was commissioned by the said company to survey and lay out a town at Pembina River. His plans were completed and shown to us.

Mr. Iddings, St. Paul's Land Company's Surveyor.

In the early part of this evening we examined the banks of the river, and found that they were raised about 42 feet above the surface of the water. The drift timber is lying plentifully upon flats or hollows, at an elevation of 35 feet, which shows the great extent to which this river must be flooded during the spring freshets. Several times the waters have flooded the fort, and a mark on the gate post indicates were the water had reached during the last great flood of the river, and which is at an elevation of 52 feet where the water stood four feet deep in the courtyard of the establishment. The banks of the river are composed of layers of red clay, silt, and calcareous clay, in which are embedded numerous fragments and stumps of trees. The country around is well adapted for agriculture; the soil is light and free, and good natural drainage might everywhere be taken advantage of.

Banks of the river described.

Floods.

Good natural drainage.

Along Pembina River, which is only 10 yards wide, the vegetation is luxuriant, and there is abundance of timber for every purpose. Red River itself is at this time flooded about five feet above its usual level, the depth of water now being 14 or 15 feet. Although it has not a straight course, its bends are long, with gentle curves, and would offer no impediment to navigation by steamboats or other craft of moderate length.

Pembina River.

The plan of the American Land Company alluded to above, is to plant two townships, one on the left bank to be called Pembina Town, while opposite to it there will be another named St. Vincent's.

Plans of the American Land Company.

* The postmaster himself was off to St. Paul's, and the sole charge of attending to postal matters is deputed to his wife, a half-breed woman, who speaks no language but her native Indian. On asking if there were any letters for us, we were answered by having the whole collection of letters given us to look over and examine ourselves.

These are to be connected by a bridge, the probable position of which was pointed out to us. The railway, which is to connect this place with St. Paul's, and for which a legislative Act has been already obtained, binding them to complete it in 10 years, will have its terminal station at St. Vincent's. Mr. Iddings considers that there will be little difficulty in making this line; the main obstacles to be contended with will be creeks and small lakes, over the former of which bridges are necessary. At present the railway is open to within 220 miles of St. Paul's, and the time is not far distant when it will be completed to that place.* There will then remain 350 miles to bring it as far as this; but as the distance from a navigable part of the Mississippi to a similar part of the Red River † is under 200 miles, it is probable that water communication will for a long time be the best method of approaching this place. From 150 miles above Pembina, Red River is said to retain the same character that it has here, but beyond that distance, although it still remains sufficently deep, its course becomes too tortuous to admit of navigation by any but small craft.‡

Aurora borealis.

To-night, for the first time since our arrival in America, we beheld a fine display of the aurora, consisting of an arch of bright convergent pencils of light. They were much brighter than those seen in England, although in a summer month.

July 26th, Sunday.—This forenoon we were occupied completing our despatches to England, and in the afternoon, assisted by Mr. Iddings, we planted a post distant 370 yards due west from that previously erected by the American surveyors, thus establishing the direction of the parallel of 49° of N. latitude.

NOTE of OBSERVATIONS at PEMBINA by CAPT. PALLISER, MR. IDDINGS (U. S. Civil Engineer), and MR. SULLIVAN.

Sextant observations on the boundary of U. S.

An observation taken at the above place by Mr. Nicolett in 1848-9 places a post in lat. 49° N.

A mean of observations taken by Captain Palliser and Mr. Sullivan places the same post in latitude 48° 59′ 49″ N.

Mr. Sullivan ascertained the variation of the compass at place to be 14° 2′ E.

Mr. Iddings, and my secretary, Mr. Sullivan, erected a second post distant from the first 370 yards due east, thus determining the direction of the frontier line.

(Signed) J. PALLISER, Capt., F.R.G.S.,
Commanding B. N. A. Exploring Expedition.
C. W. IDDINGS, C.E. (U. S.).
J. W. SULLIVAN,
Secretary and Astronomical Assistant to Expedition.

Numerous flocks of pigeons were flying over this place during our stay, but they did not appear in such numbers as are seen in the States of America to the south.

Trade at Fort Pembina.

The principal trade at this port of the Hudson Bay Company is with the half-breed hunters, who proceed annually to the plains of the west in search of buffalo, and the returns consist of robes, leather, provisions, with few other furs than wolves' and foxes'.

July 27th, Monday.—Remained at the same place owing to some of the horses straying, which were not recovered till late in the evening.

Slight frosts.

The cold last night was sharp, considering the season of the year, and every night of late there have been slight frosts.

The aneroids again in order.

The aneroid barometer being again in order, we were now able to resume our barometrical observations, which had been suspended since our departure from Sturgeon Lake. The doctor replaced the dial plates, which he found had been shifted, and treated the aneroids most successfully by firmly sewing on their faces with brass wire. The mean of those observations, which he considers reliable since leaving Fort Garry until this time, and which, from the slight change of level may be looked upon as a rough mean for the Red River valley, for 16 days, commencing on the 12th instant, is 29·03, therm. 64°.

Very fine land.

July 28th, Tuesday.—This morning, although all were astir at sunrise, it was 9 a.m. before all the horses were tackled, and a start effected. Our course, after leaving the post, was over fine prairie undulations, covered with luxuriant nutritious grass; we followed the track in the direction of the town of St. Joseph, which we were anxious to visit, being situated not far from the boundary line.

We made for a ridge of small woods slightly higher than the surrounding plain, and being about a couple of points to the south of west, and continued a slight but constant ascent to its level; thence we pushed across another stretch of prairie to the next woods, and passed through several clumps of oak copse; attempted to traverse the next stretch of plain, but finding this traverse too long for our horses, we stopped short of the woods and halted for dinner at some small lakes, the water of which had a bitter saline taste due to the presence of Glauber salts or sulphate of soda. Before starting took observations for longitude and variation of compass.

Salt lakes.

During our march we could see for a great distance to the southward the thick woods skirting the banks of Pembina River. After dinner our course was more to the southward, and towards a high hill, at the base of which the town of St. Joseph is situated, distant from our dinner camp about 15 or 16 miles. We made a forced march and arrived there about an hour and a half after sunset.

Arrive at St. Joseph.

What few inhabitants the place possessed were all asleep except an old French half-breed, who invited us to turn our horses into his enclosure, where they would not only have the advantage of hay already cut and stacked there, but we also might let them go without hobbling them, as we should have no difficulty in finding them the following morning, and here also we ourselves encamped for the night. He brought us also some "gold eyes," a species of carp, which are caught in the river here in abundance.

* Since the above was written the railway has been completed as far as La Crossa on the Mississippi, about 120 miles in a straight line from St. Paul's.

† Steam boats carrying heavy freights and fitted with first-rate accommodation for passengers navigate the Mississippi to St. Paul's from the 25th of March to the latter end of October. Small steamers again ply between St. Paul's and the Sock Rapid, about 75 miles further up the Mississippi; but as yet they are dangerous and insignificant.

‡ Since writing the above I have descended the whole of Red River in a canoe, and do not apprehend much difficulty in steam navigation at certain times of the year.

July 29th, Wednesday.—It rained very heavily during the night, cleared up in the forenoon, but unfortunately came on to rain again about 12 o'clock, thus preventing us from obtaining an observation for latitude at this (comparatively speaking) important place. The harness belonging to our waggons had originally been made for mules, and although we had altered it, it did not yet fit the horses, we therefore remained a day here in order to avail ourselves of the assistance of a professional harness maker, whom we were so fortunate as to find in this primitive town.

Could not obtain any latitude of St. Joseph.

Found a professional harness maker.

St. Joseph's has been established for several years, and consists of numerous detached dwellings, which, however, are well arranged on a regular plan with a view to the after-construction of streets. There is abundance of enclosed land, and the whole is prettily situated at the base of what is known as Pembina Mountain, just where the river of that name issues from it through a large deep valley coming from the west. To the north and east bare plains extend as far as the eye can reach, while to the south thick woods run along the base of the hill and out into the plain to the south of the river, consisting principally of poplars, but with a few oaks and ash intermixed. Altogether the position of this place is well adapted for a settlement, wells sunk anywhere in the neighbourhood yield readily ample supplies of excellent water. The neighbouring prairies are admirably suited for grazing, and from the swamps which skirt the base of the hill plenty of hay can be obtained. The fields are very fertile, and there is no lack of wood for all purposes. Notwithstanding all this favourable concurrence of circumstances for the agriculturist, the inhabitants, who are chiefly Red River half-breeds, were at this time all off to the prairies in search of buffalo, leaving their houses and fields deserted during that season of the year when their labour would be most productive. The timber in the Pembina valley and along the slope of the hill mostly consists of the Populus tremuloides and balsamifera, Quercus, and Fraxinus. Of these Populus tremuloides is by far the most abundant. The shrubs are Viburnum, Ribes, Cerasus, Amelanchier, Crataegus and Salix. Perennial plants are very plentiful in this valley; a very pretty Hedysarum and many species of Compositæ have been observed, which would be valuable for gardens. Dr. Hector, who examined the valley in search of sections, describes it as being the eastern border of a prairie level, which extends to the west without any apparent descent as far as the eye could reach, but here slopes abruptly to the level of the Red River plains by a succession of terrace-like steps. The height of the first summit level above the stream where it issues from the valley is 250 feet, but behind this, by two more gentle slopes, it gains an additional 100 feet of elevation, and as we may add 100 feet for the rise from Lake Winnipeg to the base of this hill, its total altitude above that lake will be 450 feet, or about the same as Rainy Lake. Along the sides of the valley he found enormous landslips, at a very high angle, displaying the structure of this terrace from its summit to its base, consisting almost altogether of coarse loose sand with rounded shingle and gravel. These latter beds are found towards the upper part of the section, and on its summit true boulders occur, presenting all the characters of a shore deposit, and corresponding closely with those which may be observed on the right bank of Rainy River in the neighbourhood of Fort Francis. The materials which compose this terrace level are very distinct from those which form the deposits of the Red River prairie level, which latter are marked by a predominance of calcareous and argilaceous matter. From the summit of the hill, and as far as the eye stretches towards the north-east over the plain below, all minor inequalities seem to disappear. This plain, no doubt, had formed at one time the bed of a sheet of water, and Pembina Hill, consisting of previously-deposited materials, was its western shore.

St. Joseph, description of.

Its capabilities.

The timber and shrubs.

Terrace levels.

This level formerly an ancient lake bottom.

To-day we were visited by an old traveller, one of those who first crossed the mountains in the famous expedition described in Washington Irving's "Astoria." He was, after that, for a long time, a runner with the mails between Pembina and Fort Garry. He is 91 years old, and only last week had walked from Fort Garry to this place, a distance of 70 miles, in two days, driving a young bull. He came to seek the Doctor's advice as to what he should do for his knees, for he did not, as he innocently said, "find them so strong as they used to be." Another patient of the Doctor's was a poor man, who, from the severity of last winter had been frozen out on the plains, and lost parts of both feet in consequence.

An octogenarian voyageur.

The continual haziness of the weather during our stay here has prevented all astronomical observations, but we did not feel justified in remaining on the chance of getting a fine day to-morrow. We accordingly prepared for an early start in the morning.

The day too hazy for astronomical observations.

July 30th, Thursday.—Having obtained all the assistance from the American harness-maker that we required, our cavalcade moved off at 8.35 a.m., and continued in a north-westerly direction till 12.35 p.m. The character of the prairie lands over which we travelled was, in every respect, similar to that described before, possessing numerous fresh and saline marshes, and small lakes abounding in ducks, waders, and other aquatic birds. As we were now approaching a creek, which our guide described as very hard to traverse, two or three riders were sent a-head with a view to seek the best fording-place. As we did not move off again until 4.25 p.m. our horses had a long rest, and the men had sufficient time to choose a ford for the carts and waggons. In about half an hour after we had started we arrived at the creek, and found it, as our guide had described, exceedingly bad. Here the fertility of resource of our prairie voyageurs was well displayed in extemporising a bridge; in a few minutes they had trees felled and a rough bridge constructed, over which our waggons, carts, and horses passed in safety, although crossing the place seemed, at first sight, to be quite impracticable. We traversed the creek near a clump of woods known as "Allard's Point." From this our course was for an hour and a half to the westward, after which we camped at the base of Pembina Hill, along which we have been skirting all day. This hill, from St. Joseph's to the place where we took dinner, preserves the same character of a steep slope, scantily clothed with small wood, the summit forming an even sky line, but further on the slope becomes more gentle, and facing the north ceases to be so marked, appearing like a hill seen from the prairies. The woods also become more plentiful, and of much finer growth, being disposed in very pretty groups upon the long slope into which the escarpment changes. Our encampment was close to a small well, from which, as it is only one foot in diameter, and the only water that can be found in the neighbourhood, we have to draw a supply for our animals, and to prevent them from helping themselves and trampling the place into a puddle. The creek we passed at "Point d'Allard" runs to the N.E., and is said to lose itself in an extensive marsh without communicating its waters to any other stream.

The character of the prairies here.

Construct a bridge.

Pembina Mountain, description of.

A small well the only means of procuring water for the horses as well as ourselves.

July 31st, Friday.—Rose early, but in consideration of the restless night our horses had passed from the attacks of musquitoes, we breakfasted before moving off, thus giving the animals a little time to feed. At 8.15 a.m. we started, and during the first three-quarters of an hour crossed some open ground with a gradual descent, and at the end of that time emerged on a belt of oak wood of very fair growth. From this point the ground rises rapidly and continues to be wooded with irregular clumps. The country here is very fine, and well adapted to agricultural purposes. Saw two small deer, and subsequently through the day several wolves. The woods in this locality formerly abounded in large game, such as elk, moose, and bears, but they have long since become very scarce. Still continuing to rise, we at length reached a very irregular country, the surface of which consists of conical mounds and deep basin-like depressions. On these an immense number of granite and limestone boulders were scattered. In a valley of this kind we rested for dinner at the edge of a small lake. Our general course to this lake has been west, although our track has been necessarily winding and irregular. A very curious hill rises in the neighbourhood, which is known as the Beef Lodge. A fine view of the surrounding country may be obtained from its summit, which rises to the altitude of 50 feet above the adjacent plains. We ascertained that from our encampment of last night to this place there was a rise of about 430 feet, or about equal to the summit of Pembina Hill. That we had now actually gained this level is corroborated by the fact, that the view which we get to the north shows the line of woods which mark the declivity of the hill to stretch away to the right hand of our course in a north-west direction. To the north and south the country presents the same uneven swampy character as that through which we have travelled, but to the west woods are scattered among the irregularities of the surface.

A fertile region of country.

Beef Lodge Hill.

General appearance of the country.

After dinner our course has been very zigzag, winding among the mounds and hollows which have been already noticed; but as these now became skirted and clothed with green woods, while the grass which covered the open spaces was in full grain, the landscape assumed a rich brown tint, and reminded us of the parks attached to domains in England. We shortly emerged from this kind of country, and commenced to traverse prairie undulations, each rising in succession towards the westward, with their summits clad with poplar thickets, while the intervening hollows were occupied by swampy lakes. At 7 p.m. we encamped on the borders of one of these lakes.

August 1st, Saturday.—We were delayed this morning till 9.15 a.m., and our course at first struck off considerably to the south. The Paquewin, or as it is called by the Indians, the Hill of the Great Medicine Dance, rises in a south-westerly direction at the distance of about 10 or 12 miles from our encampment, and not far from Pembina valley.

Great Medicine Hill.

Pembina River valley.

In about one hour and a quarter we arrived at the brink of the wide valley through which Pembina River runs. The descent to the river margin is very precipitous, but there is a tolerably good road, winding through copse wood, formed by the hunters, who resort annually to the plains beyond. The flat in the bottom of this valley is about one mile wide, and through this, the small stream, not more than 10 yards broad, follows a very circuitous course. Its depth at the ford where we crossed is not great, only rising to the axletrees of our carts, and the only inconvenience we experienced was in ascending the declivity with our laden waggons. The immediate banks are about six feet in height, and are composed of dark-coloured silt arranged in thin layers. The verdure in the base of the valley seemed to be very rich, and the left side especially is well wooded. We have had a long pull in reaching the opposite brink of the valley, and although the road takes advantage of a lateral ravine, the ascent still remains steep. Secondary levels are well marked along both sides of the valley, which here forms a bend towards the south-east, but more especially on the right bank. On gaining the summit of the hill there is still a considerable rise to the west, which might be fairly included as part of the valley bank, only hollowed out in a less abrupt manner from lying in the concavity of a great bend. Including this, the following table shows the various changes of level in passing through the depression.

DINNER CAMP.

	Bar.	Therm.	Feet.
East flank of Pembina valley	28·18	75	
River level	28·50	82	
Depth of valley from left brink			310
Secondary level	28·33	48	
Height of secondary above river level			161
West brink of Pembina valley	28·30	83	
Altitude of dinner camp above river level			190
Altitude of slope further west	28·10	80	54
Height of right bank above river level			385
„ left „			310
Difference in favour of right bank			75

Botanical change.

Astronomical observations were made at this place. Botanically speaking, this valley is the limit of a new country, for while the eastern side of it is wooded and irregular, the western side, at a higher level, consists of nothing but bare prairie lands. This distinction is also recognized by the hunters, who consider Pembina valley to be the eastern limits of "la grande prairie."

Grasshoppers.

While encamped for dinner a violent wind sprang up from south-west, bringing with it dense clouds, among which the lightning played vividly, without however producing a regular thunderstorm. Along with this wind came what seemed at first to be a low cloud of a brownish-black colour, but soon we discovered it by aid of a telescope to consist of myriads of grasshoppers. A breeze springing up from the east met this cloud, and suddenly the insects began to fall as thickly as snow. They soon covered the ground, giving everything a greyish aspect from the colour of their bodies. When we started the fall of grasshoppers was still continuing, though to a less amount, but still sufficient to cause us much discomfort from the blows they gave us on the face, as they came down with great rapidity before the wind.

The locust cloud had now passed to south-east, and by the action of the opposing wind had formed into a large massive bank, passing from which we observed several pillars like waterspouts; two of these were especially fine, and one had a curious twist about half way up, as if the centrifugal force was tending

to overcome the columnar shape. There were also some imperfect cones, the points of which directed downwards did not reach to the earth.

This afternoon we continued to proceed towards the west, crossing a high level plain, which is bounded to the north by a line of woods, marking the position of Pembina valley. From information given by our guide, it seems that Pembina River, a few miles above the place where we forded it, has a course from west to east, and expands into five lakes, which are of considerable size, and lie in a depression below the general level of the country, which must be the continuation of Pembina valley. To our south there is a range of low conical hills and broken ground, among which is Paquewin Hill, already alluded to. Before leaving Pembina valley it was necessary to obtain a supply of wood sufficient to last two days. We now had a long traverse of plain to make before we could again obtain wood for fuel, and therefore had to bring along with us sufficient for the cooking of several meals. We did not, however, adopt a direct traverse of the plain, but preferred going round by Long River. Although this somewhat lengthened our route, it enabled us to manage with a smaller supply of wood for cooking than we should otherwise have laden our horses with. Since leaving Pembina River also the plains were plentifully strewn with dry buffalo dung, which by also using as fuel we greatly economized the wood we took with us. This buffalo dung, the glow from which somewhat resembles that from coals, is a great acquisition to a camp fire. Water is also very scarce in this plain, so that, in case we might not meet with any, we filled a cask which we brought for the purpose, taking it along with us. At night, however, we reached and camped by the side of one of several large swamps.

Carry a supply of wood for fuel.

A long traverse of plain.

Dry buffalo dung a good acquisition to wood as fuel.

Water scarce.

This evening we were amused by one of the many proofs of credulity among the French half-breeds, and subsequently were much entertained by accomplishing its exposure.

Credulity of the French half-breeds.

After dark some of the men came to Bourgeau and requested him to take notice of a very mysterious noise in the swamp. This they asserted to proceed from the "Carrot à moreau" (a species of umbelliferous plant) in consequence of its poisonous and manitou or miraculous attributes. They insisted that this plant, which continuously kept up a muttering noise, invariably became silent at the approach of man! Determined to sift this strange but universal belief among the half-breeds regarding a poisonous plant gifted with a voice, and that voice under its control, Bourgeau set out accompanied by Hector with a dark lantern on their nocturnal search. After frequently failing to reach several spots from which the sounds proceeded, they at last effected a stealthy approach, and quickly turning on the light in the direction of the sound now almost at their feet, they interrupted a noisy little frog in the midst of his croaking. Late in the night the barking of a dog put us all on the alert. We were now close on the country of the Sioux Indians, and began to apprehend attempts to steal our horses. These Indians are wonderful horse thieves, and, in my former experience among them in 1849, I had seen several proofs of their fertility of resource in these depredations.

A slight alarm at night.

If only half the skill and enterprise expended in horse thieving were devoted by them to breeding and rearing young horses, they would become wealthy; but to be esteemed an accomplished horse thief is the summit of their ambition.

There had been Indians, no doubt, in our neighbourhood, as, in addition to the barking dog, we subsequently heard a shot—a blank shot probably fired at some stealing dog trying his chance of finding some food in a neighbouring tent.

August 2nd.—A heavy thunderstorm detained us in camp for several hours: the lightning was very vivid, playing incessantly, and seeming to run along the ground in blinding sheets. At about 9 a.m. the day cleared up, and we started. We took a more northerly course than that in the direction of the Turtle Mountain, in order to touch at various wooded points which advance into the plains from the north along the tributaries of Pembina River. We had now the Paquewin Hill to S.E., and observed another conical hill covered with woods lying to N.N.W., which is known as the Little Paquewin. About noon we came to a shallow creek, when finding some tolerably good water we stopped for dinner, which we cooked using buffalo dung for fuel. Took observations: distance from Pembina River, 24 miles.

Our course not direct for Turtle Mountain.

The wood which we had carried in the carts exhausted.

Since leaving Pembina River the soil has been everywhere very poor, being both sandy and stony, and grass grows only in swampy places; its general scarcity is now further felt by our poor horses in consequence of the plague of grasshoppers which now swarm over the plain. By making the detour to the northward of our course to-day we were enabled to camp at night in the woods of Long River before dark; its valley in the vicinity of our encampment is wide and well wooded, the river itself runs 120 feet below the level of the prairie. The sides of the valley are very irregular, having none of that even embankment-like aspect which characterizes the valley of Pembina River: the course of the stream is very tortuous, and said to flow into the first of the Pembina Lakes at a distance of four or five miles to the north of where we crossed it. The valley is filled with a dense growth of wood, consisting of oak and poplar, which extends also for some distance over the adjacent plains on either side; a few miles higher up the stream these woods cease: the banks become low and the valley changes into a shallow trough cutting through bare plains. Hector found the banks of the valley there to be composed of shale of a light buff-green colour, not occurring in continuous beds but as fissile fragments. The surface of the ground is scattered with detached boulders of fine red granite; many of these are polished by the buffalo, whose numerous tracks have worn trenches about them in consequence of their walking round them in order to scratch themselves. Before dark, numbers of goat-suckers were flying about startling us with their booming call as they swept close by our heads.

The change in the general nature of the soil.

The banks of Pembina River.

Granite boulders polished by buffalo.

Goat-suckers.

August 3rd, Monday.—The morning broke very fine, and throughout the day the sun's rays have been excessively hot. Large numbers of garter snakes have left their retreats and are very numerous on this portion of the prairie. Dr. Hector dissected one and found it to contain 54 young ones in different stages of incubation. Instead of continuing on the march of the main party during the forenoon, Dr. Hector remained to continue the examination of the valley of Long River, accompanied by one of our men; but as we went slowly they came up with us at our dinner encampment.

Garter snakes.

The country through which we have travelled to-day is rolling and irregular, and from the number of small swampy lakes, it presents more the character of moorland than prairie. There is not a vestige of wood, so we are again dependent on buffalo dung for fuel. The lakes abounded in ducks and various kinds of waterfowl, so that our fare was excellent, and although no buffalo or other large game appeared, we enjoyed an ample supply of fresh provision.

The large Prairie wolf, description of.

About noon halted for dinner, and Mr. Sullivan made observations for longitude and variation of the compass. Here one of our party wounded a wolf, and after a long run succeeded in killing him. It was one of the large prairie wolves, and known in this country as the case wolf, or large "Toganny." It resembles a dog, being of a grey colour, with the tips of the hair on the back of an olive black, the ears are erect and of a dirty red colour, and the tail is bushy and straight; the great distinction which gives the face of this animal a very different appearance from that of a dog is its white nose.

During the afternoon the country presented an irregular appearance being broken into knolls, on the summits and sides of which abundance of rounded stones were strewn, some of great size. Our course has been nearly due west, and making for a distant group of woods which we saw thrown up by the *mirage*, we encamped at 7 p.m., but found them to consist of nothing but small poplars. Luckily, however, we found some fragments of a broken cart, which we at once appropriated for fuel. From this point we obtained our first view of Turtle Mountain, which, as seen from here, presents a long blue line bounding the prairie horizon to the S.W.

Turtle Mountain.

The longitude of this place, as well as the variation of the compass, was determined, and the following bearings of the mountain were observed:—

A. (Bearing of) most southerly height of mountain - - -	W. 297° N.
B. Conical hill, called Heart of Mountain - - - - -	309°
C. Head of the mountain - - - - - - - -	330°
Bearing of clump of woods in line of route - - - - -	347°

August 4th, Tuesday.—A short time after our start, and at about the distance of four or five miles, we came to another tributary of Pembina River, known as the White Earth Creek, to traverse which we were obliged to descend into a steep valley depressed 100 feet below the prairie level. The creek is not more than 10 yards across, and at this place flows due north. It is said to fall into the third of the Pembina Lakes. Its bed is very stony, as are also the banks of the valley through which it runs.

Our approach to the mountain.

After crossing it we turned more to the south and shaped our course for a point in Turtle Mountain about one-third from its eastern extremity. We thus passed considerably to the south of the clump of woods which lay directly in our road, and when its bearing this afternoon was W. 81° N., and that of our last night's camp W. 141° N., the bearings of the three points of the mountain were (A.) W. 293° N., (B.) W. 299° N., (C.) W. 337° N., the distance between the two points of observation being 11 or 12 miles. At the place where we dined, which was in the neighbourhood of a small lake, observations for longitude and variation of the compass were obtained.

Towards evening we came in close proximity to the outskirts of Turtle Mountain, and encamped at the commencement of a fine rich prairie, studded with clumps of bushes and small poplars at a distance of only four miles from the mountain base.

During the last two days we have effected a considerable rise in our progress westward to our present encampment.

A very violent thunderstorm this evening; it has lasted throughout the night.

August 5th, Wednesday.—The thunderstorm continued this morning, and it has been accompanied by several showers of very large hailstones. A succession of very dense clouds have been passing over us, which are invariably followed by very high wind from S.W. During a lull in the storm we shifted our camp, and after going four miles to the south reached the edge of the thick woods, by which Turtle Mountain is covered. Here we again halted as we intended if the storm abated to make an examination of this part of the country during the afternoon. About noon the sky began to clear, and the storm, which has now lasted almost continuously for 19 hours, passed away to the N.E. Accompanied by our principal guide, I immediately started to skirt the hill towards the N.W., and endeavoured to penetrate the dense forest by which it is covered. Dr. Hector also, accompanied by one of the men, set off with the same view in an opposite direction. As we neared the hill, or mountain as it is called, in common with every little rising ground in this flat prairie country, the altitude which it apparently possessed when viewed from a distance has dwindled away very considerably; and now that we were close under its flank it seemed to be nothing more than a dense forest, covering a gentle swell in the prairie, and which rises from 250 to 300 feet above the general level.

Reach Turtle Mountain.

A protracted thunderstorm.

In the course of our ride this afternoon we encountered nothing but broken ground, covered by impenetrable thicket, and studded with innumerable lakes, which form the breeding-places of many kinds of water fowl,—swans, geese, ducks, coots, divers, &c.

The game on Turtle Mountain and its morasses.

I tracked up and got a shot at a wapite, but missed him. The dense thicket and the absence of all tracks through the woods, so different from the valley of the Missouri, renders the hunting here very arduous. This hill, however, had once a great name as a hunting ground, and abounded with moose, wapite, and bears, but as the buffalo resort here every winter, and bring in their trail numerous camps of Indians and companies of half-breed hunters, the game has been either exterminated or driven away. We have been disappointed by the entire absence of buffalo from the plains in this neighbourhood, where they are so frequently found; but, perhaps, it is as well for us that it is so, as we are now on the confines of the Sioux country, and we shall be less likely to see Indians, or get our horses stolen.

Proximity to the boundary line.

On my return to camp I found that Mr. Sullivan had been able to obtain a meridian altitude of the sun, and curiously enough our camp was pitched within a few seconds of the boundary line, our latitude being 49° 0′ 32″ N. This observation places the greater mass of Turtle Mountain within the United States territory, as a line carried due west from this place would pass obliquely across the hill, cutting off a portion of its northern flank, while if produced to the east it would not meet the hill at all, which from here stretches away for 20 miles considerably to the south of east.

A beautiful and singular elevation of fog.

This evening we became enveloped in a singularly dense fog, which is a very unusual occurrence on high prairie lands. It began in the small hollows in which there were lakes, and the effect on the eye was very curious. Looking down from a little height just before sunset, the country seemed as if it were undergoing gradual inundation, for while the upper air was clear, the fog was so dense that it quite resembled water rising gradually, and thus giving the many rounded knolls the appearance of islands. We watched it as it continued to rise, until nothing but the tops of the trees were visible, when, soon becoming enveloped ourselves, we had no small trouble in retracing our steps to the

encampment. We found the men engaged in making huge fires, as all found this fog to be peculiarly chilling, although, unlike the cold of a sharp frost, it did not free us from our persecutors the musquitoes. During the afternoon observed for longitude, also for variation of the compass, with an interesting local result.

Interesting local declination of needle.

August 6th, Thursday.—This morning the weather was wet. Finding that there was nothing to be seen in this neighbourhood, we determined to pitch* along the base of the hill to the westward, the mass of the party making short stages each day, so as to allow of our exploring the mountain as far as possible. We started accordingly at 9.30 a.m., and went about 6 miles to the north, in order to round a point of dense woods which here projects into the plain. We halted for dinner beside a small creek, wending its way northerly, and seemingly losing itself in the many swamps which cover the plains at this place. We observed from here a ridge at a considerable distance to the north scantily covered with wood, which our guide called the "Montagne de Poile." This elevation seems to continue as a broken ridge, covered with small lakes to the spot where we now are, whence, sweeping round to the west, it becomes merged with the base of Turtle Mountain. Shot two cranes here, one the large white crane, measuring five feet eight inches in height; the other a grey crane, measuring five feet, spread of wings, six feet. Both of these birds are excellent eating and common to this part of the country, but very wild and shy. We also killed a number of bitterns, which rose lazily out of the swamps. They are of a rich hazel-brown colour, with saffron-coloured bills. This bird is seemingly very lean, on account of its lengthy awkward build, but in reality carries a great deal of excellent *moite* fat, and has a delicious flavour. During the afternoon I left the party and rode through the woods, without, however, seeing anything worthy of notice. Just before dark I again rejoined them, where we encamped at a small lake.

Occupied in excursions about Turtle Mountain.

Montagne de Poile.

August 7th, Friday.—At early morning we received a visit from three wapite; they had observed two of our chesnut-coloured horses feeding on the opposite side of the lake, and immediately swam across to where they were grazing. We killed a doe and set to work slicing and drying the meat. This operation delayed us till after mid-day, so that we obtained the latitude and longitude of our camp, and the variation of the compass.

The large red deer.

August 8th, Saturday.—We kept on a due west course until 2 p.m. this day, and having arrived at a deep gully encamped on its eastern side. To our north at the distance of 5 or 6 miles is a large lake, known as the White Lake, and said to be of very recent origin. It lies in a hollow without any outlet, and until five years ago water was never known to lodge permanently in this place. Its bearing 2 miles east from our camp was (E. end of) N. 3° E. (W. end of) N. 291° E. During the afternoon we separated over the hill in different directions. Thunderstorms have visited us daily of late, commencing generally at 2 a.m. and lasting till 6 or 8 p.m., and the night set in with high wind.

A lake of very recent origin.

August 9th, Sunday.—This morning we started at 10 a.m., and travelled about 5 or 6 miles, when we reached a large wide valley with a small stream running through it. The latter issues from the head of Turtle Mountain, a few miles N.E. of our last night's encampment; the west end of White Lake bore N. 310° E., and the east end was not visible. We had discovered several tracks of horses, and consequently were now very careful concealing our own in the bottom of a deep ravine where they had abundance of grass.

After dinner we again set off in different directions to make a last examination of the nature of the hill. We here arrived at the northern extremity of a crescentic notch, which crosses the hill, cutting off a lofty conical summit from the rest of the mass, and known to the half-breeds as the "Tete de Tortue;" thus the hill receives its name from the hunters by their seeing a resemblance in the elliptical mass to the buckler of a turtle, its head being represented by the conical mound standing out from one end. All this part of the hill is comparatively free from wood, the wide notch-like valley spoken of being occupied by bare plains, and the rounded hill only covered with patches which offer no impediments to the rider; but on attempting however to cross right over the summit to the south we soon got involved in the woods. At last, after a long ride, Hector succeeded in gaining the highest point, having avoided some deep gullies by which that part of the mountain is intersected. From the summit he obtained not only an extensive view to the north, but away to the south and west over American territory, where nothing as far as the eye could reach was to be seen but bare and barren prairie stretching in every direction. The hill here rises very abruptly from the plain below to the height of 300 feet above the plateau level, which skirts its base. Its western face is entirely devoid of wood, and has somewhat of a fine bold appearance.

Further examination of Turtle Mountain.

Territory on the American side of the line.

From sections which the ravines afforded, Dr. Hector ascertained the mass of the hill to consist altogether of drift accumulation, and wherever an exposed surface was seen, whether near its summit or towards its base, the materials were always coarse sand and shingle with large boulders. Boulders are also very frequent along its flanks and on steep slopes. They consist of large masses of limestone, which are generally angular, and huge rounded blocks of granite, gneiss, and other azoic rocks. He considers it probable that there may be a rocky nucleus to this hill; but if it is not exposed on its northern and western flanks, where the denuding agencies have evidently been the most violent, it would be useless to look for it in other quarters. The country in the neighbourhood of the mountain is very beautiful, and somewhat like that which we traversed previous to our crossing Pembina River on August 1st.

Turtle Mountain a drift formation probably.

The forests which cover Turtle Mountain are not of much value as regards timber, the principal growth being the two ordinary species of poplar (*balsamifera* and *tremuloides*), several kinds of oak of stunted and crooked growth, a small birch (*Betula pumila*), and, round the skirts of the hill, dense thickets of willows and berry-bearing bushes.

The boundary line passes directly through the summit of the mountain, and somewhere about the part resembling the head of the animal from which the mountain derives its name, and thence passes to the north of another point termed by the half-breeds the heart of the animal.

Boundary line, Tête de Tortue and Cœur de Tortue.

August 10th, Monday.—During last night another dense fog occurred, and this morning everything was completely drenched with moisture.

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* An expression in general use among the half-breeds and Indians applied to travelling slowly with tents.

Leave Turtle Mountain.

We started at 8 a.m., and taking a N.W. course left Turtle Mountain behind us, our visit there having been much less fruitful than we had been led to expect; except, however, as regards M. Bourgeau's department.

We crossed a narrow slip of level plateau, after which we made a rapid descent of about 150 feet, and then commenced to traverse a long expanse of bare plain. At 10 a.m. we came to a small creek which flows towards the east and joins White Lake, and at 11.15 a.m., having made about 10 miles, we halted to rest our horses, the heat being very intense. At 1.30 p.m. we were off again. We saw a caloi, or one of the prairie antelope, and several of our party unsuccessfully attempted to approach it.

The Forcifer Antelope.

This antelope is known by the name of Forcifer. It is very inquisitive, a peculiarity which may sometimes be taken advantage of in hunting it by showing some attractive object, such as a red or white blanket, and then running round to the lee, when the animal will expose itself to the hunters in its endeavour to get the wind of the thing it has perceived.

During the afternoon we made a considerable rise whilst crossing a ridge of broken ground running in a westerly direction, and from its summit we obtained a view of the woods which skirts the Souris River. At 6 p.m. we reached the first bluff of these, situated at about four miles from the river, and halted for the night.

Reach the Souris or Mouse River.

August 11th, Tuesday.—We were off at 8.15 a.m., and reached the banks of the Souris at 9.30 a.m. It is a considerable stream, being 50 yards wide and about four feet deep at the shallowest place we could find to ford it. We were obliged to skirt the river for several miles before making this discovery, and even then a portage was necessary in order to gain the opposite bank. It occupied us till 1 p.m. getting all our baggage and horses across, and we then halted for dinner. At this place there was once a small winter post of the Hudson Bay Company, but it is at present deserted. It corresponds to

Nature of its Banks.

Grant's House in Arrowsmith's map. The country immediately adjacent on the north side of the river consists of numerous conical sand hills, which generally rise to the height of from 60 to 70 feet above the plain, and are composed of very fine sand similar to that which forms the hills on the sea shore. The bed of the river is of a similar composition, and cut through a rich alluvial bottom to the depth of 8 or 10 feet, and, judging from the amount of overflown land on either bank, the river

Natural paper.

itself must be subject to great floods. The land thus inundated is covered with a thick layer of substance not unlike grey packing paper. At some of the river bends high cliffs of the sand hills are exposed.

After dinner we struck off to the N.E., with a view of avoiding the swamp which lies to our north. We did not, however, proceed far, as our horses were fatigued from dragging their loads over the loose sandy soil, and we found it advisable to encamp at the edge of the sand hills. Dr. Hector, who had left the party when we halted for dinner to geologize in the neighbourhood, rejoined us about half an hour after we fixed camp. Fragments of coal were found in the bed of the river at our crossing-place. These are derived from a bed of rounded shingle which underlies the sand hills, or in some cases may have been carried down the stream from an outcrop of lignite which occurs higher up. There is a distinct lake deposit at this place in regular strata of marl, sand, shingle, and iron-shot sand, with fresh water and land shells. The sand hills have doubtless been formed on the shore of this lake. Eight feet below the surface in one section bones protruded in numbers, but they all seemed to belong to the bison, although much mineralized.

August 12th, Wednesday.—As the flies had ceased to disturb our horses during the night, owing to frequent frost after sunset, we commenced starting early every morning so as to allow of a long halt during the oppressive heat of the mid-day sun. Notwithstanding the dense fog which caused our view of the country to be greatly limited, we were off at daylight this morning. At 7 a.m. we came to a large swamp over which we had to pass, but found that we had struck it too much to the westward and consequently required to make a long detour to the east. On reaching the place where it narrows into a sluggish stream of inconsiderable breadth, but of great depth, we halted for dinner while some of the men prepared a corade or boat with willow branches and our oil cloths, which was to convey our luggage

Cross Snake Creek.

across. The latitude of this place is 49° 36′ 0″ N. After dinner we swam across the stream, finding it deeper than the Souris River which we had had only occasion to ford with our horses. The crossing of the party took more than an hour, and while we were congratulating ourselves on getting on our dry clothes again a tremendous thunderstorm, accompanied by heavy rain, came on in the centre of this great swamp where we had no means of sheltering ourselves. The stream we had just traversed is known as Snake Creek, and falls into the Souris River, a few miles to the east of this place, and about 6 or 7 miles from its junction with the Assineboine. Our course lay now a little to the north of west, and our camp at night was also north of the place where we turned to the eastward in the morning.

Fine land and timber.

Immediately adjoining this swamp bluffs of wood occur, which, although they belong to the valley of the Assineboine, are at a distance of 5 or 6 miles from that river. The land in this neighbourhood is rich, and some good wood is to be met with.

August 13th, Thursday.—The morning broke raw and blustering, so much so that on starting at 5.15 a.m. we all preferred walking to riding. We continued to pass through level country with occasional

Fall upon the road from Red River Settlement to Fort Ellice.

groups of sandy hills, having the advantage of a "trail," known as the south road to Fort Ellice from Red River. It is said to be considerably longer than the road on the left bank of the Assineboine, which cuts across from "point" to "point" of the woods marking the course of this river, and although we have never approached sufficiently near to explore it closely, owing to the deep transverse gullies in its neighbourhood, nevertheless we could easily observe it running a little to the south of east. Our horses were now beginning to tire from the length, consequently shortening our days marches. At nightfall we came to a bluff of high poplars, where we camped. The woods which sprinkle the plains in this quarter consist of nothing but poplars.

A cold night.

August 14th, Friday.—Last night was very cold, the water in our kettles being frozen, and the ground at daybreak covered with hoar-frost. Our course was north-west, following a bend which the Assineboine takes from this point. Above this the river runs to the south, while below it follows an easterly direction. The country through which we passed now rose considerably, but otherwise preserves the same features as before. At 10.45 a.m. we arrived at a large gully, which divides into two branches,

Geological exposures.

and is named Fork Creek. Here there is a small stream of water, and at some parts the banks have a cliff structure which exposed fine sections of the same shale which we had seen at Long River on the

2nd of August. Accordingly we halted for dinner to allow Dr. Hector to examine these beds, and we also determined the latitude and longitude of the place. During the afternoon we passed several other creeks, and they all exposed like sections of the Long River shale. The ground, too, is plentifully strewn with large boulders, most of limestone, and one composed of calciferous sandstone measured 9 by 9 by 3 feet.

We passed through a country thickly studded with swampy lakes, and encamped at 6.30 p.m.

August 15th, Saturday.—Some of our party left the carts at starting, intending to proceed to Fort Ellice (half a day's march distant) by the ordinary route, while the others were to pass through the woods, keeping close to the river. After descending into several gullies, which were about 200 ft. deep, with a breadth of half a mile, our guide gave up the idea of reaching the fort in this direction, and again returned to the cart track about 6 miles from where we had left it. The sides of these gullies are very steep, and covered with a small but dense growth of wood. They run only a short distance into the plain, very abruptly losing their depth, and the small streams which flow through them generally emerge from swampy lakes a little distance back.

Failed in making a short cut.

Thus the cart track avoided the ravines without deviating far from the direct course to Fort Ellice, where we arrived about noon.

Arrived at Fort Ellice.

Fort Ellice is situated near the junction of the Assineboine and Qu'appelle rivers, one on the east the other to the north, both distant about two miles. It is built on a steep thickly-wooded bank, at the foot of which flows the Beaver Creek at a depth of about 200 feet. Like most of the Hudson Bay trading posts it is built of wood and surrounded by pickets. Once it was a very lucrative emporium of the fur trade, but now its principal value is derived from its importance as a post for trading provisions; two excellent ferry-boats have been placed one on each of the rivers above mentioned; thus the whole of the trade in the country, both that of the Hudson Bay Company and also of those engaged in opposition, pass by the fort, so that the Hudson Bay Company often obtain indirectly considerable advantage from their rivals in the trade, who are frequently obliged to exchange the furs traded by them from the Indians for the common necessaries of life, which can only be obtained at this fort.

Advantageous position of Fort Ellice.

We found the fort in charge of Mr. McKay who received us in the most friendly manner. The men with the horses and carts which I had despatched from Red River Settlement direct, under the charge of Hallet, had arrived on the 1st of August, and these horses had already considerably improved by the rest and good grass they had been enjoying. The horses which we had taken with us were very much fatigued and greatly in want of rest after what had been to them a severe journey, first on account of their bad condition before starting, and secondly from the severity of the heat accompanied with the incessant attacks of musquitoes and sand flies. I therefore determined to defer any further exploration to the westward until I found the condition of those horses which had accompanied us considerably improved. I further contemplated a branch trip to the boundary line in this longitude with Hallet's band of horses while ours were recruiting themselves on the fine grass here in the rolling country to the west of the Assineboine.

Condition of Hallet's band of horses.

The horses which I had brought require rest.

The valley of the Assineboine is depressed to 250 feet below the prairie level, and is about three-quarters of a mile in breadth. On the eastern side of the river it is marshy with swamp, but on the western side, which is slightly elevated above it at this place, it is dry and produces fine grass for the feeding of cattle. The river banks are composed of sand of a light brown colour, and at this point the river averages 15 feet in depth and is 60 yards across. In the examination of this part of the river we crossed the stream by one of the excellent bateaus above mentioned, and by which all carts and horses are ferried over the Assineboine on the journey to and from Red River Settlement. The Assineboine River was described to me (by several who had descended the river to its mouth at Fort Garry) as deep but winding, and as only interrupted by two rapids which occur about half way between this and Red River Settlement.

The Valley of the Assineboine.

A good ferry here across the river.

The prairie level on either bank is reached by ascending the very steep slopes which are covered with dense wood, and which enclose the river between them; it is a great task for loaded carts to effect this ascent. About five miles above this the river Qu'appelle joins the Assineboine, and from thence we obtained a view of the serpentine character of the former previous to its waters mingling with those of the Assineboine.

Junction of the Qu'appelle River with the Assineboin

The valleys of the two rivers are well wooded, but the timber is of little value.

The soil in the neighbourhood, however, is well fitted for the growth of wheat, barley, potatoes, and other garden vegetables. There is only a very small patch of ground under cultivation at the fort, and potatoes form the chief crop.

A few head of cattle, also, belonging to the Hudson Bay Company, thrive well on the fine pasture they find in the environs of the establishment.

Owing to our protracted stay at Fort Ellice, an opportunity was afforded of making this place one of our astronomical stations, and a series of observations was therefore completed. The means of these, for latitude, longitude, and variation of the compass, are as follow: 50° 24′ 28″ N., 101° 48′ 0″ W., 20° 44′ E. respectively.

Lunar and other astronomical observations made here.

Dr. Hector rode through a good deal of country in this region in search of geological information concerning its structure, and M. Bourgeau botanized in the neighbourhood of the fort. The following are the principal trees of the place: *Populus* (*balsamifera* and *tremuloides*); in less abundance than these *Negundo fraxinifolium*, *Betula pumila*, *Fraxinus sambucifolia*, and the same *Quercus* which we observed at Turtle Mountain. We have observed no specimens of the pine family, the fort being built of poplar. While we were staying at this post a party arrived from Fort Colville on the Columbia River, having crossed the Rocky Mountains, and come round by Edmonton, Carlton, and Touchwood Hill Posts, having accomplished the journey in three months and a half. They had formerly been a portion of a large party of emigrants from Red River, under the direction of my late friend Mr. James Sinclair, which had crossed the Rocky Mountains with him in 1855. Subsequently, Sinclair, I understood, was engaged by the Hudson Bay Company, and, along with a party of Americans, was in one of the forts of the American Fur Company's trappers at the Cascade (where the Columbia River cuts through the Cascade range), when a row took place between the Indians and Americans. Firing commenced, and Sinclair, who was well known and liked by the Indians, went out to pacify them. They, however, did not know that he had been in the house at all, and fired before they were near enough to recognize him,

No trees of the pine family in this region.

Emigrants returned from the other side of Rocky Mountains.

Their account of the death of my friend Mr. James Sinclair.

killing him on the spot. After this, many of the emigrants became discouraged, the prospects, quality, and extent of the land on the Columbia not being equal to their expectations. The bustling life and active business habits of the Americans with whom they came in contact were too much for them, and

Return journey of the emigrants.

finally they determined to set off for Red River again, and had arrived thus far when we saw them. Their party consisted of about seven men, three women, and a few children, one of which had been born on the prairie, and seemed to be doing remarkably well. They had a severe journey, and when

They had eaten one of their horses.

in the mountains were so short of provisions that they were obliged to eat one of their horses. They had, fortunately, not fallen in with the Blackfeet, and had been very kindly treated by the Indians on the north branch of the Saskatchewan. Between what they obtained from Indians, and the assistance they got at the Hudson Bay Company's posts, they managed to get on very well as far as Fort Ellice: they said they had taken nine days in crossing the Rocky Mountains, but of these only

They cross the mountains by the North Kootanie Pass.

two had been very severe. They came by the northern Kootanie Pass*, their guide being a Red River Scotch half-breed of the name of Whitford; they remained here a few days to rest themselves and their horses, and afterwards proceeded to Red River. Among other arrivals were some half-breed hunters from the plains, who sold us five horses. Mr. Swanston and family also rejoined us here on their way to Fort Edmonton, that gentleman having been appointed to that post in charge of the Saskatchewan District. Several Indians were encamped about the post, gambling away their guns, ammunition, and blankets, and in short everything they possessed. Next to rum, gambling seemed to us to be their most absorbing excitement.

Branch expedition to the boundary line.

August 17th.—In addition to my wish to visit the country in the neighbourhood of the boundary line in this longitude, Dr. Hector was also anxious to investigate some indications of coal he had already found on the Souris River, still further, in addition to this, we had heard several curious accounts of strange appearances and shapes in some rocks to the southward, involving, perhaps, features of geological interest; now, therefore, that Hallet's band of horses (viz., those that had come direct from Red River, and which had arrived here long previously to ourselves,) were sufficiently rested to start away again, we determined on a branch expedition to the south. Our party consisted of Dr. Hector and myself, Mr. McKay, the gentleman in charge of Fort Ellice, who had kindly consented to accompany us, and four men, and Hallet's band of horses. Mr. Sullivan remained behind to take lunars at Fort Ellice, and Monsieur Bourgeau to classify and preserve his botanical specimens, as well as afterwards to pack and forward them to England. Shortly after noon we started from the fort and rode in a southerly direction along the west bank of Beaver Creek, crossed it where it emerges from a large swamp, and came to a succession of well marked ridges, trending north-west and south-east, whose summits are clothed with poplar, and having creeks and swamps between them. We dined at one of these creeks known as the First Poplar Creek, and camped at night on the summit of the third ridge.

Employ Hallet's band while our recently-arrived horses were resting.

Start for the boundary line.

Pipestone Creek.

August 18th, Tuesday.—After having gone some distance this morning we were delayed by having to wait some time for one of our men who had forgotten a gun at our last night's camp. At breakfast time we arrived at Pipestone Creek, which is a stream of considerable size, winding through a steep but wide valley with a flat bottom, in which it has again cut a deep channel. This creek is the same as that we crossed on the 12th, but then it was known as the Snake Creek. It rises from the north flank of Moose Mountain, and flows with an easterly course until it joins the Souris River. Its banks here are about 16 feet high, but at a distance of 10 miles below this place it emerges on a flat plain, where it loses itself in swamps of considerable extent, and from which its waters again issue under the name

Hairy Hill.

of Snake River above mentioned. There is an eminence on its right bank, known as Hairy Mountain, two miles below where we crossed. It is one of the many rounded eminences scattered over the plain in that direction, rising to an altitude of 160 feet. These hills, as well as the whole thickness of the banks of the valley, as far as we could see, consist of grey sandy drift, plentifully mixed with boulders, principally of limestone.

Moose Mountain.

During the afternoon we have passed over very swampy ground, and at night camped on a high ridge, from which we can see Moose Mountain in the distance. It presents exactly the appearance of Turtle Mountain, and forms a blue line on the horizon of considerable length.

Similarity to the country about Turtle Mountain.

August 19th, Wednesday.—By breakfast time we reached the eastern tail of the mountain, having passed through country thickly studded with clumps of wood. The distribution of wood upon this hill and its environs is an exact counterpart of that on Turtle Mountain. To the south and west of our present position we look out on a plain of boundless extent, quite unbroken by even a single tree; to the west also is a sharp conical peak, into which the east end of Moose Mountain rises, and which is quite bare.

Took wood along with us.

We now collected some wood for fuel, and again proceeded on the march. The view we got of the south side of Moose Mountain was very different to that of the north, being altogether destitute of wood, and it is said that the south side of Turtle Mountain has the same peculiarity. We dined at Moose Creek, which traverses a valley nearly as deep as that of Pipestone Creek. It flows to south-east, and joins the Souris about 20 miles lower down. Both this and Pipestone Creek are not more than ten yards in

Meet two half-breed hunters.

breadth. While at dinner, we were aroused by the appearance of two men in the valley where we were camped. After a little hesitation they came towards us, and turned out to be two half-breeds belonging to a party near the Moose Mountain, who were out in search of buffalo. They had not been successful in finding any, but assured us that to-morrow we should fall in with bulls even. This was very welcome news, as we were now some hundreds of miles into the buffalo country without having yet seen any. Camped on the prairie that night, making use of dry buffalo dung for fuel.

Kill two buffalo bulls.

August 20th, Thursday.—This morning we were off at 5 o'clock, and continued to cross the level prairie till, reaching a swamp, we camped for breakfast. The only animals we have met since leaving Fort Ellice up to this point are bands of prairie antelopes, but we had not proceeded far after breakfast when we came in sight of two buffalo bulls, which I killed. As this hunt occasioned a delay of some time, when once again started we pushed on fast in order to reach the Souris River by nightfall. As we approached this river, the ground was so covered with boulders that our cart could hardly get along.

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* British Kootanie Pass traversed in the year following and mapped by Lieutenant Blakiston in 1858.

A most terrific thunderstorm came on just as we reached the river valley, so that we were forced to camp as speedily as possible on the plain level, not having time to descend into the valley where we would have been much better off.

August 21st, Friday.—When day broke this morning we discovered on the opposite bank of the river a large camp of Indians, from the glistening of their white tents in the rising sun. Leaving the cart we rode off to examine the river and the banks of the valley through which it runs. We found the valley very extensive: from the level of the plain to that of the alluvial bottom below is 139 feet, and through this the river has cut a channel 30 feet deep. The stream is about 20 yards wide, and has a strong bed with only a little water in it. At the point where we descended into the valley, the bank, which is excessively steep, is as thickly beset with boulders as the plain above. The river here runs in an almost easterly direction, but after proceeding up it for about 1½ miles it takes a great bend, coming much more from the south. At this place the first appearance of beds of rock in the bank of the valley was observed. Hector examined them, and found them sandstone of a very soft and friable nature.

Discover a camp of Indians in the distance.

La Roche Percée.

As we continued riding up the valley slowly, we observed a number of Indians crossing rapidly towards us. From the open manner in which they approached we saw that their intentions were friendly; so we awaited them, choosing, however, a good position for observing them as they neared us. A few had guns, but the majority were armed with bows and arrows. They turned out to be a party of Stoney Indians of the plains (Assineboines) from the camp we had observed in the morning. Mr. McKay who knew most of them went over to their camp on business connected with the trade.

Assineboine Indians.

We had frequently heard from the half-breeds that there were in this country, and a little to the south of us, some wonderfully formed rocks, among which the most remarkable was La Roche Percée. Doctor Hector went to visit it, and thus describes the result of its examination:—

In the sides of the valley of the Souris at this place a group of strata is exposed, of which the following is the section: clays, sandstones, thin bedded limestones, and calcareous scinter, and ash-coloured sandy clay with silanite, and the latter containing thin seams of lignite or coal of inferior quality. No trace of fossil remains were found in any of these beds to indicate their age. The coal does not occur in well defined beds, but graduates into the shales on both surfaces. It is not visible until a light ashy deposit is removed from the exposed edges of the bed produced by the soft clay washing down from the strata above. The coal is of several qualities, some having quite the appearance of black cannel coal of fine quality, some like more glistening bituminous coal, friable, and only obtained in small cuboidal fragments, while some can hardly be distinguished from charcoal. A rough analysis of an average specimen of this lignite, made on a small scale, gave the following results:—

Aqueous and volatile matters - - - - - -	40 per cent.
Carbon - - - - - - - - -	50 „
Light orange-coloured ash - - - - - -	10 „

Of the first group an unusually small proportion is formed of tar and gas. It burns in the air with difficulty and without flame. This deposit neither occurs in sufficient quantity or of such quality as ever to be of importance to commerce. The manner in which the sandstones decompose gives rise to curious figures, which the Indians regard with superstitious dread. Hard concretions occur, which resist the action of the atmosphere for a much longer time than the softer portions, and they thus become isolated and perched in natural pillars, which are grouped as if they formed the ruins of ancient buildings. One of these pillars standing out from the side of the valley is perforated by a large hole, and is "La Roche Percée," from which the locality derives its name. The Indians never pass this stone without making some offering to the Manito which to their minds it represents, such as rubbing vermilion on it, or depositing beads, tobacco, or the like in the crevices. It is also covered with rude designs carved with their knives on the soft surface of the stone.

Our Stoney Indian visitors at this place had come from the Grand Coteau, which is half a day's journey to the south of the Souris River. They said that the Mundan Fort is distant two days from this place, almost due south. They were very anxious that we should cross to this camp to trade horses from them, but McKay visited them and found that they were in want of nothing but *rum*. A little Salteau boy, the son of a prisoner, which this tribe had taken or killed, made his escape from their camp, and concealing himself now joined us after we started on our return. Some one named him Pascal, which name he bore with us afterwards. He proved very useful, but was a thorough adept at all sorts of mischief.

August 22nd, Saturday.—We were delayed until 10 o'clock getting a supply of wood from the valley below, as we were to repass the same plain. Although we proceeded in the same direction, we did not fall in with our outward track until we reached the tail of Moose Mountain in two days. We had a second buffalo chase in crossing the plain early in the morning of the 23rd, but only killed bulls.

August 23rd, Sunday.—In the afternoon Dr. Hector left us, accompanied by Mr. McKay, for the purpose of ascending the conical peak of Moose Mountain. After considerable difficulty they penetrated the dense woods which surround the base of the mountain, and reaching the summit, got a splendid view of the country around. The hill consists of lofty irregular mounds, densely covered with woods and enclosing hundreds of beautiful lakes, some of which are of considerable size. Like Turtle Mountain, it seems to be composed of nothing but an accumulation of drift, and he found the sides of the conical peak to be thickly strewn with boulders, and composed of sandy gravel, on which there existed only a scanty growth of grass. The altitude of the peak above our dinner camp, which was considerably elevated above the plain, he found to be 340 feet. It was dark before the Doctor rejoined us at our camp, which was within a few hundred yards of where we had slept on the 18th.

Moose Mountain examined.

August 24th, Monday.—From this place we kept in the same track as that by which we went out, and arrived at the fort at noon.

August 25th.—Went to see the horses we had left to feed up here during our branch trip to Roche Percée and boundary line, found them looking very much better,—improved, but hardly yet sufficiently recruited to proceed on our western journey to the South Saskatchewan. McKay was also daily expecting a fresh supply of ammunition from the principal post, viz., Fort Pelley, of the Swan River district, of some of which I also stood in need.

Found my horses at the fort improved.

August 26th.—It appears that our chief guide and interpreter, Ferguson, on hearing that I wanted to continue our course westward, went round yesterday to the Indians about, and also to the men, to organize some testimony about the impracticability of continuing our course and the necessity of avoiding the south on account of its unfitness for carts to cross the Qu'appelle, and adopt a course through the already known country on the north branch of the Saskatchewan River. Our friend Mr. McKay easily discovered the conspiracy, and immediately informed me of it, telling me how alarmed Ferguson was at the prospects of passing through this country, and that he was endeavouring to influence the men, who even as it was were quite sufficiently alarmed already. I then asked McKay if he would accompany us and interpret for us. He said there was nothing he would enjoy half so much, but that he could not absent himself from the fort under his charge without Mr. Christie's permission. I determined therefore to start a messenger at once to Fort Pelley with a letter to Mr. Christie, the chief officer of the Hudson Bay Company in charge of the Swan River district, requesting him to allow me the services of Mr. McKay as interpreter, as well as also the pleasure of his society during the remainder of our explorations this season; I explained to him how Ferguson was frightened, and had endeavoured to deceive me in order to try and prevent our ascending the South Saskatchewan, and, in short, the great necessity we were in for a trustworthy interpreter.

Alarm of my first guide Ferguson.

Send a letter to ask leave of absence for Mr. James McKay.

September 3rd.—Started Monsugny off with my letter to Mr. Christie's, Fort Pelley, distant about 110 miles. On the 6th of September the powder, ball, and shot arrived. McKay supplied us handsomely. I now determined to start the Expedition once more without delay to the Qu'appelle Lakes on a due west course, and remain behind to await the return of my messenger from Fort Pelley with a letter from Mr. Christie letting me know whether he could spare McKay from the trade in order to accompany us.

Monsugny starts for Fort Pelley.

September 7th.—Got in the horses, arranged the loads, repaired the harness, and all got under weigh at about 3 p.m. in charge of Hector. I remained behind with Beauchamp, Hallet, and six horses, intending to start as soon as Mr. Christie's answer arrived, and to take McKay along with me if he obtained the leave we had applied for; in the meanwhile leaving the Expedition in charge of Doctor Hector, who from this date continued the journal as follows:

Send on the Expedition, but I remain behind to wait Mr. Christie's answer.

Journal of Expedition continued by Dr. Hector.

September 7th.—Leaving Fort Ellice at 6 p.m. we went due west for six miles through rich prairie land studded with poplars, and encamped close to a large swamp, which, from its south end, gives rise to Beaver Creek, while from its north end a small tributary issues to the Qu'appelle River called the "Little Scissors Creek." The barometer at sunset 28·21, thermometer 60°.

Start for the Qu'appelle Lakes.

September 8th, Tuesday.—Up at 5 a.m. The morning was dull with drizzly rain, and a high wind had prevailed during the night. Barometer at sunrise 28·26, thermometer 47°. We started after breakfast at 7.30 a.m. In crossing the swamp we met with some delay from the upsetting of one cart and the breakage of the wheel of another. During the forenoon we kept almost due west at four or five miles distance from the Qu'appelle River, but gradually increasing that distance as we proceeded. We crossed a succession of short prairies interrupted by belts of wood, passed by a number of small lakes and ponds, where we killed a great many different kinds of ducks which were very plentiful. During the afternoon we crossed a thickly-wooded ridge having a considerable elevation and running in a south-easterly direction; it is evidently a continuation of one of the parallel ridges we had passed in going to Roche Percée. As we ascended the ridge we found that the soil thrown out from the badgers' holes consisted wholly of comminuted fragments of the cretaceous Long River shales, in examining some of which we obtained two specimens of fossil fish scales, some of which had been found at Forked Creek. The wood which covers this ridge consists principally of young aspens. The road we followed, though evidently a much used track, was very bad, and sorely tried the strength of our carts. At 5 p.m. we came to a pretty little lake, and as this is the last water we shall see for many miles we encamped for the night.

Our course.

Structure of the country.

Fossils.

September 9th, Wednesday.—During last night there was a heavy fall of rain, and this morning we were delayed a considerable time as so dense a fog enveloped us that the horses could not be found; barometer 27·56, thermometer 53°. We continued to traverse the young woods over very irregular ground until 12 a.m., when we stopped for dinner at the commencement of an open and level country. After dinner we crossed several detached plains of considerable size, covered with clumps of very fine poplars, some of them measuring two feet in diameter, and reaching a great altitude. This is the only place on the plains where we have seen wood of any size. As we rode along a large badger was shot as it was walking off among the long grass. This animal runs slowly, but turns with great fierceness on dogs; and as its claws and teeth are very sharp, much resembling those of the bear, it can inflict very severe wounds. At 6 o'clock we halted on the site of some old Indian lodges in the neighbourhood of a large lake; barometer 27·50, thermometer 59° at sunset.

Remarkably fine timber.

September 10th, Thursday.—During the night it was extremely cold, with high wind. This morning we breakfasted before starting, and after passing for a few miles through woods we emerged on an extensive plain bounded to the south by the "Weedy Mountains," which seem to be nothing but a continuation of Moose Mountains to the west. After crossing this plain for 12 miles, over a surface broken into high abrupt ridges and mounds, and strewn with boulders, we reached a creek of considerable size flowing to the north, and which issues from a marshy lake lying along the northern edge of Moose Mountains, and from which also runs Pipestone Creek flowing to the S.E. About two miles on we came to wood, and stopped for dinner, where a camp had recently been pitched, and from the egg-shells which were scattered about we concluded it to be Mr. Swanston's. After dinner we crossed the tail of Weedy Mountains, which we had now reached, and encamped on the west side after proceeding but a short distance, as our horses were much fatigued from the long spell in the forenoon.

The Weedy Mountains.

Chief factor Swanston's camp.

September 11th, Friday.—Barometer 27·60, thermometer 46°. This morning was cold and raw. During the forenoon we passed over two more of the parallel ridges known as "Wolf-skin Mountain" and "Man's Head Mountain," respectively; they are separated by strips of plain, and seem to terminate, after running a short distance, to the N.W. of our track. After dinner we still kept a westerly though very tortuous course, having to wind round innumerable swamps and marshy lakes.

Wolf Skin and Man's Head Mountains.

About 5 o'clock came to a wide ravine 90 feet deep and half a mile across, and through which a small stream had cut a winding channel. The valley seemed to terminate abruptly to the south, as there a bank covered with thick wood seemed to cross it at the distance of two miles. These woods consist of balsam poplars and cherry trees, the latter being laden with a fine ripe crop, which, though slightly astringent, are very pleasant to the taste. There is, however, very little upon them, as the bulk of the cherry is formed by the pip in its centre. We encamped beside a large lake with a stony shore, which was an agreeable change to the eye from the marsh margins which generally surround the lakes. We killed a great deal of wild fowl during the day, and counted as many as 40 ducks, besides several geese, roasting at the same time round our camp fire.

Ripe Cherries.

Ducks and geese.

September 12th, Saturday.—This morning there was a stiff breeze blowing from the S.W., and the water of the lake rose into waves, which dashed on the shore, giving it somewhat the appearance of a sea-beach. Several kinds of birds also were flying over its surface; among these the Avocet (or Recurverostra), which we had not seen before. It has a long delicate bill turned upwards, as if the wrong way, giving the bird a most comical appearance. Several of them were shot, but unfortunately we had no means of preserving them. It is from this lake that the creek which we recrossed last night has its rise, issuing from its S.E. corner and sweeping round to the north, with a sharp angle at the bluff of woods we passed yesterday.

The Avocet or Recurverostra.

The country all round this lake is extremely irregular, rising into high hills without any covering but a scanty growth of grass; boulders are also very abundant. Barometer at sunrise 27·45, thermometer 48°. At about 11 o'clock we began to enter woods again, which were scattered over level plains. At 1 o'clock we reached our destination, a small trading post of the Hudson Bay Company, which from having first been situated at the Qu'appelle Lakes is known by that name. Barometer 27·06, thermometer 60°. As this was the place we were to remain at to await Capt. Palliser's joining us, I employed the time in making a visit to the Qu'appelle Lakes, lying about 18 miles to the north. Having procured a guide and a note from the gentleman in charge to a missionary who lives there, we departed after dinner, intending to return next day. For the first four miles the track, which is almost due north, passes through open woods with large lakes, making a considerable descent. After that, with the exception of a few clumps, we saw no more wood, but crossed a level open plain. We again commenced to descend steadily. It was sunset before we reached the Qu'appelle River, and descended into its profound valley by a dim twilight, which greatly exaggerated its proportions. Riding along the river we soon came to the house of the missionary, guided by the baying of the dogs. We were very hospitably received by Mr. Pratt, who is a missionary of the Church of England from Red River Settlement, and a pure Stoney Indian by birth. He has a very comfortable little house and cultivates an excellent garden, in which he rears among other things hops and Indian corn. The bottom of the valley, which is 240 feet below the plain, is about one mile wide, occupied by a succession of lakes separated by alluvial flats, through which the Qu'appelle River winds. These lakes abound in fish of very fine quality, and are said to be of great depth in some parts. At early morning we were again in the saddle, and, guided by Mr. Pratt, paddled over the river in a skin canoe, by which means we also crossed the horses and rode down the valley for four miles to the lower lakes, where there is a great slide of bank exposed. Here I had hoped to see something of the structure of the plains, but only found red and yellow clays exposed together with sandy drifts. On our return we shot and skinned a pelican out of a flock which were gliding majestically on the lake, and afterwards breakfasted on the fish we had also caught there, and afterwards joined the remainder of the party at the Qu'appelle Fort, about 18 miles distant, and found that Capt. Palliser had arrived and brought Mr. James McKay along with him.

Visit the Qu'appelle Lakes.

Mr. Pratt's mission.

Mr. Pratt's farm.

Examine the structure of the country.

Arrival of Capt. Palliser.

Journal continued by Capt. Palliser.

September 13th, Sunday.—Arrived at Qu'appelle Lakes Fort, after a fast ride of three days over the same ground which the Doctor and Sullivan had travelled; this post is in long. 103° 46′, lat. 50° 20′, var. of compass 24° 30′ E.

We found a large camp of Crees arrived for trading. Mr. Pratt, the missionary, came over and paid us a visit. He is a pure Cree Indian, educated at Red River. He reports the Crees as beginning to apprehend scarcity of buffalo, and many are most anxious to try agriculture. He thinks that if they had agricultural implements, such as spades, hoes, and ploughs, they certainly would commence operations. This opinion I found pretty general among the people of the Hudson Bay Company, and I am persuaded much good could be done by importing the simpler kinds of agricultural implements. Pratt has set the Indians an excellent example himself, and grows capital Indian corn, barley, and potatoes. The Qu'appelle Lakes may be considered the most western part of the territory east of the Rocky Mountains to which the Hudson Bay Company trade; westward of this I may say is unknown, and the whole country in this latitude is untravelled by the white man.

Mr. Pratt the missionary.

Among the Indians that had come to trade was a man with whom Mr. McKay was acquainted. This man was a remarkable exception to the generality of Indians; they call him the "peace-maker," and twice within the last two or three years he pushed his way alone into the Blackfoot country, and walked into the enemy's camp unarmed, with the peace pipe in his hand, exhorting them to peace, and offering them the alternative of killing him. The result, on each occasion, was a treaty of peace to the Crees, and a present of horses to the peace-maker. I engaged this Indian to guide us to the elbow of the South Saskatchewan, for which service I promised him a horse and a suit of clothes.

The peace-maker.

September 14th.—Mr. Pratt gave us a very fine mare in exchange for two wretched horses, one of which is not likely to live long. Started the Expedition at 12 o'clock, camped at Squirrel Hills, where we had good wood, water, and grass. Our road during the early part of to-day was mostly thorough a country moderately well wooded, over good land, well suited to agricultural purposes, where there were also lakes and hay-producing swamps, but towards evening we began to observe symptoms that showed us that we were again nearing the line of desert country, or northern extension of the North American arid basin; towards evening we passed many spots where the soil was poor and stony, and the growth of grass deficient.

Good land.

Arrive on edge of arid desert of Central North America.

September 15th.—Off at 4.30 a.m., and halted for breakfast at 10 o'clock beside a small lake; from this we had an extensive view of the Prairie Coteau, extending away to the north-west. Our Indian guide, the peace-maker, to whom we had given the name of Nichiwa, or friend, counselled us to cut wood and bring it along in our carts, as he said it was the last we should see to-day; there is now no more wood except in the valleys of the rivers. Our course was due west, and as far as the eye can reach nothing but desolate plains meet the view; at noon reached a small creek called "The Creek before where the Bones lie;" here we found water and some little grass, also a few willows and cherry bushes, but no wood fit for fuel. This creek rises from a small lake about 8 miles to the south of the Qu'appelle Lakes, into which it ultimately flows. Two Indian lodges are here, containing an old man with some women and children; the young men are away in all directions in strong parties hunting buffalo. In the evening reached the Creek where the Bones lie, where we found water and very little grass; a few willows also grew here but no wood fit for fuel.

Obliged to carry wood along with us.

The Creek where the Bones lie.

September 16th.—Were detained this morning by a thunderstorm, after which we started; arrived early in the afternoon at Moose Jaw Creek; here, at some distance from our camp, we found a considerable number of Indian tents, inhabited altogether by women and children; the men were all away after buffalo; the women were very communicative, asked leave to come and see our wives, and expressed considerable surprise when we told them that we had none. In the centre of their tents was their large medicine lodge, the exterior of which was covered with hieroglyphical characters, birds and animals of various designs. At Moose Jaw Creek we had both wood, water, and grass.

Moose Jaw Creek.

Its valley.

It is the largest river valley we have seen since we left Qu'appelle Lakes. Its depth is about 300 feet below the prairie level. The sides of the valley are very steep, and composed mostly of fine sand, with boulders thickly strewn over the surface; down near the stream willows and many berry-bearing bushes grow in abundance. Mud turtles are caught here, but we saw none. Moose Jaw Creek has its origin from the same lake as the Mouse River (Rivière à Souris) the course of which after it leaves the lake is N.W. for 20 miles, then turns N.E. until it falls into the Qu'appelle River. Here our Indian, Nichiwa, advised us to bring wood for five nights along in our carts, and told us it was the last we should see between this and the elbow of the South Saskatchewan; we therefore cut it and distributed the additional loads for each waggon and cart to take on next morning.

A very long interval of five days travel without wood.

September 17th.—The Doctor, accompanied by McKay and a small party, left the carts and went off to explore to the southward, intending to fall on the track and camp with the main body that evening. We started not long after, and found it very difficult to find a crossing for our carts and waggons over the Moose Jaw Creek, to effect which we had to travel considerably to the southwards. It was noon before we could cross this insignificant stream, on account of the general steepness of its banks at the water's edge. After dinner resumed our march, and camped early in the evening on one of the numerous small lakes, which generally are partly surrounded by swamp, and where grass was found for the horses. Our course still west, but had made more than three miles southing that morning in searching for a crossing over Moose Jaw Creek. In the evening we crossed a little creek, where there was no timber, called Thunder Mountain Creek, which rises in the Coteau and runs into Moose Jaw Creek. Cooked our supper with buffalo dung, and a portion of the wood we had taken from Moose Jaw Creek. Hector did not arrive that evening.

The Doctor leaves for a short branch trip.

He did not return that evening as he intended.

September 18th.—Started late, as we were in hopes of the Doctor and his party joining us for breakfast. When we halted for dinner we were sufficiently near the Coteau to discover Indian tents, and before dinner was over we were surrounded by Indians. When they first saw us they had mistaken us for a band of buffalo, but on coming nearer discovered us to be a party of whites, and of course rode up. They were Crees. I asked them if they had seen the Doctor, but they said they had not. After dinner resumed our course, hoping the Doctor and his party might be in advance, as they had not been seen by the Indians. About twenty-five of our new friends accompanied us to our camp. I exchanged two horses with them, and would have exchanged more, but for the extreme soreness of their horses' backs. These men told us that we were not more than two days' journey off from plenty of buffalo out westward; but they said they did not like to go so far, as they would then be in the enemy's country. Our latitude at noon was 50° 26'. Camped on a little stream, which takes its rise in a small lake about 14 miles to the south-west, and which, after expanding into two other lakes a little further on, falls into Thunder Mountain Creek.

Visited by Cree Indians.

All their horses' backs were sore.

Report plenty of buffalo to the westward. Would not go there for fear of the Blackfeet.

September 19th, Saturday.—At about 11.30 this morning Dr. Hector and party came up with us, accompanied by a large number of Crees. They had slept last night in one of the Cree lodges, and were very hospitably treated by them, having received many invitations to the festivities of the various tents, but they had been obliged to spend the previous night on the plain without food, fire, or blankets, and had ridden over 70 miles. On the day following they had met a poor Indian travelling on foot, returning from burying the bones of his relations who had died of small-pox last year, and according to custom had thrown away all his clothes to celebrate the event, and as a sort of a sacrifice to the Manito of the prairie; they gave him the only blanket they had. The small-pox is a disease of almost yearly occurrence, and fearfully fatal among these Indians. McKay described to us this evening an awful scene witnessed by himself last year when he was in charge of Fort Ellice. He told us that one-half of those tenting round that establishment had been carried off by small-pox. We heard while at Fort Ellice that small-pox was raging at Fort Carlton, where we intend to pass the winter, but trust that this may not be the case as we only have it from Indian report. The Doctor and his party had failed to find our track on the first evening on which we had separated, owing to all the ground we had lost to the southward in finding a crossing-place on Moose Jaw Creek the day before yesterday. The Doctor had slept in an adjacent Indian camp on the Coteau, in one the tents of which was suspended an Indian scalp, and, amongst other women, the wife of the unfortunate Blackfoot who had been murdered was obliged to dance round her husband's scalp. The whole of this forenoon was occupied in crossing over a succession of ridges or prairie rolls, among which are a number of lakes. These ridges are composed of light yellowish sand of very fine grain, the sides of many of which supported berry-bearing bushes and a few poplars. We passed a second creek, which, like the one we encamped at last night, takes its rise in a small lake to the south, and is tributary to the Thunder Mountain Creek. At noon an observation for latitude was 50° 27′ 59″ N. During the afternoon we were met by a few Indians, some of whom produced certificates, which they

Hector and McKay arrive.

They passed a bad night.

Gave a poor Indian their only blanket.

Fearful ravages from small-pox.

A Blackfoot woman compelled to dance before her husband's scalp.

Description of the country.

Indian certificates of good conduct.

had received from the various trading posts of the Hudson Bay Company, and which were folded and tied carefully in a piece of bark. One of these certificates ran as follows: "This is to certify that 'Awaskasoo (the Red Deer) is a good Indian, and a man of some influence in his tribe, and that he 'has brought many furs to the Company's establishments; he has once traded with the opposition 'traders, but promises never to do so again."

An Indian in pursuit of his wife.

We then met another Indian who informed us that he was in pursuit of his wife, with whom a young man had run away a few days previously. There was also among the party who had accompanied the Doctor an Indian who had been scalped not very long ago when, in an encounter with the Blackfeet, he lay wounded, and when insensible from loss of blood, and left for dead; but after his enemies had departed and his consciousness returned he made his way back to his friends. He wore a handkerchief bound tightly round his head, and did not wish to show it to the Doctor, nor did he like that his misfortune should ever be talked of. Nichiwa told us that he was one of four young men who had escaped from a massacre of his friends by the Blackfeet in a ravine near the elbow of the south branch of the Saskatchewan last spring. It appears that the Crees and Blackfeet had been at peace, and were tenting together, but after the return of the former 25 young Crees formed a horse-stealing party, and having previously constructed rafts succeeded in stealing the Blackfoot horses, and by crossing themselves on the rafts succeeded in leading off the horses swimming in their wake. When the Blackfeet missed their horses they set off in pursuit, and following up the track came to the bank of the river whence they had been taken across. While they were still there one of the young Crees actually had the hardihood to reveal their position by glancing a small looking-glass, and as it were chaffing the Blackfeet. The season being so early (just after the breaking up of the ice), the water was intensely cold, and the river very high, wide, and rapid, so that these young Crees never dreamt of the possibility of the Blackfeet pursuing them without rafts across the South Saskatchewan, and during the time consumed by the Blackfeet in the construction of these they thought they had abundance of time to escape with their stolen horses far beyond the fear of pursuit. The Blackfeet, however, turned about, and departed as if returning to their camp, and then made a detour to a point higher up the river where, concealed by a bend, they swam their horses across. At sunset they fell upon the young Crees, surrounded them in the Coulée in which the men encamped, and killed 17 of them on the spot with bows and arrows, and by rolling large stones on them. A few got away wounded under cover of the night, and only three or four ultimately recovered.

An Indian scalped without being killed.

He was one of the four young men who escaped from an onslaught of Blackfeet.

Nichiwa's account of the affair.

This account corroborated by the other Indians.

Several old Indians were still in mourning; these were related to some of the young men whose fate I have recorded. An old man who had thrown away almost the whole of his attire, and now only clad with a very old robe, and with his head plastered with mud, implored me not to go further among "these wicked men." They also alarmed my men considerably with various tales, more or less true, concerning the prowess of the Blackfeet. We camped early on a small lake where we killed ducks, and around which was a swamp with grass for the horses. Cooked supper with dry buffalo dung and a portion of the wood we had brought from Moose Jaw Creek, the land we had travelled over not differing from the nature of that which we have been traversing for several days back. Lat. at noon, 50° 28′; long. 106° 30′.

Great fear evinced by my men, and difficult to get them to go on to Blackfoot country.

Come in sight of buffalo.

September 29th, Sunday.—Started early, and not long afterwards came in sight of one or two old buffalo bulls, evidently stragglers: we at once concluded that buffaloes were not far off; we continued our course, and saw bands of bulls, at first small, but increasing in number as we proceeded westwards. Seeing that as yet there was no danger of disturbing any cows in that neighbourhood, I encouraged Mr. Sullivan to mount one of our best horses, and run a band of bulls, in company with Morin, and he acquitted himself very well, rushed in boldly, and bowled over his bull at the first shot. Morin afterwards killed a young bull, of which we were able to eat a little. We were now in hourly expectation of coming upon bands of cows, when we should enjoy fresh meat once more. We were now verging on the neutral ground of the Blackfeet and Crees, and Nichiwa smartened himself up considerably, having obtained from me an old shooting jacket, from the Doctor a pair of corduroys, and from Mr. Sullivan a waistcoat and neckhandkerchief. He never was an imposing or a fine-looking Indian, but now he looked more like a monkey than ever. The country was much the same as we have travelled over since we left the line of woods in the east. We continued to fall in with several bands of bulls, but did not molest them. Rain threatened; camped early; our latitude was 50° 28′, long. 106° 50′. We camped on Thunder Mountain Creek, which rises in two streams from the so named portion of the Coteau; it flows to the east to join Moose Jaw Creek, which runs into the Qu'appelle River.

No cows to be seen yet.

Mr. Sullivan kills a buffalo bull.

The neutral ground of the Blackfeet and Crees.

Nichiwa's attempt at an imposing appearance.

Camped on Thunder Mountain Creek.

Send out scouts in search of buffalo.

September 21st.—Started early; sent men on in advance to report on the buffalo; passed some bands of bulls. At half-past seven one of the scouts returned to the carts and reported a band of cows not three miles distant. Halted to breakfast at a small swamp, where we took a hurried meal, cooked with some of the fuel still remaining to us out of that which we had taken from Moose Jaw Creek, which wood we used very sparingly, and kept the remainder for the plentiful meal on which we were speculating for the evening. After breakfast McKay and I started to run buffalo, accompanied by Hallet and Morin (two of the best buffalo hunters in Red River Settlement). We found the ground very bad, and full of badger holes, rendering the running of the horses very dangerous, and somewhat similar to riding a steeple chase over a rabbit warren. Our horses were not in very good order, but, of course, I was mounted on the best, my own horse Pharaoh; the next best was given to James McKay; Hallet and Morin completed the hunters. We approached rather close, favoured by some sand hills, and got very near our game. When the race began, the pace was tremendous, because early in the day the cows are far swifter; in less than five minutes we left the bulls floundering in the rear, and were a-head among the cows, Hallet and I riding neck and neck. Seeing a fat one, I ran in, fired, and missed; I slackened, and riding knee to knee with Hallet, asked him for his loaded gun, saying "You cannot come up." He, a little piqued, swerved from me. McKay, who was in the rear, came up and said, "Captain, my horse cannot do it, I shall injure the horse, and do no good; take my loaded gun, give me your empty one." I, who had been reining in, took McKay's gun, and, just as I was again passing Hallet, his horse put his foot into a hole, and horse and rider got a fearful fall. I passed on, got a second shot, and killed a fine cow; slackening again, McKay came up to me a second time, and handed me a loaded gun. I rushed again into the band and got a third shot, but my gun missed fire.

Start to run buffalo.

Bad ground for running buffalo.

The run.

Hallet gets a bad fall.

I kill a cow.

Beauchamp kills another. Morin had killed another also. Arrive in sight of the South Saskatchewan. The plants. Sage Creek. Swamps abounding in wild fowl. Buffalo and wolves. Great want of grass.

My horse was wonderfully fresh, and I was debating on another race, when Beauchamp, a very good hunter, came riding up. He was a light weight, so I called him, and leaped off my horse; he jumped on, and very soon picked out and brought down another fat cow. Morin also killed a good cow. Our race was westwards, and at its termination we found ourselves in view of the bluffs of the South Saskatchewan. By the time we had cut up our meat the carts had arrived, and we camped on a small stream tributary to the South Saskatchewan, where we found wood, water, and grass. This creek is winding, and depressed considerably below the prairie level, and its sides are strewn with boulders. The plants do not materially differ from those at Moose Jaw Creek. Here we, for the first time, met with the sage (*artemesia tridentifolia*) which is a low shrub, characteristic of the great American deserts. We gave this little tributary of the South Saskatchewan the name of Sage Creek. Although the country throughout was arid and sterile, still muddy swamps very frequently occur, in which are to be found wild fowl in great abundance; out of one of these (a very small swamp) we were surprised at starting a flock of geese, in numbers quite disproportioned to its area. Buffalo were also here in great numbers, as well as their constant attendants the wolves, ever ready to attack a worn-out or wounded straggler, or some stray calf. The abundance of game here is accounted for by its being the neutral ground of the Crees, Assineboines, and Blackfeet; none of these tribes are in the habit of resorting to its neighbourhood except in war parties. The grass in this arid soil, always so scanty, was now actually swept away by the buffalo, who, assisted by the locusts, had left the country as bare as if it had been overrun by fire; even at the edge of Sage Creek we could obtain but very little grass for our horses.

Guarded the horses carefully.

We guarded the horses carefully each night, especially near daylight, the favourite moment for an attempt to steal them. Buffalo sometimes fed close to our horses at night, and bands of wolves howled piteously along the plains above. We could plainly distinguish them passing backwards and forwards by the light of the moon which shone on the bluffs above us.

Breakfast on the banks of the South Saskatchewan. Description of its banks at this place.

September 22nd.—Left Sage Creek early, and breakfasted on the banks of the South Saskatchewan. These are lofty and sandy; the points of the river are slightly wooded with willow, birch, and rough-bark poplar. In the stream itself are sand-bars, supporting a heavy growth of young willows.

On reaching an elevated position on the bank of the river we were enabled to get a view of the stream for a distance of about 10 miles, with all its windings. The valley of the Saskatchewan is about $1\frac{3}{4}$ miles in breadth at some distance above the acute angle which it makes to the north, called the "elbow," but at that place the banks are steeper, and the valley much more narrow. In ascending the valley from the elbow to the Coteau, which meets the river about 16 miles higher up, the valley makes several large sweeps, and the river becomes wider and more obstructed with sand-banks. The river, averaging 600 yards in width, is depressed at the elbow 228 feet below the surface of the plain; but at the base of the Coteau the valley is very much deeper and wider, and the river channel winds through its bottom, leaving large points of dense wood on the left bank, but on the right great deposits of blown sand. The banks are everywhere composed of drift, with immense quantities of boulders, till the Coteau is approached, when soft purple clays with cretaceous fossils occur, and having a slight dip to the north-east, rise from under the drift, which rests on them unconformably. These beds, which are of cretaceous age, form the whole height of the banks. Portions of these soft strata have been formed by the action of the atmosphere into conical mounds, which present an extraordinary appearance. As no grass grows on them, their surface undergoes constant alteration; they are perfectly black, and their outline is broken by lines of iron-stone septaria, which retain the soft strata underneath them. There is a large quantity of gypsum disseminated throughout these beds, occurring as transparent silanite crystals in radiating groups.

The river varies considerably in depth and volume.

From the high level of deposits of drift wood, and the great extent of sand-bars exposed on its banks, the Saskatchewan is evidently subject to a considerable rise above its present level. Numerous sand-banks also rise to the surface of the stream, round which the current sweeps with great velocity. Immediately after breakfast Dr. Hector started with a branch party to explore the country to the east of the elbow, and found a small stream descending to the Saskatchewan from swampy lakes to the eastward. These lakes also send off waters to the Qu'appelle, flowing in the opposite direction; and a very remarkable feature exists here, viz., that the summit level which divides these two streams lies in a valley more than 100 feet deep, and continuous with that of the Qu'appelle, only 90 feet above the Saskatchewan. This valley runs N.N.E. and S.S.W. To the westward is a country covered with sand hills, at the base of which are beds highly impregnated with iron, and containing small land shells.

Remarkable geographical feature.

I killed some good meat. Indians attempt to steal Hector's horses.

September 23rd.—Remained in camp, hunted up the river, killed a fat cow and an antelope "Forcifer." At 4 p.m. the Doctor returned from the exploration just described. It seems he was followed by some Indians with intent to steal his horses, but the party were on the alert, and Nichiwa detected them from hearing their signal, which he described as resembling the chirping of birds. He then gave the alarm, and they abandoned the attempt. In the morning they had seen the tracks of their unknown visitors, and one of the horse cords had been cut.

Recognise some vegetation similar to the Missouri.

September 24th.—Started at 9 a.m., and travelled for three or four hours up the right bank of the Saskatchewan, then descended by a steep track into the valley, and continued our course along the water's edge, and meeting sand dunes very abundantly, besides the poplars so common to the country (viz. *tremuloides* and *balsamifera*), I fell in with and recognized as an old friend the *Populus grandidentata*, with which I had been quite familiar on the Missouri and Yellowstone, and known there under the name of the Cotton Wood. We had met this, however, previously at the Kakabeka Falls on the Kammanistiquoia. The *Negundo fraxinifolium* was also found, but not in plenty. One species of *Fraxinus* and two of *Betula* are also found. The thickwood is composed of a species of *Salix* and *Viburnum*, which have been so common everywhere on our route, and the *Spinous hypophilla* is in great abundance. The *Artemesia*, which I have spoken of as met with on the 21st, grows very abundantly among the sandhills, but at this date was past flower. It attains the height of about two feet. Two other plants are in great abundance here, a small *cactus* and a *stipa*, both of which are sharp and poisonous, causing pain and irritation in the sole of the foot when trodden on.

The artemesia also here. Cactus, or prickly bear.

Some of the party kill a wapite.

After dinner, while our horses were being tackled, some of our party went on in advance, and about a quarter of a mile distance from the camp killed a fine wapite stag. This animal is the red deer

buck of the Red River half-breeds, the wawaskeshu of the Crees, and the elk of the American hunters on the Missouri. This was not a very large specimen, but only a full grown animal of average size:

His dimensions.

Height at shoulder	63 inches.
Length from nose to tail	98 „
Length from nose to occiput	24 „
Girth behind shoulder	72 „
Length of ear	11 „
Girth of neck in front of shoulder	50 „
Length of hind leg from through knee joint	48 „

The last of the flowering plants are no killed by the frosts at nigh We kill gooc meat withou hardshiping the horses.

In the afternoon we travelled along the valley of the river, our carts often sinking to their axles in the loose sand. The last of the flowering plants have now been killed by the frosts of the last few nights, and Mons. Bourgeau will have now only the seeds to collect.

September 25th.—We now every day see great herds of buffalo, and have abundant opportunity for killing as much as we require for our consumption among the broken river banks, which afford every facility for approaching them on foot, and obviates the necessity of fatiguing our horses by running buffalo on the plains.

Stormy nigh

September 26th.—Blew a gale during the night, tents twice blown down (for the tent pins had a bad hold in the sand), and our blankets were filled with fine blown sand. At about 4 in the morning the wind had partially ceased, and torrents of rain fell, which lasted about two hours, and left our camp in a fearfully dirty state. A very fine day ultimately. A large grizzly bear, tempted perhaps by the warm sun, came out of a clump of willows and lay on the side of a hill on the opposite bank of the river, just near enough to enable us to perceive that it was a bear and not a buffalo. We contented ourselves by viewing him through a telescope; having no means ready by which we could quickly cross the river we did not disturb him. My intention hitherto had been to push on to the westward as far as where the Red Deer River falls into the South Saskatchewan, at the site of an old Blackfoot trading post of the Hudson Bay Company, called Chesterfield House. This proposition of mine was received with universal alarm among the men, who thought that they had done wonders already in having gone as far as we were. They urged that the party was not sufficiently numerous, and that to proceed any further into Blackfoot territory was too dangerous. I was quite aware that the Indians in that district had acquired a very formidable reputation owing to Hudson Bay Company's having established the Chesterfield fort in 1822 by sending up 100 men, and even then they only kept it a few years, during which they lost a considerable number of men shot down by the Blackfeet, and at length abandoned it as too costly and too dangerous. Our friend Mr. McKay was on such intimate terms with us that I did not hesitate to include him in our councils, and I put the question as to the expediency of proceeding to Chesterfield House. He replied, "Captain, if you say the word go, I will say, hurrah, let's go; but if you ask my advice, I will tell you plainly that I think it is too dangerous, and more than this, if you press it, your men will break up, and beyond Beads, John Foulds, and old Hallet I could not say who would stick to you." Most unwillingly and unconvinced I abandoned the project of penetrating any further to the westward, prepared to cross the South Saskatchewan, and direct our course for our winter quarters at Carlton. In the afternoon commenced making preparations for crossing the carts and waggons over to the left or north bank of the South Saskatchewan.*

Saw a grizzl bear.

I modify my plans.

Great fear of the men at prospect of penetrating any further into Blackfoot territory

Mr. McKay' opinion.

Prepare to r turn to wint quarters.

September 27th.—By 10 o'clock this morning we had completed our preparations for crossing the river. Having availed ourselves of an island or sand-bank at the opposite side of the deep channel, and about half way across the river; we first took the body of our waggon, which we converted into a skiff by lashing oil-cloths about it, so as to make it as nearly water-tight as possible, we then fastened together all the horse lines and cords, both of leather and hemp, which we could collect, and made them into one long rope, one end of which we fastened on the shore where we stood, and then with the assistance of our waggon skiff paddled over to the sand-bar and secured the other end by means of a strong post firmly driven into the ground, thus establishing a communication by which we crossed the carts in safety. Unfortunately, however, in attempting to take over the waggon our rope at last broke, and it sank in about 20 feet of water in the middle of the channel. We then drove all the horses together into a band, and with long willow sticks drove them into the water, the men and Nichiwa shouting all the while and assailing with sticks and stones any frightened animal that attempted to turn back. The horses at last all crossed the river in safety, although they were carried by its rapid current to a considerable distance down stream before they could get footing on the opposite shore.

How we crossed the South Sas katchewan.

Lost a wagg

How we crossed the horses.

We now had recourse again to the paddle, and succeeded in fishing up and lashing together the broken extremities of our line, and with its assistance crossed all our luggage and instruments to the sand-bar. The remainder of the traverse over the river was now shallow, some of the party waded through, caught the horses, reloaded our carts, and camped on the left bank of the river at 7 p.m., where we had very fair grass for the horses. While our carts were getting ready we observed a grizzly bear wandering slowly along the base of the valley; it was probably the same we had seen yesterday. Some of the party went after him, but only succeeded in driving him into the thick growth of willows on the border of the stream, and then returned to the carts. Our camp is situated near a large marsh, with plenty of good grass in the neighbourhood. Higher up among the sand-hills Artemesia grows very abundantly. Latitude 50° 52′ 30″ N., longitude 107° 41′ W.

Cross our luggage wi line, taking advantage sand-bar m way.

September 28th.—Found buffalo plentiful on this side of the river; determined to remain a day or two to rest the horses. We were almost all day busily engaged in endeavouring to raise the sunken waggon; we found it deeply embedded in the sand nearly 20 feet below the surface, and impossible to move.

Endeavour raise the sunken waggon.

We found a beaver dam here, and after watching some time got a few shots, and succeeded in killing and securing one.

* We abandoned the traverse of this country this season, and again resumed it from the N.W. in 1859, when we thoroughly explored every portion of it.

September 29th.—It was very warm throughout the day, and we were all out about the river banks. In traversing a thicket, I started two grizzly bears, and fired at one without success; they made for the plain, and were followed by the Doctor and Hallet on horseback, over a very bad country. After a hard run Hallet succeeded in killing the female, who turned and showed fight; he deserved great praise, being very badly mounted, and having had a fall during the run. The he bear, which appeared to me much larger and handsomer (being the more grizzled of the two), however, got away. The following are the measurements of the she bear:

Hallet kills a grizzly bear.

Length	92	inches.
„ of head	16	„
Girth behind shoulder	60	„
„ at neck	32	„
Height at shoulder	34	„
Length of claws	$3\frac{3}{4}$	„
Breadth of head from ear to ear	9	„
Girth of fore arm below elbow	17	„
Length of fore foot	10	„
„ hind foot	10	„
Breadth of hind foot	$5\frac{1}{2}$	„

Enjoyed good hunting and shooting.

We were able to carry along all our hunting trophies.

September 30th.—During the last three days several of our party, including Dr. Hector, Mr. Sullivan, Mr. McKay, and myself, enjoyed excellent shooting, and killed some very fine specimens of elk, black tail deer, common deer, and Forcifer antelopes. The finest pair of wapite antlers were the prize of Mr. Sullivan. All the hunting trophies which we killed and collected here, such as wapite horns, skins, and other such spoils, we were able to take with us in our carts to Fort Carlton, whence they were shipped for England.

As any details of hunting and shooting would be quite out of place in the records of a Parliamentary Blue Book, I have not introduced the subject more than was sufficient to enumerate the different animals, and give some idea of the proportion in which they are found in the districts through which we passed. With the exception of two or three bulls, we found no buffalo until we came to within 20 miles of the elbow of the Saskatchewan. In the districts of Red River, Pembina, and San Joseph, we killed nothing but ducks, geese, prairie hens, and cranes. It was not until we came to the west of San Joseph that we found Red Deer (wapite), and then very scarce; and I may here mention that when at Fort Ellice I took a trip for three days' hunting to the south-east, with one of the best hunters of the Red River, I did not see a track; but we saw the largest quantity of game in the region of the elbow of the south branch, and also the greatest variety I have ever seen north of the Missouri.

Where we found most game.

The low ravines and sides of valleys contain good grass.

The general prairie level worthless.

A fair country for game.

At 9 o'clock this morning commenced our journey to Fort Carlton; our carts ascended the valley, and struck off in a N.E. direction. We now observed a considerable difference between this bank and that we had left on the other side of the stream. The hills here were composed of drift, and strewn plentifully with boulders, instead of the loose sand which prevailed on the south bank. Here and there we found fair clumps of wood with good patches of grass, varying from half a mile to two miles in extent, and several deep gullies which join the valley present rich and grassy slopes; all on the upper plain is, however, as bare and arid as that on the other side of the Saskatchewan. These ravines are also partially wooded, and in their vicinity cast horns of the different kinds of deer are frequently indicating the existence of a considerable number of these animals in this part of the country. The tracks of bears are also very numerous on the shore and on the sandy islands in the river, which are separated by small narrow channels. These islands are covered with a dense growth of brushwood and some timber, and near the river the berry-bearing bushes, as *Hypoplea* and *Viburnum Adulæ*, are dense and luxuriant. The common garter snake, which we first saw on our route to Pembina, is very numerous. At one spot we counted 17 of full size, and a few smaller specimens, all basking in the heat of the sun. At about mid-day a thunderstorm, accompanied by high wind and rain, put a stop to our march, so we encamped near the river. Killed a large wapite.

Length	96	inches.
Height at shoulder	64	„
Girth behind shoulder	80	„
Breadth of haunches	36	„
Length of head	$25\frac{1}{2}$	„
Breadth between eyes	9	„
Breadth between horns	$4\frac{1}{2}$	„
Height of antlers	42	„

Fire burns off his whiskers and eyebrows.

Nichiwa loses his ramrod and finds it again.

October 1st.—This morning we were off before 9 a.m., and the carts going steadily forward some of us dispersed through the valley to hunt. An accident happened to one of the men who had set off to run buffalo with his pipe in his mouth. He had fired and missed, and commenced to reload the gun in the ordinary manner, viz., by pouring out powder from his horn into the palm of the left hand, when a spark fell from his pipe and ignited the powder, the fire of which communicated with the powder-horn and blew it to pieces. The man, however, escaped without even a serious burn, and with the loss of his whiskers, eyebrows, and eyelashes. Our Indian (Nichiwa) ran buffalo also that morning, killed a good cow, but complained of having lost his ramrod, went back some distance to look for it, at length he abandoned his search, and returned to cut up his animal, in the body of which he subsequently found the remains of his ramrod. He called to Mr. McKay and said, "I have been looking for my ramrod, and see where it was all the time." He had loaded with the ramrod, and forgotten to withdraw it before firing.

Swamps, the only provision for our horses, fresh and numerous.

Swamps varying in size from 2 or 3 to 30 or 40 acres are numerous, and where these occur there is long grass. Here also are some brushwoods, but containing little timber of any considerable size. All these are traversed by buffalo paths, so that we could ride through it in every direction; the ground here like that south of the river is full of badger holes. We have seen two species of squirrels since leaving Fort Ellice, they are probably the *Arctomys Richardsonii* and *Arctomys*

Hoodii. After leaving our dinner encampment water was very scarce, many of the temporary swamp being quite dried up, and after a long search we were forced to encamp at 7 p.m. at a dirty water hole, from which a band of buffalo cows fled at our appearance. Being at some distance from the river also, our fuel is buffalo dung, of which there is no lack in this part of the country. The soil here is quite arid, and the herbage on the plains nearly worthless. Water not plenty here.

October 2nd.—Started at 6.30 a.m. and arrived at Red Deer Lakes at 3 p.m. Lat. 51° 20′ N.; long. 107° 20′ W. Red Deer (Wappiti) Lakes.

The continuation of the Coteau de Prairie has been constantly in sight, extending in a northerly direction since leaving the river.

The Red Deer Lakes, six or eight in number, extending some 20 miles in a north-westerly direction, are connected with the Saskatchewan by a small stream from their south-eastern extremity, sweeping round in a north-eastern direction to join the river. These lakes, averaging from half a mile to 2½ miles in width, occupy a deep valley thickly strewn with boulders, and here again, in conformity to the general law throughout the country relative to northern and southern exposures, the northern side of the valley is without wood, while the southern slope supports a thick growth of poplars and willows. In the afternoon I went out shooting, and killed some ducks and geese, and also a valuable fox, but the latter was out of season. The men killed a number of the musquash (a species of water-rat), the watchusk of the Crees. This animal is not like our water-rat, it is much larger, and has a flattened tail, not horizontally like the beaver, but like a vertical paddle. He, like the beaver, derives much assistance from it in the construction of his winter dwellings,—dome-shaped edifices about 30 to 40 inches high, and about 20 to 30 inches in diameter, built of mud and reeds with singular strength and tenacity; and they feed upon water-plant roots. Their fur is of inferior quality, but much used in England. They are eaten by the Indians and half-breeds, but I could not recommend it as a delicacy, although far superior to many other kinds of strange food which I have frequently eaten. Silver fox. Musquash rats

While in this valley a large band of buffalo ran right across, ahead of our line of carts, and without any exertion we killed three fat cows.

Killed a black-tail deer. This animal is a little larger than the virginian or common deer, and with larger ears. It has a very rich glossy hair, even at this season, but particularly in winter. We camped on the second of the Red Deer Lakes; buffalo very numerous, and have eaten the grass down considerably, and have not left much for the horses. Black-tail deer

October 3rd.—Started early, and ascended the northern slope of the valley containing the Red Deer Lakes, and went up once more into the prairie; breakfasted at a swampy lake on the plain. The valley containing Red Deer Lakes resembles in width that of a large river; it is said to cross the Saskatchewan 12 miles below the elbow, and said to run continuously, and to join the valley of the Qu'appelle by the last Mountain Lake. I was assured by the half-breeds that there was hardly any obstruction, beyond that of one short low portage, existing to cut off communication by this route in spring with those lakes which are west of the Qu'appelle River; information which is highly suggestive of a more minute engineering investigation, as to the expense and feasibility of a connection, by canal or otherwise, with a view of establishing communication between the Assiniboine and the Saskatchewan, should the progress or population of the country ever increase sufficiently to warrant the necessary outlay. Lat. at noon, 51° 24′ N.: long. 107° 32′. After breakfast we continued a north-eastern course, and at five camped for the night. We passed during the day many salt lakes, fringed round the edges with thick incrustation of salt, highly indicative of the rapid evaporation that takes place in these arid regions. Rise again into the plain. Features of the country connected with the valley of the Red Deer Lakes. Salt lakes.

The country we have passed over consists of irregular sandy ground covered with low coppice, and here and there rising into hills clad with poplar trees. Many of our horses are beginning to suffer from the worn state of their hoofs, and we endeavour to relieve them by wrapping their feet in dressed buffalo skin; their feet have become so worn, and their hoofs so thin and sore, as to leave signs of blood in their tracks. The loading of the carts and the weight of our horses' packs were considerably increased in consequence of the loss of our waggon in the South Saskatchewan River. From our camp we saw the prairie on fire towards the north and east. In autumn these fires are very common, when the grass is like tinder, and a spark from a pipe may be sufficient to set 200 square miles of prairie in a blaze. The Indians are very careless about the consequences of such an occurrence, and frequently fire the prairie for the most trivial reasons; frequently for signals to telegraph to one another concerning a successful horse-stealing exploit, or in order to proclaim the safe return of a war party. The disastrous effects of these fires consist principally in denuding the land of all useful trees, such as spruce, pine, larch, fir, and all soft-wood timber, which are among the most valuable for settlement, but not reproductive. Another serious misfortune likewise frequently results from these wanton fires, and from which the authors are themselves frequently punished, viz., they cut off the buffalo sometimes from a whole district of country, and thus often are the cause of great privation and distress. Nature of the country. The horses' hoofs begin to wear out. Prairie on fire. Mischief of prairie fires.

October 4th.—Started early, and in an hour and a half reached willows and poplars; at nine breakfasted in a swamp, which we had some difficulty in finding, as water was very scarce. Our fire ran after breakfast, but we quickly extinguished it, beating it back with blankets and saddle-cloths. We now observed a marked change as we proceeded, and were no longer in prairie as before; passed through quantities of scrubby wood and young poplars one and two feet high; passed on to the north of a clump we named Three Tree Point, and camped in the evening, where we found plenty of good water; passed an ancient buffalo pound, where the Indians in winter decoy and drive buffalo to slaughter in great quantities. One of our horses got so weary that we were obliged to leave him behind about three miles from where we camped. At noon, latitude 51° 45′; longitude 107° 38′. Three Tree Point Clump. A horse gives out.

October 5th.—Sent back in the morning and recovered our horse: we found all the wolves in the neighbourhood anxiously watching his movements, but we succeeded in bringing him on with difficulty, thanks to Mr. McKay, who undertook the task; travelled only a short way; dense smoke to the north and east from the fire we observed yesterday; camped in a swamp, a favourable situation in case the fire may approach in our direction. At noon, lat. 52° 3′; long. 107° 21′. At 8 o'clock this evening the wind increased to a stiff breeze, and at 10 a storm came on blowing successively from all points of the compass. This is frequently the case in the vicinity of a prairie fire sufficiently large to disturb the equilibrium of the atmosphere. The extent of this fire was very great, and the whole atmosphere glowed from north to east. Found him well guarded by the wolves. Camp in a swamp for fear of the prairie fire. A whirlwind caused by the prairie fire.

The men acquainted with Carlton think themselves within a few miles of the place.

October 6th.—This morning I was surprised to see the men smartening themselves up and putting on their best clothes, and on inquiring the reason, Ferguson told us we were very near Carlton, and would be there before noon. This announcement amazed us, as our observations showed us not within 30 or 40 miles of Carlton. We told them they were wrong, upon which they laughed and said they recognized the hills, features of the country, &c. Started, and had not long to travel before we came into the burned ground, the result of the magnificent fire we had been contemplating last night; we travelled half stifled with heat and dust over about 10 miles of rolling ground, where, however, water was very scarce, and halted for breakfast at a stagnant marsh, the only spot in the neighbourhood where the ground was not burned, and where we could find a little grass for our horses. After breakfast took our latitude observation and obtained 52° 12′. Previous to this I could not help misgivings as to having accidentally read off a wrong degree, but now it was clear that either the men or the fort were altogether out of reckoning.

The sextant proves the men to have made a mistake.

The country still arid.

In the afternoon continued our course over burned ground, and at night encamped on a swampy lake. We have risen considerably in altitude during the day; the country here again relapsed into the nature of that in the neighbourhood of the South Saskatchewan, south of elbow, viz., the loose sand and scanty growth of coarse grasses. A few poplars occasionally occurred, but none of a size sufficient for fuel. Latitude 51° 3′ N.; long. 106° 51′ W. Although I did not camp very early, I had considerable trouble to make the men camp; they still urged that if we travelled on for another hour we should reach the fort. To my reply that they must have patience, and that we should not reach the fort till the day after to-morrow, they actually scoffed, and said, "How can you know, when you were never there?"

The men still insist on their proximity to the fort.

Breakfasted at a well-known lake.

October 7th.—All hands on the alert, impressed with the idea that they were going to breakfast at Carlton, and so got away earlier than usual; travelled till 10, and halted to breakfast at a fine lake, where we enjoyed abundance of pure water, and excellent grass for the horses. Here the men began to discover the mistake they had made as to their distance from the fort; indeed there had been only 2 or 3 that had ever been there, and that very long ago; these however knew this lake, admitted their error, and began to entertain very exalted notions as to the powers of the sextant.

After breakfast passed through occasional clumps of small poplars, and over a very irregular surface of country containing a number of small lakes, most of which were brackish. The recent fire had completely destroyed the trees, and grass, save in the swamps, was totally burnt up.

The horses suffer a good deal from the state of their hoofs.

Our rate of travelling was very slow, owing to the state of our horses' hoofs, now nearly worn down to the quick, and the journey became more painful to them owing to the charred soil over which we were travelling. The whole sky was overcast with a dense canopy of dirty smoke, which made us all as black as sweeps.

We were now travelling between the two branches of the Saskatchewan, which run about parallel here at a distance of 10 to 15 miles. We crossed successive ranges of sand-hills and lines of great limestone boulders, all lying N.W. and S.E. At nightfall we encamped beside a long lake with swampy margin, within two miles of the north branch of the Saskatchewan, the high banks of which could now be seen to the northward.

First fall of snow.

October 8th.—During the night we had a violent thunderstorm, followed by snow; and this morning broke with a heavy fall of sleet, rendering everything around us damp and chill.

This may be looked on as one of the storms announcing the approach of winter, although not its actual arrival, there being generally at this period of the year a short return of genial weather, well known as the Indian summer, and during which we could have still counted on some more days favourable for travelling; nevertheless this storm, preceded as it had been by several mornings and evenings of heavy frosty fog, warned us that it was time our horses should discontinue their hard work; and I was also aware, that if the horses had not a small period of time to feed up and recruit before the actual setting in of winter, they could never withstand its rigours, and, besides this, their hoofs were nearly worn out. We had therefore reason to congratulate ourselves now, that I had not continued our course westward to the junction of Red Deer and Saskatchewan Rivers; for had we done so, before crossing the South Saskatchewan, it would have involved the addition of nearly a fortnight's work on the horses, the consequence of which would very likely have been, first, that we should have left many of them behind us on the plain owing to the state of their hoofs, and secondly, have subsequently lost many others during the winter, in consequence of not having strength enough remaining to resist the intensity of the cold.

A warning to cease from working the tired horses.

Fortunately I did not take the horses further west before retreating to Carlton.

Sun-dogs.

Prepare for arrival at Carlton.

The morning was cold, with a frosty fog, causing very beautiful and striking parahelia, commonly known as "sun-dogs;" a little after 10 the day became very fine. We breakfasted at the Stone Indian Creek about five miles from Fort Carlton. After breakfast we all busied ourselves getting out our best clothes, razors, and in short men and all made as elaborate toilet as possible preparatory to entering the fort.

Great change in the nature of the country.

Our whole ride from the creek to the fort was through rich grassy land of first-rate quality, lightly wooded with clumps of willow and poplar. The fort is not seen until you arrive directly in its vicinity, and close over the south branch of the North Saskatchewan.

Arrive at Fort Carlton.

We were most cordially welcomed, and most hospitably received by Mr. Richard Hardesty, the Hudson Bay Company's officer in charge of that post, who was then making every possible preparation for our accommodation during the ensuing winter.

End of Journey to Carlton, Oct. 8, 1857.

No. 3.

Winter Quarters at Carlton, and the several Journeys, from October 10th, 1857, to June 4th, 1858.

Dismiss the supernumerary men at the end of the season.

October 9th.—We had lost the use of many instruments through sheer work, accidental breakages, and wear and tear from the circumstance that these instruments had frequently to be packed on horses' backs. I determined, therefore, to descend the Saskatchewan from Carlton in a boat along with the greater part of my men, whose services I did not require through the winter, but who I, according to the generality of all agreements in that country, was bound to send back to the place (Red River) from whence I had engaged them. After having made all my preparations, and being ready to start,

the men refused to go down in the boat, and urged that boat service had not been specified in their agreement. I re-examined the contracts drawn up for me by Mr. Swanson, of Red River, and found that the law was in their favour; so had to give way, reverse all my plans, and make, as fast as possible, arrangements to start for Red River Settlement on horseback, myself, and make further arrangements for the men to travel on foot, providing them with dry meat and pemican, two carts, and three horses, to convey their luggage for them to their destination. They refuse to accompany me in the boats.

October 11th.—Started, accompanied by Mr. James McKay, John Ferguson, Pierre Beauchamp, and a young Indian, who provided us with two horses hired for the trip, as far as Fort Pelley. We started at three, when it was snowing pretty heavily, and reached the south branch after a sharp ride of 20 miles in a south-eastern direction, and camped on the river at six o'clock in the evening. Start off to Red River.

October 12th.—Crossed the river in a skin canoe at sunrise. At opposite side of the river found some traders of the name of McKay, distant relations to my friend of the same name. We all breakfasted together; started, made 16 miles, rested for about an hour for dinner, and made 14 after, before camping for the night. To-day we have passed through a fine rolling country adapted to sheep-feeding, fairly wooded, not swampy, but well watered. Pass through a good sheep country.

October 13th.—Saddled up, and started at sunrise; made 12 miles before breakfast, for which we halted for one hour and half; made 10 miles, halted for dinner for another hour and half, rode 15 miles further, and camped. Country the same as yesterday, rich, rolling, and would have been well wooded, but for the fires. We discovered, near camping, the cause of the great fire which had occurred this autumn. It was kindled from the camp fire of Mons. La Combe, the Roman Catholic missionary to the Crees, on his way to Edmonton; this I learned from a notice planted there, in the shape of a post, on which was carved his initials and the date of the encampment in September. Missionaries set the prairie on fire accidentally.

Wednesday, October 14th.—Cold and fine. Started early, passed some insignificant lakes; after dinner crossed burned ground, and camped in a swamp on account of the horses, the grass having been all burned off the dry ground; had no wood for our fire, save a little brush, that did little more than light our pipes; made in all about 38 miles. Camp without a fire.

Thursday, October 15th.—Started at half-past 6 a.m., made 12 miles, stopped to breakfast, where we enjoyed a good large fire to make up for last night; after a ride of about nine miles we reached the Touchwood Hills post, a ride from Carlton of about 146 miles. This fort of the Hudson Bay Company was in charge of Mr. Taylor, who received us most hospitably. I immediately started out to shoot and examine the hills, accompanied by a young half-breed who was guarding the horses. The Touchwood Hills, or Montagnes de Tondre, consist of easy undulating hills, in height under 100 feet, well wooded, however, and containing lakes varying in size from about three-quarters to an acre and a quarter in surface. After a good long ramble through them I returned to the post, about an hour after dark, having made a fair bag of Musquash rats and ducks. Touchwood Hills post. Shoot musquash ducks.

Friday, October 16th.—Notwithstanding the kind request of Mr. Taylor to remain a day at this post, we started at 8 o'clock next morning and made 22 miles before dinner; started again at 2 p.m. and camped for the night about 6 p.m. in the [*sic*] Hills, after an afternoon ride of 20 miles.

Saturday, October 17th.—Started at half-past 6 a.m., made 11 miles; stopped at 9 a.m. after crossing Mud River. Started at 11 a.m., made 16 miles, and halted for dinner at 2 p.m.; afterwards travelled 13 miles, and camped.

Monday, October 19th.—Started a little after 6 a.m.; first saw pines upon Assineboine Lake; crossed the Assineboine River and stopped to breakfast, having made 16 miles. Started at 12 o'clock, and reached Fort Pelley at a little after 2 p.m., having made 13 miles; latterly we have been in a thickly wooded country. The pine tree against which I leaned back as I sat on the ground at breakfast measured 6 feet 3 inches in circumference. Reach a pine-bearing country and thick woods.

We were most hospitably received by Mr. Christie, the officer in charge of that post, who persuaded us to remain a day with him. Mr. Christie's post has more the appearance of a commodious shooting lodge, similar to those at home in the highlands of Scotland, than to an Indian fort. An old post was still in existence in a swamp below, which was inconvenient on account of its low damp situation, and consequently abandoned. Mr. Christie's was the only commodious residence that I ever saw in the Indian country unprotected by pickets. At Fort Pelley the Hudson Bay Company have a large number of brood mares, and a very fine breed of domestic horned cattle; these wander wild in the woods, but return to the precincts of the fort to eat the hay provided for them in the winter months. Fort Pelley, Mr. Christie's post. Brood mares and domestic horned cattle.

Fort Pelley is the head-quarters of the Swan River district, a country abundantly supplied with timber, and, though swampy and full of lakes, yet containing much land that would be valuable to the agriculturist. It is likewise abundantly supplied with fish; of these the most valuable species are the sturgeon and white fish; they are both the most wholesome and nutritious of all fresh-water fish, and as an article of constant diet equal to any fish in the world, the salt-water fishes not excepted. It is a valuable feature, not only throughout the whole district, but also throughout the whole of the more northern part of the Saskatchewan, that numerous lakes, deserving almost the name of chains of lakes, occur, most of them abounding in white fish. These, even with the rough and imperfect means of fishing in use by the inhabitants, are caught in vast quantities. This would no doubt prove a most important advantage to the settler, because fish is an article of food which he can obtain at far less cost of time and labour than what would be expended in hunting, to say nothing of the skill, only to be acquired by long practice. And if the settler, while bringing his farm into cultivation, had to depend solely on hunting for his support, he would feel great difficulty in finding either time or energy for his agricultural labours. Swan River district. The fish.

Monday, October 19th.—Our Indian's time of contract expired, and he did not wish to continue the journey, and go further from his camp. Mr. Christie could not lend us any horses, as they were all out on trips; however, he gave us leave to take two of the brood mares if we could make anything of them. Therefore the whole day was spent training the mares, a troublesome undertaking; but, after a few falls, we finally succeeded, in not only making them carry but pack. We take two of the wild mares.

Tuesday, October 20th.—Started after breakfast, crossed the Assineboine River, made 14 miles on a south course, dined, travelled about 13 miles further, and camped for the night.

Wednesday, October 21st.—Breakfasted before starting, made 20 miles, dined, made 14 miles afterwards, and camped.

Cross the Qu'appe le River, and pass he night in he swamp.

Thursday, October 22nd.—The days were getting short, so we breakfasted before day, and caught the horses as soon as we had light enough to find them; we travelled about 20 miles, and dined. Arrived at the Qu'appelle River about 3 o'clock; had great difficulty in crossing the river on account of its steep muddy banks, the horses sticking and floundering, and recrossing the river several times before we finally succeeded in getting to the other side. Spent a miserable night in the swamp.

Arrive at Fort Ellis.

Friday, October 23rd.—Arrived at Fort Ellis.

Leave for Fort Garry.

October 25th.—Started for Fort Garry; at 3 o'clock crossed the Assineboine, and camped. Our party consisted of myself, Mr. James McKay, John Ferguson, and Beauchamp, and four pack horses, besides the saddle horses we were riding.

Description of road and timber.

The country between Fort Ellis and the Red River Settlement has been so fully described that it is not necessary to enter into any description here, suffice it to say, there are two tracks so strongly marked by carts as to deserve the name of roads. The country is in some places swampy, but generally good and fertile. There is a good deal of spruce, but willows, birch, and poplars form the principal timber. There is oak, however, on the Assineboine, the whole way, more or less, to Red River. The Assineboine is not so subject to flood as Red River, and contains in the valley much land that would be valuable to the settler. We reached the Manitoka portage on the 30th October.

Archdeacon Cochrane.

October 30th.—Was most hospitably received by Archdeacon Cochrane, one of the oldest, most zealous, and efficient ministers of the Church of England at Red River. Many young fellows, half-breeds, that were educated by him, bore testimony to his abilities as a missionary clergyman, for all agreed in testifying to the untiring zeal and energy of this most estimable clergyman, who I was informed on all sides was competent not only to teach school and preach fine sermons, but to teach his disciples to wield an axe and drive a plough. One of my informants told me he built the Manitoba Church near the school of the same name, in which he himself was one of his pupils; and when school was over he led the young fellows into the adjoining woods with an axe over his shoulder. "He is "close on 70 now," continued he, "and not as young as he was: but I tell you, he is hard to beat at "either chopping or ploughing." He takes the greatest interest in agriculture, and the old man has the pleasure of seeing his bright example followed by the young generation, so many of whom have to thank him for an excellent education.

Mr. Lane's post.

October 31st.—After a long cold wet ride reached the White Horse Plains, and slept at the Hudson Bay Company's post, in charge of Mr. Lane.

Arrive at Fort Garry.

Sunday, Nov. 1st.—Arrived at Fort Garry.

Arrangements for the journey to St. Paul's, in Minesota territory, United States of America.

I remained two or three days at Red River to obtain horses and outfit for my journey to the States. On inquiry, I found horses very dear and difficult to sell at St. Paul's, particularly at the end of a trip, especially when the owner of these horses was obliged to part with them in haste. I therefore adopted the alternate of making an agreement with an intelligent young fellow, named Robert Tate, to supply me with three horses and provisions for the trip, he undertaking all risks, for 60*l*.

The party.

Our party now consisted of Robert Tate, Pierre Beauchamp, and myself, and three horses; one of them was a mare for my own use, one with a small light cart for provisions, kettle, instruments, &c., and the third horse was packed with our bedding.

We started at half-past three p.m. on the 4th of November, and after a sharp ride of about 10 miles up the river, arrived at the house belonging to Pierre's mother, where we slept for the night. On the second day of our journey we travelled about 30 miles, and slept at Klein's.

Klein.

We have already, in the Journal, alluded to Klein as an intelligent settler on Red River: and we now found his house a kind of inn, fairly provided with pork, beans, flour, and coffee, and also with hay for our horses.

Arrive at Pembina.

November 6th.—Started very early, and arrived at Pembina in the afternoon. Robert Tate had brought some barley for the horses, in order to assist them through their journey, as the winter was now advanced: he unfortunately tied my mare to a rail and placed a feed of barley before her; during our absence a starving cow, attracted by the barley, attacked the mare viciously, and gored her so severely that we left her behind giving up all hopes of her recovery. I was therefore obliged, like my companions, to proceed on foot.

My mare gored by a cow.

November 7th.—Started at ten, crossed two tributaries of Red River, camped beyond the second.

Proceed through American territory.

November 8th.—Started at quarter-past 7, dined at 11, camped at quarter-past 5, made 24 miles. As the rest of the journey to St. Paul's was in American territory, and this part of the Red River Valley has been formerly described, I will not continue the diary further than to say that the route was an excellent one. The snow this season was unusually late, and we were all in excellent wind and travelled very fast.

Cross the watershed or dividing ridge between he waters of he Gulf of Mexico and Hudson Bay.

Saturday, Nov. 14th.—We arrived at Ottertail Lake, on the watershed of the Continent, dividing the waters that flow into Hudson Bay from those that descend into the Gulf of Mexico, and which have been ascertained to be 860 feet above the sea level.

Ottertail City.

At the north end of this lake we found an old Scotch settler, with his old half-breed wife and daughters, who received us most hospitably, gave the best of what he had. He had a wooden house with a stable and a cowhouse attached, and this establishment was called Ottertail City. The stable contained a horse, and the cowhouse contained an ox. Our horses were tired, as we had travelled late and early, and had come rather fast, so we remained over Sunday.

Arrive at Crowwing, the most westerly point of civilization.

November 16th.—Started from Ottertail Lake, and on the 18th arrived late on a tremendously cold night, after a run of 45 miles, at the American Indian Agency of Crowwing; thus completing our journey on foot from Red River Settlement, (allowing our Sunday to recruit the horses), to the terminus of civilization on the Mississippi, in 11 days.

At Crowwing I parted with my two voyageurs, Robert Tate and Pierre Beauchamp.

Robert Tate engages to meet me on my return from he States, and cross the country in a canoe.

They were to start back for Red River in a day or two, as soon as the horses were rested. Before taking leave of me, Robert Tate engaged to come down again the following March from Red River, to meet me, and bring along with him another hardy young fellow, to assist me in carrying out my scheme of crossing the watershed of the country by means of a canoe, on my return from the Settlements. I proposed punting up Crowwing River and Leaf River to Leaf Lake, thence to make a portage of about 7 miles to Ottertail Lake, whence the Red River rises, and by this stream to descend to the forks of

the Red River and Assineboine River at Fort Garry. We shook hands, and parted on the mutual understanding that we should meet at Crowwing on the 1st of April 1858.

From Crowwing to St. Paul's an excellent stage runs three times a week, and in the winter months, when the ice no longer permits the Mississippi boats to run up to St. Paul's, the stage waggons run all the way down the Mississippi, with only one crossing place to La Crosse, on the left bank of the river, and on to Prairie Le Chien, the extremity of railway communication, which is about 200 miles to the north-west of Chicago. The winter stage coach.

End of Return Journey into the States in 1857.

JOURNEY to HEAD QUARTERS at CARLTON, commencing March 1858.

March 21st, 1858.—Until this date I was detained, partly in Canada and partly in the States, by the business of the Expedition, as was explained in the despatches, and I arrived again at Prairie Le Chien on Wednesday, 24th March 1858. I slept on board the steamer, which was about starting on her first trip to St. Paul's. Reach the steamer and start for St. Paul's.

March 25th.—Many doubts were entertained as to whether the steamer would be able to force her way through the ice on Lake Pippin, a dilation of the Mississippi about 50 miles from St. Paul's. At about day-break in the morning she encountered the ice, and crashed through triumphantly, the engines at every turn drove the paddles against the ice with a noise like thunder. Break throug the ice on Lake Pippin.

At 3 in the afternoon we arrived at the [*sic*] of the city of St. Paul's, cheered by an immense concourse of people tumultuously welcoming the arrival of the first steamer of the season.

March 30th.—Arrived once more at Crowwing, the extremity of civilized, or rather public, modes of conveyance. Arrive at Crowwing.

On the following day I succeeded in purchasing a tolerable canoe, and looked up my bedding, kettles, &c., and completed various preparations for my canoe journey. Prepare for canoe journey.

April 1st.—According to promise Robert Tate arrived accompanied by a young Scotch half-breed named William Slater; they had started from Red River on the 11th of March, and accomplished their journey during the severest time of the whole year. In the first place the snow had melted off unusually early, they had to throw away their snow shoes and walk through half-frozen slush from morning till night; the ice had broken up on the rivers shortly afterwards, and they had to wade many of them; when they arrived they looked fearfully worn and haggard, and Slater's feet and legs were awfully swelled. I mention this as one very remarkable instance of the determination of these English and Scotch half-breeds in carrying out what they once undertake; and there is little doubt, if their energies were only rightly directed in pursuit of agriculture, commerce, and trade, they would progress as rapidly as any Anglo-Saxon communities. There is a very remarkable difference between the Scotch half-breed and the Canadian or French half-breed: the former is essentially Scotch, he trades, speculates, works, reads, inquires after and endeavours to obtain the information, and to profit by the advance of civilization in the old country as well as he can. Should his mother or his wife be Indian women, he is kind to them, but they are not his companions. Robert Tate fulfils his promise. Tate and Slater's desperate journey. Striking difference between th Scotch half-breed and the Canadian or French half-breed.

The Canadian or French half-breed, probably on account of an indolent disposition, allied to sociable habits, becomes more and more Indian. If he has energy he is a hunter, and able to beat the Indian in every department of hunting, tracking, running, and shooting. But there his energy ends, his sympathies are all towards his Indian mother, squaw, and especially his (belle mère) mother-in-law.

Before I started from Crowwing a young American told me he was very anxious to ascend the Crowwing River, in order to superintend the cutting and floating of some pines which he had contracted to procure, and intended to seek up the Crowwing River above the mouth of Leaf River, and offered me some money for his passage: I liked the young fellow's appearance and manner, so told him I would not have his money, but would like him to work with me up the stream, as the men were weary after their desperate foot journey. He at once consented, went back to the village, while some squaws were pitching my canoe, and soon returned with a capital cheese and bag of biscuits. When I returned from purchasing ammunition and tobacco at the agency, the women had finished the canoe, and we started up Crowwing River on Good Friday, the 2nd of April. We had not punted more than two hours and a half when we found the canoe leaking, and obliged to put ashore at an old deserted hunting camp on the left bank of the river. We then discovered that the women had not been able to resist the temptation of eating the grease, instead of mixing it with the gum, so it all cracked off again, and we had to occupy ourselves with staunching our canoe for the rest of the evening. Armstrong not only proved an excellent hand in the canoe, but a most entertaining companion in camp; we sat round our fire till a late hour listening to his most entertaining stories of California, where he had been for two years very successfully gold-digging. Young Armstrong. Start up the Crowwing River in the canoe. Women eat the grease for the pitch of the canoe.

The weather was now very warm and the musquitoes troublesome.

April 3rd.—Started at 7 a.m., arrived at mouth of Leaf River at 1 o'clock. Armstrong left us after dinner, and, accompanied by a young Indian whom he hired to carry his pack, started for his lumber camp. We found, at the mouth of Leaf River, a small shanty occupied by two American squatters, who received us most hospitably. The weather threatening and lowering. Leaf River squatters.

Sunday, April 4th.—A snow storm; could not travel; it cleared up before sunset: I went out and shot three fine mallords. Next day the storm came on again, but we were not able to travel till the afternoon, when we began to ascend Leaf River; here I shot the fattest goose I ever saw. We camped on Leaf River. We were very well provisioned with tea, sugar, flour; our pork was no longer good, on account of the heat a couple of days ago, therefore we threw it away, and trusted to the ducks and geese, which were very numerous and in excellent order. Plenty of ducks and geese.

Leaf River is a stream so tortuous that we found after working for hours that we had not proceeded more than a mile or two in a straight line. The weather was cold, accompanied by slight falls of snow, and the water froze on the poles, which rendered the punting sometimes painful to the hands. Weather very cold.

We continued ascending this river till we reached the watershed on the 9th April. At Leaf Lake we found a settler to welcome us, and passed the night at his house. Reach the watershed.

On the 10th of April we crossed the watershed, a distance of about seven miles, and reached Macdonnel's, leaving our canoe in the settler's care; as soon as we arrived the Miss Macdonnels har- Walk across the watershead.

nessed their ox, started for Leaf Lake, and brought us our canoe, poles, oars, &c., safe to us at their father's house a little after sunset.

We seek for the commencement of Red River.

The following day was occupied in thoroughly repairing the canoe; and did not start till the 15th, when we paddled away in search of the commencement of Red River: none of us had ever been this way before. We were overtaken in a snow storm for three days, but made ourselves very comfortable; built a shelter of branches with the canoe at the back.

Leave Garry and commence to ascend its banks.

On the 15th of April found the entrance of Red River, and commenced our descent again to the north.

Descriptions.

April 16th.—Navigation bad, a great many rapids, but no portages.

April 17th.—Had to make one portage of about a quarter of a mile, here we found a settler who had been robbed by the Saultons.

Breckenridge.

April 19th.—Reached Breckenridge, where we met settlers, who treated us most hospitably.

April 26th.—Reached Sand-hill River, heard Indians firing; I had been firing myself at ducks, did not cease doing so, not wishing the Indians to conclude that we were a party so small as to fear them.

Arrival at Coch Indian depredations.

April. 27th.—Arrival at the Grand Forks, saw houses burned down and smoking; this had been the work of the Indians.

The burned-out American fur traders.

April 28th.—Overtook the party burned out, they were traders employed by Rolette, of the American fur company at Pembina, there were three men, three women, and several children; the Indians had stripped them very bare indeed. They were making their way down stream to Pembina, supporting themselves by fishing. One of the men had a gun, I gave them some ducks and ammunition; they had plenty of fish and gave me some.

April 30th.—Passed mouth of Snake River.

Arrive at Pembina.

May 1st.—Arrived at Pembina at sunset, slept at the Hudson Bay Company's fort, found my old friend Mr. Murray in charge.

Reach Red River settlement.

May 2nd.—Started at 10 a.m., rowed all day and all night, only halting for meals, and reached Fort Garry, Red River Settlement, at 3 p.m., May 3rd.

I had lost three horses last winter.

Business detained me for several days at Red River: out of five horses which I had left three had died during the winter, notwithstanding my having taken the precaution of retaining Pierre Beauchamp in my service to look after them. I was therefore obliged to purchase two more horses.

Mr. Mc Tanish.

Mr. McTanish, the Hudson Bay Company's officer in charge of Fort Garry, did everything in his power to facilitate my arrangements, allowing me to purchase freely out of the stores for cash orders.

We start on foot for Carlton.

On the 12th of May started from Red River for Fort Ellis: our party consisted of John Ferguson, Pierre Beauchamp, and Johnny Simpson, and myself, with three carts and four horses. I had no riding horse for myself, preferring to reserve the fourth horse in case one of the cart horses should tire.

Appearance of the country in spring.

It would be unnecessary for me to detail each day's proceedings during this return journey to Carlton, and I will merely dwell on the appearance presented by the country in the early spring.

I have no cause to detract from the general inviting aspect of the country to settlers; only the grass, which was beginning to push, was not as far forward as I should have wished for the sake of the horses; the ground was in many parts heavy to travel, and the swamps difficult to pass; still there was much inviting undulating land with a rich deep soil. On the other hand I could not fail to observe very severe night frosts, which checked the progress of vegetation, and no doubt would have injured the progress of introduced crops still more severely. On the 30th and 31st of May we had heavy snow, accompanied with a cold wind.

Early in June we had no snow, and the night frosts were less frequent and less severe; the grass visibly improved. As my journey was in a north-westerly direction it was natural to expect that in proportion as I gained in latitude I should observe the season to retard in progress, but I cannot say that this was the case, and my impression was that there existed great uniformity in the climate. Travelling at that period of the year is attended with difficulty; the new grass is powerfully drastic to the horses that have been accustomed to the dry frozen stuff of the previous season, rendering them incapable of working hard for several days together, notwithstanding that my small stock of horses was recruited successively at Fort Ellis and the Touchwood Hills. It was not without considerable care and trouble that I succeeded in reaching my destination with my whole band. We had no actual necessity for hurrying, for it was too early in the season for this same cause to start with the Expedition, and we had plenty of ducks and geese, besides a capital harvest of eggs, which we gathered in the swamps as we walked along. On the 4th of June I met Doctor Hector and Mr. Hardesty, the Hudson Bay Company's officer in charge of Fort Carlton, they had come out to meet me bringing fresh horses with them; they turned about, and we all travelled together, and camped in the evening about eight miles from the fort.

Cross the South Saskatchewan.

5th of June, crossed the south branch of the Saskatchewan, and rode to Fort Carlton.

Doctor Hector made all the necessary arrangements previous to commencing the summer exploring season.

On my arrival at Carlton, I found all the gentlemen under my command in good health. Doctor Hector, who had been in charge of the affairs of the Expedition during my absence, had in accordance with my instructions hired men and purchased horses for the explorations of the ensuing summer: to carry out these objects it had been necessary for him to visit the Catholic settlement at Lake St. Ann's, fifty miles west from Edmonton. He therefore with most praiseworthy energy availed himself of this opportunity to lay down the whole of the North Saskatchewan, and visited Forts Pitt, Edmonton, and Rocky Mountain House, and even penetrated the flanking range of the Rocky Mountains during the winter.

Lieut. Blakeston conducted the magnetic observations, assisted by the other gentlemen.

Lieutenant Blakeston had joined the Expedition shortly after my departure from Carlton last October (1857), and I found the magnetic observations under his instructions and conduct ably carried out, assisted by Mr. Sullivan and Mons. Bourgeau.

Mr. Sullivan conducted the astronomical observations.

The numerous astronomical observations of Mr. Sullivan were all carefully recorded and submitted to me, as well as the computations and the results.

Monsieur Bourgeau had already made an extensive collection of early spring plants, which grow in this part of the country.

The Red River men whom I had engaged

When I arrived at Red River last November, I made arrangements for engaging men who were to proceed, in the beginning of March 1858, on foot to Carlton; and on my arrival to this place I learned that these men had arrived on the 7th of April, and were afterwards obliged to go out to the south of

the Eagle Hills, where they supported themselves by hunting the buffalo, there being no provisions to spare at Carlton. These men, twelve in number, had been allowed the use of our horses; and hunted with the hunters of the fort. last Novemb at Fort Garr forming one brigade.

The men and horses which Doctor Hector had procured during the winter, and who we called the St. Ann's Brigade, were likewise unable to be supported at Fort Carlton. They were camped in the Eagle Hills, and the horses purchased in the winter, and likewise supporting themselves by hunting buffalo. This brigade of twelve men and our half-breed Blackfoot guide Paul. The St. Ann men engaged by Doctor Hector form another brigade.

Buffalo had moved off so far from Fort Carlton, and the hunters of the fort were obliged to go such long distances in search of meat, that the supplies did not even suffice for the inhabitants of the post, who were sent off with their wives and families to winter out. Mr. Hardesty, the gentleman in the Hudson Bay Company's service in charge of the fort, could not be certain of a sufficient amount of food for the gentlemen of the Expedition, and was even obliged to request my secretary, Mr. Sullivan, and our servant James Beads, to leave the fort and join the hunters on one occasion, and on another they joined a party at Jack Fish Lake, where they supported themselves by fishing. Afterwards, on Mr. Sullivan's return, Lieut. Blakiston and Monsieur Bourgeau likewise left for the plains, on the return of Doctor Hector and Mr. Sullivan. Great scarcit of food durin the winter.

Immediately before our arrival the supply of meat had greatly increased, owing to the greater facilities of bringing the meat in in the carts, so that all the three gentlemen were residing at Fort Carlton, and continued to do so along with myself until we started again to resume the work of the Expedition. Better off ju previous to my arrival.

JOURNAL continued by DR. HECTOR after departure of CAPTAIN PALLISER from CARLTON on the 10th of October 1857.

Fort Carlton, 1857, Oct. 11.—At noon Captain Palliser left us for the winter. He has two men and five horses, and is to be accompanied by Mr. James McKay as far as the Red River Settlement, and will continue to travel with horses, if possible, all the way to St. Paul's. Sullivan, with one man, also started for Fort Pitt, to which place he is to travel with horses along with Mr. McMurray, one of the Company's agents.

Despatch the horses to the Company's guard, distant 10 miles down the other side of the river. For the winter Capt. Palliser has retained five men at this place. Beads is to be servant, Hallet, Morin, and Boucher to hunt and look after the horses, and Foulds is to travel with me as servant.

Oct. 12.—Made inventory of the stores, and adjusted the rations so as to make them last for the winter. Without waste we have sufficient of tea and flour, and will be well off if we can only secure a supply of buffalo meat. Lend Foulds to the company for eight days to help them to get up a boat from Fort à la Corne. The Indian hunters who supply the fort with meat arrived to-day to receive payment for the animals they have killed this autumn. The price of a buffalo is 3 gills of rum, and they bring dried meat, grease, skin, cords, &c., which they trade in addition. The whole fort is in a dreadful state of riot from the quantity of liquor which is being consumed, and the noise of Indians drumming, howling, and brawling is incessant at present. I was amused to observe the Indian children playing with tops, a game which must have penetrated from the haunts of civilization.

Morin was sent to-day to the swamp where we left the grey mare, but returned saying she had disappeared; however, he was too short a time absent to have gone the distance, and felt being ordered off from the festivities that are in progress so much that I have no confidence in his report.

Oct. 13.—As the house we are going to occupy is undergoing repair, go off for to-day to shoot grouse and to visit the horses at the guard. The country along both sides of the Saskatchewan in this part of its course, when back from the river bank, forms exceedingly rich pasturage, abounding in vetches, and interspersed with small lakes and clumps of aspen poplar. The distribution of the wood is most beautiful, resembling that of a home park, but, unfortunately, the timber is of no value except as fire-wood. Round the swampy margins of some of the lakes there grows abundance of a species of *equiteitum* or goose grass, on which horses fatten almost as well as on grain. At this season swarms of wild fowl are to be seen, all very fat, but very shy, being passers on their way south. The pintail grouse occurs plentifully, in large coveys, and affords sport somewhat like partridge shooting at home. My pointer dog "Hero," which I got from Mr. Johnston at Fort Garry, is rather spoiled for his proper work, as it has been of more use to us to get him to retrieve water-fowl. I saw great numbers of the case wolf (mischechogonis or togonie) prowling about. This is the wolf proper to the partially wooded country, and is about twice the size of a fox, with a tail shaped like the brush of that animal. The real thick-wood wolf is grey or black, and very much larger. In spring, Hardesty tells me, the latter are often very dangerous, as they go mad, and then do not scruple to attack any one they meet with. Hydrophobia results from their bite, and the Indian cure for it is to sew the patient up in an old buffalo robe and to fling him on a large fire until it is well singed, when he is considered *done*. I should think that if the person survived this, it must produce violent diaphoresis, which, with the fright, may produce a salutary effect on the disease. The Indians are still very drunk to-day.

Oct. 14.—Walk two miles up the river with Bourgeau to see a clump of spruce (abies alba) which grow there,—the only trees besides poplar that are near the fort. Down towards the forks of the two Saskatchewans large forests of pine and spruce occur, from which most of the timber of which the fort is built was procured. Up the river about 30 miles there is a gulley where they get birch for making cart axles, and other purposes for which hard wood is required. Their best timber, however, is brought from Shell Creek, which is sixty miles to the north of this place.

Hardesty told me that last spring he found a duck's nest, with eight eggs, in a tree about 12 feet above the water; he says it had been an old crow's nest, which the duck had appropriated. It was sitting on the eggs when he disturbed it.

Oct. 15.—Snow birds (embrizzia nivalis) are around the fort in immense numbers at present. They are very good eating, although very small.

Oct. 16.—Arrange the thermometer, &c., for meteorological observations, sink metal tube in the soil 34 inches, according to Dr. Hooker's directions for buried thermometer.

Oct. 17.—Walk to the horse guard, and find that some of the horses have picked up wonderfully. Bring back four with me to take on a trip to the Thick-wood Hills. A little snow fell to-day.

Oct. 18.—The river has risen about a foot to-day, and is covered with patches of foam like a mill-stream. After breakfast started on a little piebald pony of Hardesty's, to search for the grey mare myself. Took me five hours and a half to ride back on our track to where we left her, and could find no trace of her. The pony got tired on the way back, so that I took much longer, and did not get home till two hours after dark. It was snowing, and a bitterly cold N.E. wind in my face. The whole distance was 46 miles. I shot a splendid case wolf in prime condition as a fur.

Oct. 19.—The wolves are getting very numerous and destructive about the fort: four nights ago they killed a foal, and last night took a great piece out of its mother.

Oct. 20.—Last night the wolves killed the poor mare outright. It has been very hot this afternoon, the thermometer ranging as high as 65°. Levelled up from the river to the fort to-day, and found the doorstep of the house to be 35 feet above the mean water level. The top of the bank behind the fort I found to be 196 feet above the river, but the proper prairie level is about 50 feet higher. The fort is built on alluvial bottom of about one mile and a half in extent, and a good deal of which has at one time been under cultivation.

Oct. 21.—At 11 a.m. start for the Thick-wood Hills, which are about 25 miles distant to the N.W., taking with me Hallet, Beads, and Morin, as there was nothing for them to do at the fort, and but little to eat. Cross the Saskatchewan, which is 400 yards wide, in a boat, and find the horses waiting for us. On ascending the left bank, which is 200 feet high, we passed to the west through rolling country covered with poplar clumps and small lakes; at one of these we halted, after making eight miles, to eat a goose and some ducks we had killed. We then made for a conical knoll which bore N.W., and at sunset reached a lake about a mile and a half long, which formed one of a chain running N. and S. along the base of the hill. Its water proved to be saturated with salt, however, and on the shores crystals of sulphate of soda were lying heaped up, some of them beautifully formed and of large size. It was not till after dark that we came to a small pool of fresh water, by which we encamped.

Oct. 22.—Morning very cold and sharp. The cart continued into the N.W., making for the highest part of the hills, while I crossed the swamps and ascended the conical hill we were making for yesterday. It is called Manitoe's Rest by the Crees, and is one of the many knolls of the kind that have Indian superstition attached to them, generally about a mythical person called Wee-suk-ee-chack. It rises about 150 feet above its base, and is nearly a perfect cone. It is quite covered with grass to the top, so that its structure could not be observed, but it is probably composed of a patch of cretaceous strata, such as we saw at the elbow of the South Saskatchewan. Indeed the whole eastern slope of the Thick-wood Hills, with its broken country, strewn with boulders, and worn into conical knolls and deep pot-holes, forcibly reminded me of the country where that river intersects the *Couteau des Prairies*. On the top of the Manitoe's Rest is cut out the figure of where the great spirit reclined, which the Indians always touch up every time they visit the place; but if the cutting in the turf be the impression he left, as they say it is, he must have been a most rectangular spirit. By following up the track of the cart I overtook my men encamped by a large clear lake several miles in length, and surrounded by dense pine forests. All round this lake the margin has been encroached upon by a dense growth of *sphagnum* moss, with dwarfed and contorted spruces and larches, for the most part dead, the whole forming what is known as muskeg. This is the favourite habitat for cranberries, and others of the vaccinium tribe, also for the Labrador tea plant (ledum latifolium), from whence its name "muskeg tea," by which it is known in this region. As swampy lakes of this description form the mass of what should be dry land in the district between Lake Winnipeg and Hudson's Bay, they give the name to the Indians who inhabit that region, a sub-tribe of Crees, who are known as Muskegoes or Swampy Indians. The change to the deep rich green of the pine forest, after seeing poplars only for the whole summer since leaving Red River, was quite delightful. Besides the *abies alba*, which is the largest and best timber of this country, I observed a few *larches*, called here "junipers," but they seemed always to die before they reached any great size. We pressed on, and encamped beside an old half-breed, who had long lived and hunted in this part of the country. This afternoon we shot several of the *ruffed grouse*, which is called here the white flesher, its meat being as white as the breast of a fowl, while that of all the other grouse in the country is dark. We also shot a number of musk rats (mus zibethicus) as they swam about in the lake. In early spring numbers of them are killed for their fur, which, however, is of no great value, ten of them being equal to one prime beaver in trading.

Oct. 23.—The country is very broken between the Muskeg Lake and the mountain, and we had very hard work getting along with our cart. Our old half-breed friend had told us that we could not get close to the mountain with the cart, but I was determined to try, and after several upsets and some little chopping through the poplar woods, we at last reached a very secluded valley just at the base of what seemed to be the principal escarpment, which is very steep and densely wooded. Here we cut poles, and put up a leather tent I had, in true Indian fashion: all in great spirits at having succeeded so well. We have seen to-day numerous fresh tracks of bears and elk, and also traces of different fur-bearing animals. Round our camp we found rabbits in great numbers, so that we had no difficulty in procuring our supper.

Oct. 24.—Taking Hallet with me, I rode off at daybreak first to the north, till on arriving at a deep valley which cuts though the mountains to the S. W.: through it we followed up a small stream to its source, where it heads with another stream, said to flow into Redberry Lake. Finding that the valley did not take us to any height, but seemed to have the same depth and dimensions all the way through the hills, we ascended the north bank of it, and fell in a track cut through the woods by some Indian moose-deer hunter. As at several of the old encampments that we passed, we found the remains of several of these animals that had been killed this summer, among which were a magnificent pair of antlers, which I grudgingly had to leave undisturbed. So dense is the thicket of poplar on the summit of these hills, that without some such track as we had now fallen upon it would be impossible to make any progress. On gaining the highest level, I found that the hills are really a lofty table-land, which has an irregular surface, covered with swampy lakes and thickets, and it is only the rugged escarpment to the east which gives them the appearance of a range of distinct hills. As we returned home, on regaining the valley we became enveloped in dense masses of smoke, which rolled in volumes from the west, where the woods seemed to be on fire. As it was impossible to discover whether the

fire was far or near, we made all haste back to our little encampment, the dismal gloom giving rise to a feeling of depression difficult to shake off. On nearing our camp we got out of the smoke, as the hills then sheltered us from the direct course of the wind, but all night the sky to the south-west was brilliantly illuminated.

October 25th.—This morning ride off to the north with Hallet, keeping along the base of the hills. Soon fall on the fresh trails of Indians, which we follow up, and after riding about 14 miles, overtook them just as they were encamping, as they had killed five elk. They were on their way to Green Lake, and the track that they were following, which was evidently an old one, passing through swamps and along the margins of lakes, must be the same which Sir John Franklin travelled by with dogs when on his way north from Carlton to Great Bear Lake in the winter of 1819. The Indians we met with here were a party of Thick-wood Crees numbering nine tents. They offered us meat, but our horses were so jaded that we dared not load them in the least, as we hoped to return to our camp by dark. After a smart and rough ride we got there about an hour after sunset. A shower of sleet has given a check to the fire, which is not so brilliant to-night.

The Thick-wood Hills rise to the height of 500 to 700 feet above the plains, but a long gradual ascent leads to the foot of the sudden escarpment at which we are encamped, so that it is difficult to judge correctly of their real height, and the dial plate of my aneroid had worked loose, so that I could not trust to the readings I had recorded. The abrupt slope facing to the east follows a curved line to the north-west, and is everywhere strewn with boulders, principally of primitive rocks and angular masses of cherty and magnesian limestone. These hills form the hunting and trapping grounds of Indians, who travel about in small parties, carrying their effects, which are but few, on the backs of horses and dogs. Their principal food is moose deer, elk, and bears, and in the winter they live a good deal on rabbits, and on the Canadian lynx, which is very abundant wherever rabbits are found. They sometimes make short excursions to the plains for buffalo when the herds come north of the Saskatchewan River. They for the most part trade at Fort Carlton, but a great deal of the large quantities of fur which they annually trap has of late years been diverted from the Company by the free traders, parties of whom from Red River spend the winter among the Indians, well supplied with goods, which are furnished to them by the American traders. This rival trading on the whole would be for the good of the Indians, were it not for the wretched poisonous whiskey which is supplied to them. The tract of land between the Saskatchewan at Carlton and the Thick-wood Hills is exceedingly rich and well watered at present, forming magnificent pasture land; immense areas of it might with ease be brought into cultivation. Every variety of soil may be found in this district: light sandy soil in the high grounds, rich loam in the flats, with a considerable thickness of vegetable mould, and extensive meadow lands, affording natural hay of excellent quality. The quantity of useful timber which may be procured along the base of these hills for building and other purposes, gives an additional value to this district; want of timber being the great drawback to most parts of the Saskatchewan Valley, especially close to the river.

October 26.—Finding I was foiled by the want of sections where I expected to find a most interesting field for geology, I determined to return to the fort. On regaining the Muskeg Lake, distant from our camp seven miles, we passed round the north end of it, and came on a party of free traders, who were busy building a rough log shanty in which to winter. There were three families of them, wives, children, and all, and they had left their comfortable homes in the Red River Settlement, and travelled all this distance into the wild country to pass the winter, more I fear from the love of a wandering life than from any hope of bettering their condition by the wretched pittance of profit which they make in their trading as middle-men between the Indians and Americans. We stayed with them and dined on fresh buffalo meat, a stock of which they had just arrived with from the plains, five days' march distant. They were extremely hospitable, and pressed me to stay, as my men were old friends of theirs; but, as they had lots of traders' whiskey with them, I was glad to get away before nightfall for the sake of my men. It was this party, when on their way back from the plains with the meat, had let one of their camp fires run, and caused the great conflagration which was still rapidly advancing over the Thick-wood Hills. By pushing on to the east, our track lying to the north of that by which we approach the hills, we reached an old Indian camping ground, after crossing a large plain in the dark.

October 27.—By travelling fast reached the fort about noon, and in crossing the river found Sullivan and Blackiston both waiting for me on the bank, they having arrived during my absence; Blackiston from England by York Factory on Hudson's Bay, Sullivan from Fort Pitt. Besides letters which Blackiston brought me from England, one had arrived from Captain Palliser, dated Touch-wood Hills, directing me as to my movements during the winter.

As I passed the horse guard in the morning, I found that the horses had suffered from being too closely hobbled—"hobbling" is tying together the fore legs of the horses by a soft leather band to prevent them wandering,—so that I determined to withdraw them from the Company's guard, and keep by themselves under the care of our own men.

October 28.—This forenoon I brought our horses over to the fort side of the Saskatchewan, and sent them to a good feeding ground about five miles off from the river.

Send off Hallet and Morin with three carts along with the fort hunters, to try and get some meat.

October 30.—The fort hunters on their way to the buffalo have set fire to the plains, and the conflagration is now approaching very close to the fort; in consequence every one is out to-day burning the grass round the hay-ricks that stand in the swamps, to prevent their being destroyed.

October 31.—Fire is still running, but has turned off more to the south, as the wind is changed.

Blackiston, Hardesty, and I rode for ten miles down the river to see the pines, and to seek for good feeding places for the horses. After passing over six miles of rich country, enter on a tract of sand-hills, with a gravelly soil supporting a poor growth of grass, but in some parts covered with a dense matting of the smoking weed (*arctostaphylos ura-ursi*), the bright red berries of which afford winter food for large coveys of the prairie hens. On some of these sandy hills we observed a pine which may prove to be new, somewhat resembling the P. inops; it is a taller and stouter tree with much heavier brush. The cones are also different, being broad-based and acute-pointed, with one side more developed than the other, the scales hard and shining, and each furnished with a sharp recurved spine.

At night called to a violent case of hysteria in an Indian girl: some years ago she was shot through the shoulder by the Blackfeet; and since then she has been clairvoyant, her friends having the utmost confidence in her predictions.

November 2.—Kill a male kit fox (*vulpus velox*), an animal very common in the prairies, living in holes, several of which are grouped together on slight knolls. For a short distance it is the swiftest animal on the prairies, its length was 31½ inches, of which the tail formed 12, its height 14½ inches; its fur is a beautiful speckled grey.

November 3.—Found one of our horses killed last night by the wolves; two more are missing.

November 4.—Ground white with snow. Out searching for horses all day.

November 7.—The snow now covers the ground to a considerable depth. Have all the horses driven down the river to a new feeding ground. They are all much improved since they came to this side of the river. We only found 22; 2 being lost, 2 killed by the wolves, and one still at the Company's guard, as it is sick, and could not stand the swimming of the river.

November 8.—Go off to the guard, which is 10 miles distant. Walk home on snow shoes, which is my first experience of them.

November 9.—River nearly blocked with ice, and presents a very rough, hummocky appearance, however it will turn quite smooth in a few days.

November 11.—Go out with Hardesty dog-driving for the first time, and found it delightful. We had four dogs dragging a light sleigh, or "sled" as it is always called, made of two birch planks lashed together by cross bars, and turned up at the point: the whole shaped like a Norwegian snow shoe, but 10 feet long and 14 inches wide. As the dogs were fresh, and had no load, they went very fast, sometimes we ran behind, time about, and when out of breath would jump on for a ride, a feat not very easily accomplished by a beginner, for, as the least unsteadiness in planting your feet on the sled caused it to dodge from under you, a fall headlong among the deep snow on the side of the track was the general consequence, followed by a frantic race to make up with the dogs again, who of course had made off with redoubled speed.

November 12.—The hourly observations for winter commenced to-day, a rough but useful little observatory having been erected under Capt. Blackiston's superintendence. Visit the horses. They have found out a fine feeding ground beside a large lake, about nine miles off.

November 14.—Walk to the five-mile gully, which is up the river from the fort. Spent the day in hunting deer, without success. I saw two bands of deer, in one of which was a splendid buck, with seven does. Returning by the river on the ice, which is now quite set fast, I found the distance to be about seven miles. This was the first of my holidays, under the new arrangement for carrying on the hourly observations, which keep us all prisoners in the fort three days out of four.

November 15.—A man brought in from the buffalo hunt dangerously hurt from having been thrown from his horse, when an old bull charged him; he has burst a blood vessel, and injured his chest very severely. Measured the opposite river bank with the barometer, and found it to be 196 feet, agreeing almost exactly with a previous levelling.

November 18.—Go off with Blackiston and Hardesty to look again for the deer, but without success.

November 21.—When detained in the fort, busy with maps, reports, &c., so that many days afford no remarks worth recording. The hunters returned to-day from the plains, and the fort is the scene of riot and drinking again. Ride out to the guard, and see a black bear. Stay there all night, sleeping in a leather tent in which the horse-keeper lives.

November 22.—Follow the bear for about 10 miles this morning, but he got away from us; but it was easy to follow his track in the snow. We got some shots at deer, however; Boucher wounded one, and has hopes of getting it to-morrow. It was bitterly cold, and we were nearly frozen, riding back to our camp at night.

November 23.—Return to the fort before daybreak to take my watch.

November 24.—This morning some Indians arrived, and with them a young Englishman of the name of Vidler, who has come out to this country for the sake of hunting. He came up from Red River in the autumn along with a party of half-breeds, and has been living for the last two months in an Indian camp at the Moose woods on the south branch of the Saskatchewan. He was dressed in Indian fashion, and seems to have identified himself with their mode of life, and shows great pluck in submitting to all the hardships of his situation. As might be expected, he was at first greatly taken in at all hands from not knowing the language, and is now in rather destitute condition, having parted with most of his outfit, so, accordingly, we fit him out with things to make him more comfortable.

November 26.—Send off Hallet and Boucher to trade dogs from the Indians for my trip to Edmonton, as I intend to start by the middle of next month. All the tripping about the fort is now done with dogs, as the snow is quite permanent, though not very deep.

November 27.—Vidler left us to-day with all his effects on a dog sled he has got from Hardesty, and accompanied by his Indians.

December 5.—Go out every day just now with the dogs that Hallet traded for me. They are very savage, and don't take kindly to their harness at all.

December 10.—The arrangements are nearly completed for my start now, Hardesty having kindly fitted me up a jolly little cariole that will either do for passengers or goods' traffic. This cariole is only a sled with parchment sides, sustained on cords that pass over a back-board standing about a foot from the end; it resembles much a coffin-shaped slipper bath. The harness consists of a collar made of an iron ring, with a pad on it, which passes tightly over the dog's head, but fits his shoulder well; to this is attached two long straps of dressed hide, kept up by a band across the dog's back; to the collar and back band are generally attached rows of bells, the merry jingle of which enlivens the journey, and gives spirit both to the dogs and drivers. Favourite trains of dogs are dressed up in very jaunty style, with ribbons and brightly-coloured saddle cloths. Four dogs are attached to each sled, and they are driven solely by the voice, no reins being used. On a river where there is no decided track it is of course a difficult matter to keep them straight, and then a man generally runs before, whom they follow; but in a track where other sleds have passed, or where snow shoes have been used, there is no difficulty in driving them, as they never have any wish to turn aside the soft deep snow that is on

either hand. Where snow shoes have been used, or where a dog sled, or train, as the whole turn-out is called, has passed over the snow, the track hardens so as to remain all winter, and even where more snow falls, always affording a hard regular bottom much easier to travel upon than it is to beat a fresh track. Some of the dogs are wonderfully sagacious in discovering and keeping on old tracks, so alive are they to the additional ease it gives them in dragging their load.

December 14.—At 5 a.m. I started from Fort Carlton, my party consisting of myself, Foulds, also one of the Company's men, and an Indian lad, with two sets of dogs, one dragging my cariole, while the other dragged the sled with our provisions. As our road was up the river on the ice for some distance, and I had not been in bed all night, I lay in my cariole rolled up in robes, enjoying a snooze until it was broad daylight. When I wakened up I found that we were about 16 miles from the fort, and not far from the point at which we were to leave the pleasant smooth road on the ice and take to the plains. The course of the river is very straight here for a long way, forming what is known as the long view, which extends for about eight miles in a direction about 20° E. of N. At 9.45 a.m. we left the river at a point where it widens out considerably, and when the banks become higher. Those measured by the barometer I found to be 203 feet above the river. The real plain level, however, is about 50 feet higher. The plain is all burnt here, but there was a sufficient quantity of snow to render our progress easy. There are great numbers of immense angular blocks of the magnesian limestone lying at this place, and no other kind of boulder admixed with them. A slight wooded rising ground, in which we halted for breakfast, is known as Enasquinas Hill. The morning was very bright, and although the thermometer stood at 11°, it did not feel at all cold. We breakfasted on the site of a recently deserted tent, where the fort hunters had been staying for some time.

After breakfast our course lay to the westward, leaving the river, which as far as we could see, still held on the same course, coming from the S.W. by S. After passing several small lakes and swamps, and crossing a bare plain, which seemed to be of great extent to the south, we crossed over the southern extremity of the *Minitchenass Watchi*, a hill which forms a conspicuous object from Carlton, but when approached is found to be merely a great roll on the prairie. It is only sparsely wooded, and lies S.W. and N.E., slightly in advance of the Thick-wood Hills, of which it forms a continuation to the south, but without reaching nearly the same height. At sunset we encamped in a hollow, among a thick clump of poplars, just as we came in sight of Redberry Lake, having made 33 miles. This was my first real winter encampment, and I enjoyed the novelty very much. The first step on halting is of course to untackle the dogs, which for to-night were all tied to trees, lest they should return to the fort, as it is no use tying an Indian dog by a cord. The method is, to tie a stick about four feet long close under its neck by one end, while the other is attached to the tree, so as to prevent him gnawing either cord, and so making his escape. One man then busies himself clearing away the snow, and cutting willow twigs on which to lie, which he spreads out in a square space just large enough to hold the party, who lie side by side with their feet to the fire; another employs himself cutting firewood, tree after tree being cut into logs six or eight feet long, the great secret of a comfortable winter camp being to have good firewood and plenty of it. Accordingly a smart look out is always kept as evening approaches for a good camping place, the requisite for which being a bluff of dead wood, whereas in summer it is always water that determines the choice. In travelling in winter water can be procured anywhere by melting the snow as soon as the fire is lighted; in half an hour after the halt the kettles are generally on the fire, and all are busily engaged changing their mocassins, a good voyageur being as particular about damp feet in camp as any anxious mamma could wish her darling boy to be. The penalty of travelling with damp feet next day might be the loss of some of the toes by frost-bite, so that one has good reason to be careful. Besides care on this point, a great secret in making your feet last you on a long trip, especially with snow shoes, is to have large mocassins, and instead of attempting to wear knitted socks, wrap your feet in a square piece of blanket, as is the fashion of the country. Too much covering on the feet only increases the chance of their being injured by pressure, without increasing the warmth, for keeping up which exercise should alone be trusted to. After supper I took an observation of Polaris, and found the latitude to be 52° 42′ N., or 10′ S. of Carlton. It was a beautifully clear night, and the stars were intensely brilliant. At sunset the thermometer was at 11°, and during the night fell to 9·4°.

December 15.—Morning broke raw and overcast, with a little snow from the N.W., the thermometer standing at 26° at sunrise. We breakfasted before it was light, and started at 8 o'clock. During the night we heard dogs barking, and concluded that it was a party of traders on their return to the fort. We soon came on their track, and found that they had been encamped beside Redberry Lake, about two miles to the west of us. This lake is about 12 miles long, and 6 broad where we crossed it in a line due west, its greatest length, however, lying N.E. and S.W.: its waters have a strong bitter saline taste, from the presence of sulphate of soda in a large proportion. The ice on it is three to four feet thick, and cut up by cracks, which run for miles in straight lines. The country to the west of the lake is very irregular and thinly wooded, resembling very much that between Fort Ellis and the Qu'appelle Lakes fort. As we travelled along we saw a band of buffalo bulls, but could not approach them from want of shelter. At 11.15 a.m. we reached the eastern limit of a large plain, which is on a level with the highest parts of the broken country over which we had been passing, and only slightly inferior in elevation to the top of the Minitchenass hill. It is not like the real prairie to the south: we have seen none of that since we left the neighbourhood of the elbow of the south branch, but it is broken by small swamps with thick clumps of red topped willows. We had to stop for the day at 12.20, as there is no more wood until we cross this plain, which it takes nearly a whole day to do. We had already gone rather far into it, and had to camp at a most uninviting spot in a clump of small willows. By searching about in the swamps a small supply of wood was got, and although the wind rose, and it was very cold, we were tolerably comfortable on the whole, much more so than I expected we could be on first seeing the place.

December 16.—We were up at 3 a.m., so that we might make an early start, in case of any change in the weather taking place during the day, which would be very dangerous to us while crossing a bare wide plain. Soon after starting we came on a herd of buffalo, but did not follow them, trusting to meet with others towards afternoon. From having come so far into the plain yesterday, we found

that we had only about 17 miles of it to cross to-day, so that we reached the west side early. The country to the west is broken into high irregular hills, which stretch away to the north-east. After crossing through a few miles of this broken ground, quite bare of wood, we came to a small lake, with a thick growth of poplars on one side, where we halted for dinner. We had thus passed safely the only dangerous traverse, from its want of shelter, in the whole journey to Fort Pitt. After dinner we continued passing from lake to lake, some of them of considerable size; the whole group, which lies in a wide valley running from east to west, being known as the White Lakes. At sunset we came to a large camp of Cree Indians, but established our camp at a little distance, in spite of their entreaties that we should sleep in one of their lodges. We traded some meat from them for our dogs, and they came trooping down in great numbers, and stood gazing idly at us while we were busy getting our camp in trim. During the whole evening our fire was surrounded by swarthy faces sitting curiously observing everything that we did. Hearing that I was a medicine man, all my doings were watched with great attention. At 8 o'clock there commenced a magnificent auroral display, forming an arch about 25° high, from which rose streamers of light of bright crimson-lake colour, which, after 15 minutes, were replaced by flashes of pale green light, after which the arch split into three parts and disappeared. (I afterwards found that this aurora had been seen at Jack Fish Lake, Fort Pitt, and Edmonton, at all which places the red colour was remarked.) The Indians say this feature is rare, and is not seen every winter, but Mr. McMurray says that in Mackenzie river, in latitude 61° N., it recurs four or five times every season. The thermometer stood, during the display, at 4°.

December 17th.—Lost some time this morning changing one of my dogs, which I thought too slow, for a nice-looking one belonging to an old squaw, who did not seem to like the bargain much, but at last, by tempting her feminine nature with some bright blue and yellow beads, she was induced to make the exchange. The animal I now got is nearly a pure wolf, of large size, beautiful black and olive-grey colour, and quite as savage as any wild one. The only way of getting his harness on was to watch for a chance, and give him a sharp blow across the nose, which, for a few minutes, produces the same effect as a dose of chloroform. By putting him in the middle of the train, the other dogs, of course, kept him steady, while the whip soon made him glad to haul. Soon after starting we passed a "pound," into which the Indians drive the buffalo to slaughter them; however, they are very hard up this winter, as the mildness of the season has allowed the buffalo to stay much longer than usual out in the plains this year, severe weather always compelling them to seek shelter in the woods. As we went along one of the men shot a willow grouse with a ball. This bird, which is pure white, is very common in the neighbourhood of Hudson's Bay, but very rare in the Saskatchewan. What is known as the White Lakes is a chain of large and small lakes, lying in a long valley, bounded by broken country, sections of which everywhere display immense deposits of drift, ridges of which have been left, intersecting the valley and dividing these lakes from one another. The drift here consists of coarse red and grey sand, but with a great deal of well-marked false bedding. We kept on the south side of this valley, travelling on the top of a level ridge, which tapers away to the west, and from which we got a very extensive view to the south. From the base of the hills on which we were, an immense level plain, coated with willows, stretched to the south for 40 or 50 miles, and is bounded in that direction by the Eagle Hills, which were seen as a long blue line of high ground, having a smooth unbroken outline, only slightly higher towards the eastern extremity. On coming to the western end of the ridge, continuing to the west, we descended 200 feet into the valley, and soon after crossed a stream, which flows from the White Lakes into Jack Fish Lake. Having made 18 miles since morning, we halted for dinner at another Indian camp, the third or fourth we have seen to-day, at all of which there seemed to be one or more buffalo pounds. After dinner we followed down the stream, crossing and recrossing it, as it wends through large frozen marshes for about 8 miles, till, in crossing a neck of high land, we came down on the ice at Jack Fish Lake, the western shore of which we could just barely see in the dim twilight. However, we determined to cross, even in the dark, so as to reach a temporary establishment of the Company's, which has been placed there this winter. Jack Fish or Pike Lake is about 14 miles long and 10 wide, and was covered with beautiful clear ice of immense thickness, from the surface of which the wind had swept the little snow that had fallen, so as to render our progress extremely laborious, as neither man nor dogs could get a proper foot-hold. We kept, for some distance, along the shore of the lake, skirting a promontory that runs into the lake. The banks are about 100 feet high, and very steep, and exhibit sections of the same sandy argillaceous drift that overlaid the cretaceous beds at the elbow. It was quite dark when we reached the middle of the lake, but we held on for a small twinkling light which we saw on the opposite shore, which proved to be the fire of Mr. McMurray's tent. Since his arrival, about a month ago, at this place, he has been doing a large trade with the Indians, in opposition to several free traders from Red River, so that he had not found time to do more than build a little hut for storing his goods in, and was therefore living in a leather lodge, in Indian fashion. It was astonishing how comfortable he had made himself, and we found with him a party of free traders, who were on their way for Red River with their booty, and, notwithstanding the contrary interests, they joined round the tent fire of the Company's trader, and the evening was pleasantly spent, laughing, joking, and playing on the violin, the whole having an evening of it before they parted, so that the opposition seems to be conducted on a very amicable footing. Nevertheless this move of the Company to protect their trade by energetic competition rather than by enforcing their monopoly, seems to have been very successful. Mr. McMurray started from Red River late in the autumn with a boat loaded with goods, and which he brought up the Saskatchewan to nearly opposite this place, when he was stopped on the lowness of the water; he then got horses from Fort Pitt, and carried his goods to the lake here, where the free traders intended to winter; and from which place he has succeeded already in driving them off. He has found a great want of wood at this place, there being nothing but small poplar, so that he has to drag any timber he requires from a lake further to the north. Mr. McMurray tells me that Jack Fish Lake is divided by a narrow strip of land into two portions, but that the whole is about 20 miles long and 12 wide. Its water is slightly saline, but, as it is fed by several large streams, while a large river flows out of it to the Saskatchewan, its waters never become concentrated, like those of Redberry Lake, from which there is said to be no outlet. The lake freezes early in the winter, excepting at the north-east corner, where a large stream enters it, and where it remains open during

the whole season. Here the Indians spear an immense number of pike, as the open water, which is shallow and sedgy, is, during the winter, actually crowded with them. By nets placed under the ice, white fish are taken in considerable numbers, but of inferior quality, along with extremely large pike, perch, and many other species, which form a constant supply of food, so that Indians are always to be found in the neighbourhood of this lake. The slipperiness of the ice, which gave us so much trouble in crossing the lake, was turned to good account the other day by the Indians, as they drove a band of buffalo cows so that they had to go out on the ice of the lake, when of course they fell and stumbled, and could make no progress, while their pursuers, approaching them on foot, with ease killed the whole, to the number of 14.

December 18.—This morning the free traders set off with nine dog-sleds, all seemingly well laden, but the loads, however, might be fictitious, to deceive the Company's people, on the principle of "not to be done." Before starting this morning I engaged several of Mr. McMurray's men for the expedition next summer, as their engagement with the Company terminated in spring. Taking leave of Mr. McMurray we set off for Fort Pitt, which we expected to reach on the third day, as there was a pretty good track beaten in the snow. Our road lay over very irregular ground broken by abrupt ridges, in the hollows of which there were small swampy lakes. On opening one of these to get a drink, the water was found to be crammed with several species of cypris and cyclops; and the most intolerable stench of decomposing vegetable matter escaped from the hole in the ice, showing that even the severity of the winter, and the exclusion of air by two feet of ice, does not prevent the production of marshy effluvia. Keeping pretty high on one of the ridges to the west, in about three hours we came in sight of a high round hill at a great distance to the south-west. It is said to be the Broken Knife Hill, and lies between Battle River and the Saskatchewan. Right ahead of us to the west we had the Horse Knoll about 16 miles distant. We had with us three extra dogs to-day, which Mr. McMurray had asked me to return to Mr. Simpson at Fort Pitt. We halted for dinner at some sand-hills, which rise from a level plain of considerable extent. The sand is fine, and of a light brown colour, quite the same as those hills which we passed at Rabbit Point in October last, when travelling between the two Saskatchewans. From a camp close beside us the Indians came trooping around, so that to avoid losing things by their petty pilfering, although it was late in the afternoon, I again started, and did not come to another place we could camp at until far on in the night, and then only had a thicket of willows for shelter and firewood. A little snow came down during the night, but the thermometer did not fall below 10°.

December 19.—From starting late yesterday morning we only made about 20 miles, so that to make up for it we were off two hours before daylight this morning. In the dark we lost the track, and went off the proper direction for some time, but soon regained it again. Just at daylight we passed the Horse Knoll, keeping close to the north of it. It is about 200 to 300 feet high; is rather more abrupt to the east, but on the whole has a rounded form. Our course, which hitherto had been only slightly N. of W. now turned very much to the N. across a wide expanded plain, after entering which we crossed Turtle River, a tributary of the Saskatchewan about 40 feet wide. We again passed several groups of sand-hills, and towards noon skirted for half a mile a deep gully which traverses the plain to the S.W. We were now within a short distance from the Saskatchewan River, having for the last 4½ days been cutting across a great bend which it makes to the south. I found the latitude to be 53° 16′ N. at where we halted for dinner, near a clump of pines which grow on the west side of a gully through which English Creek runs. After dinner we crossed English Creek, and followed along the western side of a wide shallow valley through which it flows from its source among low undulating hills which we have observed to the north of us. We were now travelling amongst immense herds of buffalo,—a welcome sight, as our provisions were at a low ebb; and at some distance from the track we saw the smoke of lodges where we supposed the Fort Pitt hunters were encamped. After crossing some high ground we were descending into the valley at the base of the Red Deer hills, when we observed a band of bulls feeding in a swamp where they might easily be approached. As it was near camping time we halted till my half-breed Pewinagous approached and shot one, and then encamped at a neighbouring clump of poplars, so that our dogs for once got a good supper. The night was beautifully clear, and by an observation of Polaris I found the latitude to be 53° 28′ N.

December 20.—We started at daylight, and after a few miles we came to the base of Red Deer Hill, which is an abrupt terraced slope, very much like the eastern face of the Thick-wood Hills. After following round the base of it for a few miles, the track took suddenly right up the slope, which was so steep, that it was with great difficulty we got our sleds up. By the barometer I found the rise to be 240 feet. The top of this hill is a level plain presenting a different aspect to any I have yet seen, being covered with thick low brush, composed principally of rose bushes and small willows, and a few clumps of trees. This plain is traversed by deep, steep gullies, which give us great trouble in crossing. From the number of buffalo tracks in the snow, which is pretty deep, we soon lost our way, continuing to wander about for several hours, until my guide caught sight of a hill which he knew overhung Fort Pitt. Making for this we soon came to the Saskatchewan River, which here runs through a very deep valley with a high range like the Couteau des Prairies bounding it to the west. Red Deer Hill is evidently a detached portion of this high level which has been cut off by the river. Before reaching the brink of the deep valley in which the Saskatchewan runs, a fall of about 100 feet is effected by a long slope. From this point to the river level the descent is extremely steep, and amounts to 430 feet, but the slope is broken by two well-marked terraced levels, at 118 feet and 311 feet above the river respectively; the latter of these corresponds with the general prairie level, from which Red Deer Hill, the Horse Knoll, and others may be considered as rising. On the opposite side of the river outliers are to be seen of what must be again a higher level than that of the top of Red Deer Hill; and high conical hills, the principal of which is the Frenchman's Knoll, were seen to the north, which must also be referred to this higher level. On descending to the river we found it wind round the same large alluvial points as at Carlton, and appearing to be about the same size. Along the shore are numerous boulders of soft grey sandstone, containing fragments of cretaceous fossils. I also found fragments of coal in the sand-banks along the river in considerable quantity. From the water having overflowed, which gave rise to a new thin film of ice, we had considerable difficulty in following it, which we did only for a few miles, when

we ascended the west bank to cut off a long bend which it makes to the north between Fort Pitt and this place. In doing so we had again to climb up 270 feet, and after about six miles we came in sight of Fort Pitt, to reach which place we had again to descend and cross the river, where I was met by Mr. Simpson and the other inhabitants of the place, who all turned out when they saw a strange party crossing the river. Just as the sun was setting I observed a very brilliant meteor, so bright that it was distinctly visible even when close to the sun's disc. At sunset and sunrise for several days past there has been a very remarkable number of meteors. In the evening, by an observation of Polaris and also of Jupiter, I found the latitude to be 53° 34′ N. As the 21st is the Carlton term day for hourly observations I commenced at midnight to take similar observations for the 24 hours following.

I was glad to find that on the 24th Mr. Simpson intended starting for Edmonton, so that I should have the pleasure of his company in the rest of my journey to that place.

December 21.—Fort Pitt stands on the left bank of the river, which runs past it to the north. It is a small fort, at least the place within the palisades is small, but it is one of the best posts for trading quantities of provisions in the whole Saskatchewan district, the buffalo never being far distant even in summer, as the real bare prairies extend very far north in this longitude, almost reaching this place. The total absence of wood within sight of the fort strikes one very much, but there is abundance of timber to be had at a short distance to the N.W. The fort is built upon a flat about 20 feet above the river level, which is of very considerable extent, and merges by a gentle slope into the high lands behind without any steep bank, such as that which rises immediately behind Carlton. This feature, along with the hilly aspect of the country across the river, gives the situation a very open and pleasant look. The Indians who trade here are Crees and Blackfeet, the latter only, however, when there is any peace as at present. Sometimes, when there is war, smart skirmishing goes on close to the fort, and not unfrequently the Blackfeet attack the place itself. On account of the great number of Indians constantly around the fort much agriculture has not been attempted here. Grain is said not to succeed well, but I suspect they have chosen a bad spot for their field, turnips grew well when they were tried, and the place is quite famous for the quality and quantity of potatoes which are raised. At present the stores are quite full of provisions, consisting of dried buffalo meat, pemican, and buffalo grease, which, along with buffalo robes and wolfskins, form the principal returns from this place. A small trade is also done with the more northern Indians who inhabit the thick woods for the finer kinds of fur. However all their trading is stopped for this year, as their goods are quite done, the supply sent never being equal to the demand.

December 22.—With Mr. Chastellain I ascended the hills on the opposite bank of the river, which, as I crossed, I found to be 430 yards wide. From the top of the hill I got a fine view of the surrounding country, my companion telling me the names of all the prominent points, for which I got bearings. By a double set of barometer readings I found the high ground to the south of Fort Pitt and across the river to average 500 feet above the river level, but several points at least rose to 150 feet higher.

December 23.—During my stay at Fort Pitt I was occupied engaging men and making arrangements for having horses supplied to us in the spring. This afternoon we were surprised by a sharp fall of rain, accompanied by a sudden rise in the thermometer for a few hours.

December 24.—This morning at daylight I started for Fort Edmonton, accompanying Mr. Simpson. Our party numbered four sleds including my own one. Our course lay to the west, keeping on the north side of the river, through very broken but pleasant-looking country; and we came to a small lake where we halted for breakfast at the distance of 10 miles from the fort. Five miles further, over very bleak country, brought us again to the Saskatchewan, which, as before, is hemmed in by high and almost precipitous banks. By taking advantage of the bed of a small creek we gained the river level without much difficulty, and continued to travel upon the ice for about 15 miles until we reached the mouth of Vermillion, or Paint River. From this place, to follow up the Saskatchewan to Edmonton would involve an enormous détour to the north, so here we intended to leave the river and take straight across the country to the west, and accordingly encamped for the night before ascending the bank and entering on the plains. As we had come very fast all day, and had made about 33 miles, both dogs and men seemed rather tired; but, as it was Christmas eve, we did all we could to enjoy ourselves under the circumstances. The night was bitterly cold. The thermometer at 4 p.m. (sunset) was 9° below zero.

December 25.—Ascending the left bank of Vermillion River, which flows from the S.W. and is about 60 feet wide, we took a westerly course across a wide stretch of prairie, passing many herds of buffalo on our way. To the west of us we saw a range of hills, which we reached in about four hours, and halted for breakfast just at their base. This range seems to be a continuation of the high ground which hemmed the Saskatchewan closely at Fort Pitt, and then seems to sweep to the south up the valley of Vermillion River, all these prairie levels having a distinct relation to the present river systems. We soon began to ascend rapidly through broken country, and reached an altitude equal to the highest land opposite Fort Pitt. For five or six miles we kept through very broken country on this high level until we came to where the hills seemed to sweep again to the S.W., so that it was necessary for us to make a very rapid descent of about 300 feet, to traverse an extensive plain covered with bluffs of poplar, and which seemed to stretch for 10 or 12 miles, until it is again bounded by the same range of hills sweeping round it, and passing, as if it were a promontory, to the north. We camped early to-day so as to kill a bull for our dogs. To-day there were well marked paraheilia, or sun-dogs as they are called, and at night a magnificent display of aurora.

December 26.—This morning we were off by 4.30 a.m., and had gone a considerable distance, when we saw fresh traces of Indians, and soon heard the bawling and screaming of an immense camp, all in a high state of excitement. Diverging from our path to pay them a visit, we found that they had succeeded in driving a large band of buffalo into their "pound" during the night, and were now engaged in slaughtering them. The scene was more repulsive than pleasant or exciting. The pound is a circular strong fencing, about 50 yards in diameter, made of stakes with boughs interlaced, and into this place were crammed more than 100 buffalos, bulls, cows, and calves. A great number were already killed, and the live ones were tumbling about furiously over the dead bodies of their companions, and I hardly

think the space would have held them all alive without some being on the top of the others, and, in addition, the bottom of the pound was strewn with fragments of carcases left from former slaughters in the same place. It was on a slope, and the upper part of the fencing was increased in height by skins stretched on poles, for the purpose of frightening the buffalo from jumping out. This is not needed at the lower part of the enclosure, as the animals always endeavour to jump up-hill. The entrance to the enclosure is by an inclined plane made of rough logs leading to a gap through which the buffalo have suddenly to jump about six feet into the ring, so that they cannot return. To this entrance converge lines of little heaps of buffalo dung or brush from several miles into the prairies which surround the clump of wood in which the pound is concealed. These lines serve to lead the buffalo in the required direction when they have been driven into the neighbourhood. When first captured and driven into the pound, which difficult matter is effected by stratagem, the buffalo run round and round violently, and the Indians affirm always with the sun. Crouched on the fencing were the Indians, even mere boys and young girls, all busy plying bows and arrows, guns and spears, and even knives, to compass the destruction of the buffalo. After firing their arrows they generally succeeded in extracting them again by a noose on the end of a pole, and some had even the pluck to jump into the area and pull them out with their hands; but if an old bull or a cow happened to observe them they had to be very active in getting out again. The scene was a busy but a bloody one, and has to be carried on until every animal is killed to enable them to get the meat. I helped, by trying the penetrating power of rifle balls on the shaggy skulls of the animals, with invariable success; and it is the least cruel way of killing them, as they drop at once. There are many superstitions connected with the whole business, and the Indians always consider their success in procuring buffalo in this manner to depend on the pleasure of the Manitoe, to whom they always make offerings, which they place under the entrance to the pound, where I saw a collection of Indian valuables, among which were bridles, powder horns, tobacco, beads, and the like, placed there by the believing Indians, only to be stolen by the first scamp in the camp who could manage the theft adroitly. In the centre of the pound, also, there is a tall pole on which they hang offerings. To which piece of idolatry I was in a manner accessory by giving them my pocket handkerchief to convert into a flag. While waiting to watch this scene, Mr. Simpson traded an additional dog for me from the Indians, and after an hour's delay we started again to the west, and soon entered the broken ground which we had seen bounding the plain yesterday. For dinner we halted near a clump of dead pines at the edge of a large swamp, in which I shot one of the oldest bulls I have seen, and only wish I could have carried away the skin of his magnificent shaggy head with battered horns. We soon after dinner came to a large plain, bounded by high hills on every side: those to the south being very high with a narrow strip of pine muskey running along its base. The plain, from the elevation we were on, looked as level as a bowling green, being about 10 miles across, and is evidently the bottom of a drained lake, as in many places water-lined terraces are visible at two different elevations, following up all the little valleys and along many of the hill slopes. On the north-eastern boundary of this plain there was an immense profusion of boulders, such as I have only seen equalled at the Missouri River at the Roche Percée. The whole of the extensive flat was covered with immense herds of buffalo, and as the afternoon was bright and fine, with just enough frost to keep the snow crisp, the scene was very enlivening, reminding one of a huge cattle fair at home. The banks of this ancient lake are very steep and about 150 feet high; their slope is regular like that of an embankment, but is cut up by deep ravines and gullies by the waters pouring off the upper plains in spring, showing that the material of which they are composed is very easily eroded. The lower part of the plain is swampy, and here a large creek takes its rise, which flows into the Saskatchewan. We now entered on a district of country exactly corresponding to the White Lakes that we saw between Fort Pitt and Carlton, forming what is known as the chain of lakes. We camped on the north side of the first lake, which is about six miles long, choosing our camp near where Mr. Simpson, who had gone ahead for that purpose, had killed a fine fat bull. For the last two days we have encountered much heavier snow than before, so as to require some of the men always to go ahead with snow shoes.

December 27th.—Shortly after starting this morning we reached the end of the first lake, which is separated from the second by a swampy track three miles in length. A conical hill forms a prominent object on the shore of the third lake. It is called the Hill with the Horns, from a singular stone on the top of it, and seems to rise about 300 feet above the lake. We halted opposite it for dinner, having gone 13 miles. It is from this lake that the Vermillion River rises, and flowing to the S.E. till far out in the plains, it makes an abrupt turn to the N.N.E. to join the Saskatchewan at the point where we left that river. During the afternoon we left the chain of lakes, and crossed a very hilly country, until we came to an immense swamp, on the further side of which we camped at a clump of poplar on the side of a hill known as La Butte Noir. To the south of this is a place called La Terre, where Mr. Simpson informs me there is a round hole, from which oozes a black unctuous mud, which they have never been able to fathom with the longest pole they could find. Here we met with the track from the Snake Portage, where the Saskatchewan is crossed for Lac La Beiche, a little trading post of the Company's, about 60 miles north of the river. By examination of the trail in the snow, Mr. Simpson concluded that a party had passed that day on their way to Edmonton.

December 28.—This morning we crossed a plain, with long grass, and clumps of red willows, for 14 miles, and passed a good number of buffalos. We then came to poplar clumps, and at last fairly entered the woods. North and west of this there are no plains except of small size, completely surrounded with woods. The track winds through these poplar woods, which seem to be denser in strips running N.E. and S.W., and passing several of these we camped near a clump called Le Jollie Bois.

December 29.—We were off by 5 a.m., and soon came in sight of the Beaver Hills, a low blue line to the S.W. of us, evidently thickly wooded. Making for its north extremity we crossed several creeks which flowed to the Saskatchewan, at one of which, named the Blackfoot Creek, we halted for breakfast at 9.30 a.m. From 11 a.m. to 4 p.m. we continued to the west and a little south, over country that is evidently very swampy at certain seasons, until we rounded the Beaver Hills, when we camped at a clump of pines. We had now only 20 miles to make to get to Edmonton, so that we made up our minds to be there for breakfast next morning. It was drifting snow all the afternoon, and bitterly cold;

but we had an excellent fire of pine wood, which, with the prospect of getting to the fort next morning, put us all in good humour.

December 30.—At 3 a.m. we were again on the move, and as we had now an excellent track, over which large parties with horse sleighs had been passing, we went along at a brisk run in the dark, keeping between S. and S.W. Just at daylight we arrived at a very steep bank, in descending which we came to the Saskatchewan for the first time since leaving it at the mouth of the Vermillion River, and on following it for one bend, we came in sight of Fort Edmonton, standing on a most commanding point, about 100 feet above the river. We were soon up the bank and within the palisades, and enjoying the hospitable welcome of Mr. Swanston, who had been so kind and attentive to us all at Fort Garry, and who since then had been sent up to take charge of the Saskatchewan district. We found quite a large party assembled there, enjoying the festivities of the season, some of them having come as far from the north and west as I had from the east. My journey from Carlton, a distance of 393 miles, had occupied me 13 days' travel, certainly a quicker trip than I could have made if I had been without the companionship of such an experienced traveller with dogs on the worst part of the route, which was after leaving Fort Pitt.

1858, January 9.—Until this date I have been engaged examining the environs, and writing letters for England, which leave to-day by the winter express which the Company send with their accounts at this season to Red River. The weather has been most singular, as, on the 3rd, what must have been a circular storm passed over this place, accompanied by a great rise in the temperature, with heavy rain, followed by extreme cold. The minimum temperature for the 24 hours ending 9 a.m. on the 3rd, was 36°, while on the 6th it was only − 14°. A good deal of snow had fallen, but this recession in the severity of the winter, short as it was, has cleared it nearly all away. All say that there is an unusually small fall this winter.

I have arranged with Mr. Swanston, who has most kindly volunteered his services, to have a meteorological register kept at this place during the spring, the observations to be consecutive with the minimum and air thermometer at least, even when I may be absent.

Edmonton, which is quite as large as Fort Garry, is wholly built of wood, and is furnished with strong bastions and palisades; the latter, however, being rather rotten to be a very sure defence. It stands on a high steep bank immediately overhanging the river, about 100 feet above the water. Along and below this point are large flats of rich land, only 40 to 50 feet higher than the river, which lies at the base of the higher bank. Both of these were at one time under cultivation to a considerable extent; but now the farm attached to the establishment, though the only one in the Saskatchewan, is of very small size, not exceeding 30 acres. On a hill behind the fort stands a windmill, in which the stones were made by splitting a granite boulder that was found near the spot, and these, as may be supposed, are not very serviceable. However, they manage, when they get a gale of wind, to grind some tolerable flour, quite enough to prove that, if the business was properly conducted, it might be a valuable source of support; nine-tenths of the little flour that is consumed in the Saskatchewan is brought either from Red River or all the way from England. As it is here that the boats for navigating the Saskatchewan are mostly built, 10 or 12 new ones being turned out every year, the Company have a larger staff of tradesmen and servants at this place than at any of the other posts of the district. In all they have about 50 employés here, and the usual population within the fort is about 150 souls. These are all fed on buffalo meat, and if there happens to be a good crop they get a certain small allowance of potatoes. The consumption of meat is enormous, amounting to two buffalos a day on the average. It is no easy matter to supply this demand, especially of late years, and the loss of horses from dragging the meat during the severities of the winter, and the number of men employed for this purpose, alone renders it a very expensive mode of feeding the establishment, although the first cost of the buffalo, when killed in the plain, is merely nominal. This year these animals are within a few days of the fort, and it is accordingly well off; but many years there is great scarcity, and even starvation here.

Edmonton must be considered as being in the wooded country, but in the immediate neighbourhood of the fort there is not much valuable timber. That used for the boat-building is brought from 10 miles to the west, and is the wood of the *Abies alba*. 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 ironstone, which, when broken, are found to be full of comminuted fragments of vegetable matter. Included in these beds are various seams of coal or lignite, which seems to be of a very useful quality, as it is used to the exclusion of all other fuel in the forge at the fort. The smith, who is also collier, tells me that its quality differs much, according to the distance from the outcrop, especially if it be acted on by the flood water, which has a very deleterious effect on the beds.

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 6 feet thick, and again another of 4 feet a little higher up the bank. In the middle of the 6-foot seam there is a very fine 6-inch parting of greenish magnesian pipe-clay, which works up into a lather, and is used by the women of the fort for washing blankets. At the bend below the fort I was struck by the appearance of the bank, which looked as if broken bricks and tiles had been tumbled over it, and on examination, found that the coal seam had been burnt out, and was represented by a few inches of orange-coloured ash, and that the tile-looking stuff was derived from the beds of clay that had been baked in the vicinity. As my principal object in visiting Edmonton was to engage half-breeds for next season, and hearing that those who lived at Lake St. Anns were at present off in the plains, I have arranged in the meantime to make a trip to the Rocky Mountain

House, which is situated about six days further up the Saskatchewan. With me I am to take my own man Foulds, and two of the Company's, all having dog trains like myself.

January 9.—Having received my provisions from the store, consisting of pemican, a little dried buffalo meat, with a small stock of tea and sugar, we started by crossing the river at 10 a.m. The track at once leaves the Saskatchewan, and does not meet it again till at the mountain fort. After four miles along a track cut through dense thickets, we came to the White Mud Creek, on the west side of which there is a high conical hill of the same name, after passing which we get into more open country, forming a succession of limited openings, clothed with very rich pasturage, in which the vetch grew with great luxuriance. This is a very common feature of the country round here. After making 17 miles, we halted for the night at the side of a gully we had been following for some time.

January 10.—Soon after starting this morning we crossed Ecapotte's Creek, and here, as everywhere in this district, I observed the immense changes which are worked in the appearance of the country by beaver. Wherever there is a hollow in which water could collect, this industrious animal seems to have applied his instinctive ingenuity to create a lake. Some of these beaver's dams are of extraordinary size, stretching for hundreds of yards, and sometimes 6 to 8 feet high. Many parts of the track which is used in summer, is cut through thickets with great trouble, and the manner in which the trail took advantage of every little opening, and then chose the shortest possible line when cutting had to be effected, was truly wonderful. As this was my first experience in really thickly wooded country, I soon got quite bewildered. On entering a long swamp, we suddenly came on a party of travellers, with horses and sleighs (which by the way were made just like dog sleds, only larger), and found it to be Mr. Brazeau, the Bourgeau of the Mountain House, who was on his way to Edmonton. He had been seven days on the journey, and said that they had been living all the time on rabbits, which were in great numbers this year. After a few minutes' conversation, each party proceeded on its way, Mr. Brazeau expecting to reach Edmonton that night. When we halted for dinner at a clump of pines and poplars, I measured one of the latter (*populus tremuloides*), and found it to be of the very unusual size of two feet in diameter. In the afternoon we traversed the Stones Indian Plain, which well deserves its name from being covered with boulders, which are rather rare in general in this district of country. We felt the want of snow a good deal now, many parts where the trail passed being quite bare, so much so that we set fire to the grass, just to say that we had done so, on the 10th of January. After coming in sight of the Pigeon Hills, on the west side of which is the Wesleyan Mission Station, under the care of Mr. Woolsey, whom I had met at Fort Edmonton, we reached the Bad Beaver Dam, near which we encamped for the night. This Bad Beaver Dam, as it is called, is a succession of beaver dams, which form a chain more than a mile long, damming up very extensive swamps. The night was bitterly cold, so much so that we lighted two fires and lay between them, to counteract the keen biting north wind, which continued to blow very hard, although the thermometer fell 20° below zero.

January 11.—This morning, keeping a little more to the west, our course hitherto having been S.S.W., we soon reached a range of hills, over which we had to pass. We entered them along a very abrupt gully, in which runs Weed Creek, called after the smoking weed, which is found in great abundance. Here I again observed the pine, with cones similar to those which I had observed at the Carlton Horse Guard. It seemed to be very plentiful wherever there was loose gravel soil on the ridges. Entering a narrow trail cut through very dense poplar woods, we continued for some hours passing over these hills, till at last by a rapid descent we emerged in a swampy tract of country, bordering a stream, where we halted for dinner. At noon the thermometer stood at −16°; but there was little or no wind now, so it did not feel so keen. Keeping for a few miles to the east of south we crossed Pigeon Creek just where it enters the valley of Battle River. This river, which flows into the Saskatchewan at the Eagle Hills, takes its rise in great swamps and lakes, which lie to the north-west of this place. Its valley here is about 1½ miles wide, but only 100 feet deep. From the willow-covered flat through which the stream winds with a very tortuous course, numerous lagoons show that it must frequently have changed its course, and yet it seems to be very sluggish. It is about 40 feet wide, and the immediate banks are 20 feet high. We crossed this valley very obliquely, and camped at sunset on its western side. The thermometer at sunset was −17°, and to protect us from the cold wind this evening we made a shelter of poles, on which we stretched our sled wrappers. I took a meridian altitude of Jupiter at this place, and found the latitude to be 52° 41′ N., having travelled by the trail 70 miles from Edmonton.

January 12.—We soon came to Beaver River this morning, a stream similar to Battle River, which it joins a few miles below where we crossed it. We then crossed a wooded ridge, and passed to the south of Prince Lake, which also sends a creek to Battle River, and entered on a track of high broken country, from which the timber seems to have been burnt, and, as we broke one of the sleds, had to halt for dinner while it was being mended. Descending from the high ground we came to Gull Lake, which seemed to be a great length to the south, but we merely crossed over its northern extremity. We had now entered the river system of the South Saskatchewan, as the stream from Gull Lake flows into Red Deer River. After crossing the lake we again ascended rapidly, and at dark encamped beside the enormous root of an upturned tree, making the best winter camp I have yet seen, as we had plenty of very large timber for our fire, and lots of pine brush to sleep on. I have observed to-day on crossing all the ridges, which generally run north and south, that while the eastern side is clothed with spruce, their west slope is clothed exclusively with poplar, and that the vegetation has much more variety on the western side. Also, I remarked the number of pendent wasps' nests in the west slope, all of which facts must be connected with the prevalent winds modifying the general climate. This evening, although the wind was from the S.W., the thermometer stood at −16°.

January 13.—Following a very rugged road for about an hour we came to the valley of Blind River, which flows to the south-east to join Red Deer River. It is 25 yards wide, and has a valley exactly like that of Battle River, the upper part of which encloses a lake about the size of Gull Lake, which is seven or eight miles long. We now marched for a range of high hills, having three conspicuous rounded knobs, which are called the Medicine Lodge Hills, from their being a favourite site among the Indians for having their great festivals in spring. These hills are about 500 feet above

the plain, and in passing through them we followed a very singular valley, just as if a river the size of the Saskatchewan had once occupied it, but now without even a creek, only becoming swampy towards its lower end, where it opened out on an extensive plain, along the western border of which runs Medicine River, the largest stream we have seen since leaving the Saskatchewan. It flows south to a place called the Forks, where Red River receives large branches, and after crossing Medicine River we passed over high plains, with no timber, but clothed with a kind of dwarf birch (*B. pumilia*), only about one foot high, which forms a thick low copse like heather. Just before evening, in passing over a high knoll, called Gabriel's Hill, we came in sight of the Rocky Mountains, and I got my first view under rather unfavourable circumstances, as the sun had already set behind them. However, by ascending a hill to the south, while the men were making their camp by a clump of small trees, I was able to see their outline bounding the horizon from south to west by north, but still at a great distance. What struck me most was that all the plains should be so white with snow, but that they seemed black, and only having snow on them in streaks and patches, notwithstanding the season and their great altitude.

January 14.—Being anxious to reach the fort to-day, we started some hours before daybreak, and by sunrise had crossed the East Hill Creek, and were now following a well-beaten track across swampy plains in full view of the mountains. The effect was quite exhilarating as they became lighted up rapidly by the pinky hue of morning, and then I found that the black appearance which they presented the evening before arose from the immense proportions of abrupt cliffs which they present, on which the snow cannot rest. We got quite excited with the view, and went on without halting for about 30 miles, when my men said we were about seven miles from the fort, and they must halt and wash; so they made a fire and spent fully an hour dandifying themselves to appear before their friends. Crossing several large muskeg lakes, and then passing through a belt of heavy timber, we reached the Saskatchewan an hour before sunset, descending to it by a rugged gully that led down the side of Sandstone precipice. We followed up the river about two miles, upon beautiful clear ice, but which is full of open holes from the rapidity of the current, at one of which, caused by a rapid, we had to leave the river and pass through the woods, when we emerged in a large plain on which stood the fort. It is a roughly constructed group of log huts, consisting of a dwelling house, stores, and workshops, and all surrounded by a palisade. The woodwork is very old and rotten, and the whole place is tumbling to pieces. I established myself in one of the rooms in the dwelling house, while the men found quarters for themselves in the huts. There were many Indians camped round the fort, waiting for the return of Mr. Brazeau, who had promised to bring up a further supply of rum with him from Edmonton. The residents here, which at this time were principally the women only, were badly off for food, the store of dried meat being nearly exhausted, so that we had all to live on what was little better than the sweepings of the stores.

January 15.—After breakfast set off to a hill about two miles to the west, in order to get a view of the mountains.

After passing into the woods behind the fort, the trail led through a large frozen "muskeg," in which was a heavy growth of spruce and larch. The terrace level on which the fort stands is 20 feet above the river, and in proceeding back a slight descent is made to the "muskegs," which lie along the base of a second terrace like the first, composed of shingle, made up of fragments of quartzite gneiss, and of a deep blue and also light fawn-coloured limestone. This second terrace is covered with pines, and being free from underwood presents a fine open glade, easily passed through, quite a contrast to the woods of spruce, which are almost impenetrable. On reaching the hill I found it to rise about 80 feet above the second terrace level, and nearly 150 feet above the river, and as the timber had been all burnt from its surface it afforded a commanding view. The surrounding country presented a rolling irregular surface, everywhere densely clothed with dark green pine forest, and having the south-west horizon bounded by the abrupt and bold outline of the Rocky Mountains. I made a careful sketch of their outline, and took bearings of the different peaks. The view of the range occupies 84 degrees of the horizon, from N. 192° E. to N. 276° E. The greatest angle subtended by any one was 32 minutes. In front of the main range, that seemed to be about 45 miles distant, there is a lower but well marked range, which is wooded to the top and only about 25 miles off. The point where the Saskatchewan cuts through the near range is due west from this, and is much further distant, owing to the north-west trend of the mountains. On returning to the fort I found that a number of Blackfoot Indians had arrived, and a group of them had been watching me from the distance very curiously, as they thought I had gone up the hill to have a "medicine dance."

Three hundred yards below the fort there is a rapid in the river channel, and a fall of three feet, caused by ledges of greenish sandstone that cross the stream. A few hundred yards below this the river receives a large tributary, called Clear-water River, on the banks of which, as well as on those of the main stream, high sections of the strata are exposed. At the height of 60 feet above the stream beds of shingle gravel and sand occur, overlying all the other beds, and clearly forming the remains of a freshwater deposit similar to the terraces which occupy the valley of the river. The layers of pure sand which occur in this deposit contain fragments of the stems of sedge-like plants. The irregularities in the denuded surface of the underlying beds often form deep depressions like the "pot-holes" found in the chalk, and which are filled by the shingle deposit.

Judging from mineral composition alone, there are three groups of beds exposed in the sections in this neighbourhood.

1st. Massive cliffs of coarse-grained sandstone, composed of angular grains of quartz, cemented by calcareous matter in small quantity. Just below the ravine, where the Edmonton track comes down on the river, there is a cliff of this sandstone 90 feet in height. The lines of stratification are very obscure in this deposit, being confused by joints and false bedding.

2nd. The next group is that exposed at the rapid, and is composed of a green argillaceous sandstone, which by weathering always gives rise to sloping banks, from which concretionary masses protrude. These beds are generally horizontal, but sometimes have a rapid dip. They seem to pass into the last group, and sometimes to fill depressions in it.

3rd. This consists first of 10 to 12 feet of hard blue shale, with ironstone bands and concretions.

Under this shale lies a bed of soft argillaceous sandstone, with concretions, somewhat resembling group 2nd. Under this bed is found the lignite, with shales, and except close to it, where these shales are carbonaceous, their colour is of a light greenish grey. In the shales are found plant-impressions, among which is the "*Taxites*." At some points there are two beds of coal, but they are very variable and local. The lignite found here is better adapted for fuel than that obtained at Edmonton.

January 16th.—With a train of dogs borrowed from the fort, as my own were too tired, I started up Clear-water River, travelling on the ice for about 12 miles. The banks of the river were high and steep, and present sections of the argillaceous sandstone, sometimes forming very picturesque and ruinous cliffs, which peep out from among the dark green pines. The timber is good everywhere, but never of a large size. On the high grounds I observed here what I think must be the *Pinus resinosa*, although all the pines are termed by the Company's servants *le Cyprès*, which, however, is more properly the *Pinus Banksiana*. The tree which I suppose to be P. resinosa I have never seen lower down than the Saskatchewan. It rises with a beautiful straight trunk, with light branches, to the height of 70 feet, its trunk being often 16 inches in diameter, and finely tapered like a mast. The cones and foliage are somewhat like another pine, which grows abundantly on the shingle terraces. This tree answers nearly to the *Pinus inops*, or New Jersey scrub pine, but it presents a more sturdy habit, and also several peculiar characters. It is the same that was noticed at the "Horse Guard," near Carlton; but from that point it was not again seen along the Saskatchewan till after leaving Fort Edmonton, and never in any quantity till near the Mountain House. It seems to grow only on loose sandy soil, and prefers the surface of the terraces. Besides these pines, I observed here, for the first time since leaving the canoe route, the silver spruce (*Abies balsamea*) or Le Sapine of the voyageurs, with its beautiful foliage, dark green above and silver below. It is not a common tree here, however, the mass of the forest being still made up of the white spruce, canoe birch, and poplars, along with the pines before mentioned.

On returning to the fort at dark I found more Blackfoot Indians had arrived to trade, so that the Company's people were now much relieved, as they were almost out of provisions. As the buffalo were far out in the plains, owing to the open winter, the Indians were themselves badly off for provisions, as in coming to the fort they had nearly consumed their store, owing to the length of the journey. The desire for rum, however, soon induced them to part with some of their scanty supply, and now the environs of the fort presented a dreadful scene of riot and disorder. The Blackfoot Indians are more easily rendered violent by the liquor than the Crees, so that it is always well watered for them, even being diluted to the extent of 11 of water to 1 of spirit; and yet the trade is always one of great trouble and even danger to the Company's servants.

January 17th.—To-day I travelled up the Saskatchewan River for about eight miles, till stopped by the broken hollow ice which had formed, owing to the great rapidity of the current. As the ice in the river was still open in many places it was very dangerous, especially in the neighbourhood of the high cliffs, where there are generally strong eddies. The river opposite the fort is 130 yards wide, and when it is lowest is from two to three feet deep. At every bend fine sections were exposed of the lignite group. The river seems to be winding about in what had been an immense valley cut through these strata, and then filled up with beds of shingle, which had again been scooped out and formed into terraces, and, finally, the present river valley had been formed, cutting through not only these terraces but also the underlying strata in some cases. Thus the shingle terrace facing the bank of the river is seen to inclose patches of the lignite shales, in which have been worn deep furrows prior to the deposit of the shingle. Some sections show the remarkable manner in which the passage takes place in the mineral structure of the beds. On the left bank of the river we have the bank 80 feet high, and consisting of—

Drift with boulders.	Lignite, variable.
Shingle.	Indurated shale (Taxites).
Iron shales.	Lignite, 1 foot.
Lignite, a few inches.	Ironstone shale.
Indurated shales.	Lignite, very irregular, but compact.
Lignite, a few inches.	Concretionary sandstone, thick bedded.
Sandy clay.	River level.

200 yards below this, in the same cliff, nothing but hard blue shales are exposed, and 50 yards further on these pass into the soft concretionary sandstone, and then again into the mixed beds. There are a few dislocations in the strata, but these do not affect the beds more than a few feet. Six miles above the fort the banks are again formed of high cliffs of the coarse-grained sandstone, group 1, after which they are again low, and the surrounding country is flat. When I got back to the fort I found that Mr. Brazeau had arrived, having ridden the last 110 miles, all alone, in two days.

January 18th.—Rode to the White Mud Hill, so called because here they have a pit from which they dig the white calcareous mud used at all the Company's posts at the Saskatchewan as whitewash, and for which purpose a large quantity is taken down in the boats every spring. I found this deposit to rest on the top of the sandstone beds which form the high cliffs I saw yesterday six miles up the river, and seems to form a local mineral variety in the shingle deposits. The country is very beautiful along the north bank of the river, the heavier timber being often replaced by dense thickets of poplar. In one of these we observed the young trees, some of them several inches in diameter, bent and pulled about in all directions, and from the scratchings on the bark I was inclined to believe my guide, who said that it is done by the young grizzly bears. He said that they do this in play; and certainly they could have nothing to seek in pulling down poplars which yield them no sort of food.

There is very little known of this part of the country during the summer months, as the fort is abandoned every spring until the following autumn. When the Company's people first arrive, which is generally in October, they get plenty of Wappiti and other kinds of deer round the fort, and not far distant moose and rein-deer are always to be found.

The prairie antelope only comes near this place in spring, when it seeks shelter in the woods from the wolves during the breeding season on its return from its southern migration.

The Indians say there is a greater display of wild flowers in this neighbourhood than in any other part of the Saskatchewan, and that butterflies and other gaudy insects are very abundant, whereas in other parts of the country we have found them unduly rare. Sometimes before abandoning the fort in the spring, the Company's servants have planted potatoes, and sown barley and turnips; and what was left by the Indians of the resulting crop until their return in the autumn, was sufficient to prove that the soil and climate are very favourable to agriculture: and several other circumstances lead me to think that the latter is even more favourable than that at Edmonton, notwithstanding that place having 800 feet less elevation. Every day we had here soft winds from the west, which cause a rise in the thermometer, sometimes even to above the freezing point, and the winter is said to be always much milder, and the spring earlier, than places further to the eastward.

January 19th.—This morning I held a palaver with the chiefs of the Blackfoot bands, who are trading at the fort. Rumour travels quickly through the Indian country, and they had already heard of our Expedition, and were surmising the most absurd reasons for our intended visit to their country next year; so I thought it right to give some account of ourselves, and thus to gain the good-will of the chiefs by allowing them to have the information to distribute to their people. Only a few of them came, however, the rest being still the worse for their debauch. When the Blackfoot Indians come to a fort, one chief always remains sober, to keep the peace, and in return receives a gratuity of rum to take away with him, so that on returning to his camp he may make up for his temperance. Without this very sensible precaution there might often be bloodshed, either among the Indians themselves, or between them and the people of the fort. The sober chief of this band, called Pee-to-pe, or the Perched Eagle, seems to be a fine fellow, and insists on sleeping on the floor in my room, partly as a compliment to me, but more because he will consider it an honour to brag of among the others afterwards. At night one of the chiefs I spoke to in the morning harangued the other Indians from the palisades of the fort, upon the necessity of their good behaviour to us white men, reminding them that they get nothing but good at our hands, and not to confound us with the "Big Knives," as they term the Americans, who, he said, do not treat them well, but are deceitful. This was alluding to the Missouri traders, where the great competition of rival companies places the poor Indians on a very false footing. He then repeated to them all I had said about the Expedition.

January 20th.—Early this morning, 10 or 12 of the principal Indians, having now recovered themselves, came crowding into my little room, to hear what I had to say, and to receive papers, which, by the advice of Mr. Brazeau, who has had great experience among the Blackfeet, I had prepared for the different chiefs. These papers merely mentioned the name of each, and stated that he had promised to aid us in every way in passing through their country: but the main benefit we would derive is from each having a note of the character that particular Indian bore among the traders at the fort, so that we might be better able to judge which to trust to as guides, and also that we might at once recognize the real chiefs on meeting them in the plains, which is not always an easy matter, and to mistake is sure to give offence. With these papers I also gave to each a little present of tobacco and trinkets, and also sent by the hands of the others copies to some of the principal chiefs that were not present, trusting to Mr. Brazeau and his interpreter, Felix Monro, who is related to the Blackfoot tribe, to discriminate the proper persons.

The following is a list of those who got papers:—

A-coo-on-nistam - -	- The Main Tent-pole.
Pee-to-Pe - - -	- The Perched Eagle.
O-nis-teh-ta-mi-soo - -	- The White Calf that ran up the hill.
Ma-coo-yeh-o-mabi-kan -	- The Swift Wolf.
A Ca-oo-mah-ca-ye - -	- The Old Swan.
Natoos-a-pee - - -	- The Ancient Sun.

These two latter are the principal chiefs of the tribe.

Natoos - - - - -	- The Sun.

This also means the medicine man, and was the name always given to me by the tribe.

O-nis-teh-in-na - -	- The White Calf.
Cut-teh-saks-se - -	- The one that sits in the tent and never goes out.
Ki-en-och-in-ass - -	- The Bear's Hip-bone.
Ne nēs ta coo - - -	- The Chief Mountain.

The above are Blackfoot chiefs.

Also to one Sarcee chief,

In-nux-in-na - - -	- The Little Chief.

To one Peagan,

A-pah-mah-can - -	- The Swift Ermine.

And to one Blood Indian,

Mee-ta-schō-ta - -	- The Great Rain.

Pee-to-Pe then made a speech of the usual kind, lauding up their nation, and abusing the Crees as always being the aggressors in their quarrels. He is considered a great war chief of the tribe; and I have promised that, if he can join us, he will be accepted as guide. His address, which was long, was translated to me after each sentence by the interpreter. He commenced by saying that his tribe saw so little of the whites, that they might not know how to behave so well as other Indians, but that when we come among them, we will find them a great people with singleness of heart. That there were no doubt some of the young men who would do us harm if they could, and steal our horses; but that the chiefs would prevent them, as with them the chiefs were not like those of the Crees, but had power over their young men. Then followed a long abuse of the Crees, to the effect that, although they had lived for a long time among the white men, they did not seem to have profited much, as they were just like wild dogs, that sought to bite whenever you turned your head, and that only fear kept them from doing harm: but that his people were more noble, and had large hearts that could show hospitality.

The Blackfeet appear, from those I have seen, to be finer and more powerful men than the Crees

their women also, as a rule, are much prettier, or less repulsive, I should rather say. They are very fond of fine dresses trimmed with the fur of the ermine and otter; but I had no opportunity of seeing them in their finery, as they make it a rule when they come to a fort, of dressing as meanly as possible.

In-nux-ina, the Sarcee chief, is a very quiet Indian, having lived a great deal among the half-breed trappers. He is much respected by all the Slave Indians, which is the name given to the Blackfoot tribes by the Crees, viz., Blackfeet, Blood Indians, Fall Indians, Peakums, Little Blankets, &c. The Sarcees are also grouped by the traders along with the Slave Indians, but they are really a branch of the Athabascan Indians, who live far to the north.

January 22nd.—I made a trip into the forest to the west, and remained out two nights looking for a Stoney Indian that is said to know the Rocky Mountains well. We saw traces of him, but missed him. On returning to the fort, however, we found he had arrived with the news that he had killed two moose-deer. I could not manage to pronounce his name, which means "the one with a thumb like a blunt arrow," but he is said to be the best hunter among the "Stoneys," and once, in a single season, to have killed 57 moose-deer. He promised to meet me next summer in the mountains, and act as my guide.

January 26th.—As there was so little snow on the prairies I resolved to return upon the ice of the river, although the distance is of course very much greater. Brazeau asked my men to take some spare dogs down to Edmonton, so that on starting we found ourselves with a train of four dogs each, or 16 in all. The resources of the fort were so low, however, that we only could get three days' provisions for ourselves, consisting of 20lbs. dried buffalo meat, and a small quantity of the store sweepings and scraps of parchment for the dogs, only enough for one meal for them. We therefore felt that there must be no loitering, as we had very slight hope of getting game, and the distance is over 200 miles.

Starting at nine o'clock this morning we found the ice smooth and sound, excepting at the sharp bends of the river, so that we were able to travel at between four and five miles an hour. As the views, or straight portions of the river 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 the 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 Baptiste's 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. We halted at 6 p.m., having made 37 miles. The thermometer at nightfall was 25°.

January 27th, Wednesday.—Started at 6.30 a.m., the thermometer being 19°. Pass a number of sandstone cliffs, with ledges that cause rapids, so that the ice is much broken and unsafe, and our progress is in consequence often very tedious. 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 sandstone, 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, one of many that block up the centre of the channel, and which we set fire to, which raised such a conflagration that we were glad to escape from the heat. 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 banks the sandstones are getting more rare, and the strata are more frequently composed of clay shales. We also began to see large boulders in the bed of the stream. We passed the site of an old trading port called Biguireil Fort, which had stood on a rich alluvial flat that is now covered with a heavy growth of timber.

We had a good deal of trouble getting past several great rapids, where there was much false ice, through which our dogs broke several times.

We camped at 6 p.m., having made 41 miles during the day. At nightfall there was a little snow, and the thermometer stood at 18°.

January 27th.—We started with a fine clear morning, the thermometer being at 1° at 6 a.m. The river now changes its main direction from a northerly to an easterly direction. On the sloping banks there is now a good deal of poplar mixed with the pine forest which has hitherto predominated. Before halting in the middle of the day we passed a sloping bank of white marlites that had been cut by ravines into a succession of pyramids. By night we had made a distance of 51 miles, having continued travelling for several hours after sunset.

Our camp was on Goose Island, where the brigade of boats generally halts, the night before reaching Edmonton, when running down stream in spring.

Our dogs were now like a pack of wolves from hunger, so that we had to tie up some of the worst of them to stakes to prevent them tearing one another. The thermometer at sunset was 3°, and at sunrise 5°.

January 28th.—We travelled very fast all this day. Soon the high valley 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. At noon, when we halted, the thermometer was 28°. Soon after again resuming our march, we passed the old White Earth Fort, the chimneys of which are still standing. The country is very beautiful here, and it is a

favourite place for the half-breeds sending their horses to spend the winter, on account of the fine pasturage. The river below this point takes a small bend to the south-east, 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. By nightfall we had again made the same distance as yesterday, namely 50 miles, but as we had nothing to eat, and our dogs would only get worse by delay, we resolved to halt only for a few hours and then travel on all night. We started at 9 p.m., and found that, from the river being so closely hemmed by high banks the snow was so deep that we had to use our snow shoes for the first time. There was a curious haze in the air, and about 3 a.m., there was a magnificent display of lunar parahelia, there being three distinct bands of light: first, the ordinary fog ring round the moon; second, a horizontal zone intersecting the first ring at the position of the mock moons, and completely girdling the sky parallel with the horizon; and third, a band of light passing through the zenith, which where it intersected the horizontal band also produced mock moons.

January 29th.—At 7.30 this morning we reached Edmonton, having in the last 26 hours travelled 90 miles from the Goose Island, making in all 212 miles from the Rocky Mountain House.

We were all very much knocked up, of course, but hunger and fatigue soon disappeared under the kind attention of Mr. Swanston, who is an old and experienced traveller, and knows the proper mode of treating such cases.

February 6th, Saturday, Fort Edmonton.—The weather has been very changeable at this place throughout the winter. On Monday last and during the following night there was a heavy fall of snow, which only lay a few hours, when rain and warm wind from the south-west succeeded and cleared it away completely. To-day, however, it is again cold and dry, with a north-east wind. Influenza is very prevalent among the people of the fort: there have only been two deaths in the community, however, viz., a Norwegian who died in a fit of drunkenness at Christmas time, and an infant from hæmorrhage. Mr. Swanston kindly gave me the following census of the population of the fort, which contains as a curious item the quantity of buffalo meat that is served out each day.

STATEMENT of the DAILY EXPENDITURE of BUFFALO MEAT at EDMONTON HOUSE.

	Inhabitants in each House.			Total number of Persons.	lbs. of fresh Meat for each Family per diem.
	Men.	Women.	Children.		
Galiman's House	1	1	–	2	12
Short's „	2	1	3	6	26
Raymond's „	2	3	4	9	40
Cameron's „	2	2	1	5	26
Cunningham's „	–	1	4	5	12
Finlay's „	1	1	5	7	18
Laderoute's „	2	1	5	8	40
Dumar's „	2	2	6	10	36
Savard's „	–	2	5	7	18
Salois'	1	3	6	10	32
Cartouche's	1	1	5	7	22
Hudson's	3	1	4	8	44
Norwegians, 1st	4	–	–	4	32
Norwegians, 2nd	6	–	–	6	48
	27	19	48	94	406
Absent in the plains	15	—	—	15	120
	—	—	—	109	526

Edmonton House, 2nd February 1858.

Goitre is very prevalent among the residents here and at the Rocky Mountain House, but in a modified form, and I have only seen one case where there is any approach to cretinism. I tabulated the details of 50 or 60 cases, but have not discovered any one condition of habit of life that is common to all who suffer from this complaint. The only curious feature seems to be that children born at one fort are never attacked till removed to the other, and it again disappears on their return to their native place.

The fort assumed a lively appearance this afternoon from the arrival of the hunters from the plain with 40 horse sleighs loaded with buffalo meat. There were 18 men, and the horses were all half-broken animals that had been brought from the mountains at Jaspar House the previous summer.

February 12th.—The weather is now extremely cold, the thermometer ranging 20 to 30 degrees below zero. As I wished to see the mission at Lake St. Anns, I seized the opportunity of accompanying Sinclair, who was going there on business of the Company's. The track runs nearly due west from Edmonton through low willow and poplar copse and occasional pine woods for 50 miles. We travelled with a horse sleigh and slept one night on the road. This was the coldest night I ever camped out, the thermometer at Edmonton falling to −47°, and the one I had with me, being a mercuried one, was quite frozen.

At Carlton, 400 miles to the east, Lieut. Blackiston, I have since found, considered that the temperature fell that night to 54°.

February 13th.—The morning was very bitterly cold, and before we reached the mission we had to cross the lake, which is six miles wide, and in the course of doing so both Sinclair and myself got our faces frozen.

We found the priests, M. Le Combe and his coadjutor nearly alone, the population of the settlement being absent in the plains hunting buffalo. There are two villages, each with 30 to 40 houses, but there is very little ground under cultivation. Barley, potatoes, and turnips are the crops that succeed best, and wheat has never been raised. There is some fine land round the mission station, which is on the west shore of the lake. The great supply of food is from the white fish that swam in the lake (Coregonus albus). These fish, which are delicious eating, are of an average size of 4 lbs., and are obtained in the autumn and during the winter in vast numbers. Two years ago the quantity caught and stored by being frozen at the commencement of winter was 40,000, and these were caught in five days. The stream and lakes around this place abound with beaver, and the woods with martens, musk, fisher, lynx, and other fur-bearing animals.

February 14th.—This being Sunday we attended the little chapel attached to the mission, which is neatly built of wood, with a spire and bell. The attendance was small, and, the thermometer being at −20°, it was bitterly cold work, so that the priests had to officiate in their great coats and mittens. In the afternoon I explored the shores of the lake, which has a superficial extent of 30 to 40 miles, travelling in fine style over the smooth ice with M. Le Combe's train of dogs.

February 15th. - Taking leave of the kind and hospitable priests, we returned to Edmonton, and by changing our horse at the guard as we passed made the whole distance in one day.

February 19th.—This is the first day the thermometer has been above zero since the 7th, but it is only 2°.

February 25th.—The weather has been broken and stormy for some days, but now it is unnaturally warm. We are sitting this evening with the windows open and our coats off, and were without a fire even at breakfast time. The thermometer at 2 p.m. was 65°. The snow has all disappeared, several small streams of water running, and the ground is thawed to a depth of six inches.

Some Indians arrived to-day from the Beaver Hills, where they have killed six moose-deer within 10 to 20 miles from the fort. At one time they were very common in this district, and formed a sure source of food for the traders, but for many years they have almost disappeared.

March 3rd.—At this time I took a series of observations of the depth to which the soil is frozen, and which are published separately along with the other meteorological observations.

March 6th.—Have been taking advantage of the open weather to examine the section of the lignite strata which are exposed along the river. The thermometer in the sun, but freely exposed to air, reached 70°, which is very unnatural for this climate so early in the season, and cannot fail to do much damage by prematurely forcing the vegetation.

March 7th.—This morning I started with a guide, and Peter Erasmus, the Rev. Mr. Woolsey's interpreter, to endeavour to engage men for the Expedition from among the band of "freemen" that are at present travelling in from the plains to Lake St. Ann's settlement. We travelled with horses, having a spare one to carry our blankets and kettles. Although the snow has almost entirely disappeared from the country, and in the afternoon the ground became slushy and wet, still in the early part of the day the tracks are very bad for the horses, as the pools of water and the trodden snow is then hard frozen. After crossing the Saskatchewan River 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 10 miles we turned to the south-east, and commenced to traverse 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.

Judging from the dry stubble of last year's plants, the vegetation in summer must be very luxuriant, and all the elements of good pasture abound. In the afternoon we got into some open country, and travelling briskly reached the tents of the freemen's camp about an hour after dark, having travelled 40 miles from the fort. The tents were pitched beside Hay Lake, which is a few miles in extent and within four hours' ride of Battle River. Only half of the party had got thus far on their return, as they were heavily loaded with the proceeds of their hunt, but the rest were expected to pass this place next day, so we resolved to wait before beginning negotiations. However I did business so far as to engage one man named Plant, who very kindly gave us tent-room for the night.

March 8th.—About 11 o'clock the rest of the band arrived, forming a motley troop with loaded horses and dogs, and travelling in a style hardly different from Indians. The rest of the day was spent in winning the good will of their old chief Gabriel Dumont, who has repeatedly crossed the Rocky Mountains, and can also talk Blackfoot; and further when I succeeded in getting him to consent to act as guide for the Expedition, I had no difficulty in filling up my complement from among the young men. He gave me much information about the country to the south, and about the mountains, which I noted at the time, and which proved of much use to us in organizing our plans, but has of course been superseded by our own observations.

We remained with the camp till the 10th morning, a few miles nearer home each day, when we left them, and by a smart ride of seven hours we reached the fort. I had got a list of 19 men who were willing to go, and from which I only wished to choose 12, after consulting with Mr. Swanston, who knew all their characters. They all seemed to consider the service as a dangerous one, and were very particular in stipulating that the party would be sufficiently numerous and well supplied with ammunition.

The band was about 200 in number, including women and children. There were 40 tents, which were merely Indian wigwams of buffalo skins sewed together and stretched over poles.

Their habits differ very little from those of the natives, except that their dress is all of European manufacture. Many of the men could talk French, but all prefer to talk the Cree language. The men are generally handsome, well-made fellows, but very few of the women are even comely. They were

very hospitable, and we had many feasts of the finest buffalo meat, but the great delicacy that was at this time in season was the musk rat, which they were spearing in numbers through holes in the ice on the lakes. I found them rather oily and mousey-flavoured for my taste, but not much more so than the flesh of the beaver, which has always been much lauded.

March 15th.—I started this morning on my return to Carlton, intending to continue down the river on the ice for the whole distance, if possible. Besides my own man, Foulds, I had the services of one of the Company's men, who was returning to Fort Pitt, and each of us drove a train of dogs. The ice was very smooth and free from snow, and in anticipation of this I had borrowed a pair of skates before starting, so that while my companions were slipping and tumbling, I got along with great ease. 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. The river has a northerly course for 35 miles below Edmonton, which was the distance we made before nightfall, when we encamped at the mouth of Sturgeon River, which rises from Lake St. Anns.

March 16th.—A good deal of snow had fallen during the night, so that I could no longer use the skates. In the forenoon we passed a party of "freemen" who were encamped beside the river. They said that we should see buffalo in the course of the day, as there were large herds not far distant, on the plains above. The Saskatchewan in this part of its course receives several tributaries from the north-west, where there are many large lakes scattered along the watershed which divides it from the Mississippi or English River. All these lakes abound in "white fish" (*Coregonus albus*), and, in consequence, that part of the country is the favourite camping ground of the more industrious fur-hunting portion of the Indian population. At one of their lakes, called "Lac la Beiche," which lies 70 miles north of the Saskatchewan, and sends its waters by a river of the same name to the Athabasca, the Hudson's Bay Company have a small trading port, and there is also a settlement of freemen, and two mission stations, Roman Catholic and Wesleyan. As we were travelling along in the snow-drift we met the Wesleyan missionary, Mr. Steinshaw, accompanied by one man, and travelling with dogs to Edmonton, to meet Mr. Woolsey, his fellow-labourer at that place.

Mr. Woolsey's mission station is properly out at Pigeon Lake, 50 miles south-west of Edmonton, where the Thickwood Crees and Stoneys have made a few attempts at agriculture; but the Company's officers always invite both him and also the Roman Catholic missionaries to spend as much of their time as they can at the fort for the benefit of their own employés.

March 18th.—The snow still continues to fall, and is now a foot deep on the ice, so that our progress is slow from the difficulty which the dogs experience in dragging the sleds. For the two last days the river valley has been narrow, with precipitous banks 200 feet in height. Occasionally, sections of clay and sandstones, with ironstone nodules, have been exposed, but the stormy weather has prevented my observing them closely. This afternoon the weather began to clear just as we arrived at the Snake Portage, which is the point on the river where they unload the boats of the goods for the Lac la Beiche station. The country bordering the river in this part of its course is very beautiful, as the high banks retire and form, by combining with a still higher table-land, undulating hills that rise to the height of 300 to 400 feet. On the north side are thus formed the Snake Hills, which are free from wood except in the ravines. Below the Snake Hills the banks of the river valley are generally not more than 70 feet in height, and are no longer timbered. The river still is rather narrower also than above the Snake Portage, where at one place I found it to be 350 yards from side to side of the channel. We have passed several places where the ice is broken and irregular, and where there is even open water marking the position of rapids in the channel. We observed two large trails ascending the north bank of the river, about four miles apart, the higher being the Edmonton trail to Lac la Beiche, and the other, where there was an old boat lying, being the proper portage track. The goods are carried for 70 miles north of this point packed on horses' backs. Ledges of sandstone, mineralogically the same as those at the Mountain House, were seen cropping out along the banks near the upper portage trail, and associated with chocolate-coloured clay shale, with septaria containing fragments of shells. By ascending the bank I got a view of the Black Hill, which is a marked object on the direct trail from Fort Pitt to Edmonton, and which bore W. 230° N., at a distance of about 20 miles. At this part of its course the Saskatchewan is further north than at any other, being in latitude 54° 5′ N. From this it makes a great sweep to the south, as far as latitude 52° 20′, and then by an abrupt change in its course regains latitude 54° at Cumberland House.

March 19th.—Clear sharp morning, so that on first starting at 5 a.m. we got along very well; but as the sun acquired power the snow got so soft and wet that we had to give it up and wait till nightfall, when the cold would again set in and freeze the snow. The banks of the river where we halted had again become high and ruinous, exposing sections of septaria clays, like those at the elbow of the South Saskatchewan. I spent the afternoon searching for fossils without success till I wandered several miles along the river. As I returned across the plain, to avoid the deep snow in the valley, I fell on a fresh buffalo track, and following it up shot an old bull, and carried a load of fresh meat back to camp. We started again at 6 o'clock, and plodded on during the night, which was very dark, only halting for two hours, from 3 to 5 a.m.

March 20th.—At 7 a.m. the snow began to get moist again, so that we halted. Seeing a track of a person walking with snow shoes, I followed it till I arrived at two Indian tents, about a mile north of the river. I persuaded them to trade some provisions and a pair of snow shoes for a little tobacco and ammunition, and then returned to my party. On starting from Edmonton there was so little snow on the ground that we had not thought of carrying snow shoes, so that it was a great catch to get even one pair to beat down the track for the dogs. With them we were able to go a few hours longer before stopping for the day. Where we made our *day* encampment was near the mouth of Dogrump Creek, and a few miles below a range of cliffs of light blue calcareous clay charged with selenite crystals and ironstone septaria. At all other points the banks seemed to be composed of drift clay with boulders. Finding that I could not follow my men's example of sleeping in the bright sunshine, I went off to the north following some deer tracks. The ground on bare knolls is thawed into a plastic condition to the depth of eight inches, but on the level ground the snow is eight to ten inches deep, and in hollows three

to four feet. On the ice of the river it averages 12 inches. At 7 p.m. the snow was sufficiently hard for us to start. I took the first turn ahead with the snow shoes, and found it so easy after the plunging in the snow we had been accustomed to for some days back, that I held on till 2 a.m., when we arrived at "Soyer's Rapid," where the ice was full of holes, and had overflown the proper thick ice to the depth of several feet, and we required to travel on the thin skin of ice that had again formed. The dogs were often popping through, and we only avoided it by lying on our sleds, which presented enough surface to bear up our weight. I had fallen asleep in this fashion when we were passing the mouth of Moose Creek, where there was again much false ice. I was going first, and my companions thinking I was keeping a look-out, followed boldly, running behind me in the dark, till the ice gave way; and on their cries arousing me I found on looking back that I had escaped sharing a ducking with them. The water over the sound ice was only about four feet deep, so there was no great danger, and with a little scrambling both men and dogs soon got out again, when a big fire and a few hours' halt put them all to rights again.

March 21st.—At daybreak we reached the mouth of Vermillion River, where we encamped our first night from Fort Pitt on Christmas eve. We only halted for an hour, about six miles below this point, when, as we had only 22 miles of our journey remaining, we again started. At 11 a.m. we ascended the left bank and followed the trail across the great bend, and arrived at Fort Pitt an hour after sundown. The whole distance, by the route we had followed from Edmonton, I estimated to be 251 miles, and the journey had occupied us seven days besides our travelling during the night.

March 29th, Fort Pitt.—I found on arriving here that some letters of importance for me had been sent on by an Indian to Edmonton, and that they must have passed me on the road, so that I have waited a few days on the chance of their being sent back again. During the interval I have been bargaining for horses with Mr. Simpson, and have succeeded in getting 17 for the use of the Expedition. They will remain here until the end of May, at which time the men I engaged at Edmonton will arrive at this place, as Mr. Swanston has kindly offered to allow them to work their passage down to Carlton in the Company's boat when the ice breaks up.

The weather continues very changeable, but now there are decided signs of approaching spring. On the 29th the first goose arrived, flying *down* the river, and to-day Indians have arrived at the fort, having already seen some ducks flying over the plains.

March 30th.—The ice on the river was now so rotten and unsafe that I had to give up all idea of following it further for the present, so, along with my man Foulds, I started to return to Carlton by the trail. Besides the two trains of dogs, I had a young horse I had purchased; he was a beautiful animal, but not perfectly broken, having been brought across the mountains from the Kootanie Indians last summer by Mr. Simpson's brother. We got along slowly, as the ground is very wet and slushy, and all the ice on the swamps and creeks is rotten. The snow failed us altogether on the afternoon of the second day, so that we had to fling away the dog sleds, and make the dogs carry the things on their backs. On the 1st of April we reached Jack Fish Lake, having followed the same trail that I travelled by in December last. Here I found Mr. Sullivan living with Mr. McMurray, and learned that he and Beads had been obliged to leave Carlton in the winter, as there was a very short supply of provisions since I passed in December. Mr. McMurray and his companion Mr. McGillarray have had a comfortable little house of two rooms built on the site of the tent where I spent such a merry evening with them. As they had used green poplar in the construction of the roof the warmth indoors had developed the buds, so that the inside was in full leaf.

April 4th.—I have got Indian "travails" for the dogs, consisting of two poles joined together at an acute angle, which rests on the dog's neck, while the ends trail on the ground ten feet behind him, and kept apart by a few cross bars close behind his tail, on which the load is strapped. With 10 dogs accoutred in this fashion we continued our journey to Carlton, accompanied now by Mr. Sullivan and Beads. Mr. Sullivan and I had horses, but the rest were walking as before. The snow was quite gone from the ground now, but the lake was still covered with ice. Crossing it in many directions I observed high ridges where the ice had been raised into a crest, eight to ten feet high in some cases, then occupying the position of some of the great cracks which were open in winter, and which I suppose must have been formed and kept open by the continued shrinking of the ice as the cold increased: but as they ultimately fill up, on the ice expanding with the returning warmth of spring, the sheet breaks upwards at the old lines of fracture, and is squeezed up into thin ridges.

We had only gone about four miles when my young horse became restive, and throwing me over its head got away from us. Every effort to recover him was useless, and he was soon out of sight. I sent back and told Mr. McMurray of my loss, and he employed Indians to search for him. He was not recovered however for some weeks, when an Indian found him about 40 miles from Jack Fish Lake, and brought him to Fort Pitt, when he was recovered for me by paying 20 skins.

April 5th.—We resumed our march this morning, but leaving the track which I had travelled by in the winter to our right, I followed the coast trail. It led us behind a range of high hills, and along the border of a chain of lakes, the largest of which is called Scent Grass Lake. The valley which these lakes occupy is continuous with the valley of the White Lakes. We made about 25 miles each day, and on the morning of the 8th we reached Carlton. The track keeps so far to the north as to pass over the south end of the Thick-wood Hills, and well to the north of Redberry Lake and the Minitonass Hill.

On reaching the Saskatchewan, at Carlton, we found the ice so rotten that it was ticklish work getting across. We found Lieut. Blackiston and M. Bourgeau well and tolerably hearty, considering the short commons and hard work they had been having all winter and spring, they having alone been left to continue the hourly magnetical observations for the last six weeks.

May 25th.—Until this date I have been employed at Carlton in various ways, and making short excursions in the neighbourhood. However, as provisions are very scarce here, and the Edmonton brigade of men will soon be arriving, I thought the better plan would be to stop them at Fort Pitt, and arrange for their proceeding directly to the plains, and wait where there are buffalos till joined by the rest of the expedition. I therefore started again for Fort Pitt, taking one man with me, each having a good strong horse. We made the trip in three days, and I arrived just a few hours before the first boat of

the brigade arrived down the river from Edmonton. As soon as they had all arrived at Fort Pitt, I sent them off with all the expedition horses to encamp south of the Saskatchewan, at the Eagle Hills, and as near to Carlton as they could procure buffalo. I then descended the river with the boats to Carlton, which, owing to the prevalence of winds up the river, occupied us eight days. I have thus been able to see and map the river 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 the Eagle Hills 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. The want of snow during the winter on the prairies had made the usual flood very late, and the water as we descended was still as low as in the previous autumn, so that the navigation, even with barges, was difficult. The barges are built at Edmonton of the wood of the white spruce, 30 feet long, and, when loaded, carrying 70 to 80 pieces of 90 lbs. weight each, drawing two to two-and-a-half feet of water, and requiring, at least when ascending the river, to be manned by a crew of eight men. The trip down the river in these boats, with such pleasant companions as Mr. Swanston and Mr. McMurray, and the other gentlemen of the Company's service, was more like a picnic than hard travelling in a wild country. In fact, excepting the women and children, and even not all of them are left, the brigade every spring carries off nearly the whole civilized population of the Saskatchewan.

June 2nd.—The bustle of mustering the Company's brigade, and the starting of the boats, 30 in number, down the river, has occupied the attention of every one for the last few days, but now the fort has again assumed its dull aspect. Mr. Hardesty, the gentleman left in charge, having offered to make a short trip with me to the south-east along the Red River trail, in order to meet Captain Palliser, whose arrival we now expected daily, we started this morning, taking spare horses with us, as those of the Captain's party are likely to be tired out with their long journey in spring, which is the worst season for travelling with horses. Twenty miles through beautiful park-like country, dotted with woods and lakes swarming with wild-fowl, brought us within four miles of the South Saskatchewan, where we encamped.

June 3rd.—Early this morning we reached the river, and found that it was much more in flood than the North Saskatchewan. It is a very rapid stream, 230 yards in width, with a steep channel. The valley makes long bends or reaches, but within there are a succession of points closely studded with boulders so as to resemble artificially paved landing places, and which, every 400 yards, throw the stream with a slight ripple, not amounting to a rapid, from side to side of the channel. We constructed a rough skin canoe to carry our saddles and blankets, and then swam across with our horses.

We rode 16 miles further that afternoon, still in the same direction, and through equally fine country, where we encamped. However, the lakes which fill the hollows are nearly all salt, and even as early as this season of the year the soil is whitened with salty efflorescence.

To the east of our camp is a high hill, also called, like that west of Carlton, the Minetonass, or the "Hill by itself." These conical hills are the outliers of cretaceous and superficial deposits, that remain to attest the vast denudation which the surface of this country has undergone in recent geological time.

June 4th.—Ten miles further this morning, still to the south-east, brought us to where the trail strikes off to Fort la Corne, the next lowest fort on the Saskatchewan, and, while halting to rest our horses, Captain Palliser suddenly walked in upon us, silently as an Indian. He was walking in advance of his party, as the horses had all broken down, and they were bringing them slowly on, while he kept ahead in order to have a better chance of killing game, on which they were dependent, having no stock of provision with them. They had travelled pretty much in this style all the way from Red River, a distance of 550 miles. Leaving the rest of the party to come on slowly, Palliser, Hardesty, and myself, with the advantages of the fresh horses I had brought, almost reached the South Saskatchewan again before night, and swimming it at daylight reached Fort Carlton early next forenoon.

No. 4.

FROM COMMENCEMENT of JOURNEY between SASKATCHEWAN RIVERS to termination of 2nd EXPLORING SEASON on September 20th, 1858.

The commencement of the second season's explorations.

Lieut Blackiston to proceed to Pitt and Edmonton, and thence to join us at forks of Medicine and Red Deer rivers.

June 15th, 1858, Tuesday.—To-day all preliminary arrangements being completed, the Expedition left winter quarters at 3 p.m., and proceeded on the beaten track towards the south of the Stone Indian Knoll, a conspicuous landmark on the right bank of the North Saskatchewan River. It was agreed on, previous to starting, that Lieutenant Blackiston should proceed with a small party to Fort Edmonton, obtain a guide at that place, and again join the main body at the forks of the Medicine Lodge and Red Deer rivers. By this arrangement, I trusted that Lieutenant Blackiston's chain of magnetical observations would have been further extended to the westward; and again, I was anxious to receive some supplies ordered the year before from Norway House, and now shortly expected up the river. During the delay at Forts Pitt and Edmonton, attendant on the observations, I hoped for the arrival of the goods, which Lieutenant Blackiston was afterwards to take along to meet us at the above rendezvous.

As we had started late from Carlton, we made only five miles before encamping for the night at "Five Mile Gully."

Nichewa comes over to see us.

June 16th, Wednesday.—At 7 a.m. we continued our course along the right bank of the river, passing over the Stone Indian Knoll, until we arrived at a poplar ridge, where we encamped for dinner. Here we were overtaken by our old Cree guide "Nichewa," who had conducted us the last season from the Qu'appelle Lakes to the elbow of the south branch of the Saskatchewan. He had been tenting among the buffalo at the Eagle Hills, and had ridden to the fort the previous evening, in order to see us.

I tried to induce him to accompany me to the forks of Red Deer River, but could not succeed, and, indeed, I hardly expected he would venture any more into the Blackfoot country, as war had again broken out, and his own people had been the aggressors. At 3·15 p.m. we again moved off, and kept on a S.S.W. course for 12 miles, when we encamped for the night near the "Birch Gully." The pasture was very poor this spring, in consequence of the recent fires in this part of the country. The Stone Indian Knoll, around the base of which the river sweeps, is entirely without wood. Opposite to it, on the left bank of the river, at the distance of 15 miles, rises the Minetonass.

Is afraid to venture into their country.

Stone Indian Knoll.

From the poplar ridge to Birch Gully we passed over a fine level stretch of prairie, 210 feet above the surface of the river. As soon as we had fixed our camp, M. Bourgeau began botanizing in the neighbourhood, and found the amelanchier, viburnum, and prunus in abundance. In the gully and along the points of the river, there are plenty of poplar and of birch.

Birch Gully.

June 17th, Thursday.—Started late, to allow of M. Bourgeau drying and preserving the botanical specimens he had obtained. The delay was beneficial to the horses, which in the spring of the year had found great difficulty in getting sufficient grass, and especially here, where the vegetation is so backward.

Scanty supply of grass.

After continuing our course S.S.W. for 12 miles, we struck the elbow of the North Saskatchewan. The weather since we left Carlton has been too cloudy to allow of astronomical observations. The valley here is far from luxuriant, the only tree being the aspen poplar; the entire absence of the other species here is remarkable, but M. Bourgeau obtained here several different species of astragalus. The channel of the North Saskatchewan for some way above this place is beset by sandbanks, which at low water form great obstacles to the navigation of even the small bateaus used in the fur trade. From this point we made for the Crop Woods, where we arrived at 6:30 p.m. and encamped, passing over irregular country, where the stunted willow still remained, after all other trees had been destroyed by fire. Thus large tracts of country now prairie lands have at one time grown valuable forests, and their present absence is the result of the repeated ravages of fire. Where a scattered and stunted growth of willows is found, as a general rule, was ancient forest land, which, when dug to a sufficient depth, still discloses numerous roots of destroyed timber. The Crop Woods at which we encamped are the same as those among which we arrived on October 3rd, 1857, before reaching Fort Carlton. There are a few clumps of poplars found in a range of sand-hills: the latter rise to the height of 80 to 100 feet, and form part of a narrow belt of sandy country, parallel to the Eagle Hills.

Birch Gully.

Valuable timber destroyed by fire.

From Mr. SULLIVAN'S Journal.

June 18th, Friday.—The men engaged by Dr. Hector from the free half-breeds at Lake St. Anns had descended in the spring of the year to Fort Pitt by the boats of the Company's brigade for Lake Winipeg with the furs of the Saskatchewan district. He had then dispatched them from that place with a supply of ammunition to live among the buffalo until such time as their services were required by the Expedition, and they had encamped somewhere in the vicinity of the Eagle Hills. Accordingly Captain Palliser, accompanied by one of their party who had ridden over for orders a day or two ago, started at daybreak to bring them to join the rest of the Expedition. About two hours after his departure our carts moved off, and at five miles distance from the encampment we came to the Eagle Hill Creek, which takes it rise from one of the many Manito Lakes at the base of the Eagle Hills, and flows, at first eastward and then northward to the Saskatchewan. At our crossing place, which is six miles from the point where the creek unites with the river, the south end of the Eagle Hills bore N. 222° E., and the north end N. 292° E., and a conspicuous hill on the north side of the river bore N. 332° E. by compass. Our descent from the prairie level into the valley of the stream, for upwards of 130 feet, was by a precipitous road, made by the buffalos as they came down to the creek to drink. The valley possesses but little wood, the smaller kind of birch (*Betula pumila*) being the most plentiful, along with poplars and berry-bearing bushes. In many parts the stream was dammed up with the most consummate skill by the indefatigable labours of the beaver. We had scarcely managed to cross the stream before the sky, which had long threatened rain, at length poured down in torrents, and seeing no probability of its cessation, we encamped and protected ourselves as well as we could under the circumstances. The rain was incessant up to midnight, when it was followed by high wind. It will be remembered that it was this time last year that we were delayed at the Kakibeca Falls on the Kaministoquoiah River by the same cause.

Lake St. Anns men lived on buffalo at Eagle Hills.

Capt. Palliser goes over to bring them on to join the Expedition.

Eagle Hill Creek.

Rain on the anniversary of the wet period at Kakibeka Falls last year.

June 19th, Saturday.—Fifteen miles in a W. by S. direction over undulating prairie with numerous salt lakes brought us this morning to the base of the Eagle Hills, or as they are called by the Crees, "Mikashoe Watchee." We remained here for two hours, and then commenced the ascent, which was steep and winding. We obtained excellent sport among the ducks and geese on the numerous lakes along which we passed during the afternoon march. At 6 p.m. we had gained the summit and fixed our encampment near to the Lizard Lake, the place appointed by Capt. Palliser previous to starting on the 18th, having made an ascent of 600 feet. We here saw some herons' nests on the tops of high trees, which our party soon climbed, but they found the eggs were too far hatched to be eatable. Here we got a good view of the prairie stretching for miles at our feet, but our telescopes detected only a few timid antelopes with an occasional wolf as we anxiously kept a look-out for buffalo. This was unfortunate, as we were now in great need of an addition to our stock of provisions.

Ducks and geese in Lizard Lake.

Game scarce.

A little time after encamping the Doctor started to erect a signal which might guide the Captain to the Lizard Lake. In his absence a Cree Indian with his squaw and child arrived. The man was entirely naked, except a piece of buffalo robe wrapped loosely around him. His wife told us that he had gambled away his gun and clothes at the Indian camp, and that now, armed only with his bow and arrows, he was on his road to the south branch of the Saskatchewan in search of buffalo. The whole of their possessions were carried by two miserable dogs, which eat up all the cords and pieces of leather they could manage to steal as soon as they were relieved of their burdens. The Indian informed us that the peace between the Blackfoot and his own nation had been violated, and that a very large war-party of the former was on the road to the Cree country. The cause of rupture as

An Indian pigeoned.

Cree agressions on the Blackfeet.

usual, was horse-stealing. The Crees are invariably the first offenders, and, comparatively speaking, the Blackfeet exercise great forbearance towards them in return. They say to the former, "We do not give ourselves the trouble to come to your country for horses; you Crees have not a horse in your possession worth stealing." This is in a great measure true, for the Crees do not devote themselves to the rearing of horses like the Blackfoot.

Indian wars favourable to the fur trade.

The Indian warfare is advantageous rather than otherwise to the fur traders on the Saskatchewan. In the first place they get more horses in trade from the Indians, and in the second the Indians hunt very little in time of peace, as then the different tribes tent together, and live in ease and content; but in war time every Indian works for ammunition and supplies of all kinds.

Capt. Palliser joins with the St. Anns brigade.

June 20th, Sunday.—Still encamped at the same place. In the evening Captain Palliser joined us, followed by our St. Anns brigade. From daybreak to 3 p.m. the rain has been incessant, falling in torrents, with thunder and vivid lightning.

June 21st, Monday.—This morning we made our observations for latitude and longitude (lat. 52° 17′ 59″ N.; long. 107° 28′ 15″ W., at 10 a.m.), and the whole party moved off. From a knoll close to encampment a conspicuous hill bore by compass, north end of, N. 150° E., and south end of, N. 147° E.

The line of woods.

The extremities of the line of woods bore as follows: commencement of woods N. 96° E., and north end of, N. 320° E. At 2 p.m. we stopped for dinner at the Stoney Lake or "Mih-chet Assini Sahkiahgun," as it is called by the Crees, from the numerous stones scattered on the shores. It is three miles by two, and lies five miles off another lake of equal size extending in the same direction. At the Stoney Lake, with assumed latitude 52° 14′ N., the longitude was found to be 107° 35′ 4″ W. At 4 p.m. we again started, and at about ten miles from the lake we met a Cree chief, who confirmed the statement concerning the Blackfoot and Cree tribes being about to commence hostilities. He had just returned from the Blackfoot country, and had been near the spot where one of his tribe had been killed by a Blackfoot. After exchanging news, and giving a little present of tobacco, he left us. As we recede from the Eagle Hills, we observe that although our ascent of them was steep and difficult, yet the descent of their western flank is scarcely perceptible; in fact their high points, seen from the western side, appear only as the usual "bales" so often met while travelling the prairies. Since leaving our last night's encampment, we saw not a particle of wood, and the pasturage was the worst that we have seen. At 7 we encamped, having an hour before fallen in with a band of five buffalo bulls, two of which our hunters succeeded in killing. They had scarcely got the meat to camp, before the clouds, which had been long lowering in the south-west, poured down upon us, and a cold high wind followed. We had supplied ourselves, however, with a large quantity of buffalo bones and dung, before the latter became wet, so that we had the comfort of a good fire.

Cree and Blackfeet fighting commenced.

We continue our course along bare plains.

June 23rd, Wednesday.—At our dinner camp of this day the latitude was found to be 52° 14′ 37″ N., and longitude 108° 11′ 33″ W. The country continues entirely barren, with very poor pasturage, and a scanty supply of water, the latter being found only in small swamps and stagnant marshes. Buffalos have been seen in large numbers about 15 miles from our stopping place. At noon we came to a large coulée of about 500 yards broad, extending to the north-west and south-east, and at a level of 90 feet below the prairie level. We had expected to find wood here, but not a shrub was to be seen. The water in the lake too was so intensely saline that we were obliged to abandon it and seek a camp elsewhere; after riding for some time in different directions, we found only a swamp containing miserable herbage which had been cropped bare by the buffalos, and afforded but very scanty pasture for our horses, and a draught of water here was like a dose of salts.

Bad grass.

Salt water.

The Crees wish to visit our camp.

On our route to-day, we were informed by a Cree that his tribe had been anxiously awaiting our arrival among them, having prepared a deputation to wait on us; and to ensure an interview with our party they had moved their camp to a place where they would be likely to intercept us. They were going to demand presents of all kinds, among which a little *ishcoley wapoo* (fire-water) stood prominent. As we had always made it a rule, however, never to carry the latter article on the plains, there was no chance of their getting that; and to pass their camp and escape their numerous demands, we altered our direction slightly. Succeeding in this, we encamped for dinner in the old camp, which they had abandoned, with the view of crossing our original line of route. With assumed latitude 52° 14′ N., the longitude at this place was 108° 27′ 27″ W., and ten miles off a range of low hills extends in a N. by W. and S. by E. direction, known to the Crees as the *Oloowkiatinahk*, or Ear Hills. It was noon before we reached these hills, and, as we were in want of meat, some of us ran a band of buffalo, while the rest of the party halted near a lake, about three miles long, at their base. From this point we struck off in a W.N.W. course, passing over a succession of ridges similar in character to the Ear Hills, and lying parallel to that range. Between these ridges were prairie flats, marked with the same barrenness that we have previously remarked. We had seen those ridges from a considerable distance to the eastward, and had fancied that they were well wooded; but a nearer approach convinced us that what appeared from afar to be large trees were the small bushes, *Symphoricarpos racimosus* and (*Shepherdia*) *Ostea argentea* neither of which exceeded three feet in height. The latter was in full flower, and smelt deliciously. At 5.30 p.m. we encamped, and many of our party strolled off to hunt buffalo among the hills about the coulée. The longitude of our encampment, with assumed latitude 52° 21′ N., was determined to be 108° 44′ 25″ W.

We avoid them.

Killed buffalo.

June 25th, Friday.—It was 9·15 a.m. before we got on the march, as our horses had wandered a good distance in search of grass. Three miles to the westward we descended into a valley containing a large lake, fringed with a scanty growth of aspen and cratægus. This latter wood is of the hardest in the country, and is used by the half-breeds for pegs in carts, and other articles in which strength is an object. A section of the strata composing the prairies was exposed to view. From this point up to our present encampment in the *Wiyuahinou* valley, the country is very irregular, made up of rounded mamelons of almost pure sand, and dotted here and there by numerous saline lakes. The soil and vegetation are very inferior, and the country is probably of the same character up to the valley of the Battle River. At 3 p.m. commenced a heavy storm of rain, which lasted the rest of the day, accompanied by a perfect gale of wind. We had just finished running buffalo when the gale commenced, and in the midst of its fury we had the misfortune to lose one of our finest horses. As is usual, after a hunter has killed his animal, his horse is attached to the dead animal's horn, while the man cuts up the meat.

Cratægus, a hard wood.

A barren unfavourable country.

We lose a fine horse.

One of our party appearing on the knoll with a load of brushwood, the attached horse took fright, snapped his halter, and dashed off across the plains. Instantly four of our smartest men started in pursuit, and, as the horse had gone against the storm, it was a matter of considerable difficulty to track it. They continued to follow it till dark, but in vain, and they passed the night on the broad prairie, without a shrub even to shelter them from the storm. As soon as day dawned they mounted again, took up the horse's track, and recommenced pursuit. All their exertions to gain the lost horse, however, were in vain.

The men endeavour to follow him in the rain.

June 26th, Saturday.—The latitude obtained here was 52° 28′ 39″ N., and the longitude 108° 51′ 47″ W. The men returned from the fruitless pursuit of the lost horse so cold and drenched that we did not start to-day.

The men return without the horse.

June 27th, Sunday.—We remained in camp, and Divine service was read both in English and Cree. One of our men having been seized with acute inflammation of the lungs, resulting from his exposure to the storm on the night of the 25th while in pursuit of our lost horse, we delayed here for several days.

Antoine Shaw attacked with inflammation o the lungs.

June 28th, Monday.—Moved camp further down the valley for the sake of pasturage.

June 29th, Tuesday.—Remained at camp; sick man better.

June 30th, Wednesday.—Remained at camp. Weather very stormy, a heavy gale having prevailed from south-west since break of day.

July 1st, Thursday.—Remained at camp. Sick man better. Our stay at this place is advantageous to M. Bourgeau for botanical researches. The valley of the Wiguatinon, extending north-east and south-west, sinks upwards of 200 feet below the prairie level, and, like the numerous valleys we have met with the last week, is dotted with saline lakes. The north end of this valley is clothed principally by aspens; *Negundo fraxinifolium* (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, at which were the remains of an Indian camp, showing that a party had been here in the spring for the purpose of making sugar. The scenery in the neighbourhood of the Wiguatinon is very beautiful and diversified. Fine bluffs of wood and open glades, hills with bold outlines, rising sometimes 150 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 neighbourhood. 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 Wiguatinon valley; on the contrary, it seems to be general everywhere in this country.

Valley of Wiguatinon. Its botany.

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.

To night one of the scouts sent out to scour the neighbourhood of our camp reported that he had heard shots to the south, so the whole party were served out with ammunition and remained on the alert. There was evidently some party near, for the buffalo all appeared in motion as if they had been hunted. This morning the sick man had so far recovered as to allow of our starting.

An alarm.

At 9.40 a.m. we crossed the Wiguatinon, rounding the northern extremity of the two salt lakes in its south-western arm, and made for a conical knoll bearing about eight miles in a W. by N. direction, where we stopped for dinner. It had been used a little time before by a large band of Indians, as a site for their wigwams, and the debris of their fire was quite fresh. Here the longitude was found, with assumed latitude 52° 30′, to be 109° 2′ 30″ W.

July 2nd, Friday.—We moved on here about eight miles, and encamped in a delightful valley of about 10 square miles 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. Among the luxuriant growth of shepperdia which covered the bottom of this valley some 2,000 buffalo were lying and grazing, and with very little trouble we were enabled to kill several. One very fat cow, which we had killed, was found to be diseased. We were assured by our half-breed hunters that the disorder, which resembled the pleuropneumonia is common among the buffalo at certain seasons, but that it never prevents either Indians or half-breeds from making use of the animal for food, and that no bad consequences result from it. However, as we were well supplied with provisions at the time, we did not try the experiment. We sank a thermometer in the soil at this place to the depth of 3 feet; its indication, together with other thermometrical observations of like nature at different places, are tabulated elsewhere.

We arrive at a fertile valley.

July 3rd, Saturday.—At dawn our horses were harnessed, and about a mile from our encampment we crossed a small tributary of the Battle River, running due north. It is called Ambush Coulée from the following circumstance:—Many years ago a small camp of Cree Indians in search of buffalo made a temporary stay at this place. A war party of the Blackfoot tribe discovered the Cree trail, and cautiously followed it up until they heard the Cree squaws cutting wood for their evening fires. It was a dark night, so that the Blackfeet easily concealed themselves along the woody border of the stream, until all was silent in the Cree camp. Coming out then from their lurking-place, and stealing noiselessly towards the Crees, they rushed with one loud yell on their sleeping enemies, killing all but one very old man, and they returned in triumph. Ever since this event this part of the country has been known to the Crees as *Kanipa Kisiskoototohk*, "or the place where we were surprised while sleeping." At 1 P.M. we stopped for dinner at the base of a high hill, after traversing sand-hills for most of the forenoon, and one of our men succeeded in killing an elk doe, which he had stalked in the poplar woods. Passing over a succession of poplar-covered ridges, from the summits of which we got a fine view of the irregular country to the north and north-west, we were obliged to encamp at an early hour, owing to a storm of thunder and hail. Our horses became restless, as the hail-stones hit very hard. We were fortunate, however, in obtaining an excellent camp on the side of a small rivulet, with a good supply of wood. We noted here the two kinds of poplar, some fine specimens of the negundo fraxinifolium the shepherdia, and numerous berry-bearing bushes. It was evident that no Indians had visited this locality for some time, as the negundo (the sugar tree of the Crees) had not been tapped.

Ambush Coulée or Kanipa Kisiskoototohk.

Unfrequented portion of country.

This valley is bounded to 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. The sheet lightning continued playing in the northern sky, while the fire-fly, with its feeble efforts, lit up the surrounding coppice.

Fire-flies.

This little insect is an object of superstitious veneration with all the tribes of North America that we have seen. They regard them as the spirits of their departed friends holding their great feast on the plain, when the nights are quiet and warm and the buffalo are in the best condition.

Avoids an Indian war party.

July 4th, Sunday.—Remained encamped. Latitude and longitude obtained, 52° 34′ 25″ N., and 109° 23′ 40″ W. The Doctor started at early morning to the northward, accompanied by two men, and did not return until 8 p.m. He had fallen on the trail of a recent war party, and discovered that they had encamped near to us on the 25th of June, against the heavy rains of that date, by interlacing the branches of poplar in the shape of a sweating house, and their fires were very small. The smart hail-storm of yesterday has completely stripped most of the trees of their foliage.

Came in sight of the Neutral Hills, or boundary between Crees and Blackfeet.

July 5th, Monday.—The heat in the early part of the day was oppressive, and the musquitoes very troublesome, but the afternoon, on a sudden, became unusually cold, with overcast sky that predicted more wet weather. We had not long been on the march when a drizzling rain commenced, and before we could get under shelter we were all wet to the skin. We had only made 15 miles, in a W. by N. direction, when thus obliged to camp. From this place, the "Neutral Hills," to our south, at a distance of 20 miles, bore, north end N. 350° E., and south end N. 317° E. They are the recognized boundary of the Cree and Blackfoot tribes.

Nose Creek. Good soil on old forest land

July 6th, Tuesday.—We were delayed from making further progress until 11 a.m., owing to the unsettled state of the weather. At nine miles from this place we crossed a muddy creek only two feet in depth, which takes its rise in the Nose Hill, 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, and we have observed numerous plants which are seldom found except in woods and forests. The debris of large trees alone is sufficient proof that we are passing over what was once forest land. 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 at this date shows that spring is early, and our notes on the weather prove that the summer here is not too dry. As we were now rapidly nearing the Battle River, we had to decide as to the course which we should pursue. As the stream here takes a sweep into the plain, thus making our road to the forks of the Medicine and Red Deer River longer and more tedious if we followed along its south side, our guides recommended that we should cross the river, keep along its northern side, cut off the bend, and recross the stream at the point where we should again meet it. As the buffalos were very numerous, regulations were made to economize our ammunition, and to prevent the useless killing of animals. Besides, it is dangerous to the parties to let the men stray away from the main body to hunt. The latitude, by account, 52° 36′ N.; the longitude, by observation, 110° 23′ 45″ W.

We cut across a large bend of Battle River.

The poplar shoots all frozen this season.

July 7th, Wednesday.—After making a rapid ascent at this point over a poplar ridge, we descended into a valley filled with rounded sand-knolls and small lakes, the margins of which were clothed with poplars and willows. The tops of the poplars hereabouts seem to have been all frozen in spring. While passing through this valley we discovered a fresh moose track; Captain Palliser and one of the hunters followed up the track into the woods: shortly afterwards we heard a shot from Captain Palliser's rifle, and the moose came out with a broken leg: all hands now rode to head him before he reached a clump of wood at the end of the plain. At last he turned to bay, terrifying the horses (some of which threw their riders and ran off), but surrounded on all sides he at length fell, gallantly facing his enemies and riddled with balls and arrows. We halted in the neighbourhood to enjoy a feast of moose meat, mooffe, and gut sausage, dishes which our hunters and half-breeds prepared with great skill; the animal was in the prime of life, seven years old, and in splendid condition. His proportions, measured with a tape by Dr. Hector, were as follows: length, 8 feet 6 inches; length of head, 2 feet 6 inches; length from its nose to inner antlers, 1 foot 5 inches; girth of neck, 3 feet 6 inches; girth behind shoulders, 7 feet 4 inches; girth of belly, 7 feet 8 inches; height of shoulder, 6 feet 4 inches; height of rump, 6 feet; antlers, palmated with four prongs, 1 foot 8 inches long, but as yet not quite developed, being in the velvet, and quite soft. At 6 p.m. we arrived at the site of a great medicine lodge of the Blackfeet, where we could see the Battle River at a distance of only two miles. There is a great ceremony at these lodges. A tree in the midst of a rude fencing was decorated with curious characters painted on pieces of bark, and other offerings to the Manito. The tree is chosen by the woman who is selected by the majority of the voices of her own sex as the most virtuous in the camp. From hence we descended about 150 feet into the swampy valley of the Battle River; by following the buffalo roads we escaped getting mired, and crossed the stream, which is about 50 yards broad, and averages only four feet in depth. The country around is rich, and very suitable for agriculture. Its fine growth of woods appearing higher up the stream, chiefly poplar, with a few spruce firs, contained a large quantity of game in former years, but the incessant hunting of Indians and half-breeds there has made it at present a poor hunting-ground. We encamped in the valley just in time to save ourselves from a sharp shower.

Capt. Palliser kills a moose.

His measurement.

Offerings on the Manito tree.

The hunting of wood animals greatly injured of late years.

Battle River.

July 8th, Thursday.—Dr. Hector proceeded with two men and a pack-horse to examine the bend of the river, while the main party struck across the country to save distance, all of us intending to recross the Battle River and continue our course towards the west. Previous, however, to leaving, the latitude and longitude of our first crossing was obtained: latitude 52° 35′ 39″ N., and longitude 110° 50′ 7″ W. Ascending the steep and sheltered bank of the river, above a valley of the richest vegetation, we returned westward at the distance of 10 miles from the river, and reached the base of a very conspicuous landmark, called by the Crees *Hiskiwaornis Kahkohtake*, or the flag-hanging hill. From the top of this hill (which is elevated 400 or 450 feet above the plain) the Nose Hills bore as follows:—North end, N. 104° E.; south end, N. 113° E., 1st division; and north end, N. 122° E.; south end, N. 127° E., 2nd division. The Flag-hanging Hill commands an extensive view of the undulating country, with patches

of poplar and small lakes. The Surcee tribe of Indians use it as a place of assembly, and it is very rarely deserted by that people. Although we did not meet any Surcees in passing the hill, we were assured that they were somewhere in the neighbourhood, as we found a dead buffalo cow, yet quite warm, with an arrow through the heart. The Surcees have been for many years allies of the Blackfeet, but were originally of the stock of the Beaver Indians, a tribe inhabiting that portion of land which lies immediately to the north of Lesser Slave Lake. Although they frequently tent among the Blackfeet, yet the latter tribe do not speak their guttural language, while every Surcee speaks fluently the Blackfoot tongue, in spite of its great dissimilarity to their own. The Surcees appear to have a natural facility for acquiring different languages. Cree is common among them, and we have heard the young men make very excellent attempts at French. Being prairie Indians, their life and occupations are the same with those of the Cree and Blackfoot tribes. It is curious to remark that the goitre sometimes seen among the Crees, though very rare among the Blackfeet, is so general among the Surcees, that it is a matter of considerable difficulty to find a Surcee without a goitre* well developed. The tribe does not number more than 200 or 250 tents, or about 1,400 souls. In the proper place we shall speak at a fuller length of this people, as well as the other nations among whom our travels led us. We encamped about three miles from the base of the hill at a beautiful pasture ground which our horses seemed thoroughly to enjoy.

The Surcee Indians.

They are good linguists.

The goitre.

July 9th, Friday.—At 7.30 p.m. 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 in beds farther up the stream. As night advanced we saw two riders at full speed coming in the direction of our camp; and as they neared us we knew by the yell which they gave at intervals of a few minutes that they were not of the Doctor's party. They were two Surcees, who told us that the Doctor and his party had spent the previous night at the Surcee camp, and that he was now on the road with some Indians to join us. A large party of Piegans and blood Indians, they said, had recently started from this place to the Red Deer River, and having killed a Cree Indian were desirous of reaching a safe encampment, as no doubt a war party of Crees would be on their trail. Soon the Doctor arrived with 20 of the Surcees, who formed an advanced party of a large deputation that they intended to send to us next day.

The northern exposures generally the wooded ones.

Two Surcee Indians ride into our camp.

Dr. Hector returned.

July 10th, Saturday.—The latitude of this second crossing-place of Battle River was found to be 52° 28′ 25″ N., and longitude 111° 29′ 45″ W. We remain at camp, and send word to the Surcee camp that we are desirous of exchanging horses.

July 11th, Sunday.—We were visited by a body of about 70 of the Surcee tribe, headed by the chiefs richly attired in dresses ornamented with porcupines' quills, and trimmed with ermine. We invited them to sit down and smoke. The chiefs were pleased with their reception, and inquired all about the purposes of our journey; they remained with us the whole night. We observed that several of them had lost a joint of one of their fingers. This we learnt was the consequence of a custom common to them with many other kindred tribes, of biting off the joint of a finger when unsuccessful in the performance of a vow. Among their women also, as among those of the Blackfeet, it is not uncommon to find many without a nose, or minus an ear, bitten off by their husbands in a fit of jealousy.

Custom of biting off their fingers.

Punishment of their women.

July 12th, Monday.—Occupied till 11 o'clock in exchanging horses with the Surcees; they proved troublesome, and seemed as if they meant mischief, but thought us too strong and well armed for even their large party. We got rid of them as well as we could, and travelled a long distance before camping for the night in a tributary creek of Battle River. While travelling in the valley of Battle River, the musquitos there were wonderfully troublesome; and although we were all tolerably well used to their attacks, nevertheless we all and also our half-breed voyageurs suffered severely. The soil here was very rich, and the vegetation luxuriant. This small creek falls into the Battle River about four miles above where we crossed, and along its banks we found only the grey willow, with a few small poplars.

Surcees inclined to be troublesome.

July 13th, Tuesday.—The rain has been incessant up to this time, and as there were some appearances of a cessation towards noon, we moved on and arrived at a second creek. Our provisions were getting low, and Captain Palliser, with two hunters, were out in search of buffalo, while some of us that remained behind went off in quest of beaver. Numerous beaver dams had been observed in the small streams, and in former years, when beaver was prized as the finest of furs, this portion of country supplied a very large number to the ports of the Upper Saskatchewan. In the afternoon one of the hunters returned for pack-horses for the meat of six cows which Captain Palliser and the hunters had killed.

A good supply of fresh meat.

July 14th, Wednesday.—Eight miles from this place we encamped for two or three days to collect and dry provisions. We have named the camp "Dried Meat Camp;" its latitude was 52° 24′ 30″ N., longitude 112° 14′ 35″ W., by lunar. Captain Palliser started for Bull Lake, and our hunters set off to the south in hopes of meeting buffalo.

July 15th, Thursday.—At noon our party of hunters returned, bringing with them 11 animals, and we immediately set to work to slice them and dry the meat. By nightfall we had finished, and arranged it on poles, with small fires around it, in order to keep off clouds of bull-dog flies, which, for the first time this season, attacked our party. Hundreds of wolves, attracted by the scent, held themselves in câche at a respectable distance from us. We killed a few; but their skins at this time of year are not worth the ammunition expended. It is only in the month of January that the Indians hunt them, as at that time their skins are considered prime.

Wolves seen.

July 16th, Friday.—Captain Palliser, who yesterday returned from the Bull Lake, set off to Red Deer River: a second party of hunters was dispatched to the south for buffalo, and arrived at nightfall

* Probably the result of intermarriage with relations.

with seven. They had been 15 miles to the south without seeing those animals, and had experienced great difficulty in running, from the marshy character of the land, as they killed them on the borders of a lake 10 miles long and six broad, extending E. by N. and W. by S. Its waters are beautifully clear, and not in the least saline, and surrounded by a fine pebbly margin; and it was covered by large quantities of ducks, geese, gulls, and other aquatic birds.

July 17, Saturday.—At 3 p.m. we were again on the march for Red Deer River, and at 7 p.m. encamped. From the Battle River up to the present position the country is of the same character as that we first entered on July 6th, perhaps a little more irregular, but equally advantageous for the purposes of the agriculturist, and possessing excellent pasturage. The absence of fine timber, however, has been remarked, though in past years some good trees must have grown here. We had great difficulty in finding fresh water, the numerous swamps and small lakes being all brackish. Sometimes we have remarked several miles of country studded with these saline lakes; when the lakes and swamps which succeed are sweet and fresh we find the mosquitos a horrid torment.

July 18th, Sunday.—Remain at camp. Lat. 52° 23′ 24″ N.; long. 112° 34′ W. Heat very oppressive; see thermometer in shade of this date (75°).

July 19th, Monday.—At seven miles from this encampment we arrived at the small stream which issues from the Bull Lake, and after a south-easterly course for four miles falls into the Red River.

The La Queue and the Bull Lake.

This stream is known among the half-breeds as the "La Queue." The Bull Lake, or as it is called by the Crees, "Musloos Satikiegun," is so styled from the resemblance of its outline to a buffalo hide stretched out for the purpose of being dressed: the small stream, La Queue, representing the tail of the animal. The country about the Bull Lake is desirable for cultivation, but unfortunately no large timber is found. At the junction of the Red Deer and Medicine Rivers, however, fine timber is in abundance; and if ever a settlement should be established at that place, nothing would be easier than to raft timber on the Red Deer River down to within a few miles off. We hear from our engagés that the Rev. Pere Lacombe, the catholic missionary at Lac St. Ann's, has long contemplated removing to this locality, and we are of opinion that few places in the Saskatchewan could be found that offer greater facilities to settlers. In the valley of La Queue a few specimens of the Abies alba appeared, but the mass of the vegetation consisted chiefly of poplars. Crossing the stream we entered a curious valley, two miles long and one broad, the sides of which exposed sections of a light yellow sand, having mixed with it large pebbles of a chalky whiteness. The bottom of the valley, at this time perfectly dry, was covered by drift timber, and a limey sediment had formed on its surface. Close to this valley is a poplar ridge rising above it to the height of 200 feet in a north and south direction; while ascending its slanting side we came upon the trail of a large party of Indians going in the direction of the Rocky Mountain House; they were undoubtedly a Blackfoot war party, and had passed here only two or three days previously. On gaining the summit of the ridge our attention was attracted by smoke in the direction of Red Deer River, which we did not answer for fear of bringing a large party of Indians to our encampment. We were, however, inclined at first to do so, as Dr. Hector, who had started in the morning, had not yet come up with the main party, and we were apprehensive that he had lost himself, and that the signal fires were made by him to our party. But as Isidore, who is almost a pure Indian and an excellent hunter, had accompanied him, we came to the conclusion that there was no probability of his being at fault. Accordingly at 2.30 p.m. we moved off, passing numerous small lakes, and after crossing a second poplar ridge, which takes the same direction as the first, we

Dead Man's Creek.

reached a small creek, called by the Indians Dead Man's Creek. At this place spruce appear in fair abundance, and there is luxuriant vegetation in the low valley of the creek, which is hemmed in to the south and west by an elevated ridge. The vegetation is young, but the remnants of large trees, partially destroyed by fire, sufficiently indicate the extent to which this element has ravaged the country in this part also. At the Dead Man's Creek we again met the captain. He had fallen in and hunted with a small party of Rocky Mountain Stoneys or Assineboines, who were camped at this

The Rocky Mountain Stoneys.

place. The Stoneys are a small tribe of Thickwood Indians, whose hunting grounds lie along the base and in the valley of the Rocky Mountains. They are very poor, and go about almost naked, and suffer great misery through want of food. Occasionally they make excursions into the plains after the buffalo, but as a rule they confine themselves to the thick woods, hunting moose, elk, long-tail and short-tail deer, the big-horned sheep, and bears. They are very expert hunters. They are sprung from the same stock as the Plain Stoneys, and their language differs only as a provincial dialect from that of their kinsfolk of the plains. Unlike that nation, however, who possess all the vices common to the prairie tribes, the Rocky Mountain Stoneys are peaceful and inoffensive. They have been converted to the Christian religion, and are unusually attentive to the truths which have been taught them by the missionaries. Every morning and evening they devote a short space of time to religious duties, and make it a rule to rest from the labours of the chase and travel on the Sunday. The sacred music which has been taught them is most characteristic, and when singing in one of the solitary valleys of the Rocky Mountains, their chant sounds intensely wild. In former years they numbered far more tents than at present: now we believe there are only 35, or about 250 souls. There is a tribe

The Thickwood Stoneys.

of the same stock as the Rocky Mountain Stoneys, called the Thickwood Stoneys, whose hunting grounds are in the thick woods between the north branch of the Saskatchewan and the Athabasca River, and who are never found dwelling in the Rocky Mountains. The produce of their chase is brought to Fort Assineboine, while that of the Rocky Mountain Stoneys is bartered at the Rocky Mountain House. The "Thickwood Stoneys" are a larger tribe than the "Rocky Mountain Stoneys." They extend as far to the east as Fort Pitt, where they are replaced by the "Thickwood Crees," a tribe more allied to the true Cree of the plains than the "Swampy or Muscago Crees." We encamped at Dead Man's Creek. Paul's and Joseph's families arrive.

Spontaneous combustion of coal.

July 20th, Tuesday.—We remained at this encampment to-day to visit the coal beds, which were reported to have been on fire. It was found to be as the Indians had asserted, and far along the banks of the Red Deer River, where the coal appeared, the spontaneous fire was in activity. The Indians say that as long as they can remember this has been the case. Latitude observed 52° 19′ 25″ N.; longitude 113° 3′ W. by lunar.

July 21st, Wednesday.—At 8 a.m. we moved camp, and winding our way 8 miles through irregular and wooded country descended into a valley of Red Deer River. Our first experiment was to ascer-

tain if the river was fordable, but finding that it had a deep channel and swift current, we commenced to construct rafts for ourselves and baggage. This being accomplished without losses of any kind, we encamped on the right bank of the Red Deer River to allow of observations being made in the river valley. The depth of the valley is upwards of 200 feet, while the river averages 130 yards in breadth. On both banks the coal strata are seen, in many places 15 feet thick; but the quality of the coal is not superior to that found at Fort Edmonton on the north branch of the Saskatchewan River. On testing its value, it was found that the coal burns without any flame, but when once set on fire it burns for a considerable time. A few small pieces lit at night keep the fire alive till morning. The ash which it leaves resembles the ash of wood, and it gives out a good heat. There is a fair growth of wood in the valley of Red Deer River, and the further we proceed up towards its source the more plentiful that article becomes. Speaking from report, the river is navigable from this point down to where it joins the south branch or Bow River. The Bow River in like manner is said to be entirely free from rapids and other obstacles from this point down to where it unites with the north branch of the Saskatchewan.

Coal seen in the valley.

July 22nd, Thursday.—A rainy morning which turned out fine. We ascended the steep side of the river valley, and Dr. Hector followed up the course of the Red Deer River, while the main party kept more to the south to avoid the ravines and gullies on its right bank. At 1 p.m. we stopped for dinner, and were delayed in our further march till 5 p.m. owing to a thunder-storm. At 7 p.m. torrents of rain forced us to encamp for the night, and shortly after Dr. Hector arrived. He followed up the river's course for a considerable distance, and found the coal strata to disappear about 2 miles above our crossing-place, where it is succeeded by bold sandstone cliffs rising picturesquely from 160 to 200 feet. Some very fine specimens of the spruce fir, measuring from 1 to 1½ feet in diameter, were met with on the banks of the river, and numerous gullies, which add their water to the main river, displayed a fine growth of timber. We have remarked for the last three or four days that the grass and smaller plants have been beaten to the earth over a large space, probably by trail.

July 23rd, Friday.—After a march of two hours over swampy and uneven ground, rendered more tedious by a dense growth of willows and small poplars, we arrived at 8 a.m. at the "Nick Hills." An observation for latitude gave 52° 12′ 52″ north, and for longitude 113° 39′ 25″ west. Here we obtained our first view of the magnificent Rocky Mountain chain, which to the northward appeared like a blue line on the far-off horizon, while to the south they seemed more high and massive, their summits clad in snow, which glittered at intervals like silver crowns. Great excitement prevailed among our party at this sudden and unexpected sight, and we all looked to the Rocky Mountains as the long desired object which was to relieve us from the monotony of prairie life. From the "Nick Hills," which afforded us an excellent station for bearings, a low flat prairie extends far away to the north and west, the wooded borders of the Red Deer River being the only line of vegetation to relieve its barren surface. The three Medicine Lodges Hills bore from us N. 182° E. at the distance of about 35 miles, while the Antler Hill, towards which we bent our course, bore N. 114° E. at a distance of 9 miles. We arrived at this place at 1 p.m. and encamped for dinner. M. Bourgeau obtained some excellent plant specimens during our stay, which was only for two hours, when we directed our course towards the great prairies to our south. At 6 p.m. we encamped near a small stream, which, taking a N.W. course, falls into the Red Deer River, having passed over some undulating country with here and there clumps of fine balsam poplars entirely destroyed by the ravages of fire. It is most lamentable to see so often such masses of valuable timber destroyed, almost invariably by wanton carelessness and mischief. The most trivial signal of one Indian to another has often lost hundreds of acres of forest trees which might have brought wealth and comfort to the future settler, while it has brought starvation and misery to the Indian tribes themselves by spoiling their hunting grounds. The Indians, however, never taught by experience, still use "signal fires" to the same extent as in former years, driving the animals from their retreats and marring the fair face of nature for the future colonist.

The Nick Hills.

First sight of Rocky Mountains.

Prairie grounds burnt.

July 24th, Saturday.—At noon, in longitude 114° west, the observations gave latitude 51° 55′ 43″, and the bearing of the Devil's Head in the Rocky Mountains was observed by compass to be N. 210° E. In two hours' travel from this place we arrived at the edge of the great prairie, and encamped. Several of our party strolled off in search of buffalo, as our provisions were getting very low. 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 Wiguatinou Valley; and to do this let us imagine a line drawn from 60 miles south of Fort Carlton, which is on the verge of the great prairies, to the Wiguatinou, and thence produced 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 is inferior. Exceptions of course may be found, as for example in the neighbourhood of swamps and gullies, where the soil and pasture are better. The entire absence of wood on the prairie lands is felt by the Plain Indians during the severe months of winter. During the summer they use as fuel the bones and dung of the buffalo, but in the winter they are obliged to retreat to the borders of rivers where they can obtain wood.

Arrival at the Great Prairie. Its description.

Description.

July 25th, Sunday.—Latitude, obtained by a reduction to the meridian altitude of sun, and subsequently by meridian altitude of moon, 51° 52′ 50″ north, and longitude by lunar discs 114° 10′ 15″ west. No animals to be got in the neighbourhood; the Rocky Mountain Stoneys having tented here a long time. No news of Lieut. Blackiston; Dr. Hector started to the Forks to bury a letter for him.

July 29th, Thursday.—Remained at this camp, "Caché Camp," until the morning of the 29th July. We were then so driven for provisions that we were obliged to move off for the south. Our hunters had returned, but no buffalo were to be seen, consequently we determined on striking straight for the Bow River, as we stood more chance of getting provisions in that direction. One of the Stoneys, whom we engaged at the "Caché Camp" had some days before killed a moose, and the poor fellow very hospitably gave us half the meat. Previous to starting, however, we made a caché of all our bulky articles, so that we might travel unincumbered while in the mountains, and we left directions for Lieut. Blackiston to follow our cart track, as we had been forced to leave the Caché Camp. We had encamped for dinner when Lieut. Blackiston with his guide came on in advance of his party and made

up with the main body. After dinner we made seven miles and encamped on the banks of a small stream about three miles S.S.E. of our caché encampment.

Captain Palliser's Journal.

July 30th, Friday.—Lieut. Blackiston's carts came up, and soon after we all started together; our course was a little to the east of south. Camped early; made about 23 miles. We were now almost without provisions, but saw at a great distance two buffalo bulls. I sent out two light weights well mounted with directions to reconnoitre to the south-east, and ascertain if any cows were to be seen, but on no account to run them if they found any, but to return straight to our camp. We then continued on our course for another hour and camped; late in the evening the two men I had despatched arrived in camp reporting buffalo in great quantities about 10 miles to the eastward.

The country which we have passed over since leaving Caché Camp is poor pasturage, the soil sandy, with a proportion of white earth. The nights of late have been remarkably cold for the season of the year; the thermometer indicated half a degree below freezing point two or three nights ago. The same curious fogs which we observed at Turtle Mount in July 1857, are of nightly occurrence here also. They commence in the hollows between the prairie undulations just after sunset and gradually increase in density till they spread over the whole plains, giving them the appearance of a sea.

It is singular that we do not observe this phenomenon at the surface of small lakes and swamps, but only where no water exists.

July 31st.—Started before daylight; arrived early in the direction of the buffalo seen the evening before; halted for breakfast; the morning was cold and stormy. I allowed the men to wait until noon, by which time the buffalo would begin to lie down after feeding. They are then not so swift as if they were pursued early in the morning. We were now more than two miles' distance from the buffalo, who were not in sight, as we had taken care to take up such a position as that they could neither see us or get our wind; they were in such numbers that their peculiar grunt sounded like the roar of distant rapids in a large river, and causing a vibration also something like a trembling in the ground.

Buffalo hunt.

We had scouted the animals pretty well, so that all that remained for us was to eat our breakfast and make for the point of attack. Breakfast finished, our "runners" saddled and mounted, the whole party moved slowly on, the carts following in the rear of the "runners." Having ascended the slightly elevated ridge we then beheld our game, four or five thousand buffalo, some lying down, some grazing with the old bulls in the outskirts. At our appearance the wolves, who almost invariably accompany bands of buffalo, sneaked about and around, eagerly watching our movements, and perfectly aware that the events about to come off were to terminate in an abundant meal after the field was left to themselves. A few antelope were gracefully moving near the buffalo, and over the heads of all noisily soared some crows and ravens, and appeared quite aware that something was in the wind. Soon after seeing us the buffalo were in motion at a steady lope, crowding gradually into a thick black mass, and now the hunters came on at a steady canter increasing with the speed of the buffalo into a hand gallop; the old bulls were soon left in the rear as the pace improved, some stood blown and staring after they had made ineffectual attempts at charging the hunters on their headlong way after the swift cows. The run was magnificent, and there was considerable emulation between my Saskatchewan and my Red River men. We killed 17 cows, generally speaking in good condition, and were now not only sufficiently provided with meat for our present wants, but also enough to dry and preserve for the expeditions contemplated in the mountains. Several of the party got apparently very severe falls owing to the badger holes, but none were seriously hurt. In the evening we had fixed our camp and cut up and drawn in our meat.

Our camp, which we have called Slaughter Camp, is situated on the banks of a small tributary to the South Saskatchewan, in latitude 51° 21′; longitude 113° 50′. Here we enjoyed a magnificent view of the Rocky Mountains as the sun set behind their snowy peaks.

August 1st.—Men occupied in slicing and drying the meat and I in organizing the different branch expeditions. Remained here until the 3rd of August.

August 3rd.—Being unwilling to cross the mountains without previously knowing something further of the British territory to the south, and also being anxious to see what kind of land or what the quality of the land was in the neighbourhood of the international line from the base of the Rocky Mountains towards the east, I determined to make a rapid journey to the boundary line, distant about 170 miles. I arranged that Dr. Hector should ascend into the mountains in any direction which he thought most conducive to the interests of geological and geographical science; that Captain Blackiston should explore the two passes generally used by the Coutanies, crossing the mountains by the more northerly pass and returning by the more southerly one. I gave Mons. Bourgeau instructions to penetrate into the mountains as far as he thought conducive to the interests of botanical science. And to myself I resumed the exploration of a pass, the existence of which I had heard of when in the American Indian country in the year 1848, from Mr. James Sinclair, a very intelligent half-breed, well known and deeply regretted.*

Having made the above arrangements, I purposed, when I had visited the country in the neighbourhood of the boundary line, to return to the northward, and to meet the men and horses not appointed for the several branch trips. I had ordered these men to await Mons. Bourgeau's return from the mountains and also my return from the boundary line, our place of meeting to be the Old Bow Fort, situated in latitude 51° 9′; longitude 115° 4′. From this neighbourhood the buffalo were then not far off (as we had met them at Slaughter Camp), and I desired the hunters to kill, cut up, dry meat, and make "caché's" for each party, who would find their shares buried for them as they arrived in succession from the mountain branch, with the several branch parties under their command. I well knew that none of us would find much game in the mountains, and each would be glad to avail himself of the provisions by-and-bye which I was then organizing for them.

* He was shot unintentionally in an Indian row with the Americans at the Cascades on the Columbia River.

Having made the best arrangements in my power for fitting out and providing for the several branch parties, conducted severally by Dr. Hector, Lieut. (now Captain) Blackiston, and Monsieur Bourgeau, I prepared for my trip to the western extremity of the English boundary line, accompanied by my secretary Mr. Sullivan, our servant James Beads, Batiste Gabriel, and two more men, and 13 horses in all.

Branch expedition to the boundary line.

We started from the Slaughter Camp, in long. 113° 50′, lat. 51° 21′, at noon. On the 3rd of August our course was due south. We knew we had but arid plain to cross, with little hopes of water, save what a chance swamp might afford, until we fell on the South Saskatchewan River. Rode fast, and at about 6 p.m. arrived on the borders of a lake about two miles long, and more than a quarter of a mile wide. Found its waters salt, rested the horses for a short while, and, resuming once more our southern course, travelled till long after dark; camped without either wood or water.

August 4th.—When we awoke this morning we found ourselves about two miles distant from the river, saddled up and hurried down there as fast as possible. The river banks were about 120 feet high, and the river valley about one mile in breadth, bearing a fair growth of willow poplar, and berry-bearing bushes. One rough bark poplar there measured 9 ft. 7 in. in circumference, and we saw a fine hummock of spruce fir about two miles higher up the stream. We found the river about 200 yards wide, and its channel deep. Latitude where we crossed 50° 55′. Crossed our saddles, guns, and other effects, which were neither numerous nor heavy, in the leather tent, folding it up in a round shape, and wrapping the edges round a rope which confined it all round. We swam the horses across, and hauled our tent leather boat after us by cords attached to it, and found the stream bitterly cold, owing to our proximity to the mountains, in consequence of which the temperature of the water was not much higher than that of the glacier from which it emanated. On resuming our course to the southward, we found ourselves once more within the fertile belt; the land was good, and rolling in character, though frequently covered with boulders, which impeded our progress. The feeders to the south branch contained considerable growths of timber of a fair size. The valley and the country adjoining, which was undulating, contained fertile land and willow and poplar brush on its northern exposures. We crossed Pine Creek and Sheep River: the latter was a stream about 90 yards wide, and three feet deep, its valley about half a mile wide and well wooded, and here we camped for the night, after having travelled about 17 miles on a south course.

August 5th.—Had a very heavy thunderstorm and rain during the night, and in the morning we found that snow had fallen on the mountains, which now presented quite a wintry aspect. It was cold and wet, we did not get off till eight o'clock. Stopped to breakfast at 11.15, made 12 miles, easy travelling. The coulées were not so abrupt as yesterday, the timber was better generally, although none of it could be called valuable. Measured a balsam poplar, 9½ feet in girth at the height of my shoulder. Saw plenty of spruce fir on two insignificant tributaries which we crossed. I could not obtain a noon observation, but guessed the latitude of where we crossed the second creek and breakfasted, to be 50° 30′. Started off again at 1, and soon after saw a single buffalo cow. Changed my saddle on to Pharaoh, who was running light. He took me a long run to the east, almost to the edge of the plains. Again I carried off as much meat as I could stow away, and came up at seven in the evening with the rest of my party at the north-west extremity of a high hill. This hill I climbed, and found a spring near the top, from which trickled a beautifully clear spring, half choked with buffalo bones; these lay in masses around. Probably a large band had perished there, rolled one over the other in a snow drift. Got lat. Polaris 50° 6′.

August 6th.—Started at seven, found we were now riding along the western flank of the Porcupine Hills. Crossed a tributary to Bow River of considerable size, name unknown. Proposed to the men to call it Arrow River, as it belonged to Bow River. The proposition was highly approved of, and this stream is now Rivière de la Flèche. Arrived at Montagne des Porque épique, or Porcupine Hills, and camped at a considerable elevation. Saw some very old stunted cedars; was disappointed at the timber. The whole place was more or less destroyed by fires.

August 7th.—Started early from Porcupine Hills, preserving still (as much as the inequalities of the ground permitted) a south course; arrived at 11½ at Little Belly River, crossed it in lat. 49° 32′. During the whole of the forenoon travelled over poor flinty and sandy country; during our ride this afternoon the land greatly improved in character, and was, in some places, rich; travelled about 14 miles since noon.

August 8th.—Started at 9, travelled till 11½, took observation, lat. 49° 5′, and camped about six miles. and in full view of the Chief Mountain, thus accomplishing our journey of over 180 miles in five days.

Leaving Mr. Sullivan in charge of the camp, about 5 miles from the boundary line, I took with me Batiste Gabriel, a first rate rider and smart little hunter. We were both mounted on the best buffalo runners, and started for the boundary line in a E.S.E. direction; these horses had done no work, but had been trotting free during our journey from Slaughter Camp, so that I had means for getting over a good deal of ground, and making the best use of my time on the only day I could spare for examining the western extremity of the British boundary line on the eastern side of the Rocky Mountains. I was, most probably, the only white man that had ever been there. After a sharp ride of about 15 miles we ascended a conical hill, about 16 or 18 hundred feet above the plain, which I called Observation Mountain, situated from Chief Mountain a little to the north of east. This hill is a portion of a range of rocky spur running at right angles from the chain of which Chief Mountain forms so prominent a feature. Ascending Observation Hill we rode through forest to a considerable height; before emerging from the trees the hill became grassy and very steep. Dismounting, we attached our horses to two trees and climbed to the top of the hill. The very great extent of view from this high hill top well rewarded the exertion. I could now trace the feeders of the South Saskatchewan by their fringes of poplar and willow, or by their banks along the sandy waste, as they rose from their reservoirs in the mountains, taking first an eastern course, and then bending away to the northward. In the N.E., almost at our feet, lay the Gros Ventre Lake, from which I could trace the Belly River running to the eastward, and finally sweeping away to the north, to pour its waters into the South Saskatchewan. I saw, however, no tributary from that point of observation likely to prove a feeder to the Missouri; all waters after running a few miles to the eastward bore away to the northward. As far as the eye could reach to the north and east was an apparently boundless sandy plain. The sun set gloriously behind the Chief Mountain just as I would have given anything for one half-hour's longer

light.* A splendid moose then stepped out of the woods about three-quarters of a mile below us, displaying his gigantic though somewhat grotesque proportions. Batiste lamented the approach of night, on account of the proximity of the moose. But we had no time to lose, we had a long ride before us, so hurried down to our horses, and reached the plains as twilight ceased; we then started for our camp, but what with the numerous lakes, and the quantity of woods through which we had to force our way, we had to give it up, unsaddle and hobble the horses, lighted a fire, and waited till day-break.

August 9th.—We found the horses at daylight, and found ourselves not more than three miles from camp, rode in and found them all asleep, got breakfast, rested, and got away on our journey north again at 2½ p.m.

August 10th.—Started early, travelled along the track we had made on our way to the boundary line, passed our camp where we had slept on the night of the 7th, breakfasted where we had breakfasted on the morning of the 7th; after breakfast diverged from our former track, as we were bound for the Old Bow Fort, which was both considerably to the westward and southward of Slaughter Camp, from whence we had started, we therefore crossed Belly River a little nearer the mountains, in lat. 49° 34′; here were exposed some remarkably fine sections of sandstone on the banks of the river, some of them nearly 200 feet high and in curious fantastic shapes, and varying in their colour, which sometimes was that of rusty iron, and in other places bright red.

August 11th.—Our provisions quite exhausted. Stopped at 11; while in the act of dismounting a deer jumped out of the bush quite close to me and I shot it. Took latitude 49° 57′.

In the afternoon fell on an Indian trail, which took us along a narrow ledge of land elevated some 20 or 30 feet from the lands on our west, and more than 200 feet higher than the prairie which dipped suddenly into a great basin. The plateau we were riding along was never more than 200 yards wide, and in some places not more than half that number of feet across; this singular strip of table-land extended for four miles, due north and south, and in the bottom of the basin were three long lakes divided the one from the other by narrow rushy swamps, indeed the third lake was more a swamp than a lake. Batiste and I descended the plateau into the basin with great difficulty, on account of its steepness, in order to hunt an elk at the west side of the swamp, in which we were uncommonly near leaving our horses, who sank to their bellies; we had considerable trouble to get them out, and had to climb the plateau again, along the top of which we had to continue, and after dark caught sight of my party's camp fire.

August 12th.—We now were over persuaded by Batiste, and very foolishly left the Kootanie trail and pushed on more directly to the westward for the Bow Fort. Here we for a long time pushed our way through spruce fir and small pines, and at last got stuck in the fallen timber, and obliged to try back to the east again.

August 13th.—Travelled through woods in a north direction, crossed two or three little creeks, could not obtain any observation. Beads killed a deer, very opportunely, for we were nearly out of provisions.

August 14th.—Started at five; came in sight of the South Saskatchewan about nine o'clock. Batiste ascended a grassy patch of high land, from whence he descried the large white tent of my men, on the north bank of the river. Near this the Kananaskis River joins the main stream; we crossed the Kananaskis River in order to follow higher up the South Saskatchewan, to find an easy crossing. Some of my men now came down to the river and shouted and beckoned to ride higher up.

We rode about five miles higher up. We saw both in the banks of Kananaskis River and those of Bow River curious horizontal sections of variegated marls, of purple, blue, red, and yellow colours, some not more than two inches in width, and none over nine inches of thickness.

Continuing our ride along the south bank of the South Saskatchewan or Bow River, we passed three successive falls of the river; these falls, like the whole surrounding scene, were wild and beautiful. We were now right in the mountains, which towered majestically above us. Above the third fall we crossed the Bow River easily, descended the opposite bank of the river again for about four miles, and reached my hunters' camp before two o'clock, situated close to the ruins of the Hudson Bay Company's Old Bow Fort.

On my arrival at Bow Fort Camp I found that the hunters had not been very successful; they had not fallen in with buffalo in that neighbourhood, and had found the elk and deer very scarce, so that they had not procured much spare meat. I found them also in great dread of the Blackfeet and Blood Indians. This is now nearly the time, too, when these Indians commence to arrive from the plains in the south-east, for the buffalo in winter approach the edge of the woods, and so also do the Indians, seeking fuel and thickwood animals, in case of the buffalo failing them during the winter. I now ordered the hunters only to wait for the return of Mons. Bourgeau from the mountains, and then start with him, and proceed as far as the forks of Red Deer and Medicine Rivers, where they would not be likely to be molested by the Blackfeet, and there they were to await Mr. Sullivan's return.

My plan would have been to have proceeded westward to Vancouver's Island after crossing the mountains, and leave the men and horses to return to the eastern slope and thence to Edmonton, under charge of Mr. Sullivan. I was aware that Captain (now Colonel) Hawkins of the Engineers was engaged in laying down the boundary line from the Gulph of Georgia towards the Rocky Mountains, and a Government despatch received by me last spring expressed a desire that I should communicate with Col. Hawkins. Doctor Hector and Lieut. (now Capt.) Blakiston had each started on their several branch expeditions two or three days previous to my arrival here; I also found that Mons. Bourgeau had left on his botanical tour.

August 16th.—The wife of one of my hunters was taken very ill with inflammation; I feared she would have died. I blistered her severely, and gave her a great deal of medicine. I was occupied in making arrangements with the men who are to return to Edmonton. I retain Mathison and Ballenden throughout the winter; they are to commence cutting hay the moment they arrive at Edmonton, to help the horses through the latter part of winter and commencement of spring.

August 17th.—Busy making cachés and burying dry meat for Blakiston's and for Hector's parties, in case they should get short, and not be able to support themselves in the mountains. Wrote to the

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* My view to the southward was limited by high broken land jutting into the plain behind me as I stood facing the north.

gentleman in charge of Fort Edmonton, respecting my disposition of the men. Joseph's wife's face broken out; I am sure it is small-pox, but do not like to tell them so. She appeared to be better and free from pain, but very weak.

Took a lunar to obtain longitude of the Old Bow Fort at about four o'clock in the afternoon; result almost the same as one of two taken by Sullivan. The Old Bow Fort, close to which we were now encamped, is situated in latitude 51° 9′ north; longitude (by a mean of two sets of lunar observations) 115° 4′ 22″, and its elevation above the level of the sea (by boiling-point thermometer) 3,963 feet; the only portion remaining of this building are the stone chimneys; the rest of the fort, which was only of wood, has long since been burnt by the Indians. The scenery around is mild and beautiful. Its site is at the base of the Rocky Mountains, which tower above it to the height of 3,000 or 4,000 feet, the white summits of which, from a sprinkling of snow that had recently fallen, formed a pretty contrast with the dense sombre forests at their feet. The Bow River flows by in all the wildness of mountain character, foaming at intervals over ledges of rock in its valley, and then rushing onwards between high banks, clad with luxuriant vegetation. The Bow Fort was established by the Hudson's Bay Company, for the purpose of trade with the Slave Indians, a name applied by the Crees to the Blackfeet, Piegan, and Blood Indians. These tribes are considered by all who know them as the wildest and most dangerous of the aborigines in British territory. The fort was ultimately abandoned by the Company, owing to the expenses involved in keeping a sufficient staff of men for its protection. The barter was chiefly for provisions and buffalo robes, and very few of the fine furs were obtained, so that by the time the goods were transported, and the few furs sent to Lake Winnipeg, very little profit resulted. Besides frequent attacks were made on them by the Blackfeet, and several of the Company's servants lost their lives in defending the establishment.

The establishment of the Hudson's Bay Company, and subsequent abandonment.

Although my hunters had not been as successful as I could have wished during my absence, yet they had managed to save some meat for myself and the party I was obliged to take with me across the mountains, by some contemplated pass. This pass I have called Kananaskis pass, after the name of an Indian, of whom there is a legend, giving an account of his most wonderful recovery from the blow of an axe, which had stunned but had failed to kill him, and the river which flows through this gorge also bears his name. Of the existence of this pass I had learned from my friend, the late Mr. James Sinclair, a half-breed gentleman, formerly resident in Red River; this gentleman had informed me of this pass so long ago as the year 1848, and told me that he intended to try it the next time he made a trip across the mountains. Mr. Sinclair did cross the mountains since that period, and most likely did adopt that pass; this was not, however, the route adopted by Sir George Simpson, in his journey across the continent of America. Sir George Simpson's pass branched off from the Vermilion pass, and it was shown to Doctor Hector by one of his men, James Richards, a half breed, who had accompanied Sir George Simpson when he crossed the mountains. Dr. Hector did not follow up that pass, as it was hardly deserving of the name of a pass, because it involved the crossing of three heights of land, but nevertheless is a most direct route.

August 18th.—At noon we had completed the preparations for our departure, and, with a party of four men and nine horses, commenced our journey across the Rocky Mountains. Ascending the Bow River for about five miles, we forded the stream at the distance of about half a mile above where the Kananaskis River joins it. Making for an opening in the mountains, through woods of cypress (*Abies alba*) and fine poplar, with a dense undergrowth, we at length fell on an old track, much encumbered by masses of fallen timber lying in all directions, the result of fires in former years. A few skeleton tents, that is to say, poles arranged in the shape of an Indian wigwam, told us that we were following a hunting track made by the Indians evidently a very long time ago. We soon met the River Kananaskis, and crossed it. Here it was flowing in an easterly direction, but its course before reaching the Bow River is northerly. Our course to this point has been south by west, and our distance from the entry to the pass about six miles. We now had a magnificent view of the valley of the Kananaskis River, hemmed in on either side by an unbroken wall of mountains, the sides of which, for about 1,000 feet, are richly clad with pines. After a short halt for dinner, we followed up the course of the Kananaskis till 6 p.m., when we encamped for the night. If it were not for the density of the woods, and the obstructions caused by the fallen timber, there would be no great difficulty in taking carts as far as this point. Our Stone Indian hunter shot a black tail deer to-day.

We start on our journey across the Rocky Mountains.

August 19th, Thursday.—Shortly after moving off this morning old Paul shot a second black tail deer. At noon the mountains were capped with clouds, and a little rain fell. We were not prevented, however, from obtaining an observation for latitude, and found ourselves in 50° 54′ north. From this point we kept on a general S.S.W. course, and were all very much fatigued when we encamped for the night, having worked hard with the axe in clearing the fallen timber almost all day long. Here I observed a very satisfactory proof that lightning in the mountains must frequently be the cause of fires, and that all forests are not destroyed by the hand of man, for we saw whole masses of forest, isolated in mountain cliffs, fallen by fire, the mountain trees burnt in places so precipitous that no human hand could ever have reached them. The obstacle which a burnt forest presents to the traveller is of all others the most arduous; sometimes we were in a network of trees, lying at all angles the one to the other, and requiring no small amount of skill to choose which should be removed first. It was extraordinary to observe the great care taken by our horses in extricating their feet and legs from dangerous places. The poor brutes seemed to be very expert at this kind of work, and even when caught they would evince the utmost patience, and free themselves as gently as possible. We have passed many bears' lairs on our march to-day, and within 20 feet of our camp fire a grizzly bear had taken up his lodgings only a very short time previous to our arrival. Some of these grizzly bears are of an enormous size; they are fond of the turpentine of the pines, and are capable, when standing on their hind legs, of reaching up the stems of the trees, and stripping off their bark to the height of nine or ten feet, in order to obtain the turpentine that oozes out; but although black bears are great climbers, the grizzly bears are never known to ascend trees.

August 20th, Friday.—Keeping almost a southerly course till noon, we arrived at a patch of prairie land, which offered good feeding for our horses, and, as such places are rare, we encamped for dinner, and obtained a latitude observation, 50° 45′ north. About four miles south of this place, there is another similar patch of sward, and at its western extremity the wild and beautiful Kananaskis river leaps over

a ledge of rock in its valley from the height of 20 feet, and rushes on its way through a dense forest of pines. Piles of drift timber, carried down by the spring floods, lay here and there in sheltered bays along this part of the river, including pine trees, with their roots encumbered by masses of rock and gravel, swept down by the spring floods. At about four o'clock in the afternoon the Indian pointed out two elks. We turned aside to hunt them ; I was fortunate enough to kill them both. We camped early, and cut up and secured our meat, as this would most probably prove the last spot where we could find game before again leaving the mountains. Two very conspicuous mountains at a distance of about 12 miles to the south of us flank the height of land across which we shall have to pass to gain the western side of the watershed. From a lake at the base of the more southerly mountain a large tributary of the Kootanie has its source; and after an almost due southerly course it joins the main stream near the 49th parallel of north latitude. This river is hemmed in on either side by mountains, the sides of which rise almost perpendicularly from its surface.

August 21st, Saturday.—By noon we had arrived at the base of the two high mountains alluded to above, an observation for latitude gave 50° 37′ north. We remained here for about two hours, to take our observations. We were in a level meadow, hemmed on all sides by a dense forest of pines, which stretched far away up the mountain sides. Higher up the valley is the glacier, which forms the source of the Kananaskis River. This glacier sends off the mountain sides hundreds of small streams, which, under the sun's rays, had the appearance of silver threads. The mountain goats higher up, which looked like small white spots in slow motion, seemed to eye us as intruders. At our feet the river, which above this place spreads out into two lakes, flows through a contracted channel with great rapidity. From it we obtained some splendid trout; we got two kinds; the flesh of one was of a bright salmon colour, and of a fine flavour, far superior to the other, which was white. Crossing one of the lakes which forms part of Kananaskis River, and continuing our course to the point where we intended to make our ascent, we came on a magnificent lake, hemmed in by mountains, and studded by numerous islets, very thickly wooded. This lake, about 4 miles long and 1½ miles wide, receives the waters from the glacier above, and is a favourite place of resort to the Kootanie Indians. They cross the height of land from the west, and go off in canoes to the islets in the lake, for the purpose of hunting the elk, an animal which seems to prefer these wooded islands to the denser forests on the shore. While going round the edge of this sheet of water, where the fallen timber greatly embarrassed us, one of our horses, strangely enough, adopted the other alternative of swimming across the lake. This effort of intelligence caused us serious misfortune and dismay, as his pack contained our only luxuries, our tea, our sugar, and our bedding. For about a mile from this lake our course was difficult to the horses, on account of the broken rocky character of the country. In some places large blocks of the limestone, which composes the mountains in this part, were lying all broken and heaped in a singularly artificial manner. A few grouse have been killed, but we shot very few of any other kind of birds, excepting owls. We camped close to the Kananaskis River, at the base of the most northerly of the two high mountains noticed above. Here the river was flowing rapidly over a steep incline to the lake we had left, and above us the lofty cone-shaped mountain reared its apex to a great height, the passing clouds sometimes hiding its summit from our view. We now arrived at the termination of the lateral valley, through which the Kananaskis River follows to join the Bow River; the only serious obstacle we have met with arises from fallen timber, otherwise the course is practicable enough and almost devoid of swamp. The rise also from Bow River is inconsiderable.

August 22nd, Sunday.—We started from our encampment at half-past seven, and travelled till 10 a.m., when we reached the edge of the pine woods at the base of the height of land, took an observation for longitude, 115° 27′, then breakfasted, and at noon took observation for latitude, 50° 37′ 40″. Started again at half-past twelve on our ascent, which we found much easier than we had anticipated. At two we had nearly reached the height of land. We then stopped at a spring to rest the horses, after which we completed our ascent in a few minutes, having gained the height. Our course was circuitous, owing to the rocky nature of the summit level, which was not altogether devoid of timber. At about half-past four p.m. we camped at a small lake, about half an acre in area, where there was some tolerable grass for the horses. From this lake flow the first waters we had seen which descend to the Pacific Ocean. With these waters we supplied our tea kettle, while our scanty supper of tough elk meat was boiling in the waters of the Saskatchewan. The altitude of the summit level was by barometric measurement 731 feet above the valley of the Kananaskis River. The readings at the eastern base and at summit level are—

At base.	At summit.	D. of level.
24·52	23·76	731 feet.
·36	·77	
·33	·76	
	·74	
	·72	
	·70	
	·69	
24·403	25·736	

Very little vegetation appears along the summit of the watershed, which is overspread with masses of stones and rocks, and the only animal which we have seen is the siffleur, whose shrill whistle we heard for the first time close to our encampment of to night. It inhabits crevices in the rock, and when full sized is not larger than the common badger of the plains. It is excellent eating when fat. There are two species of this animal, but one only was seen there by us. Its fur is of a mottled grizzly brown colour, but of little value to the trader ; the fur of the other species is black, tinged with brown. The Sposshewass Indians make robes of siffleur skins; and these are almost the only clothing they possess. Towards dark the summits of the mountains became wrapped in misty clouds; this, combined with our proximity to the glaciers on either side, and the scarcity of wood for our camp fire, caused us to pass a chill and uncomfortable night

August 23rd, Monday.—Started after breakfast, rode along the southern border of our little tea-kettle lake, and commenced our descent of the western slope of the Rocky Mountains. Following the stream that issued from the lake we observed it grow larger and larger as it received innumerable little tributaries, until it at last became a broad and rapid, although shallow, stream, and assumed the dimensions of a considerable river. The first 300 feet of our descent was very steep for the horses, as well as rocky and covered with loose shingle, but as we descended the valley the slope became less formidable; at the base of this slope in the valley of this river (which the men ever afterwards called Palliser's River, to distinguish it from the other branch of the Kootanie River) we took readings, which may thus be compared with those taken in the valley of the Kananaskis at the other side of the height of land: Descent of the western slope.

Mean Kananaskis River.	Mean Valley of Palliser's fork.
24·403	24·845

Thus showing the valley of the western stream 465 feet lower than that on the eastern side of the height of land.

The rain was continuous up to 10.30 a.m., when a bright hot sun dispelled the clouds which hung over the mountains. We took shelter under some splendid trees on the left bank of the river till the rain passed, and then continued our river course along the river valley; passing here, as on the other side of the watershed previous to our ascent, immense debachals of broken limestone. At noon we encamped for dinner on the right bank of the river, in latitude 50° 38′ 55″ north. A remarkable change was observable here in the increased luxuriance of the vegetation, and also in the appearance of shrubs that we had not seen on the eastern side of the mountains. Amongst others, a species of raspberry with a remarkably wide leaf grew abundantly. At 1.30 p.m. we again got under weigh, and kept a S.W. by S. course till 5 p.m., when we encamped for the night on one of the many islands in the stream. We continued our march during the latter part of the day alternately along either side of the stream, crossing the river frequently, and for the sake of convenience sometimes riding in the river itself, in order to avoid the fallen timber. Its valley is of great breadth, and the mountains which form its sides retire to a good distance on either hand.

August 24th, Tuesday.—The latitude obtained at noon was 50° 30′ 14″ north, and our general course since noon of yesterday has been S.S.W. In the afternoon we encountered more fallen timber, and at one point in the river, where it is shut in on either side by mountains, which rise from its surface almost perpendicularly, we made a considerable ascent, thus cutting off a sweeping bend. The mountains in this part changed their geological formation, being composed of clay slate instead of the limestone, which characterizes the outer range of the Rocky Mountain chain. Towards nightfall we were almost entirely stopped by the fallen timber, piled in some places to the height of 5 or 6 feet, and rendered still more impracticable by a dense growth of young pines which crowded themselves above the fallen wood. A bright moonlight assisted us in hewing our road, and it was nearly midnight before we could obtain water and a scanty herbage for our jaded horses. Palliser's River at this place is a wild stream, contracting its channel gradually until it discharges its waters through a gorge in the mountains measuring only a few feet across. The sections of clay slate are very fine at this point, and the beds are nearly horizontal.

August 25th, Wednesday.—Seeing our difficulties increase we sent two axemen ahead to cut a road for the horses before we left our encampment; about 10 p.m. they returned, and we got under weigh and started. Our course lay along the side of the mountains on the right bank of the river, where the slate strata appeared to incline to N.E. The softness of this rock is very remarkable. It can be broken by the slightest pressure of the foot, and is easily dug out from its stratified position by the hand. We observed numerous berry-bearing bushes all along the mountain sides, facing the south. The raspberry and blueberry were by far the most plentiful. This latter attains a much larger size on the west than on the east of the Rocky Mountains, and when dried formed an excellent addition to our tough elk meat. The soil in which these bushes grew was of a light yellow sandy mud, which lay in large deposits between the hollows of the mountains, and also formed the immediate banks of the river.

August 26th, Thursday.—We came upon a few recently deserted tents of the Kootanie Indians; these, unlike the buffalo skin lodges of Indians on the eastern side of the Rocky Mountains, are formed of flat boughs of the cyprée and prushe, and are covered with birch bark. At noon we arrived on the main stream, in lat. 50° 27′ 21″ N., long. 115° 43. In the valley of this river we still found the white chalky deposit forming a remarkable feature, which frequently assumes the appearance of grotesque figures and ancient castles, and here also we found poplars for the first time west of the Rocky Mountains. We may now be considered as having terminated our descent, and although our observations made with aneroid barometers are not so accurate as we might wish, yet the following results have been obtained by a careful comparison of them, and may be considered a fair approximation. Meteorological observations.

	feet.
Considering the Bow Fort at an elevation of	4,100
Above the level of the sea, the rise of Kananaskis River to the eastern base of the height of land, was estimated at	950
Immediate rise to the height of land	750
Total ascent of the height of land	5,800
The first steep descent to the west	350
Further descent to the west base of height of land	850
Further descent to junction of Palliser and Kootanie Rivers	950
Total descent of the height of land	2,150
Subtracting these, we get the altitude of the Kootanie above the sea, which agrees with observations of Doctor Hector taken independently higher up the river	3,650

From the forks of the Kootanie there is a track to the Columbia Lakes, but so overlaid with fallen timber that we could afford neither time nor provisions to pursue it. Crossing the stream we followed the Kootanie tract on the left bank of the river, with nothing to impede our progress, and encamped after going ten miles in a south by east direction in the valley of the river. We found many small squirrels there, as in fact we did generally all through the mountains.

August 27th, Friday.—We crossed a small tributary of the Kootanie River, and had not gone far before we were stopped altogether by the precipitous character of the mountains on either side. It was decided that we should cross the stream, to ascertain whether any track existed along its right bank. Rafts were constructed and our horses swam the river. The temperature of the water was low, and the current very strong; we were carried a considerable distance down stream before reaching the other bank. It was noon before we could again start, and therefore obtained our latitude, 50° 19′ 24″ north. In the neighbourhood of our crossing place a few birch and a large quantity of cedar of beautiful growth covered the mountain sides. In the numerous ravines and gullies along our afternoon's track we found several sorts of berry-bearing bushes, among them the mooseberry, the moosoonima of the Crees, and the raspberry with the large leaf already noticed. The silver-berry willow also was in great abundance. The track to-day has been very bad, passing along a series of ravines, rocks, and gullies.

August 28th. Saturday.—From 5.30 a.m. to 11 a.m. the road we traversed was as bad as that of yesterday. We passed through groves of poplars, and the remnants of fine red pine timber show that at one time this tree must have grown here in great quantities. At noon we were in lat. 50° 10′ 12″ north; longitude by acct. 115° 50′ west. Captain Palliser, accompanied by our Stoney guide, ascended one of the mountains to obtain a view of the Columbia River, while the remainder of the party with Mr. Sullivan started to fix a conspicuous camp, and await his return. At three miles to the S. by W. of our dinner camp, we were opposite to the first of the Columbia Lakes, which at this point is only two miles distant from the Kootanie River. Towards evening we had a violent thunder storm and torrents of rain. The Captain, who had started without coat or waistcoat, remained out all night, and we ourselves were not much better off, being soaked through even in our encampment, without a tent, and with but two or three oil cloths to shelter us.

August 29th, Sunday.—At early morning the Captain arrived, having passed a pretty hard night; the lightning however had enabled him to descend the mountain and reach our camp very early in the morning. At 9 a.m. we recrossed the Kootanie River, and, continuing a south by east course till 11.30, stopped for dinner nine miles to the north of the point where a large tributary joins the main stream from the east. Our latitude here was 50° 1′ 14″ N. The river banks here display yellowish sandy mud, and the valley is composed of the same material. A few salt lakes are found on the left bank of the river, and we saw large quantities of bushes bearing small cherries, which are very extensively used as the principal food of the Kootanie Indians. Throughout the tobacco plains these cherries are very abundant, the sandy soil being suited to their growth. Encamped on the left bank of Kootanie River.

August 30th, Monday.—An accident here deprived us of all further use of our barometer. Our latitude was 49° 42′ 4″ N., and longitude 115° 33′ W. Just as we were about to encamp, a Kootanie Indian, the first human being we had seen on the west side of the mountains, made his appearance. A slight difference was observable in the cast of his features to that of the tribes we had previously been among. He informed us by signs that his camp was quite close by, and although not one of our party could speak a word of his extraordinary chuckling language, he nevertheless succeeded in informing us that he had seen Lieutenant Blackiston's party, that they had passed five days previous, that no traders had come to the Kootanie fort yet, that the Colville Indians had plundered them of their goods, and a wonderful amount of news besides, all by means of certain signs intelligible enough to our Indians and half-breeds.

While we were taking dinner the Indian returned to his camp, and told his people of our arrival; the latter at once mounted and came to meet us. We soon descried in the distance about 20 riders coming at full speed towards us. When we met them we were struck with the miserable appearance of the tribe; most of them were entirely naked except a cloth round the middle; they had neither bridles nor saddles, but guided their horses by a long hide fastened round the lower jaw. On arriving at their encampment their misery was more conspicuous; they were living on the berries which are so abundant on the Kootanie plains, and were possessed of absolutely no utensils for cooking. They had, however, numerous plates and dishes of basket work, which they are in the habit of making from the roots of the pine. In spite, however, of their great poverty in this respect, they are very rich in horses. Among the 11 tents we observed a band of at least 500, some of which were very fine animals. They possessed also a few domestic cattle, which they had obtained at Fort Colville. Among these Indians we found an old man that spoke very fair Cree, and he informed us that Fort Colville is nine days' journey from their camp, and the track to it not very bad. Through him we also inquired of them if it were possible to descend the Kootanie River from the point to the fort, and were told that the river becomes full of rapids and falls a little lower down, so that it would not be practicable, without a great number of severe portages. Captain Palliser, in accordance with the instructions he had received from Her Majesty's Government, relative to communication with Colonel Hawkins, was desirous of going on to Colville, but in spite of the most liberal offers to any Indian who would guide him to the establishment, not one would undertake the task. We were much surprised at the silence with which his appeal was received, but we subsequently learnt that the Colville tribe and the Kootanies were then at war with one another; but the Kootanies did not wish to tell us this, as they were apprehensive we should carry the information to their missionaries, who appear to exercise considerable influence among the tribe, and do a great deal of good. This, together with other important reasons, deterred Captain Palliser from then endeavouring to reach Colville. As our horses were so fatigued as to be almost useless for the return journey across the mountains, we managed to exchange them with the Kootanies by giving some blankets, cloth, ammunition, and tobacco out of the stock we had taken across the mountains for this purpose.

We begin to recross the Mountains

September 1st, Wednesday.—Having completed our exchanges of horses, we started on our journey to recross the mountains to the Saskatchewan once more. Following a N.E. [illegible]

a chance of reaching the western base of the height of land. After desperate climbing and two days very hard work in the burnt woods we found that the mountains presented one unbroken wall skirting the Kootanie plain; we were therefore compelled to retire. Being now in the centre of a vast system of mountains, where not a single animal nor even a track was to be seen, and having a long journey before us, we decided on adopting the North Kootanie pass; viz, the one entrusted previously to Lieut. Blackiston, thus being enabled to return by the Kootanie camp, and endeavouring to exchange a horse for one of their domestic cattle. We had been for some days on short allowance, eating chiefly berries, which gave the greater part of us an attack of sickness.

September 4th, Friday.—We arrived early at the Kootanie Indian camp, from which we had started on the 1st of September, and at once asked for the two-year-old ox they had in their possession; and although the old chief was most unwilling to part with him, yet he at last agreed and we killed the animal on the spot. Fearing lest a feast would be expected from us the horses were saddled while the meat was being cut up, and we started without any delay, still continuing our course down the left bank of the Kootanie River, S.S.E. for 14 miles, when we encamped. We passed an uncomfortable night, owing to heavy rain accompanied by thunder and lightning. Passed to-day a large pine that had been recently split by lightning.

September 5th, Saturday.—Eight miles from our encampment we crossed the tributary of the Kootanie River, about 150 yards in breadth, which issues from a narrow valley to the east.

September 5th, Sunday.—Travelled in a southerly direction, and camped near Elk River. My old hunter and I interrogated a young Kootanie who had found our party, and who also had a considerable knowledge of the Cree language. Being away from his companions he now became more communicative, and admitted that he had turned one of a war party against the Flat Bow Indians, with whom they had previously been at peace, stole their horses, and shot two of them without any previous provocation. He also told me that the horses I had received in exchange for my tired ones were virtually the property of the Flat Bows, and I considered this as additional reason why I should not have been wise in going further into their country at that time.

September 6th, Monday.—Came early to Elk River at its junction with the Kootanie. At this place I was obliged with great reluctance to change some of the meat of the young ox I had traded the day before yesterday, because neither my half-breed nor my Indian hunters would touch it. I persuaded the young Indian to taste it, but he immediately spit it out again in great disgust. We crossed the river at 1 o'clock, and began our first ascent, which we found very bad and steep. We could have pursued an easier course by crossing the river higher up, but I was dissuaded from doing so by the river being deep at that spot. Camped on the Wigan Creek.

September 7th, Tuesday.—Started very early, had easy travelling from half-past 6 to 10, making about [*sic*] miles from 10 to 12; the climbing was very severe both for men and horses. We now were on the height of land of the continent once more. We remained a short time in contemplating the mountains from a height of about 6,000 feet: I cannot speak accurately, as our barometer had been broken. We then commenced our descent, and stopped for dinner at the first spring we arrived at. We were now once more upon the waters which flowed into the Saskatchewan.

September 8th, Wednesday.—Started a little after 7, and stopped at the base of the Curtain or flanking range of the Rocky Mountains, after a descent of about 1,400 feet.

Here we dived into a swampy valley between the watershed and the Curtain range we were about to ascend; the weather was threatening and lowering. We did not stop long for dinner but hurried off, and had hardly commenced our ascent of the Curtain range when it came on to blow from the north, accompanied with such heavy snow that I was very fearful of losing the track. After a severe climbing of about an hour and a half we arrived at the top of the flanking range, having ascended out of the valley about 900 or 1,000 feet. The descent of this Curtain range was very severe on account of the rocky nature of the ground. On reaching the end of it we fell on a tributary to the Belly River, where we found the partial shelter of the wood very grateful from the cold north wind; by half-past six o'clock, however, we had left wind and snow behind us, and were comfortably encamped again, after a descent to the N.E. of about 1,500 feet.

September 9th, Thursday.—Enjoyed fine warm weather again. We were now out of the mountains, also out of provisions. We travelled till 11 o'clock. I started after a moose and was unsuccessful, but I killed a deer; the Indian killed a swan; Paul caught a fine dish of mottled trout.

September 10th, Friday.—At noon reached latitude 49° 47′ in sight of Windigo Mountain.

September 11th, Saturday.—Travelled for five hours; breakfasted in latitude 50° 12′; made a long spell in the evening, and camped on High Wood River.

We killed two grizzly bears yesterday, but to-day two other bears defeated us; they frightened the Indian by springing at his horse and tearing some of the hair out of his tail. I was too far back at first, and in the end fairly distanced.

September 12th, Sunday.—Started after breakfast; took latitude at noon, 50° 35′; found we had made 26 miles since noon yesterday. For the last three days we have been travelling through fertile undulating lands, the soil of which was particularly rich in the hollows.

September 13th, Monday.—Travelled slowly, the Indian and I hunting away off the track; found the deer very wild; killed nothing. The nature of the country is similar to that we had been travelling through for the last few days; in the afternoon we arrived at Bow River.

September 14th, Tuesday.—Paul and I rode out, one up, the other down the river, to find a good crossing place, then returned to breakfast on a very short allowance of fish which the others had caught meanwhile. After breakfast crossed; took latitude of crossing, 50° 55′. Saw buffalo to the east, struck off our course to follow them; came up with them about two; ran them and killed three; two of them very good. We have meat now for the whole way to Edmonton, though our tea and sugar are gone long ago.

September 15th, Wednesday.—Started after breakfast, and resumed our northern course. Our run after buffalo had taken us so far to the east, that we were beyond the line of fertile country which skirts the mountains. We made a long day, and camped about 30 miles distance from the edge of the woods, and nearly due south of our old Caché Camp, which had been our quarters at the end of July last.

September 16th, Thursday.—Arrived at the edge of the woods in the neighbourhood of the old Caché Camp. We came in sight of two tents of the Blackfeet; not knowing what humour these Indians might have been in, and having nothing in the way of tobacco or ammunition to give them, I forbad the rest of the men to go to the tents, except old Paul, who was half a Blackfoot, and whom I allowed to go and visit them; he returned to our camp very late at night with accounts that made me congratulate myself on my determination to conceal my whereabouts, and holding no communication with them. They had had war with Crees and Stoneys, and had killed Paul's brother-in-law. It was with difficulty he could get away in the night to reach my camp. I had driven in the horses, and guarded them closely all night.

September 18th, Saturday.—Started early, and left the Bear Hills; the country was now swampy and covered with willows. Camped very late at night. Old Paul took a fresh horse of his own, and started off in the night for Edmonton.

September 19th, Sunday.—Very wet day; started a little after seven, and travelled till half-past one. While we were at dinner, two of my men arrived from Edmonton. Old Paul, who arrived early in the morning, after travelling all night, brought the news that I was on my way. The men immediately started, and brought us a supply of tea, sugar, and flour. They were mounted on my two best buffalo runners, and so joined us in less than four hours. After dinner we started again, and camped about six miles from White Earth River.

September 20th, Monday.—Arrived early at Edmonton.

No. 5.

HECTOR'S BRANCH EXPEDITIONS, commencing August 3rd, 1858, to May 26th, 1859.

August 3rd.—Slaughter Camp. After Captain Palliser and his party for the boundary line left us this morning, we continued our course westward towards the base of the Rocky Mountains, which were now in constant view, bounding the horizon from S. to W. by N. The prairie's surface rises into undulations which increase in decision and altitude, till at length, where we encamped for the night, they formed a low broken range of hills. We camped early, in order that the hunters might make a final onslaught on the herds of buffalo, through which we were still passing, but not in such numbers as previously.

August 4th.—This forenoon we crossed a succession of plateaus divided by wide shallow valleys, trending to the S.E. On one of these plateaus there rests a group of large granite boulders, some of them 12 feet in height, of an angular shape, and split into several pieces that have been separated by narrow fissures, wide enough, however, to allow of a man passing through them. The blocks appeared to be scattered over the plain, in a line also N.E. and S.W.

At noon we halted by a swampy lake, and on starting again commenced to rise rapidly, skirting a deep chasm with almost perpendicular sides. We encamped beside this valley where a little ravine sheltered a few poplars and willows, which was the first wood we had seen since leaving the Caché Camp. The valley I found to be 225 feet deep, and from its sides horizontal strata of calcareous sandstone and marlite cropped out, but in which I could find no fossils. In the bottom of the valley, which was a flat a quarter of a mile in width, and covered with good grass, a small stream, not larger than an ordinary drain, flowed to the eastward.

August 5th.—Continued travelling to-day over broken rolling country, with occasional outcrops of indurated micaous sandstone. There is a very marked increase in the variety and luxuriance of the flowering plants, and the pasture is abundant and well mixed. Encamped in Rock Gully, so named from the ledges of sandstone which protrude from its banks. There is a clump of large poplar trees close to our camp, so that the men can procure poles with which to construct stages for drying our buffalo meat in the sun.

August 6th.—We delayed our start till noon to take advantage of the clear powerful sun for drying the meat. We then traversed a magnificent plateau traversed by rocky gullies and glowing with a rich profusion of brightly-coloured flowering plants. The snow of the mountains with the foreground sharply lined by projecting ledges of rock was quite exhilarating, after the dreary monotony of the arid plains. Leaving the carts to move slowly on I struck off to the south, and by descending 600 feet over a succession of rolling hills reached Bow River after six miles. At this place it is a swift, rocky stream, with clear water. There is little or no wood on its banks, and the pasture is poor compared with that at the higher level. Sections of shale and sandstone, with seams of coal, occur along the banks, much disturbed and forming flexures, the strike of which is N.W. and S.E. A succession of hill ranges are thus formed by those beds, which lie parallel with the mountains, and rise 600 to 1,000 feet above the river level, and meeting its course at right angles. I got some fine trout from the river, caught by some Indians that I met, and at night joined the carts just before encamping under Dream Hill. Our camp was in a most picturesque position surrounded by well timbered hills except to the west, in which direction a level plain seemed to sweep up to the base of the mountains, foremost among which rose the craggy knob called the "Devil's Head."

August 7th.—Half an hour after starting this morning we came to Deadman's River, and found that the plain we had been admiring the previous evening was really the valley of that river, which rises near the "Devil's Head," and the level appearance is due to the manner in which the valley has been filled up by deposits of rounded shingle, obliterating all irregularities and only crossed by terraces that hem the river channel into very close limits. To cross this river we were obliged to seek a shallow rapid at where it joins Bow River, and it was only with the greatest care and trouble that we were able to get the carts down the steep bank and pass this point. We then skirted along the left bank of Bow River during the forenoon, travelling on level terraces which also skirt its valley. As we travelled along we were met by a number of Stoney Indians who continued to accompany us during day. At noon the valley commenced to become contracted and rocky, and we were much delayed by the carts getting repeatedly upset. Where we halted the river is hemmed in closely by rocks and forms a succession of rapids, and as the lands are well wooded the scenery has assumed quite an alpine character

In the afternoon the road was very bad at some places, but with the help of the Indians, who were very well disposed, we reached the site of the Old Bow Fort at sunset, and encamped on a fine level shelf a few hundred yards up a creek that joins Bow River at this point and elevated 90 feet above the water. As we were to be here for some days and to make our arrangements for travelling in the mountains without the carts, we induced our Stoney Indian friends to camp beside us in order to get them to trade leather and pack saddles with us for tobacco and ammunition. We had seen a good many deer as we came along and just before encamping a young black bear was started and shot by Lieut. Blackiston.

We remained here busily engaged in preparing for our work in the mountains, and in examining the surrounding country, making observations and obtaining corrections for instruments until the 11th of August, when the expedition broke up into the branch parties.

August 11th.—Having placed the horses and supplies for Captain Palliser under the care of "old Paul," his guide, at 4.30, I started at the same time with M. Bourgeau, who also wished to follow up the valley of Bow River. We both chose this route as it allowed of our entering the mountains at once without travelling further in the open country, which yields little of interest either to the geologist or the botanist.

My party consisted of Peter Erasmus, Sutherland, and Brown, all Red River men, and also my Stone Indian friend, who had promised the previous winter to serve as my guide in the mountains, and who had just turned up in time to keep his word. As he is known to be one of the best hunters in the tribe, and his Indian name, which signifies "*the one with the thumb like a blunt arrow*," is so unpronounceable, I called him *Nimrod*, which name has stuck to him ever since. I had with me eight horses, three of which served to carry all the little baggage I cared to take, consisting principally of instruments, bedding, ammunition, and tobacco; for as I was assured that in the part of the mountains I intended to explore, there was abundance of game, I did not take any provisions excepting a little tea and a few pounds of grease.

Crossing the deep ravine, beside which the expedition had been encamped for the last five days, we skirted the left bank of Bow River, and soon the valley became hemmed in by the precipitous cliffs of limestone that form the mountains of the outer range. In the ravine, shales were exposed of a purple colour, slaty fracture, with a good deal of iron in cross seams, but not so soft and earthy in their texture as the clay shales I had seen overlying the grits ten miles down the river. These I again saw, however, shortly after starting, exposed in a second ravine, which we had to cross, and through which the track is steep and bad. After three miles we saw the track leading to the ford by which Bow River is crossed to reach Kananaskis Pass. Up to this point our trail passed through fine open woods of young pine, over high level terraces. On reaching the first point where the valley narrowed, we had to cross over heaps of loose rounded stones that had been swept down by the torrents, so that we got on very slowly; our horses with their tender feet being quite unfit for such rough ground. We had, indeed, fixed light plate shoes on some of their feet, but these only seemed to increase their discomfort. Above the contracted part of the valley we plunged into a labyrinth of dense forest, some of the black spruce trees being of great size, and struggled on through fallen timber till we reached the rocky spur of the mountain on our right, which above the torrent hems in the river so closely that we had to make a considerable ascent in order to pass over it. In the group thus formed there has been a great accumulation of shingle, not of the kind that forms the terraces, but of larger and more angular fragments. This damming back the river has given rise to several large lakes (*Lacs des arcs*) that occupy the width of the valley, excepting the channel of the river, with which they only communicate at flood season. The scene that opened to us on crossing the point was very striking.

Just beyond a second spur like that we were upon we had a peep into a valley so wide and extensive that it appeared to us, hemmed in as we were by precipices several thousand feet in height, that we were looking right through the range into comparatively open country. The peaks on either hand were of bold grotesque shapes, caused by the varying power of resistance which the contorted strata composing the mountains present to the atmosphere. They are formed of thick bedded limestone, with fragments of encrinite stems, sometimes blue and crystalline, at others dark, earthy, and bituminous. Alternating with these are groups of earthy shales, which are only preserved high up in the mountains, so that I had not an opportunity of examining them.

(Section 23) gives a sketch of the plications of this first range, as seen along the south side of the valley. On the north side there are but two subsidiary ranges that abut on Bow River, while on the opposite side there are five. It was quite dark before we descended into the valley by a faint trail leading through burnt woods to an open rocky spot beside one of the lakes, where we encamped.

Bourgeau has named the lakes *Lacs des Arcs*, and the peak opposite Pigeon Mount, the one behind our camp, Grotto Mountain, and a high peak to the west, on which the clouds were gathering and curling about Windy Mountain. During the night the thermometer fell to the freezing point, but at six a.m. it stood at 40°

August 12th.—At dawn started with Bourgeau to ascend Grotto Mountain. Passed over rugged ledges of deep blue limestone, which weathers to a light blue colour, and is traversed by veins of calc spar. The surface of these beds is very rough, and masses of chert are left protruding by the action of the weather. After ascending 500 feet we get out of the timber, but more by getting on to rugged surfaces of rock, as large trees were growing at least 800 feet higher in favourable situations. At this point Bourgeau began to get alpine plants in abundance, among which was a saxifrage with a denticulate leaf. We followed up the bed of a torrent till our progress was stopped at a point where the stream commences by a trickling fall, several hundred feet in height, into a clear pool with green mossy banks, and in which we performed our morning ablutions. On one side of this little valley is a great deposit of angular blocks of rock, mixed with calcareous clay, forming the sides to the height of 150 feet. In this deposit we found a large cave, with a high arched roof and narrow mouth, and like Robinson Crusoe's, with its old goat for a tenant, but in this case he had long been dead. The floor was quite battered hard by the tracks of sheep and goats.

Turning from this point, which was 1,000 feet above our camp, we descended by another spur of the mountain to breakfast. I did not start till noon, when I got the latitude 51° 1′ 44″ N., and having

taken leave of Bourgeau, who did not intend to proceed much further up the valley but to cross to Windy Mountain, I continued on with my own party. Our track led over the spur of Grotto Mountain, from the limestone of which I procured some fossil shells (Productus, &c.) We then entered the great valley, which runs N.W. and is several miles in width. We kept for several miles high up on the side of it, skirting along high banks of the terraced deposits which had been preserved from erosion by the spur we had just crossed. We passed some singular masses of the concrete that forms the terraces left standing like spars and chimneys on the sloping face of the deposit. At dark we camped by some old Indian wigwams where the valley is wide and flat, and with fine patches of level prairie along the river for our horses. Just opposite to our camp there is a mountain with three peaks which form a striking group, while a little further up the valley there is a cross valley or nick bounded by a very lofty precipice. Being right in the middle of the valley we were about $1\frac{1}{2}$ miles from the mountains on either hand. To the S.E. this valley seemed to be continued by a depression in the mountains caused by the absence of hard beds to protect the strata of soft shales which here form a beautiful syncline.

The regularity of these beds is very wonderful. Hitherto, with few exceptions, they have always dipped to the W.S.W. or towards the mountains, but such is the baldness of the upper part of the mountain that there is no difficulty in discovering that the beds have been so completely overthrown as to give the whole flexure this general dip.

August 13th.—Wishing to give Nimrod a chance to get us some meat, of which we already stood in need, I did not move our camp to-day, but ascended the range to the east, and found it to be composed of the same limestone beds as before, dipping at a very high angle to the W.S.W. I got more fossils and found one bed of limestone that was quite full of the encrinite stems and corals. I also got Productus and Spirifer, so that the limestones are either of carboniferous or devonian age. The Indian killed an Apicee-Moosus or black-tailed deer. It was a large buck, and its head looked different to me from those of the prairies. Length of head from occiput to nose $13\frac{3}{4}$ inches; ditto from inner cantlers 7 inches; width between base of antlers $3\frac{1}{2}$; ears $10\frac{1}{2}$ inches long; he had also wounded a large moose deer, but it escaped across the river.

August 14th.—The thermometer during the night only fell to 40° and at noon was nearly 70°. After getting the meridian altitude we travelled for a few miles further up the valley.

August 15th.—Started early this morning, and soon reached the point where the river turns from the W.S.W. to enter the wide longitudinal valley. Here the shingle deposits were again greatly developed, and travelling on the terraces we kept well from the river till we reached a beautiful little prairie at the base of the "Mountain where the water falls," as the Indian name has it, or the Cascade Mountain.

It rises on the left side of the valley, where it becomes contracted and cuts through the second mountain range. Having still a few hours of daylight I measured a base line on the little plain in order to ascertain the height of the mountain, which is extremely vertical. I found that its summit was in view at a horizontal distance of 2,200 yards, and its height above the plain at the base to be 4,521 feet. It is composed of strata which have a general dip of 30° to the S.W., and form precipices which rise round the south-eastern face of the mountains, towering one above the other to that height. Although it appears from that side to be a detached mountain, it is really the south end of a range of cliffs that continue the first longitudinal valley to the N.W.

An old Stoney, from the Indian camp we had left at the Bow Fort, joined us this evening, having come through the first range by a pass to the south of the "Devil's Head," in which he says there is a lake the length of half a day's march, where they catch the finest trout and white fish in the country. At the upper end of the lake which sends a stream into Bow River just below where we are camped, he says there is a "height of land" to be crossed, and from the other side of which rises Deadman's River.

This old "Stoney" told me that he once guided Mr. Rundel, the missionary, to this place, and that he lived here for many days camped in the little prairie.

There is only one way of getting up Cascade Mountain, and that requires a very long round. The Indians often get the white goat on it and the grey sheep is common. Once a white goat was wounded and got on to a ledge beside the waterfall, and stood there for seven days, and then it fell down over the precipice, when they found that it had been shot in five different places. The Indians say they are the hardest to kill of all animals.

August 16th. The track was so bad ahead, according to Nimrod, who was off before daylight this morning, and returned early having killed two sheep, that we required to halt to-day and let the men go on and clear it out.

At 8 I started up the mountain. For the first 300 feet I climbed up through dense woods and then came to an escarpment of limestone beds, among which is a bed of a buff colour about 80 feet thick, without fossils; over this lie beds of the same blue cherty limestone as on Grotto Mountain, and having the same fossils. I got up about 1,000 feet (by the sympiesometer), when I got clear of the woods, or merely found small stunted brushwood; but a precipice formed of grey limestone with veins of calc spar compelled me to turn more round the north face of the mountain, but still allowing me to ascend rapidly. While resting here a humming bird, blown by a strong west gale, flew against my face, but I did not succeed in capturing it. This is the first I have seen since leaving Red River settlement, and it certainly seemed quite out of place among the alpine vegetation. In the shales along with the limestones that contain the cyathophyllum I found a fragment of a conularia, and it is probable that we have them represented in the coal measures among those disturbed beds.

Following the base of the precipice soon led me to a point beyond which I could not pass without descending into an immense corrie, from which I started a large band of sheep. These animals are singularly matched by nature with the colour of the grey limestone rocks, so long as they are looking towards the observer, when it requires a very skilful eye to detect them; but the moment they turn to flee they become very conspicuous, as every part of their body as seen from behind is pure white. It is often quite startling in ascending a mountain and gazing as you suppose at nothing but the grey rocks, when suddenly a flock of white objects appear fleeing away from you, and as suddenly they seem to vanish when their inquisitive habits make them wheel in a mass to have another look.

The bottom of the corrie was filled with large angular blocks of rock, and patches of snow remained almost converted into ice, but not worthy of being termed glaciers. Among the blocks of rock the sifleurs or mountain marmots kept whistling in a very loud shrill note answering one another, and I also heard the squeaking note of the little Pica or tailless hare, which is very common here. This is one of the most comical animals I have seen. It is about the size of a small rat, but made exactly like any other rabbit, excepting that it has round open ears. It sits up on its hind legs and calls its note in the most impudent fashion faster and faster as you approach, but always ready to pop out of sight so quickly that you can hardly shoot them, at least with a flint gun.

The sifleur generally plays the same trick, but he is not impudent, and does not allow you to come so close before he dives among the rocks. Round a little lake that is fed by the frozen snow, there was a beautiful emerald-green carpet of alpine plants, many of which looked like old friends in the Scotch mountains.

From this point I made a long and steep descent of about 2,000 feet into the valley to the north. The highest trees are *Abies alba*, which has a short thick stem, only one or two feet high, while the branches are long and recumbent, spreading over the face of the declivity like thatch, so that I found it easier to slide down over the tops of the trees (such as they were!) than to push my way through the diminutive forest. Below this, for 500 feet, the forest is composed of the *Abies balsamea* of good growth, and then followed the ordinary trees of the mountain valleys, of which the *Abies alba* and *nigra* are the largest, along with birch, and sometimes the *Prusche*, which is the large species of spruce fir that was first seen at the Bow Fort, which somewhat resembles the hemlock spruce of Canada. The point where the thick underbrush with flowering plants commences, of which the *Delphinium* is the most striking, is 300 feet above the valley.

August 17th.—We started early this morning, the thermometer shortly after sunrise being at 56°. The men with the pack-horses followed the track which they had cleared the previous day, while with Nimrod I set off to see a fine fall on the river, which lay about three miles out of the direct course. A high hill stands out in the centre of the valley, and it is in breaking past this that the river is compressed into a very narrow spout-like channel, and then leaps over a ledge of rocks about 40 feet in height. As we returned from the visit to the falls we saw a band of ewes, and succeeded in killing two of them. Above the rocky contraction of the channel the river is dilated and sluggish, and the valley is filled up with large swampy lakes, just like those in the cañon through the first range. This obliged us to keep along the side of the hills, where the fallen timber forms a much greater impediment than on flat ground. The second range is made up of three subsidiary ranges. The Terrace Mountain, which overhangs the first longitudinal valley, corresponding to Cascade Mountain on the other side of the river, is composed of the same limestones and shales dipping at 50° W.S.W.

This direction of the dip prevails throughout the range, but it is probable that the limestones which are thrown up almost vertically on its western flank are the lowest beds, the whole group forming one synclinal trough, that has been completely overthrown.

Looking up the valley to the W.S.W. we had before us a truncated mountain, evidently composed of massive horizontal strata, and which I named Mount Bourgeau. The pass that Sir George Simpson crossed the Rocky Mountains by in his journey round the world lies to the south of this mountain, and I half thought of crossing the river and following it, but we found so much "white water" in the streams from the south, showing that they were in flood, that the old Indian who still travelled with us said we would fail in getting through that way, as the valley is so bad at one place as to require travelling actually in the stream, between perpendicular walls of rock, for half a day, and if it is flooded this becomes impossible. I, therefore, determined to continue up the same side of Bow River, until opposite an old neglected pass that used to be used by Cree war parties, and known as the Vermilion Pass. Shortly after noon we came up with the packhorses just at the turn of the river, where it enters the second range. Here we halted and cooked some of the mountain sheep. The meat was in fine order, and had no particular flavour, yet it made not only myself but also other two of the party very sick. This, however, was the only time I ever saw this kind of meat disagree with the stomach, so it may have been due to some ailment in that particular animal, as we all soon came to consider the wild mutton of the grey sheep as the finest food we could get.

After a halt for two hours during the most intense heat, we again started and crossed over a low point of rocks, close to the river, where we entered the second great valley, which is of magnificent proportions. Along the eastern side runs a wall of vertical beds, of light grey limestone, the serrated edges of which at once suggested the name of Sawback Range for them.

The valley is three to four miles wide, and on the west side we have quite a change in the features of the mountains. The strata which compose them are nearly horizontal, and the mountains form cubical blocks or ranges of battlement-like precipices, while super-imposed masses resemble towers and bastions.

Through this valley we turned to the N.W. by W., and found the bottom of it occupied by an extensive morass overgrown with scrubby pines, and the *Labrador Tea plant*. At considerable expense of our horses' strength we got across this quagmire, which might have been avoided, but only by cutting a road through the fallen timber along the mountain side; we reached a spot with very rich pasture, where we camped for the night, having made 17 miles, with seven hours' travelling, which is a fair day's work in the mountains. There are many caves in the limestone precipices of the Sawback range, some of them at a great altitude above the valley. Seeming to stand out in the centre of the valley is a very remarkable mountain, still at the distance of 12 miles, which looks exactly like a gigantic castle.

August 18th.—Soon after starting this morning we came to a hill, about 400 feet high, from which I took a set of bearings, and got a fine view of the mountains. Through a deep valley to the south-west is a very massive mountain, completely snow capped. To the S.E., down the valley, there is also a snow-capped mountain, but up the valley there is quite a number of peaks, none of them very prominent, but all glittering with white. Castle Mountain I now saw to be connected with the east side of the valley. "Nimrod," who had been seeing many wapite tracks yesterday, was a-head of the party to-day hunting, and after travelling three hours we saw him on a hill at a distance, making

signs. On joining him I found that he had tracked up a moose deer, and got one shot, and had hit it in the rump. In chasing it he had fallen on his knife, which was stuck in his girdle, and broken it, and one of the pieces had hurt his back severely. Notwithstanding this he had tracked up the moose for about four miles, and now knowing where it was hidden the Indian wished me to have a shot. When wounded these animals generally run for some miles, and then seek to hide in a thicket. However, even in summer, when the ground is hard and baked, an Indian can follow their track as easily as we could follow a footpath. And so Nimrod had done in this instance, for a wary turn through the woods for half a mile brought us to the game, and advancing against the wind without disturbing a branch we got within 40 yards of him, standing with his long nose straight out, and his antlers laid back on his flanks. I gave him the benefit of both my rifle barrels, which was the first notice he had of our proximity. After that he only bounded about 70 yards before he fell. When we approached him, however, he showed fight, and got up again, but it would not do, as he was fast going.

He was a fine buck, Nimrod thought about seven years old; his dimensions were as follows:—

	ft.	in.
Height at the shoulders - - -	6	$2\frac{1}{2}$
Length, rump to nose - - - -	8	4
Girth behind the shoulder - - -	12	0
Length of head - - - -	2	4
Width between bases of antlers - -	0	7

The antlers were in velvet, and not full grown.

We lost some time getting two of the pack horses, which, with our riding horses, were able to carry the meat a few miles on to a creek, where we halted, and where I got an observation for latitude. The heat is very intense every day between 12 and 2, much more so than we ever experienced on the plains. It is cold in a corresponding degree at night, however, and although every morning the higher mountains are enveloped in fog, it has yet been always clear in the valleys.

During the afternoon we got entangled in fallen woods that lay breast high to our horses, and gave us a great deal of trouble. After three hours work we had only made five miles, which brought us to the place where we cross Bow River for the Vermilion Pass. We camped by the side of a small clear stream, and for the first time put up the little leather wigwam I had traded from the "Stoneys," as I intended to remain here a couple of nights and prepare the moose meat. Peter Erasmus, who had gone off hunting yesterday afternoon, lost himself, and slept out in the mountains, without even his coat, as it was hot when he started, and he had left it with his horse.

August 19th.—Our camp was right opposite to Castle Mountain, so that early this morning, taking Sutherland with me, I started to ascend it. We had a tedious walk through woods for five miles before we made much of an ascent, but then we began to rise very rapidly. At 1,000 feet above the valley, before we had got quite out of the woods, we came to a cliff, about 80 feet high, composed of quartzite and indurated sandstone of a pinkish hue; the beds were nearly horizontal, and as they seem to continue so all the way to the top of the mountain, which is at least 3,000 feet higher, these quartzites must be the lowest beds I saw. On this cliff we first heard the call of the sifleur. Above the point is a grassy slope, having an inclination of 33°, and so slippery that it was only with great trouble that we got over it; it would seem to indicate the occurrence of some soft beds that have weathered into the slope. After this we reached the first of the cliff ranges that are so conspicuous from the valley below; it was composed of quartzite, passing into a conglomerate of pebbles of milk quartz and other rocks. When 2,000 feet above the valley we passed round to the N. side of the mountain, and found that a deep valley separated it from a lower spur composed of splintery shale of a dull red colour. The mass of the mountain, which yet rose more than 2,000 feet above us, seemed to be composed of thick bedded limestones, and these breaking away as the soft shales below them have been destroyed has given rise to the castellated appearance. We saw several bands of sheep, but did not get a shot; however, we killed two of the marmots or sifleurs. It is the size of a badger, with coarse short hair and no proper fur. It has large incisor teeth like those of the beaver; it lives among the rocks, and has a large nest, in which it lays up stores of provisions for winter, during which season it never comes abroad; but whether it hybernates or not the Indians do not know. It returns to its hole late in September, at which time it is very fat, and quite as good eating as the beaver, having the same rat flavour. It was 8 p.m. when we got back to camp, having had 12 hours hard walking.

August 20th.—The moose meat having been sliced and partially smoked, we started to cross the river at 9 a.m., having spent the morning searching for a ford. The place where we crossed the river is only 60 yards wide, but very rapid, and taking our horses above the girth if they kept the oblique line of the ford we had discovered, but some of them that turned to go more directly were obliged to swim. The stream was in average summer water, neither high nor low. The little Vermilion Creek, which comes down from the height of land, joins Bow River below the fort, so that we did not see it. At first we had a tough climb up the face of a terrace of loose shingle for 150 feet, but by going a little round we might have ascended it where less steep. We at first followed the brink of a valley, which the creek has cut through these superficial deposits. We then struck through the wood to the south-west, which clothe the gentle sloping and wide valley that leads to the height of land. Finding the lowest ground of the valley to be rather soft, although we were away from the creek a considerable distance, I kept up more on the mountain side, so that we had to make a descent to the real watershed, the position of which so near to Bow River and so slightly elevated, took me quite by surprise.

We had been travelling six hours through the woods when we came to the height of land, but had not made more than 12 miles. Excepting once, when going along the mountain side to the west, which was quite unnecessary except to save cutting fallen timber, we had not passed over any rocky ground, and indeed, were yet far within the limits of the woods, the trees being even larger and finer than in the valley of Bow River. By repeated observations with the aneroid and sympiesometer I found the highest ground we had passed over to be 800 feet above Bow River; but the height of land where we encamped is only 540 feet above the same point.

The valley at this point is several miles wide, and the mountains on either hand are still wooded a long way up the slope. The source of the stream flowing to the east is from a deep lake with rocky margins, composed of quartz rock, in thick strata, dipping 20° W.S.W. A stream of muddy water, about 12 feet broad, descends from the north-west, and when within 300 yards of this lake turns off to the south-west, forming the first water we had seen flowing to the Pacific. We encamped beside this stream, and I levelled across through the woods to the lake for curiosity, and found that the lake is the lowest by 17 feet. I then ascended the mountain to the east for 1,000 feet above our camp, reaching the limit of the woods after 500 feet. The mountain is composed of quartzite almost passing into gneiss in some beds, and is a mere spur from a large central mass of snow-capped mountains to the south-east, which I named Mount Ball, after the Under-Secretary of State for the Colonies (in 1857). On the opposite side of the valley I saw that the Vermilion River rises from a glacier of small size in a high valley of Mount Lefroy. The small quantity of water flowing from the mountains hitherto has astonished me, being a great hardship in climbing them, as it is almost impossible to get a drink except now and then from a trickling stream in a fissure, which disappears before it reaches the valley. The shingle deposits which line the valleys also absorb the few torrents that would otherwise be tributaries to the main stream; but now, on what is the commencement of the western slope, every little valley and ravine has its torrent. We got a shot at a white goat, being the first we had seen, and wounded it, but it escaped by its better knowledge of the rocks. They are very large animals and walk in a deliberate manner, picking their steps over the rocks as if their feet were tender. It was long after dark before we got back to camp, and we had some difficulty in getting down the mountain.

August 21st.—Heavy soaking mist this morning, which soon wetted everything we had, for the first time since entering the mountains. Nimrod had been absent all night, as he went off yesterday while we were ascending to the height of land, upon a fresh moose track. It was a buck, and he followed him back all the way to Bow River, and killed it in the evening, but too far from where he expected us to camp to bring any of the meat, so he slept beside it and ate what he could. We descended the valley of Vermilion River for four hours to the south-west, making equal to six miles in a straight line. The valley is tolerably open, and the descent is uniform. The dense woods often compelled us to cross and recross the stream, it being so much easier to travel on the shingle in the channel than chop our way through the forest; but there is no want of level land on both sides of the stream along which a trail might be cut, which might be followed in any state of the stream. Several small streams come from both sides of the valley, so that the river increases rapidly in size. At one tributary, larger than the others from the north-west, we halted at noon in lat. 51° 6′ north. A mile further on we arrived at a sudden bend which the river makes to the south-east, changing its course at right angles. Here, in the corner of the valley on the right side, is the Vermilion Plain, which is about a mile in extent, with a small stream flowing through it. Its surface is entirely covered with yellow ochre, washed down from the ferruginous shales in the mountains. The Kootanie Indians come to this place sometimes, and we found the remains of a camp and of a large fire which they had used to convert the ochre into the red oxide which they take away to trade to the Indians of the low country, and also to the Blackfeet as a pigment, calling it vermilion. We found horse tracks here, but evidently of a band that had been there the previous summer.

In a valley facing us, as we turned to the south, is a glacier of fair size, which comes lower down than any ice I have seen in this district of the mountains. We now kept along the left bank of the stream on a fine level shelf 60 or 80 feet above the water. The valley is now quite open on this side, but on the other the mountains slope up rather suddenly, but not precipitously, while the woods have all been burnt, giving it a naked bald look. The fire must have "run" several times, as even the fallen trees had been burnt, which allowed us to pass along freely. We camped on a flat, with good pasture close to the stream, but 50 feet above the level. The banks are rocky, exposing slates of grey blue colour, dipping to the W.S.W., at a very high angle. The mountains opposite to us are, however, composed of the blue limestones, which are much less inclined. We found raspberries and small fruit of different kinds very abundant near our camp, but as yet there is no marked difference in the vegetation from the east slope of the mountains. Among the burnt woods the whole surface is covered with a vigorous growth of epilobium angustifolium, with bright pink flowers and ragged seed-pods, scattering hairy seeds.

August 22nd.—Three hours march this morning brought us to a large tributary from the north, taking its rise from Mount Ball, the pyramidal top of which, completely snow-clad, had a very imposing appearance from this side. We halted in lat. 51° 2′ 45″. The valley is again well wooded, and the river becomes confined in a narrow ravine of white arenaceous slate, dipping at 60° W.S.W. The valley is not the least confined at this point, however, only the river channel. Just below this place we were embarrassed with fallen timber, and, as it looked better on the opposite side of the river, we forded it, but were soon compelled to ascend the bank, still in the fruitless search for an easy road. However, matters got worse instead of better, as we got involved in a forest of cedar (*thuja*) the first I had seen since leaving Lake Winipeg, and which was almost impassable. Night overtook us, so that we had to camp in a little swampy "opening," tying up several of our horses, as they might be inclined to start off in the night to seek for food. During the night we had a thunder storm and heavy rain.

August 23rd.—Being determined to make no more blind attempts at seeking for an easy trail, at daybreak we re-descended to the river, and kept along its margin as well as we could. As every bush and tree was loaded with moisture, it soon did not matter much whether we went into the river or not, so that we frequently saved a difficult turn by accepting a ducking. After four miles we came to where the river again changes its course to the S., and receives a large stream from the N.E. This is perhaps the stream from the Simpson's pass to the east of Mount Bourgeau. In the afternoon the valley became much contracted, by the approach to two lofty mountains on either hand, but still there was ample space on each side of the river to carry a good trail. Just before entering the "gorge," we passed high banks of white gritty calcareous marl, having a chalk-like texture. This deposit is 150 feet thick, and at many places the banks showed the marks of teeth, where the white goats had been gnawing it, and their wool was plentiful on the bushes all round. This deposit is a local variety in the

shingle, gravel, and sand that everywhere skirts the valleys of the mountains, and has been moulded into terraces in the most regular manner. After passing through "the gorge," we encamped on a meadow where the valley of the Vermilion led into a very wide valley lying N.W. and S.E. In descending the Vermilion River valley, the strata observed were as follows:—First, the mountains at the "height of land," composed of quartzite, were succeeded by a group of hard and soft beds, each about 50 feet thick, and seven or eight of such alternations occurring in plications with a westerly dip. These soft beds are highly ferruginous, and contain nodules of clay ironstone, and from these the ochre of the Vermilion Plain is derived. Then follow heavy beds of limestone with a gentle dip, while on the south side of the valley where it is directed to the S.E., the mountains are composed of horizontal strata of blue slate rock, closely banded with red stripes. The tops of the mountains form conical and pyramidal masses, marked as if ruled with parallel lines. But in the bottom of the valley the river first cuts through grey slaty rock not cleaved, and then through soft white sandy slates, all of which dip at a very high angle to the W.S.W. The men, by Nimrod's advice, carried away pieces of this soft slate, and at night they were all busy manufacturing pipes from it. At "the gorge" we again have the deep blue limestone as at Grotto Mountain, containing the same fossils.

August 24th.—This morning Nimrod, who had set off early to hunt, returned shortly as white as it is possible for a red Indian to be with fear. He had been chasing a deer, and had suddenly come on a panther, but further than saying that he had wounded him, we could get him to tell us nothing. The panther is not very common in the mountains, but the Indians generally kill a few every year about Red Deer River or along Bow River, and in spring they are sometimes met with by the Blackfeet Indians out on the plains, when they run them with horses like buffalos. From seeing them so seldom the Indians are much more afraid of them than they are of grizzly bears, although there is no comparison between the ferocity of the two animals.

We now left the trail which we had seen very distinctly in passing through "the gorge," and turned to the right in a west course through dense woods. We ascended a good deal and travelled on terraces of shingle, where the timber consisted of pines, as is usual in such soil. At noon we halted in latitude 50° 52′ N., being still in woods so thick that we were travelling for no advantage. I therefore camped, and sent off Peter and Nimrod to spy out the land, and as everything was soaking with wet they adopted the Indian plan of stripping to their shirts, so as to go lighter through the woods, and in this garb they were absent the whole day. They had crossed the Kootanie river, in the valley of which we were encamped, and returned with great accounts of the size of the timber where they had been. They had also found a faint trail leading up the valley.

August 25th.—Keeping along the high level terraces on the left side of the Kootanie valley, we continued to the W.N.W. In crossing a creek from the north, I again observed the white slaty rock still dipping at a high angle S.W. After three hours we descended 300 feet to the bottom of the valley, and crossed the Kootanie river, which is at this place only a small stream, much blocked with fallen timber, having a tortuous course through a wide flat bottom, occupied by large swampy meadows. The valley is two to three miles wide, and the timber is very fine on its slopes, especially that to the south. After a short halt we continued up the valley, keeping by the edge of the stream, in hopes of getting a shot at a beaver, which animals are very numerous, judging from their tracks, which were like beaten pathways all along the bank. We saw where they had been cutting up trees five and six inches in thickness into short billets, to use in constructing their houses and dams. Shortly after passing two streams, one from each side of the valley, we encamped in some burnt woods by the side of a morass. As we were encamping, we heard the cries of a panther, which are exactly like those of an infant. Nimrod says that they call in this manner when they come on the tracks of men or horses, and he seemed to think it might come close, or even into our camp during the night; so when he lay down to sleep, he kept his "dagare," or big Indian knife, close to his hand.

August 26th.—Without much actual rain, every morning since gaining the western slope of the mountains has been wet, and this proved no exception. The constant moisture has had a bad effect on our moose meat, which, although well enough prepared to keep in the dry climate of the east slope, has within the last few days completely rotted. This is the more serious, as we now seldom see any tracks of game. Nimrod yesterday saw tracks about a week old of a moose and two young ones; but they seemed to have been travelling. He then got a shot at a black bear, but missed it, and saw no other tracks.

This morning we passed an old pemican caché, which must have been very old, and probably belonged to some horse-stealing party that had visited the Kootanie country, and had hid the provision for their return in this place. It was made of heavy rough logs, built up in the form of a square hut, about 10 feet every way. Yesterday, we passed the remains of a very old encampment that must have been inhabited in winter, as the trees round it had been cut down on snow shoes, the stumps being six feet high, showing the snow to have been four to five feet deep. We saw signs of this being a very fine fur country, for marten and other tracks were very abundant, but the absence of game, which is very unaccountable, prevents the Indians tenting up this way to trap. At noon we arrived at two lakes, each several miles in extent. They occupy the bottom of the valley, which still retains the same dimensions, but their margins are formed of terraces 100 to 150 feet high, composed of the white mud and gravel beds. The day had cleared up, and the scene where we encamped on the margin of the upper lake was fresh and charming. Its shallow waters were thrown into waves by a stiff westerly breeze, and plashed on a shore of pure white sand; but when we entered the lake to bathe, we found that a few yards from the shore it had a muddy bottom that was almost unfathomable. There were a number of kingfishers flitting over these lakes, grabbing at the swarms of young trout. Also several flocks of a small tern, and a bird like a curlew, and on the shore the delicate little *Avocet* with its recurved bill dabbled in the mud in numbers. I now began to see many plants I had not before noticed; among them the Western Barberry (Mahonia), a large-leafed plant bearing a fruit like a flat raspberry; a Vaccinium, with a very large blue berry, and several ferns (*Botrychium*, *Osmunda*, and others), which I had not seen in the mountains before this. There was also a great deal of small maple shrubbery, and the trunks of some large cedars were lying about, all of the fine timber having been burnt. Besides the *Abies alba*, which reaches

It grows to a great size in the valley, often four and five feet in diameter. It is not a lofty tree, however, but has very stout heavy branches. It is much like the hemlock of Canada in the foliage. Its bark is so exactly like that of the rough-barked poplar (*P. balsamifera*), that where they have been growing together, it was only by carrying the eye up to the foliage that I was able to distinguish which was the pine trunk. Its cone is about two inches long, large-scaled and tumid.

The mountains along the south-west side of the Kootanie Valley in its upper part are very steep, but not so high as those on the opposite side, being wooded nearly to the top. They are composed of strata inclined at a high angle, and run as an unbroken wall.

The Kootanie River rises from the lakes at this place, and, without any break in the continuity of the valley, the waters of Beaverfoot River flow in the opposite direction to the north-west. The terraces rising above the highest level of the water have thus evidently nothing to do with the present watercourses in the mountains. I was so anxious to keep to the west, as I knew the mountains to the south were being explored by Captain Palliser, that in place of following down the Kootanie River, I had turned up to the north-west in the hope of finding some transverse valley about its source, by which to reach the Columbia proper, and have been much disappointed when I find it runs on continuously.

The valley in which we were now encamped, and which to all appearance is as spacious to the south as to the north, has been reached from the eastern plains without any difficulty excepting fallen timber; and by the route I have followed very little grading would be required to make a good passable road. The distance from the Bow Fort to the crossing-place for the Vermilion River, including for all the turns in our trail, was 57 miles, and the rise of the river between the two points I estimated at 300 feet. The only places where there would be the slightest difficulty in carrying a road throughout this distance, might be at the rocky point just below the *Lacs des Arcs*, and again for a few hundred yards at the angle of Grotto Mountain. At all places grading of the most easy description, with a few bridges over some narrow ravines, would be all that is necessary beyond the clearing of the timber. Excepting at these two rocky places, the road would everywhere pass over the superficial deposits, which are hard and firm for long distances. After crossing Bow River, the distance to the height of land is less than nine miles, our course in gaining it not having been direct. It is a steady slope leading from a wide notch in the mountains to the west of Bow River, at a point where the valley is of its widest dimensions. The rise, which is certainly not more than 550 feet from Bow River, might be accomplished very easily in making a road, and there is nothing like a narrow valley to limit the choice of ground for its construction. From the height of land down the Vermilion River to the valley of the Kootanie River, the aneroid observations, compared with estimates made on the spot, show a descent equal to 1,400 feet in a course of 35 to 40 miles by the windings of our trail. For the first six miles, where the valley is directly to the south-west, it is somewhat narrow and confined, but yet there is an ample margin along either side of the stream, to allow of the construction of a road. From the angle of the valley at the Vermilion Plain, the road would require to be carried along the left bank of the river until near where it receives the large tributary from the north-east, before turning south to pass through the "Gorge." In ordinary water there would be no difficulty in fording the river at many points in its course. On reaching the valley of the Kootanie River, the road could be carried either by the north-west or south-east with equal facility.

The source of the Kootanie River, where we encamped on this date is in latitude 51° 0′ 37″ and probably 300 feet below the level of the old Bow Ford.

August 27th.—During this forenoon we followed along the north-west, which has now become the right side of the valley, as we are travelling down stream. For the first few miles the bottom of the valley is occupied by a mossy swamp, with small deep lakes, crowded with the gaudy flowers of the *Nuphar lutea;* the narrow mossy streams were full of trout of two different kinds, common on the mountains. At noon we reached a large torrent from the north-east, which takes its rise in the glaciers of Mount Vaux, which were glittering in the sun on the right side of the valley. The shingle terraces are here replaced by an enormous deposit of moist grey sand, stratified with beds of gravel, and containing fragments of silicified wood. This deposit is several hundred feet in thickness. The mountains on either hand are composed of quartzite and slate, but the central and higher portions of those to the north were plainly seen with a glass to be composed of stratified rocks resting almost horizontally. In the bottom of the valley we passed several masses of true gneiss, and one or two greenstone dykes. In the afternoon we passed two large streams, in the valleys of which grew quantities of raspberries, which were very welcome, as we had almost no provisions left. We had great difficulty in making progress all day, as the valley deposits no longer presented regular terraces, but formed a rugged slope cut by deep ravines, encumbered with fallen timber. We encamped on an open spot by the river, and endeavoured, without success, to catch some trout for our supper.

August 28th.—Soon after starting this morning, Nimrod said he recognized a mountain which he knew to be upon the North Saskatchewan, and accordingly said we were descending a branch of that river. I however thought that hardly possible, as the vegetation was too luxuriant for the east side of the mountains, and we were already at too low an elevation for the rapid stream that we were upon to be any feeder of the Saskatchewan. At noon we reached latitude 50° 30′, after four hours of very hard work, chopping our way through the fallen timber. We had only gone two hours beyond this point when a violent storm compelled us to camp for the night close to the river, among fallen woods.

August 29th.—For the last few days, since leaving the lakes, our horses have fared badly, as there is no fine grass in the valley excepting in the swampy bottom, but there it is too soft for them to feed. Their legs are also getting very badly cut by the constant leaping and scrambling over the fallen timber, so that on the whole they have their tempers and patience tried a good deal. We had travelled a few miles when we came to a large flat, where the wide valley terminated, dividing into two branch valleys, one from the north-west and the other to the south-west. Here we met a very large stream, equal in size to Bow River where we crossed it. This river descends the valley from the north-west, and, on entering the wide valley of Beaverfoot River, turns back on its course at a sharp angle, receives that river as a tributary, and flows off to the south-west through the other valley. Just above the angle there is a fall about 40 feet in height, where the channel is contracted by perpendicular rocks.

A little way above this fall, one of our pack horses, to escape the fallen timber, plunged into the stream, luckily where it formed an eddy, but the banks were so steep that we had great difficulty in

getting him out. In attempting to recatch my own horse, which had strayed off while we were engaged with the one in the water, he kicked me in the chest, but I had luckily got close to him before he struck out, so that I did not get the full force of the blow. However, it knocked me down and rendered me senseless for some time. This was unfortunate, as we had seen no tracks of game in the neighbourhood, and were now without food; but I was so hurt that we could not proceed further that day at least. My men covered me up under a tree, and I sent them all off to try and raise something to eat. Peter I sent up the mountain in the angle of the valley, to take bearings, and to see what the mountains were like to the west. He ascended 3,500 feet by the aneroid, but did not get to the highest part of the mountain, which is quite a low one compared to those north of the valley. It is composed of the grey limestone, and splintery iron shale, all dipping 35° to the E.N.E. The mountains seen to the N.W. were high and snow-clad, but beyond those forming the side of the valley there were more seen to the S.E. The men all returned at night without having killed anything. Nimrod had tracked some wapiti, but there were traces of Indians having been in the neighbourhood in spring, probably Shouswaps or Kootanies, and they found a very bad trail leading down the valley to the S.W. Nimrod, who had been that way, found the river soon became hemmed in by high rocks, so that the trail had to go high up over the mountain. There had only been two trails, with very few horses, and they appear to have returned from this post by the same road they came. At one of these camps he found wool of the mount goat, and also wapiti hair. The deer tracks he had seen were leading up the valley to the N.W., and were not fresh. This evening we saw several flocks of geese flying down the valley to the S.W.

August 30th.—I was so much better by noon, that I took a meridian altitude, and found the latitude to be 51° 10′ N. The men were again hunting to-day, and Peter and Brown found a large flock of white goats, but the only one they shot managed to get to the edge of a precipice and fell over, so that they got none of the meat.

Nimrod went a long distance after the deer, and came back quite lame, having run a sharp spike into his foot. He had seen the wapiti and missed a fine buck. We were now in a bad way, as, although I had kept a private *cache* of about five pounds of pemican, which I now produced, it was only enough for one meal for us all. I intended however to make it last for three days, by which time we should, from the look of the stream which I intended to ascend, be able to reach the height of land, and get back to the east slope of the mountains where we would be sure to find game.

August 31st.—Every morning just now we have dense fogs, that generally last till nine or ten o'clock, but the evenings are fine and clear. After travelling a mile along the left bank of the river from the N.W., which because of the accident the men had named Kicking Horse River, we crossed to the opposite side. It was 90 to 100 yards wide, and almost too deep to ford. The motion on horseback gave me great pain, but we managed to get along slowly till noon. We left the river a considerable distance to our right, following notched trees that Nimrod had marked the day before when out hunting in order to show us the best way, as an Indian soon finds out the right direction to carry a trail in.

At nightfall we again struck the river, where it passes through a narrow defile, and through which we found a well-marked trail. This is generally the case whenever the valleys are narrow, as there, whenever Indians have passed in former times, they have been limited to the same track: while in wider parts of the valley they hunt about in search of game, without leaving distinct traces of where they pass.

The deposits of red and grey sand, with clay and gravel, are at least 600 feet thick in the valley. Our course had changed almost to due north, and we passed over the grey slate strata, dipping first to the N.E. at 5°, and then changing to a high angle in the same direction. Where we encamped the river is hemmed by high precipices of blue limestone. The river is very muddy, and with the imperfect tackle we have, consisting of some large cod hooks and twine, we cannot catch any trout.

September 1st.—Started early, sending Nimrod and Peter ahead to hunt. The valley soon after starting got very wide, with extensive swampy flats and clumps of fine timber. The willows fringing the margins of these grassy swamps exactly resembled hedgerows enclosing green fields.

Halt at noon, in latitude 51° 16′ 30″ N., a little way below where the river receives two large tributaries, one from the east and the other from the N.W.

Above this point the main stream makes a large bend to the east, to avoid which we crossed a high rocky spur of the mountain, and again met the river by descending into a magnificent cañon, where we encamped.

The higher portions of the mountains we passed this day are capped with a great thickness of slate rock with ferruginous bands. The valley or cañon in which we encamped is about half a mile wide, enclosed by rocky walls, that often rise nearly perpendicularly 4,000 to 5,000 feet. They are composed of the white slate rock, on which rests unconformably enormous beds of limestone, much dislocated; while the banded slate rock and ferruginous shales form the higher parts of the mountains.

September 2nd.—Started very early, as our only hope of getting any game was by reaching the east side of the mountain. Nimrod had indeed again seen wapiti yesterday, but the fallen woods were so difficult to hunt in, that with his lame foot he only got a long shot, which he missed. We travelled on the shingle flat, which occupies the full width of the valley, crossing and recrossing the river, which must during the spring floods cover the whole valley bottom. After five miles the valley terminated in a sudden slope, covered with heavy pine forests. Entering these we began to ascend rapidly, but loitered a good deal to eat large blueberries, that grew in abundance, and which we were very glad to get, although not very substantial food, when we had been fasting altogether for the past day, and living on only very short allowance for the previous five. After gaining a considerable height, we found it necessary to cross the stream, which was boiling and leaping through a narrow channel of pink quartzose rock. It was with much difficulty that we effected a crossing, and then we had much climbing over moss-covered rocks, our horses often sliding and falling. One, an old grey, that was always more clumsy than the others, lost his balance in passing along a ledge, which overhung a precipitous slope about 150 feet in height, and down he went, luckily catching sometimes on the trees; at last he came to a temporary pause by falling right on his back, the pack acting as a fender; however, in his endeavours to get up he started down hill again, and at last slid on a dead tree that stuck out at right angles to the slope, balancing himself with his legs dangling on either side of the trunk of the tree in a most comical manner. It was only by making a round of a mile that we succeeded in

bruised, to the rest of the horses. In the lower part of the ascent we passed much cedar and birch, but as we rose we got into forests exclusively composed of spruce fir. We travelled eight hours before camping, the last two being over fine level ground through open forest. We passed many small lakes, and at last reached a small stream flowing to the east, and were again on the Saskatchewan slope of the mountains. The large stream we had been ascending takes its rise from a glacier to the east of the valley through which we had passed. We encamped in a beautiful spot beside a lake, with excellent pasture for the horses. I had killed a grouse, and we were glad to boil it up with some ends of candles and odd pieces of grease, to make something like a supper for the five of us after a very hard day's work. We were now 1,275 feet above our encampment of last night, and the cold was very sharp, and we felt it more severely in our famished state.

September 3rd.—This morning all the swamps were covered with ice. As I was now nearly recovered from the accident, I started with Nimrod at daylight to hunt, leaving the men and horses to follow a prescribed course to the east. We took our horses with us, and after a few miles we came to a large stream from the west, up the valley of which we saw a great glacier. Following it down, we came after five miles to a large river, which Nimrod at once recognized as Bow River, and then I began to recognize the mountains down the valley, 15 or 20 miles to the east, as the Castle Mountains. The descent from our camp at the height of land of the pass which we had just traversed is very slight to Bow River, and cannot amount to more than 100 feet. We crossed Bow River, and leaving our horses tethered in a swamp, set off to hunt on foot. We saw several fresh moose tracks, and followed one for more than two hours, but failed in coming up with it. Towards noon, on coming to the river, I found our party had crossed, so I made for them in order to get the latitude. Nimrod soon started again into the woods, and had not been long gone, when we heard most furious firing, and in a short time he returned in a high state of glee, having shot a moose. We at once moved our camp to where it lay, about one mile distant, in a thicket of willows. It was a doe, and very lean, but, notwithstanding, we soon set about cooking and eating to make up for our long fast. It was not till we got the food that we all found out how depressed and weak we were, as desperation had been keeping us up. I had three days before promised that if nothing was killed by to-day I would kill one of the horses, and this evening, if Nimrod had not killed the moose, the old grey that fell over the cliff would have been sacrificed. I had refrained from killing a horse sooner, as I have been warned by experienced travellers that once the first horse is killed for food many more are sure to follow, as the flesh of a horse out of condition is so inferior as merely to create a craving for large quantities of it, without giving the strength or vigour to induce the hunters to exert themselves to kill other game. The prospect of starving is then looked on with indifference, as they know it will be avoided by killing another horse, until at last too few are left to carry the necessaries for the party, who then undergo great sufferings, and, as in the case of several American expeditions, some may even perish.

September 4th.—This morning, as we were still cooking the tit-bits of the moose, a Stoney Indian suddenly popped on our camp, having smelt our fire a long way off. He said there was a camp of eight tents six miles further west, so slinging our moose meat on the horses we set off to join them. It was snowing nearly the whole day, this being the first of the season. We kept N. W., leaving the Bow River to our left. The valley is very wide here, the mountains appearing quite distant when we got a glimpse of them through the forest. Immediately on our arrival at the camp, which was in a pretty secluded spot, by the side of a mossy lake, the squaws took the whole management of our affairs,—unpacked the horses, put up the tent, lined it beautifully with pine foliage, lighted a fire, and cut wood into most conveniently sized billets, and piled them up ready to hand. They then set about cooking us all sorts of Indian delicacies,—moose nose and entrails, boiled blood and roast kidneys, &c. They had only been encamped here two days, having arrived from the North Saskatchewan. They had reached this valley, like ourselves, starving, but already there had been killed in the last two days seven moose deer, including Nimrod's one. It seems that this place, being far in the mountains, is only seldom visited, and, as the valley is wide and thickly wooded, moose deer are always found plentifully. The country that animal likes is exactly the kind which now surrounds us. The ground is irregular, the risings covered with a moderately open growth of spruce forest, while in the hollows are long openings occupied by firm mossy swamps and lakes, or muskegs as they are called, and which support an abundant growth of a slender delicate-branched willow about 4 to 5 feet high, the tender terminal shoots of which form the principal food of the moose. The Indians in hunting are very observant of the cropping of the willow tops, and there was something quite exciting in the significant gleam of Nimrod's eye as he pointed out where the willow tops were yet wet with the saliva of the animal, or when, in walking rapidly through the woods, he would stop suddenly and pick up a morsel of half chewed leaf which it had dropped, and when he found that it had stopped to take several bites from one bush, then he pulled off his gun cover and looked to his priming. The moose walks right on the points of its toes, so that its track consists, on hard ground, of dots, in pairs, at a distance of 3 to 4 feet. In soft ground its foot-prints are of course more evident, and like those of wapiti or buffalo, but they have always a deep punctured look, which at once distinguishes them. In hunting this animal the Indian never follows its track directly, as it always, before it lies down, or even stops to feed in one place, goes for some distance against the wind, and then doubles back nearly in its own track, so that any one following it would be sure to pass its hiding-place, and taint the wind that was blowing towards it, when it would at once break away. To overcome this instinct of the animal is the highest test of the hunter's skill. When he comes on the track of a moose that has been travelling leisurely along, and has evidently not been disturbed or chased, he at once leaves it and makes a great circuit, to cut the track again about half a mile further on. Moving swiftly and silently through the forest, he trusts to his keen eye to detect the line of these little dots as he crosses it at right angles, and feeling almost by instinct where the moose should have passed, if he does not find its track, he at once concludes he has doubled round the animal. He then returns by the circuit to where he started from, and works up by a succession of lesser circuits, against the wind, till he sees a place where his experience tells him the moose is most likely to be. Then, if the ground is hard and the branches of the trees dry and likely to crackle, he strips off all his clothes, and glides like a snake through the forest, peering and prying to catch the first glimpse of the animal. At last he sees him, but all the trouble and fatigue is not to be

wasted on a miss, so he patiently works up close to the animal, who, if at rest, is generally buried in a thicket, and perhaps only visible to the keen Indian's eye by the lazy flap of his large ear. They generally get within 20 yards before they fire, and then often comes a most difficult piece of judgment, to determine from the position of the ears or the tips of the antlers as to how its body lies, and where to fire so as to hit it mortally. Then a quiet deliberate shot into the thicket, without seeing the spot of the animal to be hit is followed by a crash and a whiz through the brake, and the Indian at once dashes off to head the fugitive, in which he generally succeeds, as this animal, even when not hit, always halts a few seconds when about 60 yards from where he was disturbed. But if he fails in this attempt to come up with him, he coolly examines the track, and perhaps goes back to where he fired from, and to the lair of the moose, and reasons out the effect of the shot, looking for the ball-mark on the bushes and trees, because he knows that the animal will now run a distance proportional to the wound it has received, and will only stop short of a 5 or 6 hours' flight from mere weakness. He then follows the track, and in nine out of ten cases the moose is found dying or dead within half a mile. Sometimes, of course, it is shot dead, and never rushes off at all, or only goes a few yards.

At evening a half-breed arrived, who was tenting with these Stoneys. He was a brother of Paul, our chief guide, and whom I had left at the Bow Fort to go with Captain Palliser. He was very glad to see us, and get all the news, and made me a present of a fine buck moose; he had just come in from hunting, and offered to go with my men for the meat to-morrow. Other Indians also returned, and altogether they had killed three more moose to-day. They had, however, gone long distances.

During the night the great pine tree by which our tent was pitched caught, from a roaring fire we had lighted against its root, and neglected to put out when we turned into our blankets, trusting to its being green. But the fire caught the dry grey lichens which drooped in festoons from the branches, and which, being highly charged with turpentine, gave out a magnificent blaze, the roar of which luckily wakened me up, and, without waiting to see how much was burning of the forest, I caught our powder and my trowsers and bolted right into the swamp. It did not communicate with the other trees, however, but after brilliantly illuminating the forest for half an hour, and having consumed the foliage and resinous bark, it died out, leaving the charred trunk and branches as sturdy as ever. The glare of light which this fire threw on the dark forest and swarthy faces of the Indians, who gathered round to watch its progress, was very striking.

September 5th.—This being Sunday we were wakened at an early hour by the hymns of our Stoney Indian friends, who join in worship every morning and evening, but several times upon this day. None of them went hunting, as it was Sunday, but Paul's brother and two of my men went for the meat of the moose that had been given to us.

September 6th.—This morning we got our female friends to slice and dry the meat over fires. All of it was very lean, and we could not get any fat or grease to trade from the Indians, which was a bad look out, as it is nearly as hard to live on the dried meat of a lean animal alone without grease, as it is to starve altogether.

September 7th.—The snow storm still continues, but the fall is very slight. There has been thunder every evening to the south of us. This evening, the meat being dried, I gave a few presents to the squaws, principally needles and thread, and a few buttons, fire-steel, and flints.

Paul's brother told me that I could follow up Bow River to its source, and that I would see great valleys filled with ice, and that then I would come on the North Saskatchewan; but he said we would get nothing but white goats that way, and at this season they were not fit to be eaten. However I determined to try that route, and trust to our stock of dried meat lasting us till we got to the eastern ranges, where there are plenty of grey sheep. A young orphan boy in the camp, who wished to join some friends at a camp on the North Saskatchewan, I allowed to join our party, as he will be useful. I also got rid of our old friend "the grey" horse with the bruised countenance, and by giving a little "to boot," got a very good animal in exchange.

September 8th.—Leaving our Indian friends, we struck through the woods till we met Bow River, but after two hours a snow storm came on, of such violence that we had to halt till it passed. By noon it had quite cleared, and I found the latitude to be 51° 28′ N. Starting again, as there were now only occasional showers of snow, at three we passed a tributary from the S.W. The valley now became contracted a good deal, the mountains on the south and north sides having the same aspect of masses of alternate horizontal strata, and then a grassy slope between the base of the precipitous portion and the upper limit of the forest. Right before us Goat Mountain stood out at right angles from the western range, causing us to bend to the east. In the angle thus formed is a large lake, from which flows the tributary just mentioned, and at its head a glacier, of small size, nearly reaches the water level. Bow River was now a stream of very small size, but very rapid. We soon crossed to its left bank, and after passing round Goat Mountain the valley became much expanded. It was bitterly cold all the afternoon, and the night was clear, with sharp frost. We did not put up our tent, which, when pitching in a regular manner, we generally flung over a shed of poles, but this night we made a regular winter encampment with pine foliage under us. The mountains to the north of our camp had a very curious outline, the men saying that they were like an old woman's jaw.

September 9th.—We got on pretty fast this morning, as the timber was small and open. We are getting very high now, the barometer reaching less than 24 inches. The stream is now shallow, and flows over a clear rocky bottom. Our Stoney boy shot several trout as we came along with his arrows; and I saw also for the first time how to catch the tree grouse with a snare. He took a short piece of sinew twine and made a nooze, which he fastened on a slender pole, and advancing slowly to the bird gently passed the nooze over its head, and pulled it off the tree. The grouse did not seem frightened in the least, but sat gravely looking at him all the time, and actually when the nooze was close dodged its head into it. We often adopted this plan of catching them afterwards, and I never found much difficulty in effecting it where the forest was dense. There are four kinds of grouse in the mountains, the pintail grouse or common pheasant of the plains (*Titrao phascanellis*), the white flesher or ruffed grouse (*Titrao umbellus*) which has light grey plumage. The first of these is found in patches of open prairie, and the second in the cypress or poplar woods. The third kind is the Spence grouse (*Titrao Canadensis*), and is smaller than either of the others. It plumes

found inthe dense forests of spruce fir. The fourth kind of grouse is only to be seen by ascending the mountains to the upper limit of the woods, except in winter, when it is said to descend into the valleys. It is much larger than any of the others; the male is almost black, with a small crest of reflexed feathers; the female is dusky grey. They make a loud booming noise when flying, and are easy to shoot when they are once within range, but, unlike the other kinds, this large grouse is a very shy bird. It is *Titrao obscurus*. The half-breeds in the country always call the prairie grouse pheasants, and the tree grouse partridges, but both are misnomers.

An hour's ride brought us to where Bow River dilates to form a narrow lake, the water of which was of a bright green colour. Two miles further we reached a second and larger lake, being two miles long and one broad. Along its western shore the mountains rise precipitously, except at one point where a narrow valley allows a short glacier to reach the water's edge, being fed from the perpetual ice and snow that mantle the mountains in that direction. We kept along the east shore of the lake till it was terminated by an open prairie with a considerable slope, the surface of which is mossy, with many springs, from which the first waters of the Bow River rise. Ascending this prairie slope, we reached some open spruce woods, which clothe the valley, and halted just before the valley begins to descend to the north-west in lat 51° 40′ N. The altitude of this point is about 6,350 feet above the sea, being much higher than the height of land either of the Vermilion or Kicking Horse passes.

On starting after noon a few hundred yards brought us to a stream, at first small, but soon increased by many branches which flow to the North Saskatchewan. The view from this point was very fine. The descent to the valley below, unlike that we had ascended, is very sudden, and the angles of the mountain on either hand jutting in successively from the sides of the valley formed a vista for at least 25 miles. We did not at once commence the descent of the slope, but kept along the right or east side the valley for fully a mile, and then took down a break-neck trail that winds through the woods to its bottom.

When we reached the river we had made a descent of 900 feet. Following it down we still decreased our elevation rapidly, and after three miles, or six in all from the height of land, reached a beautiful lake, three miles long and two broad, and there encamped. This lake is closely wooded on all sides to the water's edge, except at one point on the west shore, where a spout-like glacier reaches through the woods almost to the shore. The surface of this glacier is very steep, as it descends at a very high angle from the ice-fields, which are 2,000 feet above it. It is a perfect ice cascade, and is broken at several points by fissures both longitudinal and transverse. The lower end of it is much attenuated, and there were signs of a great avalanche at no distant period, as there was an immensely broad belt of the forest swept away and buried up in the ruins. This lake, with its shores clothed with deep green pines, while back from these rise the precipitous mountains for 6,000 to 7,000 feet, contrasted with the beautiful tint of the fissures in the ice cascade. The strata are here composed of quartzite limestones and shales that dip away from the valley on either hand, the river flowing through a grand anticlinal fracture.

September 10th.—Keeping along the "Little Fork" of the North Saskatchewan we passed two shallow lakes, into which it dilates. These have been caused by the heaping of detritus or moraine matter across the valley; and these accumulations, along with distinctly scratched and smoothed surfaces of the sides of the valley where rock surfaces obtrude, all point to a time when the glaciers which now only occupy the higher valleys were more extended. The moraine matter is easily distinguished from the deposits of shingle which fill up the lower valleys, as the fragments are angular, and much larger than those of the terraces, which are invariably smooth and oval. After halting for a time in the middle of the day, while Nimrod endeavoured to find some wapiti, of which we saw the recent tracks, we continued down the left side of the valley, and at one place, where there had been a great slide of stones, which had swept a broad tract of the forest from the side of the mountain, we had to make a considerable ascent. We then struck through dense woods, from which we did not emerge until we reached the North Saskatchewan at nightfall. Along this river we found at this place a very distinct trail, much more so than any we had seen in any other part of the mountains. This evening, September 10th, after we encamped, we observed the comet for the first time, as hitherto our view to the westward had been blocked by mountains. It bore, at 8 h. 35 m., W. 25° N., and was 55° 17′ from the Polestar, and 31° 4′ from the first star in Ursa Major.

September 11th.—The channel of the North Saskatchewan, opposite to our camp, was 150 yards wide, but a little higher up the stream is cut up into several channels by large shingle flats. It is a large river even so near its source as this point, being deep and swift. The valley is very spacious, its sides densely wooded, sloping gradually back to the base of the mountains, which has the effect of dwarfing their really great height, the appearance of which is yet further reduced by the sheer precipitous cliff which they present. During the night we heard a great noise, like distant thunder, at intervals, which Nimrod said was caused by ice falling in the mountains.

On the opposite side of the valley from our camp, the mountains are not so high, and are composed of beds of quartzose sandstone and earthy shale, having a very slight dip to the north-east. Along the water's edge the sandstone ledges that crop out are quite soft and unaltered.

We followed up the track for a few miles, when at last it quite disappeared, as the higher bank along which it ran had been washed away by the river. We therefore took to the shingle flats, which were covered with a carpet of Alpine plants, the seeds of which are carried down by the spring floods to situations much lower than their natural habitats. The most plentiful of these are the *Dryas Drummondi* and the *Epilobium alpinum*. The former of these I have traced down the North Saskatchewan for 50 miles below where it leaves the mountains.

After six miles we reached a point where the river receives a large feeder from the west, the main valley turning to the south. Here we crossed to the left side of the stream, and ascending a slope of 150 feet, wholly composed of white glistening calcareous mud like that on the Vermilion River, plunged into one of the most dense forest growths we have encountered. The fallen trees were numerous, but all moss-grown and rotten, so that they did not impede us so much as in those woods where there had been recent fires.

As it approached noon we came to an opening where a slide of rocks had swept down the forest. The latitude here was 51° 54′ N. While halting here, a big-horn sheep came down the mountain almost

close to us, but seeing us first, made off without our getting a shot. Nimrod says this is the only place where these are to be seen so far in the mountains. A little way further through the woods brought us to a large lake, which occupied the full width of the valley excepting a narrow margin along its north shore, and which was very much encumbered with fallen timber. As we were chopping our way along, the same horse that played that frolic once before again plunged into the water, and swam off into the lake. We had to leave him alone, lest our endeavours to get hold of him should only start him for the other shore of the lake, which was a mile wide. After a time he turned to land again, but his pack was so soaked that we had to halt for the night where we were. To occupy the remaining daylight I sent two men on to cut out a track, while I tried to dry and save the few skins and plants I had collected, and which had been unfortunately packed on this horse.

Our camp was the most curious I have seen, as the fallen trees on the slope of the hill were so large and so interlocked that it was with difficulty we found places to stretch ourselves here and there among them. We fished, and set lines in the lake, but without success. It appears to be very deep, and the south shore is almost precipitous. In the afternoon violent gusts of wind occasionally blew down the valley, raising the water into large waves; but the evening was calm, and the reflection of the opposite mountains was wonderfully clear. Trying to shoot some bats that were flitting in numbers over the water, we found that the noise was echoed in a most wonderful manner by the successive points from side to side of the lake, the report being thus repeated in a sharp distinct manner six or eight times.

September 12th.—Two hours, with the aid of the track the men had hewn, brought us to the west end of the lake, where there is a few miles' extent of open grassy plain, fringed with woods, intervening between the foot of the great glacier and the water's edge. Encamping on this plain, I found the latitude to be 51° 52′ 16″ N. Reserving the ascent of the glacier for next day, I ascended the south side of the valley, and found it to be composed of deep blue limestone, full of iron pyrites in nodules. The mountain was very precipitous, and almost wholly without wood, as the slope is too great. On the north side of the valley, which is one to two miles wide, the quartzose beds form the highest parts of the mountains, and they have a very cuboidal fracture, giving rise to mock battlements and towers, as the soft shales weather from below them. The perpendicular cliff thus formed is 1,000 to 2,000 feet in height, and from its base to the bottom of the valley a slope covered with forest, and through which occasionally peep vertical cliffs, occupies the remaining 2,500 feet of the full height.

September 13th.—Start at sunrise to ascend the glacier, accompanied by Sutherland. The other men I sent off to hunt for sheep or deer, of which we found a few tracks. I wished Nimrod to go with me, but he would not venture on the ice, but told all sorts of stories of sad disasters that had befallen those Indians that ever did so; how that, if they did not get lost in a crevasse, they were at least sure to be unlucky afterwards in their hunting. After crossing shingle flats for about a mile, we reached a high moraine of perfectly loose and unconsolidated materials, which completely occupies the breadth of the valley, about 100 yards in advance of the glacier. Scrambling to the top of this, we found that to our left a narrow chasm, with perpendicular walls, brought down a stream from a glacier, descending by a lateral valley from the south, but that the greater bulk of the water that formed the river issued from ice caves, that were hollowed beneath the great glacier of the main valley. By rough triangulation, I found that the width of the terminal portion of the glacier in view from this point was 550 yards. This portion of it terminates in a slope of 22°, but after a few attempts, we found it was too much cut up by transverse crevasses to allow of our ascending it. These crevasses radiate from an angle in the perpendicular confining wall of the glacier along its southern border, the squeezing of the glacier round which, without doubt, gives rise to these fractures. After taking a series of bearings from this point, we followed round the lower end of the glacier, having to wade through several streams issuing from below the ice, till we found the surface forming a uniform slope unbroken by crevasses. This was immediately beyond a point where a great longitudinal fissure seemed to divide the glacier into two halves up the centre of the valley; that portion to our left being pure ice much crevassed, but free from dirt on its surface; while to our right the surface we now ascended was less steep, smooth, and unbroken, but so discoloured by foreign matters, that at a little distance it might have passed for a talus of rocky fragments. It was very cold work for our feet, as we merely wore mocassins, without socks of any kind. The mocassins, however, gave us one advantage, which was the securing of a sure foothold. Toiling on, the slope gradually became less steep, and at last we seemed to reach the average level of the glacier, getting a splendid view over its surface up the valley. By the aneroid, I found this point to be 1,500 feet above the terminal moraine. I now saw that the glacier I was upon was a mere extension of a great mass of ice, that enveloped the higher mountains to the west, being supplied partly through a narrow spout-like ice cascade in the upper part of the valley, and partly by the *resolidifying* of the fragments of the upper *Mer de Glace*, falling over a precipice several hundred feet in height, to the brink of which it is gradually pushed forward. A longitudinal crack divides the glacier throughout nearly its entire length, sharply defining the ice that has squeezed through the narrow chasm, from that portion of the glacier that has been formed from the fallen fragments, the former being clear and pure, while the latter is fouled by much debris resting on its surface, and mixed in its substance. The more rapid melting of the dirty portion of the glacier gives it a smooth undulating surface, which is much lower than the adjoining surface of the pure ice, which besides is much cut by crevasses and ice valleys, through which flow considerable streams, that often disappear into profound chasms. We had to go a great way round to avoid one of these rents, and at last had to jump it when about four feet wide, and, as I found, by timing the fall of stones, 160 feet deep. The ice was beautifully veined in some parts, and the streaks were often contorted in a manner exactly like the foliation in metamorphic rocks. The precipice at the head of the valley stretches for more than two-thirds of its width; the remainder is occupied by the ice cascade. The blue pinnacles of ice, tottering over the edge of the cliff, were very striking, and it was the noise of these falling which we had mistaken for thunder a few days before when many miles down the valley. On coming fairly in view of the precipice, when about two miles from the fort of the glacier, I found, by watching the fall of these pinnacles, and observing the interval till the crash was heard, that I was a little over four miles distant, so that the lower part of the glacier is about six miles in length. After examining the surface of the glacier, and arriving at its upper end close to the precipice, we struck off to the north side of the valley, to ascend a peak that looked more

accessible than the others. With some difficulty we got off the edge of the glacier, and climbing through some scrubby pines of low stature, soon came to a surface of naked rock. Here we found traces of where a bear had been digging roots of alpine plants. The mountain was almost precipitous, and formed of nearly vertical beds of soft white slate and quartzose rock. We started an old goat, and got quite close to him, but not having a gun could do him no harm. However, we forced him along a ledge between the mountain and glacier, and tried without effect to get him to jump on to the ice, by rolling stones on him from above. We reached the top of the mountain at three o'clock. My aneroid had ceased to work some time before reaching its summit, its lowest reading being 22·11 inches. We were probably about 4,000 feet above our camp at the foot of the glacier. The summit consisted of a narrow ridge sloping to the S.W., at an angle of 40 to 50 degrees, while, to the N.E., it presented a sheer precipice more than 1,000 feet in height. We only got along by crawling at some points, while sometimes an abrupt nick in the knife-like edge had to be passed by dangerous climbing.

We had a splendid view over the *Mer de Glace* to the south and west, the mountain valleys being quite obliterated, and the peaks and ridges standing out like islands through the icy mantle. The valley below us is really fed by three great glaciers, but only the one we had crossed fairly descends into and occupies it. One behind the mountain on which we stood descends from the same ice-field, but by a lateral valley to the north, and it terminates about a mile short of where it would join the great glacier, and at a much greater elevation.

The mountains to the north are very rugged, but not so high as those to the south of the valley. In that direction there is one peak which has a pyramidal top completely wrapped in snow, and at least double the height of where I stood above the valley. Descending again to the glacier in the midst of a snow storm, with a cold wind from the N.E., we skirted along the north edge, passing where the stream from the northern glacier passes under the great glacier by an immense cavern, the floor of which sloped at an angle of 30°. At one point we thought at first we should require to turn back, and gain the surface of the glacier, as we came to a precipice that was closely hemmed in between a wall of ice and one of rock. However, by knotting our leather shirts together, and taking off our moccassins, which were now frozen, we managed to get past the difficulty, and pushing on rapidly reached our camp at eight o'clock. The hunters had been unsuccessful, and we were now limited to the dry lean moose meat, which has not much more nourishment in it than chips of parchment. During the night we saw a great glare of flame down the valley at the lower end of the lake, and we rightly conjectured that the fire we left at our halting place among the fallen woods had set the forest on fire.

September 14th.—At seven started down the margin of the lake, and in two hours reached the lower end, and found that the fire had already destroyed a large area of the forest. The wind was luckily from the west, so that by keeping close to the stream, and going in the water whenever practicable, we got along; but, as sometimes we were forced to pass over the smouldering ground, our horses' legs suffered a good deal. When a forest of green and rotten timber, such as this was, burns, the fire progresses in a different manner from among dry woods. The layer of dried foliage, often a foot deep, smoulders away slowly, and when a dry tree is met with, or one braided with the turpentine lichen, then a sudden blaze takes place. The first passage of the fire is rapid, but it often remains smouldering for months in spots.

On regaining the main valley of the North Saskatchewan, I struck up the "Middle Fork" for a few miles. Being struck with the height of the almost perpendicular mountains, our having the valley to the west, I measured a base line on the shingle, and taking a well-marked point found it to be 6,000 feet above the eye. This point is only a spur from the high mountain seen to the south of the glacier, and which must be several thousand feet higher.

Return down the valley, and camp among some sand-hills on the right bank, a little above our camp of the 10th. Nimrod and the Indian boy were absent all night, having crossed the river to hunt. Near our camp we found some old buffalo dung, and the Indians told us that not many years ago there were many of these animals along the valley of the North Saskatchewan, within the mountains. Eleven years ago, they say, there were great fires all through the mountains, and in the woods along their eastern base; and after that a disease broke out among all the animals, so that they used to find wapiti, moose, and other deer, as well as buffalo, lying dead in numbers. Before that time (somewhere about 1847 or 1848) there was abundance of game in all parts of the country: but since then there has been great scarcity of animals, and only the best hunters can make sure of killing. I have heard the same description of the sudden change that took place in the abundance of game from half-breed hunters in different parts of the country; so there is little doubt that there is some foundation for the account given by the Indians.

September 15th.—This forenoon we kept along the north bank of the river, following an excellent trail for some miles, when we lost it, as it seemed to cross the stream at a point where it was too deep for us to ford it. The two Indians hailed us from the other side, having killed some goats, so I sent Erasmus over with horses for them to fetch the meat. At noon halted at a point where the valley turns about due east, and were joined by the hunters. We tried to eat the goat meat, which was that of a fine young kid, and was fat and exceedingly good-looking, but in spite of our hunger none of us could retain it on our stomachs, as the rank musky flavour gave rise to intense nausea.

In the afternoon we found a ford, and crossed to the left or north bank of the valley, where we again fell on the trail. We went very fast, and after 12 miles we crossed a rocky point where the river abruptly changes its course to the north, entering a wide valley that is prolonged through the mountains to the S.S.E. The shingle terraces, which are developed extensively throughout the valley, here expand to form an extensive plain free from timber and covered with "bunch grass."

We traversed the plain for 6 miles, and then encamped at a little distance from the river beside some old Indian tents.

This plain, which is 7 or 8 miles long, and 2 to 3 wide, is called the Kootanie Plain, as at the time that the Kootanie Indians exchanged their furs with the traders of the Saskatchewan forts, before there was any communication with them from the Pacific coast, an annual mart was held at this place, to which the Kootanie Indians crossed the mountain, while the traders came from the Mountain House. This accounts for the well-beaten track which runs along the valley.

September 16th.—While Nimrod, the Indian boy, and Erasmus went to hunt sheep, I returned alone on our track to the rocky point, to examine some pines I had noticed there. They grow on sand-hills, and have much the appearance of Scotch firs, the trunks and branches being twisted, and of a red colour. The cone is large, and covered with a fragrant balsam.

Ascending the spur which forms the rocky point of the valley (Pine Point) I found that it was composed of 200 feet of quartzite, overlaid by shales and limestones, and thin bedded sandstones composed of coarse grains of quartz with specks of green colouring matter. These sandstones exhibit much false bedding, and are not unlike what we might expect the sandstones at the Rocky Mountain House to be like if much altered and disturbed. The terraces along the edges of the Kootanie Plain are beautifully marked, rising successively many hundred feet above the river. The surfaces of the higher ones are covered with cypress pines of sturdy growth, but free from underwood. The widest terraces are quite free from timber of any kind, excepting only in the ravines, where there are poplars and small cherry trees. The leaves of the poplars were now quite yellow, and the vegetation began to show the advance of autumn.

In the evening the hunters returned. They had seen a large band of rams, and had killed four that were in excellent condition, but they could only carry very little of the meat down the mountain, so I determined to wait here another day to get it.

September 17th.—Taking three of the horses, as Nimrod said that we could take them close under where he had killed the sheep, we started up a rocky gully to the west of Kootanie Plain. After scrambling through a rocky chasm for a few miles, we ascended for 900 feet by a slope so steep that the horses could hardly obtain a footing.

Not wishing to test my horses by Nimrod's idea of their capabilities, I would not take them further, as I saw it was merely to save the trouble of dragging the meat down that the horses were wanted so far up the mountain. Unencumbered by the horses, it did not take us long to reach the point where the sheep were lying, and leaving the men to cut up and carry off the meat, I continued to climb to the top of the mountain. It was very steep, and I left my rifle with them, as I had not my sling with it, but after getting clear of the woods I regretted having done so, for while sitting on the rocks a flock of at least a hundred rams rushed close past me, so close, indeed, that I hit them with stones. Even when frightened and fleeing they keep to well-beaten paths, and move with wonderful rapidity. I did not observe any ewes in the flock, which quite agrees with the Indian's account of their habit of living separate for many months in the year, the rams keeping high up in the mountains after the lambs are of good size, while the ewes are found by the ravines and crags along the rivers. This mountain consists of strata with almost a vertical dip, and its summit was a long ridge composed of,—*a*, dark sandy shale: *b*, light grey fissile sandstone, being almost pure sand; *c*, splintery sandstone in thin beds; *d*, light buff sandstone, hardly consolidated, and weathering with great facility: *e*, white limestone and shale that weathers to bright vermilion colour, and traversed by veins of calc-spar. Each of these groups of strata are about 100 feet thick. *f*, cherty limestone, weathering red, 200 feet; *g*, same as *c*, 80 feet; *h*, white cherty limestone: *i*, buff marlite easily acted on by the weather; *k*, quartzose rock, being the lowest bed visible. Continuing along the coast of the ridge the same beds again occur in the reverse order, and the highest part being formed of black calcareous shale, with flattened nodulated masses of sandstone that resist the action of the weather. On starting from camp my aneroid read 25.27 inches; at the point where we left the horses 23.25; some time before reaching the top it came to its old limit of 21.20, as it has invariably done on ascending high enough; but on returning to camp in the evening, it again read 25.25, showing that the instrument suffers no derangement by being carried beyond the range of its index. The highest point I reached was about 4,300 feet above our camp at the Kootanie Plain. Although snow was lying in sheltered spots far below this altitude, yet there were no true glaciers, which shows the most remarkable difference, at which I have always been astonished, between the altitude of the snow line in the eastern portion of the range from those valleys that communicate with the western slope.

September 18th.—During our stay at the Kootanie Plain, the Stoney boy caught several fine trout in the river. The banks are in general 100 feet high, and ledges of quartzose sandstone cross the stream at intervals, giving rise to rapids. The terraces are composed of large pebbles of the quartzite and limestone, and often of heavy deposits of gravel and pure sand, which is moist and incoherent. At 8 o'clock we started down the valley, which for 14 miles lies almost due north. At where it turns to the E.N.E. the river receives a large tributary from the N.W., called Wapa teehk or White Goat River. Through this valley Nimrod said a trail runs to Jaspar House, known as "Old Cline's" trail. Cline was a trader that every summer travelled through the mountains from Jaspar House to the Kootanie Plain, and then returned through the woods by their eastern base, collecting, during this tour, enough provision to support him at the trading post of Jaspar House during the winter.

Two miles below Wapateehk River we halted in latitude 52° 18′ N. The valley of the North Saskatchewan is much wider and more open than that of Bow River, and its course through the mountains from its source is also much more direct. The same succession of longitudinal valleys may be remarked however. Thus the Kootanie Plain is bounded to the east by the Saw Back range, which presents the same wall-like character. To the west of the great valley the mountains have the same massive character as in the relative position on Bow River. In descending the "Little Fork" from the height of land of Bow River, we got occasional peeps of a lofty peak to the east, which I named Mount Murchison, occupying, however, such a central position among other high and precipitous mountains that we saw it only at intervals. The Indians say this is the highest mountain they know of, and, if a rough triangulation that I made of what I supposed to be the same peak from the Kootanie Plain is to be trusted, it must be 8,000 to 9,000 feet above that point, or 13,000 to 14,000 feet above the sea.

The average altitude of the mountains is 11,000 to 12,000 feet above the sea, and I do not place much reliance on estimates of altitudes greater than that, as there is a striking appearance of uniformity in the altitude of the mountains. However, their shape, always partaking of a craggy nature, is very deceiving, and whenever I have been able to get any measurement, I always found that I had underrated the true height.

The valley of Wapateehk River corresponds with the first longitudinal valley, and it is continued to the south by the valley of a small stream that heads with the northmost of two branches which join to form Red Deer River, while the other one flows in the same valley from the south from a divide that gives off the stream that joins Bow River at the Cascade Mount.

Still keeping along the left bank of the river, after 8 miles we passed out of the mountains at 4 o'clock, being just 38 days since the time we entered them at the old Bow Fort. The outer range consists of the same blue limestones and soft earthy shales, arranged in gigantic plications, as seen along Bow River at "*Lacs des Arcs.*" In crossing the last rocky point we started a band of ewes, and killed two of them.

The largest, which Nimrod says is of average size, as follows:—

Height (shoulder)	36 inches.
Length	51 „
Height (rump)	39 „
Girth behind shoulder	43 „
Length of head	12 „
Scimiter-shaped horns, length	5 „
Inner cantlins to tip of nose	6½ „

Covered with tubular hair like the prairie antelope. Face very like a sheep's, and of light ash grey. Back of brownish grey colour. Front of legs dark slate colour. Back of legs and rump pine white. Tail, 3 inches long and black. Udder with two teats full of milk.

The river after leaving the mountains turns a good deal to the north, and quite suddenly the country becomes comparatively level on either hand, still, however, at a little distance back forming hills 800 to 1,000 feet above the river. The outer, or Brazeau's range, formed a line of lower mountains 15 or 20 miles to the east, and the space between forms a wide valley, the irregularities of which are nearly obliterated by the magnificent development of the shingle terraces. A few miles from where we killed the sheep these terraces form the banks of the river to the height of 200 feet, the pebbles being cemented into a hard conglomerate, and seem to rest on the upturned edges of grits and clays, with lignite like that at the Mountain House. The conglomerate is evidently formed from the underlying beds, and fills up the inequalities of the eroded surface. Remaining to examine the sections, I fell some distance behind the party, who had pushed on to avoid a great storm of thunder and hail that now commenced. The fall of rain and hail was so severe that the horse tracks were quite obliterated, and I was pushing on very fast in doubt of whether I had passed them or not, when suddenly my horse shyed at a bush, and immediately out sprang a splendid panther. I did all I could to pull off the leather cover from my rifle, but it was so soaked with the rain that I found it immoveable. He stood a few seconds within 12 feet of me, lashing his tail, and as if in doubt whether to spring, while my horse danced about in a state of disquietude, till at last he made off into the brushwood again. He was of a browny red colour, and I had only time to remark the great width of his face, and the length of his tail. This is the only one I have seen in the mountains, although in some localities his easily-distinguished track is not unfrequent. After some time I was led to where my men had encamped, by shots which they fired as signals. From the trend of the mountains and the difference of latitude, the point where the North Saskatchewan leaves the mountains must be nearly two degrees of longitude west of the Old River Fort.

September 19th.—By Nimrod's account it was only six miles to Big-horn Creek, where, as he said, there was fine food for the horses. I meant to stay a few days to let them recruit for the long journey that yet remained for us before reaching Edmonton. As it was too wet to start early in the day, I set off alone, with directions that the rest should come on, and camp if the weather cleared. As the day cleared we found that the mountains were quite white with the snow that had been falling while we were getting heavy rain.

The country in the great valley between Brazeau's ranges and the mountains proper, is very beautiful. The timber is a good deal cleared away by fire, but still large bluffs remain, while, in the openings on the high grounds, there is rich pasture, and poplar and willow brakes. The occurrence of low cliffs, by the outcrop of the strata of pink quartzose sandstone, gives a freshness and variety to the scene that is wholly wanting in the plains.

Sheep River is a tributary from the north-west, and rises near the source of McLeod's River. Its banks are quite precipitous, and from 200 to 300 feet in height, exposing sections of dark shale, with coal and ironstone. Along with them are beds of quartzose sandstone and grit, either of a pink or buff colour, and sometimes with the green tint of the beds at the Mountain House. The whole are much disturbed and indurated, but at this point have no high dips. These strata have a medium character between the lignite group of the Mountain House and the strata that I examined in the mountains west of the Kootanie Plain. I thought at the time they were all of the same age.

Riding on for a mile beyond the creek I chose a good camping place, and waited till the rest came up. Nimrod arrived first, and just as he was getting off his horse he spied three brown bears that were digging roots in the swamp, within 200 yards of where I was sitting, but being on foot I had been too low to observe them. We both fired, but missed, and then had a long fruitless chase after them towards the river.

September 20th.—At daylight I set off to visit a hill about 1,500 feet high, lying four or five miles north of our camp. It consists of heavy beds of carboniferous limestone, full of encrinite stems and corals, and resting on it unconformably are the grits and shales of Big-horn River. Retiring at noon, I found the latitude of our camp to be 52° 24′ N. I then revisited Big-horn valley, but several miles above the point where we crossed. The strata have much the same character, but are more disturbed as the limestones are approached, which seem to have been thrust through them as if an intrusive rock. The shales sometimes pass into soapy clay, containing fragments of sandstone. There are also thin-bedded dark grey micaceous sandstones, much ripple-marked, and grey carbonaceous sandstones, in beds from 1 to 6 feet in thickness, with partings of carbonaceous shales, passing into true coal in some places. Also seams of clay ironstone and clay shale.

The Stoney boy killed one of the large grouse near the top of the detached hill I visited in the

forenoon. It was a hen. Length, 18$\frac{3}{8}$th inches; tip of beak to inner angle of eye 1$\frac{5}{16}$th inches; stretch of wings from tip to tip, 24 inches. Its colour was grey, but more dusky than the grey prairie hen; the eyes red; the feet very small and yellow; tail black, with five feathers on each side (the central ones were wanting). The upper mandible was more hooked than in other kinds of grouse.

September 21st.—Engaged preparing skeletons of the big-horn sheep. A party of Stoney Indians join us, they have been north tenting in the woods, and are on their way south, to the Bow Fort. They pitch their tents beside us, and we all become great friends. Nimrod was out hunting all day, and as he returned unsuccessful after dark, he saw close to our camp what at first he took for a horse, but discovered it to be a wapiti, by its antlers showing against the sky, he fired, and thinks he hit it.

September 22nd.—At daybreak I set off with Nimrod to look for the deer, and soon found him not yet dead, but lying within 300 yards of our camp. It was a splendid buck, with large antlers, and measured 5 feet 7 inches in height at the shoulders. He was not in good condition, however, and as we had plenty of good mutton, we handed him over to our Stoney friends, to convert into "pounded meat" for us, reserving only the marrow bones, which we discussed raw after the Indian fashion.

The Indians had made up a party to hunt sheep on the south side of the Saskatchewan, and asked me to join them; so at 8 o'clock, taking Erasmus with me, we started down Big-horn River, but after three miles, in the course of which we descended a succession of terrace levels, we reached the river, and crossed it without difficulty, as the Indians knew a good ford that only reached to the horses' girths. The south bank ascends rapidly, and we soon gained a considerable altitude, when, leaving our horses in a secluded dell, we split into two parties, each six or seven in number, keeping on opposite sides of a deep precipitous ravine of great depth. This is a famous place for sheep at this season, and when the Indians can find a flock grazing on the side of the ravine they drive them to the bottom, where they are met by another party of hunters, and as they try to escape up the other slope their habit is to huddle together, so that they become an easy mark for the hunters stationed above them. Luckily for the sheep, but unluckily for our sport, there was some misunderstanding, owing to which the other party of hunters started the game while we were yet toiling up through the fallen timber, so that a flock came rushing right past us, but going at such a speed through the woods that it was difficult to get a shot. However, Nimrod, who was just before me, killed two with his common flint gun, while I only killed one with my double rifle. Nimrod then set off through the woods, running like a deer, loading and firing all the while, and killed two more. Erasmus, who was with the party on the other side of the creek, kept up the honour of the party by killing a ewe and a lamb. We followed up the gully for some time, but only got a few straggling shots. There were 12 in our party altogether, being myself, Erasmus, and Nimrod, and 9 Stoneys from the camp, and at the end of the day we found there had been 10 sheep killed, of which Nimrod killed five, Erasmus two, myself one, and the Stoneys only three among them. That it may not seem like butchery, I may mention that from their habits the Rocky Mountain sheep is quite as difficult to hunt as any deer, while the grey colour renders them a less easy object to aim at. All that were killed were ewes or year olds, and I saw no large horned rams among them, this being the season that they keep separate.

The perpendicular sides of the ravine were 250 to 400 feet deep, and formed of dark sandy shale, with flakes of mica. Their strata were covered with an aluminous efflorescence, and in one place I got abundance of a small species of ostrea, but badly pruned. Lower down the ravine the grits appear, but the section is not continuous, so I could not determine their relative position.

As we returned I observed that there is a deposit of freshwater or river silt over the lower shingle terraces, and that in some places the higher terraces, especially along the sides of ravines, are covered by a deposit like the drift of the lower plains, consisting of coarse sandy clay with large sub-angular boulders derived exclusively from the neighbouring rocks. Nimrod was the great man among the Indians on returning to camp, as a good hunter is always held in the highest estimation. He does nothing but idle and smoke in camp, and may lord it over the rest as he pleases, as they are all afraid to offend him.

There is great regularity in the changes of the wind at this place. Thus all day it blows gently from the S.W. till about 3 p.m., when it freshens to a gale. At 6 p.m. the lower stratum changes to a N.E. wind, the upper clouds still continuing to move from the S.W. for an hour or two later. The north-east wind generally blows pretty fresh, and brings fog and low clouds; but two hours after sunset it clears up, and a light wind sets in from the S. or S.E., which falls to calm towards morning.

September 25th.—Our horses are improving rapidly, as it was merely food and rest for a few days that they required, with the exception of one that had been severely burnt in passing through the fire at the Glacier Lakes. I managed to exchange him with the Stoneys, however, for another that was sound, though perhaps not so fine a horse otherwise. I examined the banks of a ravine about five miles east from camp to-day, and found much the same strata displayed as on Big-horn Creek. A coarse sand-stone, in beds from six to ten feet thick, and composed of white and pink grains of quartz, with very little cementing matter, and in some beds a good deal of a green mineral in small specks, and in others minute flakes of mica and specks of carbon. The shales are much indurated, and contain abundant but obscure impressions of plants. With these shales are beds of very rich ironstone. The dip varies much, and the strata are traversed by great faults. The sandstones often form lenticular beds, and the shales in one case I observed to occupy a hollow in the sandstone, so that the overlying beds of sandstone appeared unconformable. This confirms me in the idea that these are the same strata which occur at the Mountain House, only differing in their being much disturbed and indurated.

September 26th.—I had a long walk this day to reach the N. aspect of the limestone hill. It is composed of beds dipping at 35° to W.S.W., and to the N.E. presents a perpendicular cliff about 1,000 feet high, with about one third of its height concealed by a talus of broken fragments: the section is as follows:—

Crystalline limestone of light blue colour, with corals and encrinites -	300 feet.
Dark arenaceous beds - - - - - -	100 „
Splintery compact limestone, very dark coloured - - -	400 „
Soft subcrystalline and cherty limestone, with a good deal of bituminous matter and encrinite stems - - - - - -	200

Round the base of the hill the grits and sandstone are found always dipping from it, so that those to the west appear almost conformable, while those to the east dip exactly in the opposite direction.

The masses of limestone tilted at a considerable angle seem to have formed islands at the time that the grits, sandstone, and clays, were being deposited, and then a further disturbance increased the dip of the limestones, thrusting them through the later beds, which acquired a radiating dip.

September 27th.—This morning, after giving away everything we could spare as presents to our Indian friends, and leaving with them the boy that had accompanied us from Bow River, we started to continue our journey to Edmonton. The seven days' rest had greatly improved the horses, and without it I doubt if we should ever have got them to winter quarters.

The Saskatchewan turns to the S.E. from this point to cut through Brazeau's range, but we kept on due east for a more northerly depression through the same hills. After a few miles of open timber we got into thick spruce forest as we approached the hills. We passed several large lakes and streams, and found the ground very soft. After 15 miles we reached the valley through the range, and encamped by the source of a stream that flows to the E. North and south of us, were lofty bluffs of limestone rock, the beds of which dip to the west at a high angle.

September 28th.—Follow down Miry Creek, and at noon cross it by a rude Indian bridge, and, halting, find the latitude to be 52° 30′ N. In crossing a swampy "opening" during the afternoon we get a view of the range through which we have just passed, and find that it looks much higher from this side than from the west. Now that we were out of the mountains we found many plants still in flower, such as delphinium and rhynanthus.

During the afternoon we continue to follow the creek till we again reach the Saskatchewan, to which we require to make a descent of 270 feet through a rocky gully, the sides of which are formed of the sandstones and iron clay shales, as at the Rocky Mountain House, only here they are tilted at an angle 15° to the south. The shingle terraces were now found along the river valley, or on the high table-lands back from the river, the intervening bit of country being soft and swampy. Finding it tedious following the long bends of the river, we again ascended the bank, and at nightfall camped by a spruce swamp. We began now to see larch in the low grounds, that tree not being common in the mountains. The night was clear, with sharp frost.

September 29th.—We had travelled about two hours this morning, when we came to the fresh tracks of a band of wapiti. By a careful search we soon found them, but the wood was so dense that, although one at least was wounded, they all escaped.

Before starting again I found the latitude to be 52° 26′ N.

We again descended to the river, and found the valley much wider than before, with extensive alluvial flats. Passed several sections of soft coarse sandstone, with clay partings, but no coal. The timber is very fine on the flats, some of the balsam poplars and white spruce trees being of great size. We found a trail leading along the river, through a succession of small prairies with rich pasture, so that we got along rapidly, and made fully 20 miles before we encamped.

September 30th.—The valley has now expanded till the high lands are represented only by rounded hills at a considerable distance, while in its descent the river has acquired secondary banks 60 to 70 feet in height. At where we halted in the middle of the day, strata of earthy shale with concretionary masses of sandstone dip to the S.W. at 10°, and overlaid unconformably by soft buff-coloured sandstone, with clay partings. The upper strata are quite horizontal, and evidently fill up hollows in the lower beds.

This evening we reached the Rocky Mountain House, but found that the traders had not yet arrived from Edmonton. The place had a deserted look, the parchment windows being torn, the doors standing ajar, and the court-yard choked with weeds. We established our camp in the kitchen, and tearing down some of the half-rotten pickets, soon made a blazing fire, but I did not feel nearly so comfortable as if we had been encamped as usual. Our supply of sheep pemican that we had made was now finished, and on looking for the bag of dried meat the Stoney Indians had prepared for us, we found that it had dropped out from the pack, so we were left without any provisions, and had still 180 miles to travel. During the night there was much thunder, followed by snow, being exactly the same kind of storm that ushered in the previous winter, and which we encountered on the 6th of October before reaching Carlton.

October 1st.—Ground white with snow. In the prairie behind the fort we soon killed some grouse for our breakfast. The horse we had got from the Indians at Big-horn Creek strayed off into the woods, leading astray several of the others, and we were detained all day searching for them.

October 2nd.—The snow has all disappeared this morning, but it is a very hard frost. Crossing first the Saskatchewan and the Clear-water River, we kept to the E.S.E., and at noon were in latitude 52° 23′ 30″ N. At night we reached the "Last Hill Creek," and fell on the track I had travelled the previous winter. We encamped an hour before dark, to leave time to shoot rabbits for our supper.

October 3rd.—The wind was bitterly cold to-day from the N.E. We travelled along briskly, and made 23 miles by nightfall, when we reached Blind River. Just as we were going to encamp we heard a dog bark a little to the north, and as it was an object to fall in with Indians, with whom we might get some provisions, we turned off in that direction, and found a little camp of Pigeon Lake Indians hid among the trees. There were six tents, some of the families being of Stoney Indians, and others of Thick-wood Crees. I gave them our leather tent, which we had carried all through the mountains, in exchange for some wapiti venison. They told us that these deer have already commenced to go in large bands, which is a sign of an early winter. Snow began to fall at dark, and in the morning there was five or six inches on the ground.

October 4th.—Push on all day in spite of the drifting snow, and made 28 miles, but in the course of the afternoon, when we had crossed Beaver River, the storm increased to such violence that we had to halt and make a regular winter encampment, building a shelter of pine foliage.

October 5th.—The snow continued to fall during the night, and this morning we were quite covered over, as the wind had changed, and our shelter had only produced a heavy drift. On the open plain the snow was nearly two feet deep, and as our horses were in a miserable place, where they could get no grass, we drove them to a swamp, and let them feed till mid-day. As it was very cold, I tore up my

blanket for the general good, to make wrappers for our feet. In the afternoon the snow ceased, and we crossed Battle River and Pigeon Creek. The latter stream, although only about 20 feet wide, was so deep that we had to swim it, plunging through it by a rapid dash on horseback, without taking off our clothes. The effect of the plunge on our worn-out horses was, that a few miles after, they began to give out, so that we could hardly get them along.

October 6th.—We travelled on slowly, all on foot, driving the jaded horses through the deep snow, and at noon reached the Bad Beaver Dam, where I found the latitude 53° 5′ N. At night we had only reached the "Stoney Plain," and were still 25 miles from Edmonton.

October 7th.—A sharp frost during the night had "set" the snow, so that it did not impede the horses so much, besides it seems as if so much had not fallen in this district as further to the S.W. At noon we reached the White Mud Creek, and halted to wash our faces before arriving at the fort. At 4 we reached the river, and soon attracted the attention of the inhabitants of the fort, and I had the satisfaction of distinguishing Captain Palliser and the rest of our party awaiting me on the other bank. The swimming of the horses was a troublesome work, as some of them were very weak.

Captain Palliser's Journal.

Shortly after my arrival at Edmonton our party was increased by that of my friend Captain Brisco, and his companion Mr. Mitchell, another English gentleman, who had come out to the far west in search of adventure and heavy game. The fort was then in charge of Mr. Brazeau, an American gentleman, in the service of the Hudson's Bay Company, generally in charge of the Rocky Mountain House during the winter, but who comes down to the head quarters of the trade at Edmonton during the absence in summer of the chief factor, who leaves to attend the council at Norway House, Lake Winipeg. Fort Edmonton, the largest fort of the Saskatchewan, is built altogether of wood, consisting of one good-sized house, two stories high, the habitation of the officer in charge of the post; it also contained ourselves afterwards, and some visitors. Adjoining the house are the storehouses of the Company, containing their goods and furs, besides the log-houses inhabited by the men engaged by the Company, together with their wives and families; the whole is surrounded by wooden pickets or piles firmly driven into the ground close together, and about 20 feet high.

In shape it is an irregular hexagon, about 100 yards long, and 70 wide; and contains a population of about 40 men, 30 women, and 80 children, almost entirely supported on buffalo meat, the hauling of which, for sometimes upwards of 250 miles across the plains, is the source of great and most fruitless expense. Indeed the labour and difficulty of providing for a consumption of 700lbs. of buffalo meat daily, and from so great a distance, would frequently become very precarious, were it not for an abundant supply of fish from Lake St. Ann, about 50 miles to the west of the fort, whence they are capable of hauling 30,000 or 40,000 in a season; these are a fine wholesome white fish, averaging four pounds weight each. Besides this, great quantities of provisions are traded here, it is the principal depôt for provisions, as the several brigades of boats are most supplied from this place. Few fine furs are traded here, those which are obtained being chiefly from half-breeds belonging to the settlement at Lake St. Ann's, where there is a Roman Catholic mission, under the direction of two French priests, who have induced the half-breeds to cultivate the ground, and sometimes they realize very fair crops of barley and potatoes. Little agriculture is carried on about Fort Edmonton, owing partly to the want of acquaintance with even the leading principles of agriculture, and principally from the disinclination of both the men and women to work steadily at any agricultural occupation.

On the 1st of October Lieutenant Blackiston arrived from his expedition to the Kootanie Passes over the Rocky Mountains, and on the 7th of the month Doctor Hector arrived from his branch expedition, and on the same evening Mr. Christie (whose acquaintance I had made at Fort Pelley) reached the fort in advance of his brigade, which he had left at Fort Pitt. He was now the Hudson's Bay officer, promoted from Fort Pelley to take charge of the Saskatchewan district, and the hearty welcome he gave us made us feel quite at home in our winter quarters.

Our first care, now that we were established in our winter quarters, was to provide, as well as we could, in order that our horses, who were now very much the worse for all the fatigue that they had undergone during the exploring season, should be protected, as well as circumstances would permit, against the severity of winter. I had already, when at the base of the Rocky Mountains, sent on two men to Edmonton, to cut a good supply of hay for their winter use, and these men (Todd and Ballenden) worked so well, that they had already 17 stacks, averaging four loads apiece, cut and saved before my arrival. My next care was to pay off the greater portion of the men, retaining only those necessary to guard the horses during the winter. As I mentioned already, these were in two brigades, viz., the Red River brigade, and the St. Ann's brigade.

In order to pay them their wages, it was necessary for me to await the arrival of the boats up the Saskatchewan from Norway House, with the outfit I had ordered the year before. All payments in this country being made in kind, adds considerably to the trouble of paying wages, which are first calculated in skins, and then paid in kind. The value of the skin differs in different parts of the country, thus, a skin in Swan River district is about 2*s.*, and in the Upper Saskatchewan it is about 2*s.* 3*d.* Again, at Forts Shepherd and Colville, where the influence of the gold begins to be felt, it is 8*s.* 4*d.* Our having to conform to the habit of the country in paying many of our men, occasioned a great loss to Government, as, counting by skins, the better class of articles have only a small nominal value, the Company balancing the loss on them against the high nominal value they put on other articles, especially rum.

Mr. Christie, who understood the pricing and value of the articles, very kindly undertook the payment of the men, which is thus conducted:—Mr. Sullivan made out account of wages due to them, deducting advances, &c. I then signed this, and each man presented it to Mr. Christie, who sat in my shop in the fort, surrounded by ready-made clothes, blankets, beds, axes, knives, files, kettles, tea, sugar, tobacco, &c., and the man kept taking what he wanted till Mr. Christie called out "assez," upon which the account closed.

immediately turn to the ribbons or beads for an equivalent of the difference. I did not pay any men of my Red River brigade until all the St. Ann's men were settled with, because they were returning to Red River, where they could get what they wanted on better terms there. The freight up the Saskatchewan was necessarily heavy, all which was taken into wages account at the time of their agreement. Nevertheless, like children at the sight of toys, it was difficult to deter them from purchasing, and I had considerable trouble in laughing them out of the idea of buying an expensive article, in order to carry it back to the place it came from at considerable trouble and inconvenience.

About the 12th of October I took leave of my Red River men, who started down in the boats, which also conveyed Lieutenant Blackiston on his way home.

The two brigades were now paid off, and had started for their general destinations. There remained now of the Expedition but those who were necessary for the protection and care of the horses; these were removed about 11 miles off on the Big Lake, and went with the horses of the fort: my men retained to attend them were Pierre Beauchamp, Sam Ballenden, and Baptiste La Graisse, all three from Red River.

Before the departure of the boats, our servant, James Beads, received a letter from below (Red River) to say that his brother had been killed that summer on his way from St. Paul's by the Salteaus; he therefore asked my leave to return in the boats. I hesitated for some time before granting this leave, but recollecting that I should require a special mail next year, in order to receive my commands from Her Majesty's Government, I gave him permission to go, at the same time providing despatches which should organize means for his return, with my instructions from the Colonial Office for next year.

Our time was now pretty nearly at our disposal; from time to time we rode over to look after the horses, worked up observations, and enjoyed a considerable period of repose and good food, of which we stood much in need.

On the 22nd October Dr. Hector started, with one man and two horses, on a geological trip to Fort Pitt, and returned on the 1st of November.

On the 6th of November I started with an Indian to hunt over the country to the south of Fort Edmonton. We remained out for a fortnight. I was enabled to see a good deal of the country during the first week, before the snow fell. I found the soil rich, and fairly wooded, chiefly with clumps of poplar and birch; vetches grew luxuriantly, and also succulent grasses; the whole country afforded fine feed for horses; in many parts it was swampy, but these swamps were now frozen hard, forming fine feeding places. We fell in with Thick-wood Crees on Beaver Lake, and killed some deer, elk, moose, and black bears. I returned to Fort Edmonton about the 4th of December, after having seen a good deal of the country and lakes south of the North Saskatchewan River.

While we were at Edmonton we were frequently visited by the French priests of the Catholic mission at Lake St. Ann's. Mons. La Combe, the head of the order, was a most excellent benevolent gentleman, possessing many estimable qualities most valuable in a missionary. He spoke Cree well, and had obtained a good deal of influence, not so much, however, among the Indians as among the half-breeds.

The merit of introducing a Christian influence among the Indian tribes in this part of the country is principally due to the efforts of the Wesleyan missionaries. Mr. Rundle, who must have been a very able and influential man, is spoken of among them with reverence and enthusiasm to this day. Mr. Woolsey also, the present missionary, is a most excellent benevolent person.

The Indians which I consider to have thus benefited by Christian precept and example, are the Thick-wood Crees and Rocky Mountain Stoneys, who, being remote from civilization, are not so liable to be corrupted by the baneful proximity of the white population.

At Christmas the festivities of the season were celebrated, in imitation of the manners and the customs of the old country. The catholic missionaries from Lake St. Ann's perform mass, and Mr. Woolsey conducted the Church of England service in the principal room of the fort.

On several occasions during the winter at Edmonton was visited by Blackfeet, and I told them that next year it was my intention to travel right through the heart of their country. They told me if I went to Rocky Mountain House I would see them. I therefore determined to go there and make friends with their chiefs, with a view to facilitate the progress of the Expedition through their country in the following season.

Captain Brisco and Mr. Mitchell were also anxious to hunt, and to see the country; and having a fair lot of horses they determined to try the trip, although rather a bad time of year for travelling on horseback. I accompanied them, with two dog sleighs and Sam Ballenden. Ours was a pleasant trip; we fell in with plenty of buffalo; travelled very slowly on account of the horses, who had often very deep snow to struggle through, and reached Rocky Mountain House early in the month of February.

My old friend, Mr. Brazeau, received us all with a very hearty welcome. He complained of loneliness up at his post, and assured us over and over that our visit conferred a great benefit upon him, being naturally very sociable; he was also most entertaining.

Mr. Brazeau had been for many years in the American Indian fur trade; was a wonderful Indian linguist, and spoke Stoney, Sioux, Salteau, Cree, Blackfoot, and Crow,—six languages, five of which are totally distinct from one another. Being of an old Spanish family, and educated in the United States, he also spoke English, French, and Spanish fluently. He carried on a very brisk trade with the Blackfeet, but seemed to be most wretchedly supplied with goods for the trade, and latterly had to send away bands of Blackfeet, 80 and 100 strong, well laden with buffalo robes, bear skins, wolf skins, and other less valuable furs.

While at Rocky Mountain House I frequently made hunting excursions, thereby affording myself opportunities of getting acquainted with the Blackfeet and their chiefs on Red Deer River. I was visited by all the chiefs to whom Dr. Hector had given papers, considered by them as valuable documents, and, after reading them and granting more, made them some presents of ammunition, tobacco, cloth, &c., which I had brought from Edmonton for that purpose. Rocky Mountain House is a small post, in a very shaky condition, nevertheless the business of the Company is briskly conducted, and work seems much more the order of the day than at Edmonton, where the half-breeds in the service of the Company appear very idle, lazy, and impudent.

There are several kinds of employés of the Hudson's Bay Company, now diminishing very much throughout these portions of their district, viz.,—the old Canadian voyageur, a hardy, jovial, respectful, and well-conducted man; also the old hands which used to be engaged from the Orkney Islands and other parts of Scotland; their places are now fast supplied by lazy French half-breeds from Lake St. Ann's, who, if they are desired to work or ordered to do anything they dislike, may go away as soon as they have received their advances, and join the Indians out on the prairies.

During the latter part of winter and commencement of spring the boat-building progressed rapidly, 13 fine Mackmow boats were turned out before the 1st of May, about 35 feet long, and capable of carrying 75 pieces of 90 lb. each. Mr. Brazeau also ordered a small skiff for us, in which Capt. Brisco, Mr. Mitchell, and I started with our two men, George Daniel and Sam Ballenden, and hunted down the river; we were, however, overtaken by the large boats, and completed our journey to Edmonton in one of them with Mr. Brazeau and his family.

Sunday, May 9th.—Arrived at Edmonton early in the morning. Mr. Christie was preparing for his start down the Saskatchewan with boats, and thence to Norway House and head of Lake Winipeg.

1859, May 12th.—A detachment of boats started. After this period the greater part of our time was taken up with looking after the horses and making arrangements for starting again on a third season's explorations, in case that we should receive orders from the Government to that effect.

May 23rd.—The last detachment of boats started from Edmonton under the charge of Mr. Christie, the gentleman in charge of the district, on his way to Norway House. During the whole winter of 1858–9, Mr. Christie showed us great attention, and was most anxious to do all in his power to give us every accommodation. His arrangements in order to effect this object caused him considerable inconvenience; and his disposition of our trading goods, and the kind manner in which he undertook the payment of the men at the close of their engagements last year, deserve our warmest thanks.

Our botanist, M. Bourgeau, also availed himself of this opportunity to return home *viâ* Red River, in order to fulfil engagements made prior to the formation of our Expedition, when Her Majesty's Government did not contemplate its extension beyond 1858. We were very sorry ind eed to lose our friend, who was a great favourite with us all. In addition to his acquirements as a botanist, he united the most sociable jovial disposition, ever ready not only to do his own work, but assist anyone else who asked him. He also possesses the most untiring energy in camp, and no fatigue ever deterred him from immediate attention to the securing and preservation of his specimens, as his collections sent home abundantly prove.

Dr. Hector's Journal—continued.

Friday, 22nd October 1858.—Since arriving at Edmonton have been engaged preparing maps and reports, and making arrangements for regular meteorological observations being taken throughout the winter. As the first snow had now disappeared, and the Indian summer had commenced, I took advantage of the open weather to make a trip down the Saskatchewan as far as the Snake Portage. I was accompanied by Ballenden, and each of us had a horse, and one to carry our blankets and kettles. We were absent for nine days, and supported ourselves on ducks and rabbits. Keeping along the Fort Pitt track to the Black Hill, we then struck off to the north, and passing through broken country by the La Bêche trail, reached the Saskatchewan at the lower crossing-place. The banks are here formed of sandstone and clay shale with ironstone seams, like the beds at the Mountain House. I then skirted the Saskatchewan for 40 miles above the point, and then struck off to the west-south-west, in direct line for Edmonton. This took me through quite a new country, and one that is seldom travelled by any but Indians. I crossed the Egg Hills, which are 300 feet above the plain, and to the south-west of which lies a large lake of the same name. Its margins are very swampy, and it was swarming with ducks, geese, swans, and other wild fowl at this season. From the north end of the lake we struck through dense poplar thickets, which continue all the way to the north-west angle of the Beaver Hills, where we again fell on the Edmonton track. I was much struck with the admirable pasture which is to be found even at this season all over this extensive tract of country, and of that kind which is most valuable for the support of animals during the winter. The poplar thickets affording shelter surround and enclose limited prairies that yield a rich growth of vetches and nutritious grass of sufficient growth to bear up the snow and keep it loose, so that horses and cattle can scrape their food from under it at least until the later spring months, when, in some winters, the crust might be a serious obstacle. On the hills, such as the Egg Hills, and on the larger tracts of open land, there is a good close growth of grass that is admirably adapted for sheep, which might easily be left to themselves excepting during a few weeks in the months of March and April, so far as climate is concerned, but the hordes of wolves that at present occupy the country would be a fearful tax on the rearing of this kind of stock. Spots where there is a deep rich soil admirably adapted to agriculture, are to be found in every direction throughout this district. By the river there is abundance of that kind of timber which the Hudson's Bay Company find fitted for the construction of the forts, boat-building, and other purposes, and, although of quality that would not be much esteemed in Canada or the United States, or even at the Red River settlement, yet it is not to be despised. The poplar groves will yield abundance of firewood, and if it is cut green during the winter, when it splits with great facility, and stacked till the ensuing season, it makes a clear-burning fire, without sparks, and gives out a good heat. We returned to Fort Edmonton on the 31st of October; and, as the results of this journey are of a kind more easily collected by inspection of the maps, I have not extended my journal in detail.

November 26th.—Fort Edmonton.—The rivers were now frozen over, and the permanent snow covered the ground in sufficient quantity to permit of travelling with dogs; so with three dog sleighs, and accompanied by Erasmus and Richards, and a Cree Indian I had engaged, known as the "Fox," I started to visit the mountains in the neighbourhood of the "Devil's Head," as it was necessary to learn something of the nature of the country along their base beyond the mere valleys of the great rivers.

Started from the south side of the river at 10 o'clock, and reached the White Mud Creek at 12. We then followed the middle Black foot trail

which fall steadily, the air being dead calm, and cover the ground and the branches of the trees with a beautiful efflorescence. The haze gives rise to well-developed parahelia, or sun-dogs as they are called, almost every day towards noon.

November 27th.—The steady weather is threatening to break, as it is not so cold, and a little snow has fallen. In the forenoon rain fell, and then set in, and it became very heavy work for the dogs to drag the sleds over the moist snow. We were travelling through a wide shallow valley that lies between the Beaver Hills and the Woodpecker Hills that overhang Pigeon Lake, and had been following up a branch of White Mud Creek, but in the afternoon fell on a stream flowing to the south to join Battle River. The country is thinly wooded, and abounds in rich pasture, the grass showing well above the snow, which is six inches deep. We encamped in a bluff of pines, and during the night we had rain, and high wind from the S.W., the thermometer rising several degrees above the freezing point.

November 28th.—The Blackfoot track continues to the S.S.E., but we now left it and turned off to the S.S.W., making for the south end of a low wooded hill called the *Musquachis* or Bear's Hill. Cold weather again set in during the afternoon. We now found the snow to be much deeper than about Edmonton. Before encamping at the south end of the Musquachis, we crossed a plain about nine miles wide.

November 29th.—Very clear and cold. Till noon we passed through poplar thickets, and saw many elk tracks. On reaching some Stoney Indian tents, four miles north of Battle River, I found the latitude to be 52° 46′ 26″. We thence continued along the north bank of Battle River, which here runs to the east, and encamp beside a small lake. Even with the snow covering it, we observed traces of the cart track that lead to the old Bow Fort, and that is always used by travellers who cross the mountains.

November 30th.—Snow falling heavily all day. We crossed Battle River, and followed what is known as the Wolf's Trail, through a range of low hills, and encamped a good deal to the right of our proper course, as there is little or no timber to be found for long distances in this part of the country. Yet it is not true plain country, as it is covered with a small growth of willows and alders. Even at this season, much of this district looks inviting. Our camp was beside a lake, surrounded by hills 200 feet in height, in a bluff of poplars, that were sheltered in a ravine. The thermometer continued to fall rapidly, and during the night reached −23°.

December 1st.—After four hours we reached Red Deer River, just below the mouth of Pas-co-pee or Blind Man River, which rises to the north, near to the Saskatchewan. The latitude of this point I found to be 52° 18′ 13″ N. The banks of Red Deer River are 170 feet high, and very ruinous. They exhibit sections of nodular argillaceous sandstone, with ironstone bands overlaid by marlites. Fragments of silicified wood were common along the foot of the bank, but none were observed *in situ*. The concretionary nodules are of a greenish buff colour. The bedding is very distinct, and, on following down the river for a few miles, thin strata were seen to rest unconformably on the sandstone of the Nick Hills, which cross the river below this point. The Nick itself was about 15 miles to the south-east; and it seems as if the sandstone, which last season we found to overlie the lignite group, forms the basin of a large river, in which thin bedded marlites and buff concretionary argillaceous sandstones had been deposited. The outline of this basin is very distinctly marked by a succession of headlands on either side of the valley, which gradually increases in width to the west. The evening was very clear and calm, but intensely cold, the thermometer falling to −37°. We had a splendid camp around dry pine woods, and kept up a roaring fire all night, generally having six logs on at a time, each about one foot in diameter and eight feet long. The stars were wonderfully clear, and, when Jupiter was near the meridian, we distinctly saw, as it were, two irregularities on its margin with the naked eye, and which, with a common field glass were clearly defined as two of the satellites. For several days at this time, even with the small sextant telescope, two large spots were observed on the sun's disk. This phenomenon may have had something to do with the production of the sudden extreme of cold which occurred at this time, and which I have since learned was felt all over the central portion of the continent.

December 4th.—For the last three days there has been little variety, as we have been ascending Red Deer River, travelling on the ice. The banks preserve much the same height, excepting where the river sweeps close under the Hunt Hill, then the south side of the valley is 500 feet above the water level. Near this place I saw a section that shows the marlites and buff sandstone to rest unconformably on chocolate-coloured clays, with ironstone septaria, and grey sandstone, with lignite and carbonaceous shales. This forenoon we reached the point where the cart trail from Fort Edmonton crosses the river, and where Lieutenant Blackiston crossed it the previous summer. The banks here are only 40 to 50 feet high, and on both sides of the river there are fine level plains, covered with rose bushes and small shrubs. A little way above this point the main river is joined by Little Red Deer River from the S.W., and a mile higher by Medicine River from the N.W. In the low expansion of the valley at the confluence of these streams, which locality is always talked of as the "Forks," there are large forests of spruce firs of large size. It is at this point that the Indians are so anxious to have a fort established at which they might trade, instead of travelling all the way to the Mountain House from the plains. I should think it much to the Company's advantage to comply with this wish, as the goods could be transported with great ease overland by carts to this point from Fort Edmonton, and with much less toil and expense than it takes under the present arrangement to drag the boats up the very rapid portion of the Saskatchewan between Fort Edmonton and the Mountain House.

The materials for boat-building exist at the Forks in abundance, and the returns could be taken down by the South Saskatchewan, and join the rest of the brigade at Fort La Corne. The complement of boats usually built at the Mountain House for the Edmonton returns, could still be built by a detached party of men, at the same place or even lower down the river. The great advantage would be that at Red Deer River the traders would be close to the buffalo, and so secure provisions with greater ease and certainty, also that the establishment would get its outfit much earlier in the season.

At the crossing place at "The Forks," the river can be forded with pack-horses when not too high, but the line of shallow water is oblique, and difficult to follow without a guide. The river is more rapid above this point, and we began to find many open holes in the ice. These are not dangerous however,

as the ice is quite thick close to their edges. Where we encamped at night we killed a fine porcupine, which was very fat, and made an excellent supper. Its length was 27 inches; length of head, 4 inches; length of tail, 7½ inches; and its girth, 16½ inches. The quills are about two inches in length, and when not erected are almost hidden in long yellow hair. The Indian preserved them, as they are used in embroidering mocassins and leather shirts. He extracted them by a very ingenious process, taking advantage of their barbed points. He took his leather gun-cover, and flapping it against the porcupine, then withdrew it with a jerk, which pulled most of the quills out, and left them standing in the leather, and then there was no difficulty in grasping them by their blunt soft roots, and so obtaining them in handfuls.

December 5th.—The thermometer is keeping steadily about zero, and during last night a little more snow fell. The river banks are very high, and densely covered with pines. Much of the river still remains open, but as yet we have no difficulty in getting along on the sound ice. I went off to hunt in the high level during the afternoon, and, although I saw plenty of deer, the excessive cold spoiled my shooting, so that I returned empty handed.

Upon the ice we have found the remains of several deer that have evidently been chased and killed by bands of wolves, and strangely enough these have always been full-grown bucks with fine antlers. We came on one carcass and drove off the wolves before they had finished their meal, so that we were able to secure a hearty supper of fresh meat at least for our dogs, which, like ourselves, were getting tired of the simple pemican fare. This buck had been obliged to swim an open place in the river, for we found his hair covered with a complete coat of ice, and this had probably impeded his flight and aided the pursuing wolves.

December 6th.—After going a few miles this morning we all fell through the ice, but managed to get out again in safety. However, wet clothes are not to be trifled with when the thermometer is at −20°, so we got to land, made a big fire, and dried ourselves. Before starting again, I found the latitude to be 51° 50′ 28″ N. In the afternoon a bend of the river to the S.W. allowed us to have a view of the Rocky Mountains, which look comparatively close to us now. The bearing of the Devil's Head from this point was S.W. ½ S. The banks of the river are so densely wooded that sections cannot be frequently observed, but they appear to be formed of chocolate-coloured clay shales, with ironstone nodules in their strata, that are dipping at a gentle angle to the E. They look very like the beds at the Snake Portage, in the North Saskatchewan. I found no fossils in these strata, but in those at the forks of Medicine River I found, in calcareous concretions among the marlites, masses of concrete, composed of paludina, planorbis, and other freshwater shells.

December 7th.—The ice became more open as we proceeded up the river, so that when, within about 40 miles of the mountains, we fell in an Indian track which crossed the valley, I determined to turn off to the south. It was with great difficulty and labour that we got the "sleds" up the bank, which was 240 feet high, and not only very steep, but much encumbered by fallen timber. We found the upper country comparatively level, and thinly wooded with poplar and large willows. After six miles we began to ascend a series of dry, sandy, and shingle terraces, covered with the cypress pine (*P. Saskatchewensis*).

The Indians' trail was only a day old, so we pushed on and reached their camp at nightfall. I found it was the camp of my friend Samson, the same with whom we had encamped so long by Big-horn River in the end of September. He had been pitching slowly along the base of the mountains since then, and was now bound for the "Edge of the Woods," as he heard that the buffalo were close and the Blackfeet few. Samson said that he was at the Kootanie Plain in the first week of October, when we had the great snow storm before reaching Edmonton, but that in the mountains no snow fell there. He says I did right in leaving Red Deer River, as its channel gets very rocky and the stream rapid when near the mountains, so that it does not freeze till late in the season.

One of the Indians came in from hunting after we arrived, having shot a splendid buck with an arrow. He had stalked it, and got so close that he drove the arrow 14 inches into the deer. This shows that although they nearly all use guns, yet the Indian has not yet forgotten the use of their ancient weapon.

December 8th.—I engaged an Indian from this camp to accompany us, as the "Fox" did not know much of this part of the country. He was the same Stoney Indian that we had seen near Bull Lake the previous summer, and from whom Sullivan had traded a horse.

After a few miles we descended rapidly from the terraces, and skirted the valley of Little Red Deer River, keeping a south-west course.

There is much fine pasture in this valley and abundance of good timber. We saw a good number of small deer, but the country is too open to hunt them successfully without losing much time.

At night we descended to the river, and camped among splendid pines. The banks of the valley are from 300 to 400 feet in height, so that we feel as if we were in the mountains again.

The stream is only 20 to 30 yards across, and does not appear to be very rapid. We found plenty of tracks of all kinds of game in this valley and along the ice; otters seem to have made regular beaten trails.

December 9th.—Ascend the river on the ice all day, the sides of the valley getting more mountainous as we enter the outer range. The sections at first consist of the soft argillaceous sandstones, with clay partings, almost horizontal. These gradually become tilted up and much indurated, and at last, along with a great thickness of shales and thin-bedded sandstones, are formed into great flexures. The valley then becomes very narrow, with precipitous sides. At noon we were in latitude 51° 29′ 28″ N. Passed a section where the beds of clay ironstone had been over and fractured so as to resemble an arch of brickwork. The shales are much glazed, and often have a steatitic look. Round the open holes of the ice we saw flocks of small birds of a dusky grey colour, and having loose plumage like the Canadian jay, but being only half the size of that bird. They dip into the open water in search of food, and those that we shot had their wings tipped with icicles in consequence. The Stoney Indian says they only come to the mountains during the winter, and that they are then very common. It was bitterly cold this afternoon, and as the Stoney was thinly clad he began to freeze, so that I had to unlash my sled and give him one of my blankets. However, as we were going against the wind he did

not recover at once, and lest he might be severely injured we encamped and made a large fire. The Indians, when the weather is very severe, seldom go out from their tents, at least they do not continue travelling all day as we were doing. His clothing, till I gave the blanket, consisted only of a thin deer-skin shirt and leggings, and a small worn-out blanket coat. As I had a large buffalo robe, I let him make his newly-acquired blanket into a coat with a cowl, and gave him my second blanket to sleep with.

December 10th.—The aurora is much less frequent this winter than last, but towards daylight there was a beautiful display of green and red streamers, that occurred in the N.E., and wakened us too early, as we mistook it for dawn. The thermometer was then −17°. A few hours after, when day broke, it had risen to −4°, and the sky was clouded owing to a change in the wind.

Early in the day we got through the outer range, and then turning to the south reached the source of Little Red Deer River at noon, in lat. 51° 21′ 40″. It rises in a wide valley that spreads out south into the "Prairie la Graisse," a favourite camping-ground for the "Stoneys" and which is one of the places mentioned by Sir George Simpson in his "*Overland Journey.*" It is curious that, although only 20 years have elapsed, we find it almost impossible to learn, even when on the spot, the exact route by which he traversed the mountains, and his own description is very indefinite. However, it was shortly after he passed the "Prairie la Graisse" that he entered the mountains, so it was probably by a pass known to exist close by the Devil's Head Mountain, which would lead him to Bow River at the Cascade Mountain, after which point I have previously described his route.

As the snow was not deep, and pretty firm, we travelled rapidly, and after 27 miles reached the Dream Hills, among which we encamped the previous summer, the night before reaching the Bow Fort. Turning a little towards the mountains we fell on Waiparous Creek, and had to make a descent of 400 feet to reach the stream beside which we encamped. In effecting this descent, which was exceedingly steep, we untackled the dogs, and each held on by the "tail line" of his "sled" and, sitting in the snow, dragged behind to prevent its acquiring an impetus. I was going down in fine style after this fashion, when a young pine tree got between my legs and pulled me up short, the jerk broke the line; and the sled with the instruments and kettles, slid off like a shot. As the slope terminated by a perpendicular cliff of 90 feet, over which I could just see the tops of the tall pines growing up from below, I thought there was no hope, but when just on the brink it struck a rock that whirled it round, so that it buried itself in the snow without further damage.

December 11th.—On waking this morning we found that we were quite snowed up by a heavy storm during the night. I happened to be first up, and the effect was very curious, as there was not the slightest trace of our camp,—men, dogs, sleds, and fire all being covered by unbroken snow. When this occurs I always notice that the additional warmth, and perhaps the knowledge of the extra work on rising, makes us always much later in starting. The dogs also make the most of it, as no whistling or calling will make them reveal themselves, and the "knowing ones" are only to be found by walking round the camp in every direction, till you tramp on them.

On ascending the opposite or right bank of the stream, we crossed a wide level plain, wholly formed of rounded shingle, being an expansion of one of the valley terraces up the valley of Dead Man's River. On reaching that river we found it still quite open, only having small masses of ice floating in it. The temperature of water was 30·4° Fah.

Being thus deprived of the only route by which we could hope to get further into mountains with the dogs, as everywhere here the country is covered with dense forest, we turned back for a mile and encamped at a small lake; however, during the afternoon and next day I made a long excursion to the N.W. along the base of the mountains, in search of a line of junction between the sandstones and shales and the limestones of the mountains, without success. From below the shingle terrace, and from the rocks along the river, I found many springs escaping, the waters from which deposit a rusty sediment, and have a temperature of 35°.

The Virginian deer is very abundant in this district, and we are continually starting them, but seldom get a shot. However there is one killed nearly every day by some of us. The does are fat at present, and very good eating: in size the deer is between that of the Scotch red deer, and the fallow deer. We have not noticed any of the black-tail deer running with the Virginian deer, as they are more fond of keeping in low coverts along the rivers. The Virginian deer can be distinguished at any distance, from its bounding motion, and its conspicuous broad white tail, which it carries erect. The latitude of our camp at the lake is 51° 14′ 2″ N.

In the steep ravine of Waiparous Creek, below our camp of the 10th, strata of hard indurated sandstones, with black carbonaceous streaks, are seen dipping to the west. The thickness exposed is about 1,500 feet in the course of four miles, but they are repeated several times. In the shales I found fragments of ferns like "*Pecopteris*" but they unfortunately crumbled to pieces before I got back to Edmonton. This group of strata seems to form the nuclei to the flexures of the softer shales and sandstones that contain so much clay ironstone.

December 13th.—Start on our return to Edmonton, at first taking to the south till we fall on Bow River, at the foot of "Dead Man's Hill" (Chi-pei-watchi.) There was once a great battle fought here, and there is a grave built in the wood on the top of the hill, in which the slain were buried.

On passing Dream Hill we entered a wide valley, and as we travelled along rapidly among the broken ground, we started band after band of deer, just as if we were passing through a deer park. This is the only time that I have ever seen game in such plenty in the country, excepting of course buffalo herds.

December 14th.—Early this forenoon we reached Rock Creek, and after crossing it came on a small band of buffalo. We killed two, and encamped to enjoy the marrow-bones, for which we had a keen relish after faring so long on lean venison.

December 15th.—After going two hours this morning, we fell on a fresh trail, and soon arrived at a camp of Stoneys, who where overjoyed when we told them that we had seen buffalo the day before, as they had come out to the plains in search of them, and were now starving.

The latitude at the camp was 51° 25′ 24″ N. We are now on the edge of the woods, to the east being bare undulating prairie, while to the west the country is more or less wooded all the way to the mountains. The land we were upon is high, so that I got a fine view of the mountains and also of the plain

country. The latter, with its snowy surface and the dark well-defined margin of wooded country, looked like a great frozen sea. The Indians showed us where the summer track lay, and with a little difficulty we were able to follow it along the edge of the woods till nightfall.

December 16th.—Continued all day following the track, but towards evening we came to a considerable stream called "Edge Creek." We then followed it, and as we were all fresh, and the night was clear, did not halt till near midnight, when we reached Little Red Deer River at where Edge Creek joins it. We encamped in a bluff of pines, and found the ruins of an Indian stockade which had at one time been thrown up by some war party when they were pursued. It consisted of conical lodges of heavy trees piled in such numbers as to resist shot, and surrounded by a breastwork of logs that communicated with a large enclosed space where the horses had been concealed. It was well adapted for defence, and yet in so secluded a spot that a large party might lie there in concealment.

December 17th.—Leaving Little Red Deer River, we crossed a range of high ground that is continuous with the hills about the "Caché Camp;" got a fine view of the mountains, and took bearings of all the points I know, also of the *Ki-hi-watchis*, or Hawk's Hill, a prominent conical land-mark lying in the angle between the two Red Deer Rivers.

About noon we killed a fine old bull to obtain meat for the dogs. At dark we again struck Little Red Deer River, and followed the ice for some time. As we went along, after it was pitch dark, something stirred in the thicket in the side of the river, and Richards at once fired in the direction, and shot a young bull dead. Three hours after dark we came to where the ice was much overflown, so that we were obliged to camp. Both our Indians (the "Fox" and the "Stoney") are beginning to tire. The "Stoney" especially seems to be a soft walker, and has been but little used to snow-shoe work. Although the Indians can do great feats, and go long distances when hunting, they do not stand the daily travelling so well as the half-breeds.

December 18th.—Leaving the men and dogs to follow the river, I started with the Indian to make straight for Red Deer River, at the crossing place. On getting up to the plain we saw a large band of buffalo, and approached them by crawling in the snow, by which I got the best view I ever had of the animals when quietly feeding. The snow was about 12 inches deep on the open ground, and in feeding I saw that they used their noses like pigs to plough it up, and did not scrape like horses with their fore feet. We easily got within 50 yards before we fired, but the frost had so weakened the lock of the Indian's flint gun that it would not go off, so we only killed one, and a very lean one it was. Away out towards the "Caché Camp" we saw the plains quite covered with them, so not wishing to disturb the herds we turned north to the river, and had a camp prepared by the time the others arrived. They had killed a deer as they came along. We were now at our track where we passed on the 4th, and on measuring I found that 9 inches of snow had fallen on it since we passed.

December 19th.—I sent "the Fox" and Erasmus with a dog-sled to get some meat. They were off from daylight till after midnight. They saw great bands of buffalo, and killed six, and brought back a load of choice meat.

In the marlstones along the river at this place I found concretionary masses of limestone filled with freshwater shells.

December 20th.—Before starting this morning one of the dogs, that is a notorious thief, actually poked his nose into the kettle as it was boiling on the fire, and took out a piece of meat.

Crossing Red Deer River we kept to the N.N.W., and as the snow was deep two of us always required to go before the dogs to beat the track. Notwithstanding we made very long journeys each day on that course till the 23rd, when we again struck the Blackfoot track north of the Musquachis. The same afternoon, after crossing the hills north of Weedy Creek, we were obliged to halt, as we could not run against the north wind that blew very strongly in our faces, with the thermometer about —9°. We therefore camped in some willows, but being anxious to reach Edmonton we started as soon as the wind lulled, at 3 a.m.

December 24th.—There was a magnificent auroral display as we travelled along, consisting of streams of all colours, which was so bright that it continued visible until it was quite light and the sun had almost risen. Towards daybreak the cold wind again sprung up, and the "Stoney," as before, was the first to freeze. In the afternoon we reached Fort Edmonton just in time to join in the fun of Christmas Eve. This trip occupied 29 days; and the distance we walked, excluding side trips, was 536 miles.

1859, January 12th.—The winter express having now left with our reports and letters for England, I started to-day for the Rocky Mountains at Jasper House. I had with me Erasmus, Richards, and a Company's voyageur named Louison. Each of us had a dog-train, and as we required to take pemican for 28 days we were heavily loaded, each sled having about 350 lbs., including bedding, instruments, &c. It was beautiful weather, although cold, so Mr. Christie got up a party to go and camp the first night with me at the "horse-guard," about 25 miles from the fort on the track I was to follow.

They had two horse carioles and several dog-sleds with provision for the pic-nic. As the track was hard, we reach the "horse-guard" in about 4½ hours, and spent the afternoon visiting the horses; those belonging to the Company and also to the Expedition being kept at a place where there is fine feeding and shelter on the large tracts of prairie along the Sturgeon River. The horse-keeper gave up his log hut for our use, and we passed a very merry evening. To show what a good train of dogs can do, provided they have a hardy and expert driver, I may mention the following circumstance. Mr. Christie found on arriving at the "guard" that he had forgotten a letter he wished me to take to Jasper House. He at once sent back his clerk, Mr. Sinclair, to the fort with his dogs, although that gentleman had just driven them the 25 miles out to this place. Sinclair got to the fort before midnight, and sent back a man with the same dogs, who arrived with the letter for us before we were up in the morning, the dogs having thus run 75 miles in a good deal under the 24 hours.

However, M. Lecombe, the Roman Catholic priest, has been frequently driven from the mission at Lac St. Ann's to the fort in his dog cariole, a distance of 50 miles; after which his man Alexis, one of the best runners in the country, has loaded the shed with 400 lbs. of meat, and returned to the mission before next morning.

January 13th.—At the same time that the pic-nic party started for the fort, we commenced our

journey westwards, and for four miles had the benefit of the track to Lac St. Ann's. We then turned off to the N.N.W., and after crossing Sturgeon River reached the Sandy Lakes at noon. We soon found it necessary to use our snow shoes, as, although a party for Slave Lake had passed a few days before, the track was not hard enough to bear our weight. We kept along small lakes as much as possible, for although there is a trail cut through the woods all the way to Fort Assineboine, it is much obstructed with fallen timber.

January 14th.—This afternoon we crossed Pembina River, which is about 80 yards wide. It has a large valley and some fine patches of open land along its banks. The timber is much finer all over the country we are now passing through than any in the neighbourhood of Edmonton. Pembina River is the most southerly stream of the prairies that flows to the Arctic Ocean, but does not run from the mountains.

January 16th.—The trail all this forenoon, as we approached the Athabasca, was very much obstructed by fallen timber, and the work of pulling the heavily loaded sleds over the trees was excessively fatiguing.

At 2 o'clock we reached the valley of the Athabasca, which is a river rather larger than the Saskatchewan at Edmonton, and, in proportion to its size, with a much wider and deeper valley than that river. By a long and steep descent we got to the level of the stream, and travelling up it on the ice, after seven miles we reached Fort Assineboine, a deserted post of the Hudson's Bay Company. It consists merely of a few ruinous log huts on the left bank built on a beautiful level prairie several miles in extent, and elevated 30 feet above the river. Behind the fort the higher banks rise, but not very abruptly, to the height of 180 feet, and beyond the country seems to be level, but very heavily timbered. Along this portion of the river there is, however, much fine and partially open land reminding me of the district around Fort Carlton. There seems to have been several acres under cultivation round the post at one time, but only the fences and a dense growth of weeds now remained to mark the fields. Opposite to the fort there is an island in the stream covered with very large timber, and on the south side of the valley the forest is dense and the trees seem to be of good size. In passing through the woods south of this place, we have seen many birch trees of large size, and sometimes on the rising grounds the forest is wholly composed of this tree, which is the only hard wood the country produces, and therefore of great value.

We took possession of the kitchen of the fort, and by cutting down some of the old palisades soon got plenty of fire-wood.

January 17th.—I waited here till noon, when I found the latitude to be 45° 31′ 4″ N. Before starting we pulled up the floor of a room in the hut and buried a bag of pemican as a *caché* to serve to take us back from this place to the fort on our return from the mountains.

The snow was very deep on the river, and required that two of us should always take it in turn to walk ahead while the other two drove the dogs.

January 18th.—This morning we passed several high cliffs of sandstone, and below these the river is generally very rapid and the ice full of open holes. The river seems to be much more swift than the Saskatchewan when at the same distance from the mountains. We saw several otters, and wherever open holes occur in the ice their tracks are very numerous. In the morning the thermometer was 14°, but during the day it rose very rapidly, with a great storm of wind from the S.W. When we encamped this wind was at its height, and was bringing down the trees all around us. It came in great gusts, sometimes with a few drops of rain. At 4 p.m. the thermometer was 31°, barometer 26·90; at 6 p.m. thermometer 38°, barometer 26·96; and at 7 p.m. thermometer 40°, barometer 27·02. About 10 p.m. the storm ceased, the sky cleared, and the thermometer at once fell to 1°, and the barometer rose to 27·47. This fluctuation of the barometer, although small compared to what occurs at the sea level, is extreme for this country.

January 19th.—Passed a great deal of rough ice to-day. In the forenoon saw coal for the first time in this river. It occurs in a cliff of sandstone, 110 feet high, as a wedge-shaped mass, three to five feet thick, running for several hundred yards, and perhaps more. The sandstone is softer than that at the Rocky Mountain House, and contains large concretions of clay ironstone, but no clay strata. There is an extensive stratified deposit over these beds, filling up hollows in the eroded surfaces, that is of much more recent date. It consists of gravel and sand in well marked strata, the sand often being as coherent as the older deposit on which it rests. At one point this newer deposit seemed to pass into marlites, like those on Red Deer River, at the mouth of Blind River. The older deposit often has a slight dip, but the newer deposit remains horizontal in all cases, and, as it is high above the river level, it does not appear to be a valley deposit.

Snow fell heavily all day, and it is becoming very hard work with the snow shoes. Where we encamped there were some very fine trees: birch 2 feet in diameter; silver pine (*Abies balsamea*) 2 feet 6 in.; and the rough-barked poplar (*Populus balsamifera*) 4 to 5 feet in diameter.

January 21st.—Continued snowing during the night, and the thermometer fell to 10° out in the centre of the river. Where the snow has neither drifted nor been swept away by the wind, it ranges from 35 to 40 inches in depth, but only 20 inches of this is new soft snow. However, this is enough to make it very hard working, and some three of us going before the dogs does not render the track firm enough to bear them up, until the first sled has passed over it also. After two miles, we passed the mouth of "McLeod's River," a large tributary from the south-west. The main river is cut up with many channels in this part of its course, and seems to be very sluggish. After having cut off a large alluvial point by crossing through the woods, in descending a steep bank of about 12 feet to gain the ice again, Louison stupidly smashed his sled, so that we had to put the load on the other sleds, and leave it behind. Two of my dogs, that I had only bought before starting, and were quite wild, had made their escape within a few days after we started, but still continued to follow us, skulking behind like wolves, and only joining their companions at night. We tried every plan to capture them, but only once caught one of them in a snare, but he cut it through with his teeth before we could secure him.

January 22nd.—At noon to-day we halted to cache another bag of pemican, which we did by building logs over it, carefully fitting them together by notches. The great danger to a caché is from the wolverine, a small rough-haired animal, like a miniature bear, but much stronger in proportion to his

size than any other animal in the country. He is possessed of great cunning also, and it is very difficult to defeat his marauding propensities. Their Indian name is *ker-kes-shu*, and many wonderful yarns are told about them round the camp fire. For instance, that a man once left his gun, with the leather cover on, leaning against a tree, while he went to skin a deer he had killed, on his return his gun was gone, and no trace of anything to be seen in the snow excepting the track of a wolverine, that seemed to have gone to where the gun had been left. Following the animal's track, he found after more than 300 yards, the mark of his gun trailing in the snow as the animal had dragged it along, but for this distance it must have carried it clear of the ground, a matter of some difficulty to a little beast not higher than a fox.

January 23rd.—The river banks are still densely wooded. This evening we camped at where we found the trees notched, and names cut out on them. Among them I found Jeffrey's name, a botanist, who crossed the mountains in 1852, and was afterwards killed in Mexico.

January 24th.—The banks of the river are now becoming high and rocky, formed of ledges of sandstone, with a sprinkling of cypress pines growing in the cliffs. On the south side, where we encamped, the bank appeared to be 300 feet high, and very steep. The snow is still very deep, but by going steadily we generally make 18 miles a day.

January 26th.—The valley of the river has widened considerably, as if we had passed through the sandstone country, and the timber is again very fine, some of the birch trees being of good size. In the afternoon we passed "Baptiste's River," a tributary from the west, which is 90 yards wide. In continuing to ascend the Athabasca our course turned more to the south above this point. We seem to be passing through a range of hills, but although I ascended the bank for 250 feet, I could see nothing of the surrounding country, on account of the dense woods.

January 28th.—After going six miles this morning we fell on the track of Indians, who must have passed within the last two days. They had come down on the river from the south, and after following it a short way, had struck off to the north. I sent one of the men to follow the trail, while we went on slowly till camping time, after which he rejoined us, bringing several of the Indians with him. They were Assineboines, that live in the thick woods, and trade at Lac St. Ann's. They wore crosses, and had a most miserable appearance. They have been starving most of this winter, and very anxious to get ammunition in exchange for furs. Their tents, seven in number, were about five miles to the north of our camp in the woods. I got them to change two pairs of snow shoes with us, as ours were getting rather worn out, and one of the men was beginning to suffer from *mal du raquette*, or inflammation of the tendons of the foot in consequence.

January 29th.—The snow was light to-day, but yet it remained very cold, so that at noon, when I halted to find the latitude, the thermometer stood at −25° in the shade. To-day we passed Dead Man's Rapid, which is a very dangerous place for the boats to pass when ascending to Jasper House. A few miles above this we passed Old Man River, a small stream from the S.W. The banks now became low and covered with spruce, with large swampy flats at a little distance back from the river.

On the morning of the 30th we came in sight of the mountains, and began to find the snow much less deep than before, so that we travelled rapidly, and by evening had made 27 miles. As we were preparing to encamp we observed a smoke rising out of the woods, and ascending the bank found a camp, four tents of Iroquois half-breeds. We brought our dogs up the bank, and encamped beside them. They were badly off for provisions, and living altogether on the little hare, but which they said is very scarce this year in the woods. These Iroquois were originally trappers in the service of the N.W. Company, and on the junction of that company with the Hudson Bay Company, they turned "freemen," as those are termed in the country who are not in the service of the Company, and have since tented about like Indians, trading the skins and furs they procure at Jasper House. There are only about 30 tents of them, and they all talk the Cree language besides their own, and have latterly intermarried a good deal with the Cree half-breeds of Lac St. Ann's.

At the place where we encamped the river valley is very wide, and the lands rise into hills on either hand. In the bottom of the valley there are large alluvial flats, one of which is known as "Le Grand Bas-fond." These are bounded by successive terraces of shingle, such as were seen in the rivers further to the south. With the aneroid I found that there were three better marked than the others, at 15, 100, and 210 feet above the alluvial bottom of the valley. Our camp was on the highest of these, and above it in some places there rose a yet higher terrace, that reached 370 feet. The moulding of these terraces is very perfect, and everywhere they support a growth of cypress and pines, that like dry gravelly soil.

January 31st.—Before we descended to the river this morning we got a splendid view of the mountains, which present a bolder outline here than I have seen elsewhere. Miette's Rock is a bold object, bounding the valley of the Athabasca to the south, and resembling the "Devil's Head," which lies to the north of Bow River. I wished to get to the fort to-day, a distance of 40 miles, so we started early, and went very fast, as there was no snow on the ice to require us to use our snow shoes, which we felt to be a great relief, having been constantly walking with them for 17 days. The river is very rapid in this part of its course, and hemmed in by cliffs of sandstones and shales, lying at high angles.

At three o'clock we reached the point where the Athabasca emerges from "Lac à brulé," which lies at the base of the mountains, which rise from its western shore at least 3,000 feet. This lake was swept by such a violent wind from the south that we could hardly make way against it over the smooth ice. Its eastern shore is formed of immense sand-hills; and as we reached its upper part we found the ice so covered with the same material that the dogs could hardly pull the sleds.

Above the lake, which is seven miles long from north to south, we entered a wide valley in the mountains; but finding that the river was so open that we could not follow on the ice, we left it to our right, and kept along a track through dense woods. It was quite dark when we reached the base of Miette's Rock, where a spur of the mountain from the south compelled us again to seek the river, which we now found to be a rapid stream, without more than a mere fringe of ice about its margins. After searching about for a crossing place in the dark without success, we took the most shallow place we could find, where the river was very rapid, and without taking the harness off the dogs, unfastened them from the sleds, and pitching them into the water, pelted them with pieces of ice, so that they swam for

the other side of the river. We then got off the edge of the ice ourselves, and found the water took us above the waist, and getting the sleds, loads and all, on our shoulders, waded through the rapid, which was about 100 yards wide, and so reached the left bank. The wind, which had changed at sunset to N.E., was bitterly cold, so that the plunge into the water felt rather warm at first, but on re-emerging we at once stiffened into a mass of ice, for, as I found half an hour afterwards, the thermometer stood at $-15°$. In this state we again tackled the dogs, that were all frozen into a lump with their harness, and after a run of two miles through the woods, we reached Jasper House at 10 p.m. This is a small post of the Hudson's Bay Company which had been abandoned for some years, but was this winter again occupied, and placed under the charge of Mr. Moberly, who received us most kindly.

Immediately on arriving I set up the thermometer, in a good position facing the north, for the purpose of taking regular observations to compare with those being taken at Edmonton; and, as I had arranged with Sullivan to take hourly observations on the 1st of February at that place, I commenced at midnight to do the same here, and, with Moberly's assistance, continued them for the 24 hours following.

Jasper House is beautifully situated on an open plain, about six miles in extent, within the first range of the mountains. As the valley makes a bend above and below, it appears to be completely encircled by mountains, which rise from 4,000 to 5,000 feet, with bold craggy outlines; the little group of buildings which form the "fort" have been constructed, in keeping with their picturesque situation, after the Swiss style, with overhanging roofs and trellised porticos. The dwelling-house and two stores form three sides of a square, and these, with a little detached hut, form the whole of this remote establishment. The general direction of the valley of the Athabasca through the mountains seems to be from south to north, with a very little easting. Four miles below the fort the Athabasca receives a large tributary from the W.N.W., which is known either as the Assineboine or the Snake Indian River. Opposite to the fort, from the opposite direction, comes Rocky River, and these two streams, with the Athabasca, define four great mountain masses. Thus, on the east side of the main river there is the Roche Miette, which, although really some miles distant, seems to overhang the fort. Higher up the valley is Roche Jacque, and on the west side of the valley, and opposite to these two, we have the Roché de Smelt and Roche Ronde. These names were given long ago to the mountains, at a time when a great number travelled by this route across the mountains. As late as 1853 there was communication at two seasons by this post with the Columbia district. In March, when the snow had acquired a crust, the express, with letters and accounts, started from Edmonton by the route I had just followed, and continued on to the boat encampment, to which place, by the time they arrived, owing to the earlier spring on the west side of the mountain, the brigade of boats had ascended from Vancouver. The mail from the western department was then exchanged, and taken back to Edmonton, and thence to Norway House, along with the Jasper House furs.

The second time of communication was in autumn, after the Saskatchewan brigade returned to Edmonton in the beginning of September, upon which the officers and men bound for the western department, taking with them the subsidy of otter skins that the Company annually paid the Russian Government for the rent of the N.W. coast, crossed the portage to Fort Assineboine, then ascended the Athabasca in boats to Jasper House with pack-horses, reached the boat encampment, and then descended the Columbia to Vancouver, where they arrived generally about the 1st of November. The journey from York Factory or Hudson's Bay to the Pacific coast by this route generally occupied three and a half months, and involved an amount of hardship and toil that cannot be appreciated by those who have not seen boat travelling in these territories. Above the fort the river dilates into large shallow lakes, along the shores of which are piled great sand-hills. The wind generally blows in this valley with great violence, and often in the course of a few hours everything is covered many inches deep with sand. This prevents any gardening in the neighbourhood of the fort, and gives the plain it stands on a sterile aspect. However, at the site of an old fort just without the mountains at the Lac à brulé, vegetables and barley grow well. The winds have only two prevalent directions, from north or from south, that is up or down the valley. The first is a cold wind which brings snow, but which is at once melted again under the influence of the mild wind from the south. As the result of this there is never any depth of snow in this valley, or indeed in any of the eastern parts of the range. During the whole winter the hunters climb the mountains in search of the big-horn sheep, and only rarely have to use snow shoes, although they generally carry a small strong-made pair to use in crossing drifts. The big-horn is very plentiful in this part of the mountains, and forms the principal food of the people here, who are often put to great straits, as it has to be hunted from day to day. There are two or three Iroquois hunters attached to the trading post, and they are sent off every morning before daybreak, and seldom return till late in the afternoon. Early in the morning the sheep descend the mountains to the "*Salinas*" or salt lakes, and if the hunter can succeed in intercepting them in the woods before they regain the bald part of the mountains they fall an easy prey, but otherwise, to get a shot at them involves a great deal of hard and often dangerous climbing. The hunters generally use dogs, which are beautifully trained to turn the sheep as they rush up the mountain to reach the most inaccessible precipices.

In the forenoon we could always see bands of the sheep on the mountains round the fort with the aid of a good glass, and once in this manner I watched the progress of a hunt upon the Roche de Smelt. When the sheep are killed the hardest work yet remains, of carrying the meat down the mountain. The hunter seldom does this, however, but returns home, and next day another man is sent for the carcase, which he carries on his back with a strap across his forehead, in the same manner as they carry "*pieces*" over a portage. At one time there were many moose deer in the valleys of the mountains, in the neighbourhood, but they have latterly become very scarce. This winter the hunters have only killed two, but they know where another has his feeding ground, and do not intend to kill him till spring. The perfection to which the Iroquois carry moose-hunting may be judged from the fact that one of them has visited this moose several times during the winter, and seen him once, yet without disturbing him.

Another article of food on which Moberly has been feeding his people this winter is the wild cat or Canadian lynx. Up to this date they have killed 83, more than half of them having been shot by Moberly himself, as he has a splendid dog that hunts them till they climb a tree, and then watches them till his master comes with the gun. The wild cats are about the size of a small greyhound, and

their flesh is excellent eating when fat. As the mountain mutton was very lean at this season, while the cats were fat, we used to combine them by stuffing the cat with minced mutton, and roasting it whole, this made a very savoury dish.

For the first few days of the month I was occupied taking observations for latitude and variation of compass; also correcting my aneroid barometer by the boiling point of water, and taking meteorological observations, which are elsewhere tabulated. The latitude of Jasper House is 53° 12′ 15″ N.; variation of compass 25° 31′ E.; both results being derived by the means of several sets of observations. On the morning after I arrived at this place, I lost one of my best dogs in an unfortunate manner. They have recently been in the habit of killing foxes and wolves with baits poisoned with strychnine, and the head of a fox that had been thus killed last November, and lain frozen in the trodden snow of the court yard ever since, was scraped up by my dog, and after he gnawed it for a few minutes he fell down in a fit and died. To prevent further accidents of this kind, I got an old horse from Moberly, and killed him to feed the dogs with. In former days, the people residing at this place used to subsist during the greater part of the spring on horseflesh, as there were large bands of these animals running about almost wild in the lower part of the valley. Their numbers have, however, been much reduced of late years, by large bands having been driven down to Edmonton. It is found, however, that these mountain-bred horses will not thrive in the plain country, but die in the course of a few years. This is either owing to the greater severity of the winter, or to the change in the nature of the pasture.

February 2nd.—This afternoon I accompanied Moberly on one of his lynx-hunting expeditions up the valley of the Snake Indian River, and found splendid sections of the strata. This river flows to the E.N.E., between high perpendicular banks of sandstone and shales, which form a succession of anticlines and synclines, having a W.N.W. strike. These plications are well marked, and the strata appear to be the same as those observed on Waiparous Creek, near the Bow Fort.

These strata seen consisted of,—

(*a.*) Black carbonaceous shales within coal partings.
(*b.*) Cherty dark blue limestone.
(*c.*) Dark brown earthy shales, with ironstone bands.
(*d.*) Buff-coloured marlstone; weathers to a bright vermilion.
(*e.*) Dark grey sandstone.
(*f.*) Flagstones, dark purple and grey-coloured.

These beds are a minor plication of the upper group of strata, that form the mountains on either side. The great masses of mountain limestone have been so completely overthrown, that they apparently dip uniformly to the S.S.W., while these mixed strata are seen to be much disturbed, and, as in the case of this valley of the Snake Indian River, to occupy fractures in the greater plications. We left the river after ascending it for six miles, and then struck off to the south, skirting the base of the mountains on that side of the valley. A trail through this valley leads to Smoking River, a branch of Peace River, but it is said to be very rugged. Ten or twelve miles up the river there are splendid waterfalls, and beyond that point the valley is at a very high level, and the woods that occupy are favourite haunts of large bands of cariboo or mountain reindeer. Smoking River is about two days journey to the N.W., and along its valley there are extensive prairies, of which the Iroquois hunters speak in high terms as the finest land in the country. They say that the winter there is very open, and the pasture always good. In autumn wild fruit is plentiful, and in consequence it is a famous place for both black and grizzly bears. The Iroquois have several times grown turnips, potatoes, and barley there with great success, but only as an experiment. Until a few years ago, these prairies supported large bands of buffalo and elk.

When we compare the description given by Sir Alexander McKenzie of the prairie country along Peace River, with its vast herds of buffalo and elks, when he passed in 1793, with the present northern limit of the large herds of these animals, at least three degrees of latitude further south, the change is very striking; and still more so if it is true, as the hunters say, that the disappearance of the large quantities of game has only taken place within the last 20 years. The country along Smoking River is occupied by the *Beaver Indians* and the *Chickanees*, which are two branch tribes of the Athabascan Indians.

There was once a little tribe of Indians known as the Snakes, that lived in the country to the north of Jasper House, but which, during the time of the North West Fur Company, was treacherously exterminated by the Assineboines. They were invited to a peace feast by the latter Indians, when they were to settle all their disputes, and neither party was to bring any weapons. It was held about three miles below the present site of Jasper House, but the Assineboines being all secretly armed, fell on the poor Snakes in the midst of the revelry, and killed them all. Such was the story I heard from the hunters here.

February 3rd.—A pack of thick-wood wolves have been killing a number of the horses belonging to the Company during the winter, and the hunter having found a fine young mare just freshly killed the other day, salted the carcass well with strychnine, and this morning we set off to observe the effect. Crossing the lake we walked about two miles through the woods, when we fell on the track of the poor mare and her pursuers. She had been hard pressed by three of them, one on each side, cutting off the bends she made, while the others followed close behind, and at last had seized her haunch and thrown himself down, so that he left a broad track where he had dragged through the snow. On reaching the carcass we found that the strychnine had done its work, for there lay four enormous wolves, besides five or six of a smaller species, while about a score of large ravens were lying about, either dead or in different states of paralysis, some lying on their backs with only power to croak, and others wading about in the snow in a most solemn manner, with their wings trailing behind them. The large wolves, who were the real offenders, were splendid brutes. The two youngest were nearly black, while the old ones were grizzled grey, like Scotch stag-hounds. The largest measured two and a half feet at the shoulder, and was five feet eight inches in length. The hunters say there is yet another of the family, and that the survivor is well known by his track, as he has only three feet, for having once been caught in a steel trap, he freed himself by gnawing off the foot he was held by.

As we returned to the fort, with Moberly's assistance I roughly measured a base line across the

valley, of 3,762 feet, by which to get the positions of the mountains, and also the approximate altitude. By this means I found that the Roche Miette, which seemed almost to overhang the fort, is nearly at a distance of four and a half miles, while its summit is elevated 5,800 feet.

February 4th.—The weather continues more like spring than winter, but they say that this will be succeeded by cold weather in a few days. The warm wind is very local, however, as one of the men who was sent off for a sheep that had been killed in one of the side valleys, returned with his feet frozen, having, in consequence of the warm weather round the fort, worn no socks under his mocassins. The wind is very violent, with occasional lulls for one or two hours towards evening. The fort is sheltered by wood to some degree, but a little higher up the valley the air is darkened by clouds of sand, which is carried to great heights by the whirlwinds.

At 9 a.m. I started with Moberly to ascend the Roche Miette, and as we had to follow down the valley for some miles and cross the river, we took horses with us for so far. I now saw where we had forded the river the other night in the dark, and it certainly looked an ugly place, and if we had only seen where we were going, we might have hesitated to attempt it. Having ridden about six miles from the fort, we left our horses, and commenced the ascent of the mountain, carrying with us a small pair of snow shoes, with which to cross any bad places we might come to: but as we found the snow was everywhere hard, with a glassy surface that supported our weight, we soon left them behind. Indeed it was only at intervals that we required to cross patches of snow, for we followed a ridge or "*crete*," as they call it, from which it had been swept by the violent wind of the last few days. After a long and steep climb, we reached a sharp peak far above any vegetation, and which, as measured by the aneroid, is 3,500 feet above the valley. The great cubical block which forms the top of the mountain, still towered above us for 2,000 feet, but it is quite inaccessible from this side at least, and is said to have been only once ascended from the south side by a hunter named Miette, after whom it was named.

This mountain is formed of a mass of strata which have at one time formed the trough of a huge plication.

		ft.
a.	Hard compact blue limestone and shale, with nodules of iron pyrites	2,000
b.	Fossil shales almost black	300
c.	Hard grey sandstone	100
d.	Shales towards the upper part, with green and red blotches. The lower part rust-coloured.	500
e.	Cherty limestone and coarse sandstone obscured by timber	2,000

The ridge we had ascended is formed of the cherty limestone and capped by yellow shales, with beds of black sandstone forming the highest point. Between the peak we were on and the face of the high cliff above us there was a gully 150 feet deep, which had been worn out of the soft shales that underlie the blue limestone. I crossed this gully, and scrambled up the opposite side in search of fossils, but only found a few obscure impressions in the friable shales. I observed a remarkable fact here, which shows how local the open weather is in this region of the mountains. The wind, which blew freshly from the N.E. in the bottom of the gully, was so intensely cold that I got quite benumbed, being but lightly clad and heated with the long climb. At the same time, however, Moberly was sitting at a greater altitude on the top of the peak, smoking, and enjoying a comparatively balmy breeze blowing from the S.W.

Seven hundred feet below the highest point we gained, or about 6,600 feet above the sea, the woods commence by stunted trees not more than a foot high, and only growing in sheltered situations; but this limit is determined not by the altitude but by the exposure to wind. A considerable distance below this point, where the forest commences, we halted for some time to enjoy the view and to take bearings of the different mountains. We had a very extended prospect of the country to the east of the mountains, which is completely covered with pine forests, through which we could follow the winding course of the Athabasca River to the N.N.E. for 40 or 50 miles. The range of hills through which it breaks, above where it is joined by Baptiste River, we now saw to be of considerable altitude, and to form an outer range running N.W. and S.E.

To the east of the Roche Miette is a range of mountains known as the Fiddle Mountains, and separated from it by a creek of the same name. Overhanging Lac à brulé is Bullrush Mountain, and between it and Roche Ronde, which is next furthest to the west, Moose River flows to the S.E. through a wide and thickly-wooded valley, which seemed to extend for 25 miles to the N.W. by W.

The valley of the Athabasca at this place is about two and a half miles wide, and below us we observed where it receives the Snake Indian River. With my telescope I made out the general arrangement of the strata on the opposite side of the valley, and afterwards corrected it by a visit to the spot. It was six o'clock before we returned to the fort, by which time we were in capital trim to enjoy a supper of the big-horn sheep's head and trotters.

February 5th.—Although the weather still remains mild and open here, it is evidently snowing outside of the mountains to the east. In the forenoon a duck was shot in the river before the fort, and a man at once jumped into the water, and swam for it. When we remember that in the prairies the rivers will remain ice-bound for three months from this date, a circumstance like this shows the contrast very forcibly between the climate of the eastern base of the mountains and that further to the S.E.

February 6th.—The weather is much colder to-day. In the valley the wind was S.W., and the mountains capped with clouds. By noon the wind had changed to N., but the upper stratum of air still moved from the S.W., giving rise to dense fog. At sunset the north wind was blowing strongly, the thermometer dropped to 15°, and snow fell heavily, showing the extreme simplicity of the meteorological phenomena at this place. During the night the thermometer registered 3°.

When arriving at the fort I had taken care that we had enough pemican left to take us down the river again to the first caché, so that we would only have to draw on Moberly's slender stock for provisions while we remained at his post. To-day I found out that my three men, not liking the lean mutton that all the rest of us were eating, had taken our bag of pemican out of the store, and completely

finished it. As such a misdemeanour was not to be passed over, I determined to send them back at once to Edmonton, and leave them to get as best they could down to the first caché, rather than having them hanging about Jasper House, while I was absent on a trip I intended to make into the mountains.

February 7th.—This morning the men started for Edmonton, taking with them my sled and load, as I intend to return through the woods direct to that place, and will not be able to get the sled along. I, however, retained three of my dogs for the trip into the mountains.

February 8th.—The weather is now bitterly cold, and I occupy myself with taking additional observations for latitude, variation of compass, and the boiling point. In the afternoon some "freemen" arrive from the Lac à brulé. They have brought a few skins and furs to trade for ammunition, but have been nearly starved during the early part of the winter, the game being so scarce. There is a rule at Jasper House that no freemen are to hunt within 30 miles of the post, and as Moberly had an eye for the moose that his hunter was keeping in caché till spring, we determined to pay them a visit next morning, and see what they were about, taking the hunter with us, so that if there was any chance of the freemen or their dogs disturbing the moose, it might be secured for the fort at once. It is a very anxious task to provide for the little community at Jasper House, as they only arrive there in the beginning of November from Edmonton, by a fatiguing journey with pack-horses through the woods, which last "fall" occupied 19 days. From the time of their arrival they require to live on till next spring from hand to mouth. In order to save the game around the fort until the depth of winter, Moberly had abandoned it on his first arrival, and for two months they all lived in a camp about 20 miles up the valley, at a place where there are plenty of big-horn sheep. Until a few years ago this trading post was not altogether abandoned during the summer, but the person in charge made a hunting tour for several months to accumulate provisions for next winter's support, and during these trips as many as 30 to 40 moose deer would be killed and several hundred big-horn sheep. In addition he always returned in time to secure a stock of fish before the frost set in and closed the mountain lakes, which abound in "white fish" and trout.

February 9th.—We had a very cold ride for 10 miles down the left side of the valley to reach the freemen's camp, as the thermometer stood at —14° when we started, and did not rise above —7° all day. We found them living on the banks of Moose River, in huts built of the branches of pine trees. Along with the Iroquois there was an old Canadian, named François, who is famous for the well-trained hunting dogs he possesses, and which, by their wonderful abilities, keep him supplied with food when much better hunters are starving. We engaged "Tekarra," one of the Iroquois hunters, to accompany us on our trip towards the source of the Athabasca, and afterwards to guide me through the woods to Lac St. Ann's. The trail by which we reached the freemen's camp first led through fine open woods to the Snake Indian River, which we crossed upon the ice with some difficulty. We then followed along the base of the mountains by a very bad trail. As we returned, our new guide, Tekarra, fell with his horse in crossing a creek, and bruised his foot, which is a bad beginning for the snow-shoe trip he has before him.

February 10th.—We started this morning up the Athabasca, our party consisting of Moberly and myself, with Tekarra and a Canadian named Arkand, Moberly driving the dogs by the river and lakes, into which it dilates above this point, while we travelled along the right side of the valley with horses; but as the thermometer stood at —20° he had decidedly the best of it. We travelled for nine miles over sand-hills, which occupy the bottom of the valley, but which are mostly covered with well-grown trees. We encamped just above a slight bend which the valley makes, changing its direction from N. by W. to N. by E., and at which we crossed the river. The valley was now bounded to the east by Colin's Range, which is composed of vertical beds of limestone that at once reminded me of the Sawback Range further to the south. On the west side of the river a tributary of good size joins it, called Snaring River, after a tribe of Indians that at one time lived here, dwelling in holes dug in the ground, and subsisting on animals which they captured with snares of green hide, in which manner they used to kill the big-horn, small deer, and even moose. On the hills opposite our camp we saw several bands of the big-horn, and notwithstanding his sore foot Tekarra managed to kill a young ram.

On the 11th we reached a point opposite to Miette's House, where there was once a trading post, at the point where the track branches up the Caledonian Valley to Fraser River, from that which leads by the boat encampment to the Columbia.

The valley was now more open, and occupied by low hills of gneissoid rock, which seemed to form a floor on which the limestones rest.

We had now crossed the river three times, and were camped on the right bank above the mouth of Bad River, by the valley of which there is a pass to the North Saskatchewan at the Kootanie Plain. We saw much fine timber to-day, and our progress was much impeded by the trunks of the *Prusche*, which is the species of spruce fir that resembles the hemlock, but with a different cone. After we encamped, Moberly joined us, having shot a fine young ram.

February 12th.—The river above our encampment makes a great bend to the west, so this morning, to avoid following it, we crossed a high ridge. We reached the highest point at noon, where I found the lat. 52° 55′ 50″ N. From this point I had a fine view up the Caledonian Valley, which is to all appearance wide and level, and runs without interruption for at least 30 or 40 miles. It used to take six days to travel from this point to Fraser River, at a point where boats could ascend to. That was when a good trail existed through the woods, but now that the route has been abandoned for so many years it would take a much longer time.

The valley of the Athabasca, above Miette's House, is very wide, and is bounded to the east by a long mountain composed of the earthy shales, with only a few detached masses of the more massive strata capping them. We now descended to the south, and passed the *Campment du roches*, where we found many signs of former travellers, and among others our friend Hardesty's name, written on a tree last summer as he returned from the boat encampment, where he had been sent to meet Mr. Dallas. We then reached the *Prairie des Vaches*, where we encamped, intending to take our horses no further, as beyond this point there is little or no pasture at any season, but especially in winter.

February 13th.—Tekarra's foot is so much inflamed with his hunting exertions, that he will not be able to guide us up the valley to the Committee's Punch Bowl, so I changed my plan and followed up

the main stream of the Athabasca instead. At noon we reached the mouth of Whirlpool River, which is the stream that descends from the Committee's Punch Bowl, and I found the latitude 52° 46′ 54″. Leaving the rest to follow up the Athabasca, I ascended a mountain opposite to the valley of Whirlpool River, and had a fine view up it towards the boat encampment. Having been directed by Tekarra, I easily recognised Mount Brown and Mount Hooker, which are much like the mountains towards the source of the North Saskatchewan. They seemed distant 30 miles to the S. by W. At nightfall we encamped where high rocky banks began to hem in the river.

February 14th.—Allowing Tekarra and Arkand to return, Moberly and I continued to follow up the river, having now to use our snow shoes for the first time since leaving Jasper House. We saw some white goats, but did not get within shot of them. As we were halting for a rest a wolverine came wabolling down the river on the ice. We remained still till he got quite close without seeing us, when Moberly fired and put the ball right through him, so that his blood spouted out on the snow. He at first rolled over, but on our approaching him he started up and ran off, staining the snow with blood. We followed on our snow shoes, and pressed him hard, so that he ran up the bank and made for the mountain, where, getting into a cliff of the rock, he escaped us. The distance he ran while losing so much blood, surprised us very much, as at first we thought he was killed outright. After following up the river for 10 miles we found it became quite a mountain torrent, hemmed in by lofty and rugged mountains, two of which, that were very prominent, I named after my friends, Mr. Christie of Edmonton, and Moberly. We now returned down the river to overtake Tekarra, and just at nightfall, and about four miles short of our camp at the *Prairie des Vaches*, we found the tracks of nine reindeer that had come down on the river since Tekarra passed in the morning. We followed them for some distance, but it was now too dark, so we continued to the camp, and arrived at eight o'clock, after a walk of 36 miles; and as none of us had killed anything this day, we had to lie down to sleep without supper.

February 15th.—As I was anxious to see the part of the river we had avoided while on our way up the valley, I took the dogs with me and followed it alone, while Tekarra and Arkand crossed the valley by the track with the horses, and Moberly returned to have another look for the reindeer. For six or eight miles I got on splendidly, the ice being smooth and sound, but beyond that the river became rapid, and was not frozen over, and besides was so hemmed in by rocky precipices that it was difficult to get along at all. At last I reached Miette's House, where I was able to get into the woods for a few miles, and so avoid the worst part of the river. However, as the snow was deep my dogs would not drive through it, and I had to walk on and beat a track for a few hundred yards at a time, and then return and drive them on to where I had reached. This process was so slow that I did not reach our appointed camp till nightfall, although the distance was only 16 miles from where I started in the morning.

The stream from the Caledonian Valley is about half the size of the Athabasca. It flows from the W. by N., rising from Cow-dung Lake, and is said to be very rapid, with several fine falls in its course. The rocky point which obstructs the Athabasca above Miette's House, consists of vertical strata of gneiss, which form ledges across the stream. If there is any gold washed down by this river it will be intercepted here, as these ledges will act like the bars of a rocker. At night Moberly joined us again, having been unsuccessful in getting a shot at the cariboo, although he had seen them.

February 16th.—Twenty miles further down the valley this morning brought us to Jasper House again. We found that during our absence, Moberly's fine dog, which he had left behind in charge of one of the hunters to assist in killing sheep, had eaten a poisoned bait and died, which is the second valuable victim to strychnine since my arrival here.

This evening one of the hunters brought in a splendid ram, which he had caught by setting a snare in a path leading to a "salt-lick." Judging by the marks on his horns, he must be nine years old. His head and horns weighed 45 lbs.; the height of the head, 15½ inches; of the horn, 3 feet, and its circumference at the root, 14½ inches.

The angles subtended by some of the surrounding mountains, measured by the sextant, were as follows:—

				°	′
Roche Miette, distant about	4	miles	-	14	30
Roche de Suett	„ 6	„	-	7	40
Roche Ronde	„ 7	„	-	6	20
Pyramid Mountain	„ 14	„	-	3	45
R. Jacque	„ 5	„	-	7	25

To-day I was busy making preparations to start on my return to Edmonton, and, as I was unable to carry all my instruments, I left them under Moberly's care, to be brought down with the boat in the spring. I also ruled a register for him, in which he undertook to enter the thermometer and barometer readings regularly until May. As he wished Tekarra to return at once from Edmonton, and bring back a supply of ammunition, he sent with us a young lad named Louis Cardinal to accompany him back, it being a rule in the service never to let a man take a long journey alone.

Tekarra expects that we will take 12 days to reach Edmonton, but thinks that as we will see plenty of rabbits, and perhaps large game, we need not carry more than a few days' provision.

February 19th, Saturday.—Leaving Moberly again to his solitary life, we started at 10 a.m., and as there are horses to be sent as far as Le Grand Bas-fond, we get the benefit of them for that distance, one of us taking it in turns to drive my three dogs, which dragged an old sled that I intended to take as far as the trail would permit. It was not till the evening of the second day that we reached the point of the river where we camped the night before we arrived at Jasper House, and where we were now to leave the river and strike direct through the forest for Lake St. Ann's.

February 21st.—We left the sled this morning, and tying a little of the load on the two strongest dogs, carried the remainder on our own backs. Our supply of provisions only consisted of 18 lbs. of pemican, 2 lbs. of flour, a little tea and sugar. Each of us had a blanket and a few extra pairs of mocassins and blanket socks. My papers, books, and sextants, with two kettles, an axe, and a gun, completed the luggage we required to carry. Following the river a few miles we ascended the right bank.

After a little searching we found the blazings on the trees that marked where the track runs, and

following these we marched steadily on to the E. by S. Although the snow on the river at where we left it was not more than 10 inches deep, in the woods it was accumulated to about 2½ feet, so that with our snow shoes we walked smoothly over the fallen logs. It was very soft and loose however, especially in the swampy places, where there is a growth of low willows, so that it was heavy work for the one whose turn it was to walk first. In the course of the forenoon we found that the loaded dogs could not keep up with us, so we had to carry everything ourselves. By evening, we had only seen and shot one rabbit, which rather alarmed us, so that we at once reduced ourselves to short allowance of pemican, our stock of which, by itself, was only sufficient for three days' rations.

After going 31 miles to the S.E. from where we left the Athabasca at noon on the 22nd, we struck McLeod's River, where it flows to the N.E. It is a stream of considerable size, with a wide deep valley, on the sides of which were displayed sections of the sandstone and lignite strata. We followed it till evening, and encamped at where it changes its course to take a great bend to the south.

On the 23rd we crossed this bend, leaving the river to our right for a distance of 23 miles on a E.N.E. course. The country is much more open than I expected, the timber having been removed from large tracts by fire. Before camping, we found a covey of wood grouse, five in number, and killed them all, which saved our pemican to-night.

February 24th.—Followed along McLeod's River for 17 miles. The banks are very high, and the snow lies very deep on the ice, and in many places is converted into slosh by the overflowing of the river.

February 25th.—By the evening of this day, we reached the point where we leave McLeod's River, as its course turns almost due north to join the Athabasca. Our pemican is now finished, as we have killed nothing since we shot the grouse the other night.

February 26th.—On leaving McLeod's River this morning, we travelled to the E. by S., through forest very like that we saw on the portage route to Fort Assineboine, consisting of fine large trees of pine and birch. In the forest we saw fresh tracks of the moose-deer, which Tekarra followed, while Louis and I waited with much anxiety for the result. In a short time he returned, having got quite close to them, but a sudden change of the wind gave them the alarm, so that he did not get a shot. Much disheartened, we walked moodily on till evening, when we began, after making 20 miles, to get into pretty open country, and encamped among poplars. After hearing so much of the bad country between Edmonton and the mountains, I have been much surprised at the great extent of fine land and open wooded country. There is no doubt that there must be much swamp in summer, but the surface of the country is rolling, and a great deal of it is occupied by high dry lands.

February 27th.—After starting this morning, we fell on a creek flowing to the east, and as the timber is quite burnt off this part of the country, we got a fine view, which included a few distant peaks of the Rocky Mountains. The fallen trees rendered walking very laborious, however, as our snow shoes frequently caught in the knots and made us fall, which was very trying to our tempers, already much soured by starvation. At noon we arrived at a little swampy valley, where the snow was trodden down as if by the tracks of a large band of buffalo. However, Tekarra after looking around said, it was only the place where three moose-deers had been feeding all winter, and with wonderful quickness he picked out their most recent tracks, and told us to go on steadily and only to halt if he fired three shots, which was to be a sign he had killed one of them. We had only gone a mile when we heard a shot, and immediately after two others. This at once banished our fatigue, and regardless of the deep snow and fallen timber, we made off in the direction of the firing. Here we found Tekarra busy cutting up a fine three-year-old moose, which was the youngest of two he had seen. We at once made a fire by the carcase, which lay among fallen timber where the snow was about four feet deep. Our appetite was tremendous, so that, although the flesh of the animal was so lean that at other times we would not have eaten it, we continued cooking, eating, and sleeping the remainder of that day, and the whole of the next, by which time there was little left of the moose but the coarser parts of the meat. Our three dogs also, who had eaten nothing but the bones of the grouse and our cast-off mocassins since leaving Jasper House, enjoyed themselves to the full; indeed both the dogs and masters conducted themselves more like wolves than was altogether seemly, excepting under such circumstances.

March 1st.—This morning we started quite refreshed, each carrying a load of cooked meat to last us several days. The weather was now warm, and the sun very powerful during the day, which made the snow very wet and heavy for the snow shoes.

On the evening of the 2nd, after making 37 miles from our "Moose Camp," we reached "Buffalo Chip" Lake, which is about 18 miles long, and 5 in breadth. We struck it about half way from its south end, and camped on its margin.

March 3rd.—This morning we travelled on the ice of the lake for 10 miles, the snow on its surface though deep being crisp and hard. This lake is bounded to the N. by a range of hills that rise about 400 feet and have a N.E. trend. At the south end of the lake we found a stream 40 yards in width, along which we skirted till evening, making in all 30 miles to-day. The country we passed through to the south of the lake is very fine, resembling the best spots around Edmonton.

March 4.—Five miles this morning brought us to Pembina River, which at this point flows to the N.E., in a valley 170 feet deep, the banks of which are very high and ruinous, and at the water's edge is a section, displaying a bed of impure bituminous shale 10 feet thick. A little above this point the coal has been on fire for many years, just as on Red Deer River. Ten miles after crossing Pembina River, having passed over a ridge of land that forms the watershed of the Saskatchewan, and which is within a few miles of Pembina River, we reached a series of large lakes, on the ice of which we travelled very fast. The largest of these, *Lac des Isles*, is 13 miles long from east to west. After reaching the east end of it, we passed for 7 miles through the woods, and at dark reached the N.W. corner of Lac St. Ann's, having made in all 35 miles to-day.

March 5th.—Starting at daylight, after 10 miles we reached the mission station of Lac St. Ann's, and were kindly welcomed by the priests. They had heard from my men, who got back safely to Edmonton in 12 days from Jasper House, that I intended to return direct through the woods: and as the priests knew from the half-breed hunters of the scarcity of game this year in that direction, they had great fears for my safety, and, at Mr. Christie's desire, were next day to have despatched a party to relieve me. I had told Erasmus that he was to meet me at Lac St. Ann's on the 5th or 6th of March

with a fresh train of dogs, and I had just arrived at the very time, and found him waiting for me; so I only took advantage of M. Le Combe's hospitality till night, when, leaving Tekarra and Louis to come on next day, I started with Erasmus about 10 p.m., and having a good track and fresh dogs we ran the remaining 50 miles of the journey to Edmonton in 10 hours, arriving there to breakfast in the morning.

Edmonton, March 20th.—News having been received from Fort Pitt that Mr. Chastellan, a clerk at that place, was very ill, at Mr. Christie's request, and accompanied by him, I made a journey there with dogs. As we followed the winter road, which I have already described, it is not necessary that I should give my notes of this trip in detail. As the sun was now powerful during the day, we intended to travel only at night, and accordingly started from Edmonton at 10 p.m. on this date, and continued travelling till the sun had acquired power, next morning at 9 a.m., when we reached the Blackfoot Creek, a distance of 40 miles from the fort. We slept there all day till 6 p.m., when we again started, and by the morning of the 22nd reached the edge of the plain at the Egg Lakes. At this time, however, the weather, hitherto fine with clear frosty nights, began to change for the worse, and as the quantity of snow had also increased, and we had no track, we required to use our snow shoes constantly, which rendered our progress slower. However, by the forenoon of the 23rd we had reached the east end of the Chain of Lakes, which is more than half the journey. We met here with some trappers, who advised us to leave the ordinary route and keep more to the south, as by that means we should fall on the track leading to Fort Pitt, on which they had been hauling meat from a buffalo "pound" during the winter. We unfortunately took their advice, and struck out into the bare rolling plains along Vermilion River, but had not gone many miles from the woods when a great snow storm set in, so that we could not distinguish objects 100 yards in advance. Nevertheless, that evening we reached the "Pound" by mere chance, but it was quite deserted, and we only found in the neighbourhood one old Indian and his wife suffering from snow-blindness, and consequently starvation, from not being able to hunt. Thinking that next day would bring us to Fort Pitt, we gave them nearly all our provisions. On the morning of the 24th the snow storm continued as violent as before, and the wind had so swept and drifted on the plains that we could not find a trace of where the track lay. To make matters worse, I found that, owing to an oversight, I had left my compass, so that we had to take our chance as to the direction we were going in, having no assistance from the sun or any object, excepting that occasionally we passed low hills, on one side of which there always grew a few stunted poplars and willows, and that side I knew from experience must face to somewhere between north and east. By the middle of the day, on consulting, we found that each of our party (five in all,) had different ideas as to where the north lay, which was a sure proof that we were lost. We travelled on rapidly for two days in this state of uncertainty, the sky still continuing to be overcast; and now having got among partially wooded country, we lost even the feeble help from the position of the bluffs, as they grew on all exposures. At last, after we had gone a distance more than sufficient to take us to Fort Pitt, we fell on a fresh trail, and, following it up, reached an Indian camp. On hearing where we were bound for, the Indians would hardly believe us, for we had turned completely round, crossed the ordinary winter road, and were now within a few miles of the Saskatchewan, at the Snake Portage, and were travelling on the trail leading from that place to Edmonton; or, in other words, we were already half way back to our starting place. We at once turned right about, and, as the weather cleared up, we reached Fort Pitt in two days, arriving at 6 o'clock on the morning of the 28th, well starved, and some of us quite snow-blind. We had thus taken eight days and a night to make the trip; but all the while had travelled at a rate that, without losing ourselves, would have brought us to Fort Pitt in four days and a half, having, instead of 195 miles, travelled more than 300. This unfortunate expedition, which luckily was attended with no serious consequences, only shows how even the best equipped parties must run a risk in winter when travelling in this country. Chief factor Christie, himself an experienced traveller, being the bourgeois of the whole district, of course had two of the best men he could get. I had in addition Erasmus, whose qualities as a traveller I had well ascertained in several hard trips, and who moreover had travelled by this very route to Fort Pitt in the beginning of the winter; and yet, in spite of all this, and of my own knowledge of the country, which I had already mapped, without doubt we fairly lost ourselves, wore out our dogs with hunger and fatigue, and only escaped great privation and risk by mere accident.

On arriving at Fort Pitt we found that besides Mr. Chastellan many other persons were labouring under a kind of low fever, so that I had at once quite a large practice. But in another respect our visit was rendered very opportune by a most unfortunate circumstance that had occurred two days previously, which required Mr. Christie to exercise his functions as a magistrate. It seems that a second party of Americans, eleven in number, had started from St. Paul's to attempt to reach the gold mines on Fraser River, at the same time, in the spring of 1858, with the party that passed Fort Edmonton, and crossed the mountains last October. The second party, however, only reached the Moose Woods on the South Saskatchewan when the winter set in, then had continued travelling as far as this place on the snow, and were now working for the Hudson's Bay Company, making nets, harness, &c., for which they were to receive provisions to enable them to continue their journey in spring, besides their rations for the present. As might be expected, a party of independent men, without a leader or discipline, had not made the long journey, and suffered the many privations they had endured, without a certain amount of jealousy and discord among some of the members. A quarrel of this sort had unfortunately come to a head only a few days before our arrival, which proved fatal to one of the party. The immediate altercation was about some trifling matter between two of them in a log house within the fort, that had been given to them to live in, and in their anger, and in presence of some of their companions, they drew their revolvers, and fired six shots at one another, at a distance of only a few yards. The one that first drew his weapon was mortally wounded, and so rendered unsteady by the first shot fired at him, which accounts for the escape of his antagonist from this murderous style of encounter, with only one ball lodged in his hand. Three balls lodged in the body of the aggressor, so that he only survived a few hours. As the occurrence took place within a Company's fort, Mr. Christie thought it his duty to investigate the whole case, and, examining the witnesses on oath, drew up a full statement in triplicate, one copy for the Council at Norway House, a second to be taken by the Americans in spring when they crossed the mountains, and to be produced if any proceedings were instituted against the survivor, and

the third he retained himself. As the evidence clearly showed that the man who lost his life was the first to draw and fire his revolver, and even that he had previously borrowed it for the purpose from one of his companions, the position of the survivor in reference to the affair was not such as to warrant Mr. Christie interfering directly, or to detain him for further trial in a country where there is neither law nor government, so that he merely advised that his companions should see that he surrendered himself, on reaching the Pacific coast, to the proper authorities, and by standing a trial there be freed from future imputation.

After two days Mr. Christie returned to Edmonton, leaving me to remain at Fort Pitt until the snow had disappeared, as, besides my being useful to the sick people at this place, I could then have an opportunity of seeing the important district between it and Edmonton under the aspect of early spring. He took with him two men from Fort Pitt, as there were things to be sent down from Edmonton; and I seized the opportunity of having my instruments and other working gear forwarded to me, as when I started I had anticipated returning immediately. The men were only gone seven days, Mr. Christie having reached Edmonton on the fourth day; and without resting, the two men returned with their dog sleds, heavily loaded, in three days; and, as the distance there and back is 380 miles, both by estimate and as measured by the odometer, they thus had run 48 miles per diem when going, and as they returned 62 miles per diem. Yet such is the zest for travelling with dogs in this country, that no one considered it at all a wonderful feat.

The spring is much more advanced at Edmonton than at Fort Pitt; for here the snow is deep, and every day brings a storm that adds to it, while at the former place it has nearly disappeared, and they have genial weather with mild S.W. wind.

I remained at Fort Pitt until the 26th of April (the guest of Mr. James Simpson, the gentleman in charge, and my old travelling companion during the previous winter), and during that time I made several short trips in various directions. The time passed very pleasantly, as some of the Americans were very superior fellows, and had already travelled through most of the western states and California. Mr. Louch, an English amateur hunter, also returned from the plains, where he had been hunting buffalo with the Indians.

Immense flocks of the little snow-bunting (*Embrizza nivalis*) assemble round the forts at this season. They are only numerous at Fort Carlton and Fort Pitt at this time and late in autumn, but at Fort Edmonton they remain throughout the winter.

The snow continued to be two to three feet deep until the night of the 17th of the month, when it began to melt very suddenly, and on the 18th the first geese and ring-necked plovers arrived. On the 20th the ice began to break in the river, but only by the weight of water that overflowed it from the melting of the snow.

On the 26th I got horses from Mr. Simpson, and with a light cart that had been made for me, and to which I attached the odometer, I crossed on the ice, and started for Edmonton. Not many hours after we crossed, the river suddenly rose nine feet, and bursting away the ice cleared the stream next day. It will be seen by referring to my notes of the previous winter, that the ice was so rotten on the 27th of March that I could not travel on it, and that it broke up on the 7th of April, so that the spring was thus nearly a month later than this year. Yet this does not show the full difference, for the warm weather commenced early in the spring of 1858, and the thaw was very gradual, while in 1859 it has continued cold and stormy until within seven days of the final breaking up of the ice.

In returning to Edmonton, besides my man Erasmus, I was accompanied by some of the Company's servants that were bound for that place to help to bring down the brigade of boats with the furs. We had a good deal of trouble in crossing many of the streams, as they were much flooded. As every stream in the plains flows in a deep trough, a flood adds to their depth without increasing their width, so that we had repeatedly to go through the whole business of swimming and rafting in the icy waters of creeks not more than 15 to 20 yards across, and which in summer are only dry gullies. The rapidity with which grass springs up when the snow clears off the ground is very astonishing. Places where fire had consumed the grass in the previous autumn, after that season's growth had ceased, now became green in the course of a few days, as the snow always disappears from these spots first. On the last two days of the month there was much warm rain, and at night vivid lightning, but without our hearing any thunder. On the 3rd of May we reached Edmonton, having occupied six days in the journey, which was considered a fast trip for horses to make in the spring. The distance corrected from the odometer readings is 195 miles by the track.

May 5th.—Farming operations are now well advanced around the fort, and it was with much interest that I heard Mr. Christie's plans for improving this post, and establishing agriculture on such a scale as to make the Company more independent of their half-breed employés, who are such a thorn in the side of whoever has charge of this district. On the 9th the boats arrived from the Rocky Mountain House, and with them came Palliser, Brisco, and Mitchell, so that we were once more altogether again, for the first time since Christmas. During this month, until the boats left on the 26th, our great employment, besides writing and mapping, was doing all we could to get our horses into order for the summer's work, by shifting their feeding ground, exercising the buffalo runners, and physicking the sick, of which there were several in the band. The number of Indians loitering about the fort, waiting till the boats should start, compelled us however to have our horses guarded about 35 miles distant to the west on the beautiful prairies along Sturgeon River. Although there was still frost at night, yet the weather was this month mild and genial, and, considering the latitude and continental position, the vegetation was wonderously vigorous. Although this season is considered to be later by nearly a month than is usual, yet everything was much further advanced by the beginning of May, than we found it in the middle of June 1857, around Lake Superior, which is five degrees of latitude further south. The fort was now very lively, as all were busy preparing for the great annual voyage to the coast of Hudson's Bay, which occupies the whole summer. Besides the brigade from the Rocky Mountain House, Mr. Fraser's brigade from Lesser Slave Lake and the Athabasca, and Moberly's Brigade from Jasper House, both arrived; and the repacking of their furs, the launching and loading of the boats, and all the necessary preparation, gave the inside of the fort an air of business and mercantile activity that looked more civilized than anything we had before seen in the Saskatchewan. Outside the fort, however, the large motley

encampments of Indians, voyageurs, and Lac St. Ann half breeds, with all their women and children, dogs, and horses, at once destroyed the illusion, the crowds of loiterers showing that the lazy population still maintained that proportion usual in this country to the number of those that work.

The chief factor's work at this juncture is no sinecure. He has all the surrounding population condensed on his hands, and just at the time when every scrap of food acquires tenfold value. Those that start down the stream have not only to carry food for themselves, but also for the brigades to many other parts of the country, while in the fort are to be left the women and children with perhaps only two or three men, and if the buffalo are distant they will certainly suffer a summer of great privation. But the crews of the boats bring their families to loiter round the fort and to see them off, and great trouble and anxiety arises from endeavouring to escape feeding these, and yet without offending the hot-tempered half-breed voyageurs, who have generally received advances, or are in debt to the Company, and would gladly seize any excuse for deserting.

On the 25th the last of the brigade of boats started with Mr. and Mrs. Christie, and with them went our friend and colleague Bourgeau, very much to our regret, for the Expedition will feel quite incomplete in the plains without his methodical habits and quaint drollery.

On the 26th I was left alone at the fort, only retaining Erasmus, while all the rest of the Expedition started for the plains.

On the 6th the Americans arrived from Fort Pitt, and I engaged one of them, Burnham, who had been a California miner, as I had found at Fort Pitt that he was very handy and thoroughly to be trusted. On the 7th Beads arrived with the letters from Red River, and along with him *Vital*, a half-breed from Red River, who was bound for a trip across the mountains to see some relations at Colville. On the 10th of June I started to join Capt. Palliser, and from this time till leaving him again at the Cypress Hills it is not necessary for me to give my journal, as the substance of it is incorporated with that of the Expedition for that period.

No. 6.

From Edmonton, 24th May 1859, to the Forks of South Saskatchewan and Red Deer Rivers; thence to Camp of the United States Commissioners from the Gulf of Georgia.

Capt. Palliser's Journal, continued.

May 24th.—Occupied engaging men, and paying small bills to the women for needlework, washing, &c.

May 25th.—The scarcity of provisions at Edmonton now became very serious: it was evident that we must all go out to the plains and look for meat. I was in expectation of letters from the Government, with orders either to return home, or continue the Expedition. My party was however too large to be supported in the fort, where every ounce of provisions was of the last importance. Under these circumstances I had nothing for it, but to make a start in search of food, leaving Dr. Hector at the fort to await the arrival of letters and orders from the Colonial Office.

We had now been two years carrying out our explorations to the westward in British North America, the greater portion of the time in the field. As the advancing winters had rendered each season no longer available for horses, we still prolonged our endeavours, and extended our researches by the ordinary means of travelling in snow shoes, accompanied by trains of dogs. We had now carried on the explorations from the valley of Red River westward along the boundary line, examined all the country drained by the Assineboine and Qu'appelle River, explored and laid down the whole valley of the North Saskatchewan to its glaciers in the Rocky Mountains, and also the lower portion of the South Saskatchewan, to beyond the elbow, up to 109° of longitude. Traversed in several directions that region of country between Fort Ellice and Fort Carlton, and containing the Touchwood Hills, Swan River, Fort Pelley, and the lake districts.

We had also travelled the piece of country between the two Saskatchewans, examining and laying down Battle River.

Again from Fort Assineboine, in lat. 54½°, long. 114½°, through the belt of woods at the base of the Rocky Mountains to Jasper House, in long. 118°, and altogether extending to the southward, by various journeys, our examination of that rich belt of country, along the base of the Rocky Mountains, to the boundary line at the Chief Mountain. And notwithstanding that, in addition to all this exploration of territory, the Rocky Mountains had been crossed and recrossed, and several passes discovered available for horses, yet a glance at our chart showed us that a great block of country in the neighbourhood of the boundary line, viz., from long. 109° to long. 113°, still remained unexamined, as well as the greater part of the South Saskatchewan (commonly called Bow River), which still remained unexplored. Under these circumstances, I had written to her Majesty's Government, by the winter mail, acquainting them of what still remained to be done in order thoroughly to explore, completely to report on the country, and in short to exhaust the subject of those regions of North British America as far as the western slope of the Rocky Mountains, also requesting that we should be allowed not only to complete this work, but also afterwards to return home westwards, instead of recrossing the plains of the Saskatchewan.

Owing to the few opportunities afforded in the country for postal communication, I had ordered our servant Beads (whom I had permitted to return in October, to Red River to visit his parents after the murder of his brother by the Sioux) to await in early spring for the Government Despatches; and by also having written directions by him to enable him to hire a companion and engage horses, I thus contemplated receiving an extra mail so early in the year as to enable us to avail ourselves of the whole season of 1859, to continue our explorations, intending to resume them from Edmonton, in a S.E. direction, to that point nearly where we had terminated in September 1857, and thence to resume them through the Blackfoot, Pigeon, and Blood Indian country, along the boundary line once more to the Rocky Mountains.

May 26th.—Started for Bull Lake accompanied by Captain Brisco and Mr. Mitchell, five carts, and 47 horses, including those belonging to my friends, and some few the property of the men. Our stores consisted of ammunition, tobacco, blankets, calico, knives, cloth, &c., for Indian presents, or for the

barter of horses for the whole season: our supply of provisions was very small, but we hoped with care and the assistance of some chance ducks, that we might shoot on the way, to be enabled to reach Buffalo. Our party was now of a very motley description, comprising Scotch and French half-breeds, Americans, Indians and squaws, one Dutchman, and a negro. I had considerable difficulty in forming a party at all, in order to enter a country so very little known, and considered very dangerous; so dangerous that this portion of territory has not been traded in by the Hudson Bay Company since they were compelled to abandon their forts on the Lower Saskatchewan, or Bow River; and when they did penetrate the country it was up the Bow River, with a brigade of 100 men and the outlay of 10,000*l.*

I am sure I should not have succeeded in traversing the country I contemplated to explore, but for the large preponderance of the Anglo-Saxon element among our forces, which were thus constituted:—Gentlemen,—Mr. Sullivan (my secretary), Captain Brisco, and Mr. Mitchell. Scotch half-breeds,—Samuel Ballenden, James Todd, George Daniel, Felix Munroe, and Oliver Munroe. French half-breeds,—my old hunter of last year Paul Cayenne. Canadian,—Oliver Larose. Americans,—Maxwell, M'Lauren, Cook, and one coloured man, Dan Williams. These Americans were some from a party who had made an unsuccessful attempt to cross the mountains last season, and being anxious to make their way to the diggings across the mountains, requested me to take them into my service, at any wages I thought proper; wages were no object to them, as all they wanted was to be enabled to travel across to the gold regions. Although these men were not as effective voyageurs as the half-breeds, yet I could perfectly depend on them in case of a panic and desire to return among some of the men, who all more or less feared the country we were now attempting. Doctor Hector by my directions remained at Edmonton to await the arrival of our servant James Beads, now almost daily expected from Red River with my letters and instructions from the Colonial Office. In addition to the party above mentioned, were several women and children, who begged to accompany us in hopes of food. These consisted of Felix Munroe and Paul Cayenne's wives and children, along with some three or four Indian women and several children, belonging to my Blackfoot guide Pelope and Dr. Hector's hunter of last season, Stoney Nimrod, now in Captain Brisco's pay. I may as well mention that I strongly objected to this man being brought along with us, anticipating difficulties with the Pigeons and Blood Indians as we advanced; but my poor friend Capt. Brisco was so impressed with his great powers in hunting, and so anxious to obtain his assistance, that he requested me so strongly to allow him to come along with him, that I reluctantly consented. Our first start did not augur well; after crossing the river we found that none of the horses would pull; had to take the carts up the steep bank of Saskatchewan opposite the fort, about a height of 200 feet: fastening leaders by their tails to the shafts we succeeded in surmounting the difficulty, and went as far as White Mud Lake, where we camped.

May 27th.—We crossed White Mud Creek about seven miles from Edmonton; lost two horses. Hector advised me to abandon them, and leave him to find them, and take along with him when he came to join us at Bull Lake. After breakfast he returned to the fort, and we continued our journey along swamps for some miles, through willows and along lakes. Killed a few ducks.

May 28th.—Continued along the Blackfoot trail over more hilly ground than yesterday. We are following a wide shallow valley between the Beaver Hills and the Woodpecker Hills, and towards evening we struck Weedy Creek, a small stream flowing to Battle River, beside which we encamped. We here dug up some small beaver dams, but were unsuccessful: our stock of provisions was now very low, although we had made it go a little further by killing ducks; but these were, strange to say, notwithstanding the favourable appearance of the country, very scarce.

May 29th.—Leaving Weedy Creek we went over some hills; saw the last of the pines, which we observed on the way to the plains, with the exception of a few on Red Deer Lake. Our track all day lay over a rich plane country, free from swamp, intersected by lakes with firm banks, a valuable piece of land. We made a long day, and camped after crossing Battle River.

May 30th.—Traversed a hilly country; left the Blackfoot track on our left; our direction was now S.W. Arrived at Elk Lake, about six miles long and two miles in its widest part; travelled round its western shore; turned off due east, and camped on the south end of the lake.

May 31st.—Travelled easterly, and soon after resumed our general S.E. track. Our Stoney hunter here advised us to send off in a western direction, a rapid journey of about 40 miles, to some tents of his tribe, and trade some meat. I dispatched him along with Mr. Sullivan and one of the men, and furnished them with a little tobacco and ammunition to trade meat.

June 1st.—Finished our provisions, along with a few ducks which I had killed, and arrived at Bull Lake.

June 2nd.—Felix Munroe killed a young red deer most opportunely; it was, however, very lean and tough. We travelled to the eastward, and fell upon Eagle Creek, where we had passed the year before. Here some of us started off to hunt, leaving the main party to go on and camp again at Bull Lake.

June 3rd.—Captain Brisco, Felix, and Paul killed four beavers; Mr. Mitchell and I a few ducks; the whole was eaten that night, together with the last of the red deer Felix had killed the day before.

June 4th.—To-day is Saturday. Old Paul and Felix dislike hunting to-day, being persuaded it is Sunday, but, strange to say, have no objection to the far more laborious expedient of digging up the beaver dams, turning off the water; to effect both of which objects they must remain for hours working up to their middles in very cold water. The result was a failure; we got nothing, the creek being too deep to drain, and I, with great regret, was obliged to serve out rations of flour, a luxury only kept for Sundays and in cases of sickness.

June 5th.—Started early, continuing a southern course. Left Bull Lake altogether. This lake is so called from resembling the shape of the skin of that animal when taken off and spread on the ground. Served out rations of flour in the middle of the day. In the evening Felix returned with the meat of a very lean cow he had killed. He told us, when in pursuit of a bull, which he espied a long way off, two Indians appeared to spring from the earth, as it were, ran the bull, and killed him with arrows. Guarded the horses very carefully all night.

June 6th.—Started early; soon arrived at the edge of the woods; cut and carried small loads of wood in each of the carts for use on the prairie course south. Came in sight of buffalo. Felix Petope (our Blackfoot guide), Brisco, and I, killed four buffalo; not one of them was good, although Petope

hardshipped my best horse terribly searching the band before firing. The prairie was so hard and [*sic*] that I began to fear, in case rain might fall, that the Doctor might not find our track after a few days. Sent back to edge of woods; buried a letter, and dried meat for him, which we also buried. Two young fellows, Sircees (allies of the Blackfeet), came into camp; told us the Indians we had seen running the bull a day or two ago, were from their camp not very far off.

June 8th.—Travelled on rather fast; at noon found a lost horse, evidently must have belonged to the Sircees. Petope claimed the horse, according to prairie law, and having seen him first; I resisted the claim, would not allow any one to have the horse. Petope left, in consequence, in a rage. I allowed him to go, but afterwards sent after him when he was cool, and speechified him into acquiescence of my conduct, explaining to him the difference between prairie law, which was to seize all you could, and the Queen's law, which was to endeavour to do your best always to restore property to its rightful owner.

June 9th.—Sent on to search for buffalo; found Brisco and Mitchell, Felix and Piscan. Killed five cows, of which Mitchell's was the best. Felix got a bad fall, and broke a gun. I desired them not to bring the meat home, but to seek for the nearest water; and we shifted camp to where the meat was, fortunately finding water not far off.

June 10th.—Started very early, and before noon arrived to where the hunters were guarding the meat; loaded the carts very heavily, and pressed on, in order to get to the Hand Hills the following day as early as possible.

June 11th.—Reached the Hand Hills, where I determined to make a permanent camp. We commanded an extensive view of the country, on account of their considerable elevation over the mountain plain, which enabled us to see any buffaloes which might traverse the plains: we were also enabled to recruit the horses, and get them into condition for the long journey before them, and bled some of them, which made them feed better afterwards. We also killed a good many buffalo, and lived on fresh meat every day, slicing and drying provisions with the overplus, to take along with us through the country, where we had not so good a chance of finding game. Lat. 51° 33′; long. 111° 30′.

June 12th, Sunday.—Read the prayers of the Church of England, Ballenden translating the most important ones into Cree, also first and second lessons. A wet day.

June 13th.—A wet morning, cleared up after noon. The women continued to make dry meat, which they were all obliged to turn over again, as it had got wet in spite of all our efforts to shelter it. Much has been spoiled. Bled more of the horses. Dispatch Felix to report on the extent to which the rain had obliterated our track, as I feared that the Doctor would find it difficult to find it, and consequently it might be necessary for me to send to meet him, in order that he might fall in with the cachés of meat I had buried for him at different intervals on our track. Nimrod's wife has for some time been anxious to go back to her friends; her husband proposes to take her back, and to return to us. I endeavoured to dissuade them, however, fearing the danger they would have incurred from the Blackfeet. They have again renewed their requests, and I was not sorry to let them go: having represented the danger to them they still insist upon leaving me, and must therefore take the consequences. Came on to rain again in the evening.

June 14th.—Our track across the arid country, between this and the woods, is nearly obliterated; I have therefore started Oliver and Todd, with three horses, back to Bull's Lake, with orders to bury directions for Hector in order to find us. Sent him back also meat and grease. They ought to be back in four days without forcing the horses. Brisco and Petope went to hunt on Red Deer River.

June 15th.—We were visited by a war party of Blackfeet, about 42 in number. I knew them, having seen two of them when hunting last winter. Invited them to sit down; made them a feast; gave them a smoke. Made them a speech, in which I told them they would be sure to have tribulation if they went to war against the Crees. They replied that they were maddened by the manner in which the Crees had stolen their horses; and I replied, that I would use my influence in persuading the Crees to restore the horses; upon which I made them a few presents of ammunition and tobacco, and they turned back. Two of their allies, the Sircees, joined them. One of them I recognized to be my old friend, the little chief, who took my view of the war question, and spoke against an attack on the Crees. In the evening Nimrod, the Stoney hunter, and his wife came running into camp, carrying their little child. They had been pursued by Blackfeet, who had shot their dogs, robbed them of all they possessed, *i.e.*, the payments received from me in ammunition, cotton, and blankets: they were fired at, and had a very narrow escape with their lives. Proposed a race for a flannel shirt. Fifteen champions stripped ready to start. Although among my half-breeds were several splendid runners, I could not persuade any of them to enter the lists. Felix, however, whom I pressed very hard to contend for the prize, remonstrated, saying that he was an old married man, with 5 children, and that it was unreasonable of me to ask him to run; finally he exclaimed, "I will not run unless you order me, in which case, of course, I "cannot help myself." I replied, "I order you to run." With a shrug of his shoulders, and a glance of satisfaction he could hardly conceal, he walked to the starting post. The distance was 200 yards down a gentle slope, and thence up a more rapidly rising ground. Felix and the 15 youths made an excellent start. The race was well contested for the first 120 yards, but as they ascended the rising ground, Felix, who was slightly in the rear when in the valley, began to gain at every stride, passed the three foremost, and came in the winner by three yards, and carried off the red flannel shirt. I then handed a white one to the young Indian who came in second. Late at night the war party returned, broken up, back to their camp.

June 16th.—The Blackfeet chiefs paid us a visit, accompanied by their soldiers. They were very troublesome, and alarmed my men considerably, telling my interpreters that their time was come to die, and other threats of a similar nature. Previous to their arrival, however, I had ordered the fire-arms to be disposed in such a way, that, on a given signal from me, each man could arm himself at once. I preferred this arrangement to that of receiving my visitors armed, as I always wished to convey to them the idea of an attack upon us being an act of folly on their part; for besides the fearful consequences of a present resistance, a terrible vengeance would remain in store for them from the swords and cannons of the soldiers which would surely be sent out to revenge us. I found that Petope had been the author of the mischief, by representing to them that we had sent tobacco and ammunition by my secretary, Mr. Sullivan, some time ago to the Thick-wood Stoneys, and that now we were denying them the

tobacco they begged for. They offered to trade horses, made a few overtures, then backed out, by which I perceived that their object was merely to ascertain the extent of our stock of goods, which I always kept covered. I firmly refused to trade any more after exchanging one horse with a sore back for a sound one.

By the exercise of patience, firmness, and speech-making, I managed to pacify my troublesome customers. Some of the young men made overtures to the Stoney hunter, Nimrod, and told him they regretted extremely that some of their people had stolen his horses; but that if he and his wife would accompany them to their camp, they would not only restore all his lost property, but make him a present of a horse in the bargain. Contrary to Felix's advice the foolish fellow and his wife were induced to go along with four or five young Blackfeet soldiers. The result of that evening's journey was very nearly the death of the Stoney, and the abduction of his wife. But fortunately Mitchell and Sullivan, who were out hunting, were attracted by the gleam of a gun barrel, saw the party disappear in a coulée without reappearing again on the other side; their suspicions were roused and they galloped up on the height. Seeing how matters stood they rode to their assistance, and the Blackfeet ran away.

June 17th.—Ran buffalo; killed a hen; none fat; the buffalo in this region very lean, and poor eating.

June 18th.—Olivier and Todd returned to camp. We have not been troubled by the Blackfeet for two days; keep strict guard on the horses night and day.

June 19th.—Doctor Hector arrived in camp with our servant Beads; bringing the required news from the Colonial Office, directing the continuance of the Expedition through the remainder of the as yet unknown country in the neighbourhood of the boundary line, and also granting us permission to return home *viâ* Columbia River and Vancouver's Island. After leaving us on the 27th of May, in order to await Beads' arrival from Red River, he engaged a Blackfoot Indian (married to a Cree wife), who had been trading at Edmonton, to look after the horses, and to go with him as guide into the Blackfoot country. After this period he described great hardship for want of provisions at the fort, the supply of ducks obtained not being nearly sufficient for the consumption of even the few people that remained there after our departure and that of the boats, and making up with the deficiency in eggs and rats. At last, on the 4th of June, Brazeau was obliged to kill one of the domestic cows: this was, he said, the first he had tasted since he left Fort Garry in June 1857; the difference in the coarse taste of the fat, after the lighter and more digestible flavour of the buffalo, made him feel quite uncomfortable. On the 6th several Americans arrived from Fort Pitt, and on the 7th of June at 4 p.m. our servant Beads arrived with the English mail; he had made a most wonderful rapid journey, having accomplished a distance of about 1,000 miles on horseback in 34 days. It will be remembered that I previously stated in this journal that, in consequence of this young man's brother having been killed in the summer of 1858 by the Sioux, in the summer route between Red River and St. Paul's, I permitted him to go down by the fall boats from Edmonton to visit his parents at Red River, and availed myself of his engagement to return to organize a mail by which I could receive letters from England in answer to mine of last autumn, sufficiently early to avail myself of the season of 1859; and well he accomplished his mission. He started with a companion from Red River, who turned back after a week or 10 days; then performed the greater part of the journey to Fort Pitt alone; where he succeeded in obtaining a companion, a French half-breed of the name of Vital; and finally completed his arduous journey of [*sic*] miles; arriving at Edmonton on the 34th day after his departure from the Red River settlement: he was obliged, however, to abandon one horse on the road, but exchanged his horse for a fresh one at the several trading posts on his journey. The Doctor's journal, which I shall now transcribe in substance, up to the period of his joining me at the Hand Hills, as I have above related, was as follows:—

June 8th.—Engaged Burnham, one of the Americans from Fort Pitt, who arrived here to-day.

June 9th.—Delayed, in order to provide clothes for Beads, who had lost his in swimming with the despatches across the Saskatchewan.

June 10th.—Got in the horses from the guards. I had found Palliser's lost horses on the other side of the river, and this evening I crossed the band of 23, which I had to take out to the plains, and along with them the baggage. Took the boiling-point observations in order to correct the aneroids, and distributed and balanced my instruments in two cases for one horse to carry in the mountains.

June 11th.—Started from Edmonton; crossed to Saskatchewan; had great difficulty in collecting the horses, two of whom had strayed away through the thick brushwood. Besides pack-horses, I had the light cart I brought from Fort Pitt, to the wheel of which the odometer was attached. Camped on White Mud Creek. Weather stormy; stiff S.W. gale. Thermometer at sunset 57°; barometer 27·44. Party consisted of Erasmus, Beads, Burnham, Boucher, and Vital, with Amoxapeta and his wife.

June 12th.—Camped at Windy Creek; found where Palliser and his party had been breaking up the beaver dams. Burnham put a new axle-tree in the cart.

June 13th.—A party of Americans, now only nine in number, the rest having engaged with Palliser, were camped here. I desired Peter Erasmus to continue our course by the Blackfoot track, while I went with the Americans to put them on the trail for the Old Bow Fort, whence they intended, without a guide, to cross the Rocky Mountains by the pass which Palliser laid down. Dined with them at noon, and, leaving with them a map of Kannanaskis Pass, I struck off to the eastward, and again fell on the trail of my men near Battle River. Crossed that river by a good sound ford, where it was 90 yards wide and 2½ feet deep, and the banks 120 feet high, and very steep. The rain so heavy that night that we could not keep up our fire this evening.

June 14th.—Leaving the men and horses to follow the Blackfoot trail, I started off with Amoxapeta along the shore of Elk Lake. Killed four ducks, and collected 55 eggs (principally water-hen's), and enjoyed the first full meal we have come across now for several days.

June 15th.—Passed over broken ground, but a rich alluvial soil towards the west; came on Palliser's track, which we judged about 10 days old, consequently concluded he had pushed straight through the woods for the plains. We camped at the edge of the woods.

June 16th.—Sent Peter on the trail to try and come up with the Captain. We crossed a belt of prairie about 10 miles wide, and then came into the last woods. We were now so badly off for food and so hungry that I was obliged, although very reluctantly, to broach one of the flour bags, two of which I was carrying along with us. We now passed out into the arid plains, and shortly found two letters buried

in the track by Captain Palliser. Vital and I rode on for nearly 20 miles after buffalo tracks, and at length, from a slight rise in the plain, descried a band of bulls, which we ran, and out of which killed two. Returned about midnight to where the rest were camped, bringing them some of the meat, but they had fallen in with a band of cows, and Beads had killed two. The buffalo dung, which was our only fuel, was however so wet that we could not make any fire worth speaking of, and had to eat our meat nearly raw.

June 17th.—Peter returned, having followed the trail of the carts until he arrived at high hills, from which he could neither see buffalo nor woods; he consequently thought it more prudent to return, as he was hard up for food, and his horse too tired to face the plain. We camped at the foot of these hills, but have seen no wood since we left Bull Lake; the grass everywhere parched and stunted, and, excepting the rain pools, all the water is nauseous. Large bands of buffalo passed our camp in the night, travelling to the N.E.

June 18th.—Crossed the high hills (the Squirrel Hills), and travelled over a wide, level, arid plain, interspersed with salt lakes, in sight of a range of very marked hills, with an abrupt escarpment to the west. Where we found a large creek, flowing to the north-east, we encamped.

June 19th.—A few hours travelling brought us to the Hand Hills; we ascended the north face, which is long and steep; it becomes then a table-land, which we crossed, following along the Captain's trail to the west brink, when we suddenly came in sight of his camp in a valley that opens to the west.

The Hand Hills are a plateau, with rugged and steep sides to the north-west and south, while to the east it slopes gradually. The slope is much furrowed and worn; the plain all round the base of the hills is bare and arid, but the high level of the hill bears a very fair and almost rich pasture, being 680 feet higher than the plain; it also contains lakes of pure fresh water, and gullies with a small growth of poplar.

June 20th.—Read over my despatches carefully; we sent for Paul, Felix, and my most trustworthy men, Beads (our servant), Ballenden, Erasmus, and Daniel, also for all my Americans. Explained to them that I intended to pursue our course to the S.E., cross Red Deer River, and explore the country to the forks of Red Deer and Bow Rivers, from thence pursue a western course to the Pigeon and Blood Indian territory to the Rocky Mountains. I addressed myself first to the Americans, and asked if they were prepared to follow me throughout; they replied that they would stand fast by me, no matter where the country or what the danger. Beads, Ballenden, Erasmus, and Daniel, likewise declared their determination to go on. I next addressed myself to Paul, who replied, "It is all very well for those who do not know the country to be brave about it, but speak to any of the old ones who knew, and who have experience of the country; take me, for instance, who have had my clothes pierced with bullets, and had my relations killed; ask if there is one of us who have not had some of their brothers, or brothers-in-law killed by these Indians. The country is too dangerous, and I have spoken."

Felix replied that the country was dangerous, and even as far only as we had yet gone the Blackfeet were sulky, and had threatened him and his brothers, as I myself must know, having used such expressions as that "their time was come for to die," and such like threats; and concluded by saying that he, for his part, would go on; but that the party was too small, and that the women and children had better return.

I did not like to lose old Paul, and feared the alarm which would more or less be caused by the retreat of such an experienced veteran as my old hunter, who had followed me through not only the whole of the last season, but also through the greater part of the winter of 1858–59. I also thought that a little additional force would give Felix more confidence, and render the traverse of the country less objectionable to the others, and I finally persuaded old Paul to promise to go on, if we increased our party by four more half-breeds; and finally, I arranged that Felix should start for Edmonton with letters to Mr. Brazeau, to engage not more than six or less than four good hands, engaged at the wages of the Expedition. Besides the reasons above stated, I had a far more important one. I perceived that the Blackfeet were very much disappointed at our small presents of tobacco. I had not reckoned on a sufficient quantity for the exigencies of the country, and I wrote to my friend, Mr. Brazeau, to let us have back again a bale of tobacco, which had been returned at the urgent request of Mr. Christie, as the Company was very short of that article. I urged my friend very strongly, feeling confident he knew even better than I did the importance of the article to any party situated as we were; and I felt confident that however greatly he might be in want of the tobacco himself, he would waive his claims in favour of our far greater emergency. Ballenden, who wished to leave one of his horses at Edmonton, was sent by me to accompany Felix. We organized a start, and sent them along with a plentiful supply of meat, for the journey there and back again. My directions were to leave half the meat buried north of Battle River, to be taken up again when they repassed on their way from Edmonton back to the camp. The party started in the evening. Petope also departed with his wives back to his camp. We were not sorry to get rid of such a troublesome nuisance, although he has carried off one of our trade guns with him.

June 21st.—We now formed a party of 5 gentlemen and 15 men, which I formed into five watches to guard the horses day and night Spent the rest of the day calculating and taking lunars.

June 22nd, 23rd, and 24th.—Running buffalo, and slicing and drying meat, in case of their ceasing to pass. We killed three grizzly bears, but no one could claim them.

June 25th.—Shifted camp about five miles S. $\frac{1}{2}$ E. to a small swamp on the top of the hill. Red Deer River sweeps round the base of these hills through a level plain at a distance of from seven to ten miles. Its immediate valley is a depression varying from 240 to 300 feet in depth; plains extend in all directions, where there is no grass and no fresh water; even in the river valley there is very little wood, and no grass.

June 27th.—Some Blackfoot chiefs arrived. Doctor Hector rode to Red Deer River to examine the strata, intending to follow it up a considerable distance, and remain out from camp two days, accompanied by Captain Brisco, who was hunting, attended by two of the men. The chiefs behaved very well. I gave them tea, and made bread for them; they had a good smoke, and I gave them some tobacco before they started.

June 29th.—The Doctor returned on the third day, describing interesting appearances in the strata along the banks of Red Deer River, which is 130 feet wide, and flows through a valley averaging 1,200 yards across. The hunters had been unsuccessful, but they caught some round-bodied carp and gold-eyes, which were similar to those found in the Saskatchewan at Carlton. He found both the cactus and sage bushes in large quantities; the former was in flower.

July 1st.—Burnham proposed to try if he could find any gold in Red Deer River. I replied that I feared the geology of the country would not admit of its being there; but I not only encouraged him to go, but accompanied him myself; old Paul came along too. We washed and panned a considerable time; found no gold. I killed a beaver, which we eat for dinner, along with a couple of gold-eyes (fish) supplied by Paul. The river valley was similar to where the Doctor had visited it.

July 3rd, Sunday.—Read prayers. Served out tea, tobacco, and flour, as usual.

July 4th.—Felix and Ballenden returned, bringing with them four additional men, Brother Piscan Munroe (brother to Felix), and three French half-breeds, Anos, Wapishoo, and La Douceur; they arrived in a sad plight, not having eaten anything for four days. Their eyes were wild with hunger; they described a sad state of things at Edmonton; Brazeau obliged to kill the working cattle. Such was the fearful state to which the inhabitants of the fort were reduced for want of food, that they persuaded the men to tell them where they had cached the meat provided by me for their return journey from Edmonton to my camp. One of them went back, brought it in, and distributed it among the women and children in the fort.

July 5th.—A Cree war party of about 24 young fellows on a horse-stealing expedition, visited us to-day. I made them a speech, and turned them back by the accounts we gave them of the strength of the Blackfeet. Sent out the hunters after buffalo; remained in camp to look after the Crees.

July 6th.—I find, on sending back to look for a tired horse left by Felix at a swamp about five miles off, the day before yesterday, that he had been stolen by our friends the Crees.

July 7th.—Visited by a troublesome party of Blackfeet; they begged a great deal, but, on the whole, were not ill-behaved; they had plenty of provisions and robes, neither of which we wanted. We gave them some tobacco, and their chiefs some tea and bread. We also handed them some tobacco, purporting it to be a present to them from Brazeau, and begged them to go and trade their surplus provisions at the fort. Prepared to start the expedition once more; very great unwillingness on the part of the French half-breeds to move. Old Paul came to me and declared off, saying he was exceedingly sorry to leave me, pleading the commands of his "mother-in-law" as an excuse, but, in fact, terrified at the prospects of travelling through the heart of the Blackfoot country. I remonstrated in vain, and at last had nothing for it but to give him leave to go; no sooner was that the case than all the other French half-breeds commenced to signify their intentions of turning back also. I replied that I granted leave to Paul on account of his family, and on account of his long previous services to the expedition; also to his nephew Moise, to accompany him, because he could not well get on without him; but that I would not allow anyone else to leave the camp: a slight murmur of disapprobation then arose concerning this decision, and before they had time to get together or combine, I exclaimed, "who is the first man who will say that he will turn back?" upon which, one bolder than the rest stood up, and exclaimed, "I will go back." I rushed right at him, and seized him by the throat, and shook him, and then catching him by the collar, kicked him out of the camp. I called out then to know if any other wished also to go back, but, fortunately, the retrograde movement extended no further. Started at once for Bull Pond Creek.

July 9th.—The Old Swan, an old chief of a very great age, came to see me. I had met him before at Edmonton, also at the Rocky Mountain House, where he called me his grandson, and professed a great regard for me. He requested me to come and visit the Blackfoot camp, now no more than ten or twelve miles off, at the south side of Red Deer River. Doctor Hector and I, accompanied by Peter, Erasmus, and Olivier, started for the camp, taking with us a little ammunition, tobacco, and calico. This very large camp was in many ways a novel sight, even to us who had seen so many Indian camps. We now found the Blackfeet here numbering about 400 tents; they had originally been 500, but 100 tents of these had pitched away further up the river. The Blackfeet tents are not only much larger than those of the Crees, but much better provided with internal accommodation, such as leather curtains to protect them from draughts, bedding, kettles, tin plates, and porringers, and in a great many cases with forks and spoons; the tents of the chiefs are about 20 or 22 feet in diameter; but there are some medium tents, or tents where the chiefs assemble in council, that are nearly 30 feet in diameter; some of their ceremonial dresses are peculiar, and the manner in which they perform their singular dances is very energetic and wild. As we entered the camp, men and children of all sizes flocked around us, but the chiefs kept back the crowd every now and then by one word, or even by only a very slight gesture. They came forward, and took all our baggage in charge, and also our horses. There were several cases of sickness in the camp, not of a very severe kind. The Doctor had brought his medicines with him, and relieved several, especially one or two children, and his success with these rendered him very popular. We were in great want of leather to repair harness, renew hobbles, and various lashings; our trade went on briskly, but we did not do much in the horse trading, and, as usual, found these (like all other Indians east of the mountains), very unwilling to part with their horses; they are also very keen judges in horseflesh.

July 10th, Sunday.—Could not get away from the Blackfoot camp last night; did not get back to our camp till 8 o'clock at night, and we were accompanied by Old Swan and two or three other chiefs and their soldiers. Ours is now a very good camp. In the creek was good grass and fine water. Mr. Sullivan had shifted it while I was away, we were about 20 miles from the Blackfoot camp. Latitude 50° 58'.

July 13th.—Petope returned to us; I had rather have done without him, but could not well be ungracious to the fellow; he brought back the horse, but gave away the gun; however, I told him I would deduct it from his payment, which made him sulky once more. Amoxepeta and I also had a row, but I saw he wanted a pretext to leave us; we learned that he had been married to a Pigeon wife, and had shot her dead in a fit of jealousy, and now feared to meet her relations, in the direction of whose camp

we were travelling. We now bid fair for continuing without Blackfoot guides at all, which, after all, is not of much consequence, save for affording a greater facility in finding water, which will become very scarce by-and-by.

The Blackfeet are very troublesome, and require some exercise of caution and sternness to repress an inclination to be too familiar. Arms ranged along the carts, which are so disposed as to make a parapet shelter, but the arms are concealed under a curtain of tent-leather placed apparently for the protection of the goods and pemican.

July 14th.—Arrived at noon on Berry Creek, the largest river valley of the tributaries to Red Deer River which we have yet seen, but its waters are now nothing more than a chain of disconnected pools. After dinner pushed on to Red Deer River. Served out a little flour, this is a luxury we now seldom indulge in. A wretched soil everywhere; the horses miserably off for grass.

July 15th.—Finding it difficult to follow the river valley, we turned back into the plain again to the north, passed over very broken ground, and shortly after noon came to the brink of a wide valley from the north, which again compelled us to descend. This valley, which was five or six miles wide, was full of buffalo. Six of us set off to run (Mitchell, Sullivan, Hector, Peter, Felix, and Vital), killed 10 in all, the buffalo ran right for us, some making their way between the carts, where we shot several of them. There are some fine spots for pasture near our camp, together with many acres of grassy plain in the valley.

July 16th.—Travelled several miles along the river, and found a place to ford about 250 yards wide, with a good firm bottom and water up to the axletrees. A difficult ascent up the right bank of the river; followed along the south side of the river, and halted for dinner among some large poplars. In the afternoon passed some fine wooded bluffs along the river and saw several wappiti: Brisco killed one.

July 17th.—Ascended out of the valley on to a high plain covered with boulders. Saw a good deal of buffalo and many antelopes; also five grizzly bears, two old and three young ones, at which there was much firing and only one killed: obliged to descend again at the end of our day's journey to camp on the river for water: saw many buffalo.

July 18th.—We ascertained from Petope and Amoxepeta that the most favourable place to cross the Bow River was higher up. I therefore determined not to take the carts and party to the forks of Red Deer and Bow Rivers, but to ride on with one or two others to the spot where the old Chesterfield Fort of the Hudson's Bay Company once stood: neither of the guides wished to accompany me, but Amoxepeta was at last shamed into it. He and I and Beads and Bouché started there after breakfast: rode over an arid plain for about nine or ten miles, when we crossed a steep ravine tributary to Red Deer River, and at about six miles further came upon Bow River. I arrived considerably before sunset, and contemplated the view with some satisfaction, having now penetrated to that region from the west in July 1859, which we had reached from the east in September 1857, before we turned off to the north to winter quarters at Carlton. Viewing the two river valleys from the high lands at the junction, they presented a considerable difference in appearance. Red Deer River was a serpentine stream with broad alluvial promonteries containing willows and rough-bark poplars; while Bow River, as far as I could see down stream, was between high precipitous banks, and where the tops of a few willows were seen appearing out of heaps of sand. From our position we descried a party of five men on horseback, who stood a short time to contemplate us and then fled away, although on the opposite side of Bow River, the crossing of which would have presented a very serious obstacle to us, even if we had been inclined to pursue them. Amoxepeta became very much alarmed and wanted me to return to our camp, an idea I would not listen to after the long distance we had ridden our horses. Seeing, however, I could not persuade him to remain, I allowed him to turn about, a permission he was not slow in availing himself of. After sunset we descended into a valley of Red Deer River, to where we had noticed some good grass for the horses: we unsaddled and hobbled our horses, lighted our fire, and camped for the night.

July 19th.—Left at daylight; found the horses all safe: went out hunting along the woods on Red Deer River: on our way back saw several small deer, killed one: stopped to breakfast, and afterwards had a very long ride to catch up our party, who had started this morning to southwards of their camp for a crossing on Bow River. We came up with them at three o'clock in the afternoon; we had hardly joined them when a number of Indians from the Blood Indian camp, south of Bow River, came up: they had heard of our course from their allies the Blackfeet: started off, crossed the river, and came up with us: they were accompanied by one Blackfoot. A short time previous to these Indians coming in sight, one of our carts broke down in going over a succession of sand-hills: one of my French half-breeds (Wapishoo) was dining, I told him to wait where he was, and that I would send him back help to lash the wheel together, and take the cart into camp, which I intended should be close by. Before I had time to reach the head of the line of march, the cowardly fellow saw the Indians coming, took his horse out of the cart, and ran away. The Blood Indians rode up and shook hands with me: they had all come unarmed in compliment to us. We camped, invited the chiefs to smoke, prepared something to eat: meanwhile the Blackfoot Indian rifled the cart abandoned by Wapishoo: stole three guns and a blanket. I spoke to the Indians, who replied that he was not one of their tribe, and the chiefs were not accountable for him. I answered, that although he was not of their tribe, yet he was their guest, and I held them accountable: they remained silent a little time, and then the chiefs despatched two young men after him, who returned the guns next morning; they said that he had cached the guns, intending to return to take them, but had taken the blanket across the river with him. I thought it better to be satisfied with this partial recovery of the property than to fail in an attempt to recover the blanket, particularly as they promised to make restitution whenever I should visit them in their camp. We were now halted on a salt lake, the only water we could find. The Doctor had had a severe spell with the carts in the sand-hills; he killed a grizzly bear. We drank a little water by digging a pit, and drinking through a silk handkerchief; the men and horses were in great want of water, and the heat was very great while travelling through miles of burning sand. In the evening left the high broken country and descended into a valley running north and south, which was the direction in which Amoxepeta ought to have taken them, *i.e.* in a direct line and avoiding the sand-hills, which had been all but impassable to the carts, and fearfully severe on the horses.

July 20th.—Continued our journey; found the ground very much broken, and the travelling very severe for the horses. Soil worthless. Found a human skull on the plain. Two Blood Indian chiefs, very fine young men, with noble carriage and intelligent countenances, rode up, followed by other Indians; they promised to give me a horse each if I would dress them. I gave them coats, and desired Amoxapeta's wife to make the cloth into leggings, and in short we dressed them completely. They thought themselves very fine, but to anyone observing their awkward constrained appearance now, contrasted with the easy dignity with which they made up to greet us clothed in their own apparel a short while previous, would indeed have considered the change one for the worse. We camped on a swamp, where we killed several rattle-snakes.

July 21st.—Arrived at Bow River and camped in the only bluff of woods we could see in the valley. The valley of Bow River here is far more expanded than below the forks of Red Deer River; the banks also are very lofty. We started three grizzly bears, which made for the woods. The Doctor, Mitchell, Stoney, Felix, and I came up with the hindmost, poured a volley into him, but no one could claim him. Vital, who was on horseback, came up unexpectedly on the old female bear; she turned on him and frightened him off.

July 22nd.—Occupied constructing a raft to cross the luggage. The Doctor engaged measuring the breadth of the river, 250 yards wide and from five to eight feet deep. Mr. Laren, who was on the river bank holding the staff, was suddenly disturbed by the appearance of a grizzly bear coming in his direction, he flung down the staff and rushed down to the bank of the river ready to jump in in case of his charging. All hands were speedily after the bear, and he soon fell covered with wounds; no one could claim him.

July 23rd.—This place seems quite a favourite haunt of the bears; two of them rushed out of a thicket behind our camp, some of the men headed them on horseback, Hector, Brisco, the Stoney, and I were on foot: the bear got out to an opening, where he slackened his speed to stand up and look about him; we all four fired, the bear fell, I awarded him to the Doctor, who was nearest and fired first. The other bear charged the men who were chopping, and who in their haste to rush through the bushes, jumped over one another and broke a gun.

There was not timber enough to make a second raft, more than the half of the one we had made was built with drift-wood, and consequently very clumsy; besides the raft we constructed a kind of boat with the leather tent, which we wrapped about it, and then gathering the edges of the tent round the cord which encircled it: and so managed not only to cross a considerable quantity of luggage, but also the four women; viz., the Stoney's wife, Amoxapeta's wife, and both Petope's wives. The last thing was to swim the horses over: we all undressed, each jumped on a horse, and swam with the animal, twisting a lock of his mane in the forefinger of the left hand, and striking out with the feet and right hand, thus obtaining full assistance without in the least distressing the animal, who merely partially drew his man through the water without having to support any of his weight; the raft and the leather tent boat were also drawn by the men, holding with one hand on to the horses' tails and hauling a rope attached with the other. The horses who had no riders were driven into the stream, and urged forward by shouts and stones thrown at them till they were forced out of their depth, when they continued to swim steadily across; some of them, however, got into a bad eddy very far below down stream, and were nearly lost. The work was very hard on the men, some of whom swam nine times across the river. Several Indians from the Blood Indian camp came up where we had crossed to the south side and invited us to their camp. At about eight miles distance on our way there, we met a number of young men riding at full speed up the river to a point where a fearful accident was just reported to have occurred. Some women had been gathering berries there and came upon a bear, he at once seized one of them and dragged her into the bushes, one of the women having jumped upon a horse returned to the camp with the news. The young men succeeded in killing the bear, but reported the woman not only dead, but frightfully mangled. We continued our ride to the camp, and sat with the chiefs for some time. While we were in one of the tents a sick child was brought in to the Doctor, who made some mixture for it out of medicines he had taken with him to the camp; before, however, he had time to give the child anything, one of the medicine men of the tribe, accompanied by his satellites with their drums, rushed into the tent, snatched the child out of the Doctor's hands, and commenced drumming and howling. The Doctor told them through Felix, who had interpreted for us, that he would not answer for the child, which soon afterwards died. We returned to our camp late in the evening, accompanied by fourteen or fifteen of the Blood Indians, who brought horses with them which they wished to exchange.

July 24th.—Our Blackfoot guides, Amoxapeta and Petope, are getting frightened, especially the former, and talk of returning, which I am rather glad of, for they are both expensive and useless. Shifted our camp nearer to the Indians, about 240 feet above the level of the river, where there is fresh water and better grass. The Indians told us there was now a great deal of sickness among them, and they requested me to come into camp and pray for them, that the sickness might be removed. I complied, and read the general confession and the Lord's prayer, which Felix translated into Blackfoot after me. A woman brought a child to the Doctor, which was in a fit, and while he was occupied in making up some medicine for it, the medicine man, who had interferred yesterday, came in in a similar manner, and attempted to take away the child. The mother of the child, however, aware of the result of the medicine man's exertions in the case of the child, which occurred yesterday, flew like a tigress on the medicine man, and effectually prevented all interference with Hector. The child recovered.

July 25th.—The Indians are very troublesome. Our horses are strictly guarded; nevertheless young scamps are continually prowling about them. Start early on our journey, but the Indians follow us, and come up with us at noon. Amoxapeta's wife gave birth to a child. Only for the condition she had been in, Amoxapeta would have left long since; but to all his injunctions of turning back she refused compliance; said he might go back if he chose; but that she was far too comfortable and well treated; and she called him a coward on one occasion. He then struck her. She told him to beat away; but that he was a coward still. She had gained her point, which was not to leave the expedition until the birth of her child. We now left them behind. Petope, who had left one of his wives in the Blackfoot camp at Red Deer River, now went off, accompanied by the other. He had not signified to

us his intention of leaving us that day, and it was not until his protracted absence in the evening from camp made us conclude that he was really gone. He took away a horse with him. It would have been a difficult task to follow him. I should have been obliged to send Mr. Sullivan with a party to recross the Saskatchewan; they would very likely have had a collision, and, in the end, most probably would have failed in recovering the horse. In the afternoon we reached a coulée, with hills and plains formed of blown sand. The Indians came up with us. The chief invited me to a feast. I went over, accompanied by Mr. Sullivan and some of the men. More attempts to steal the horses during the night. When we were seated in the old man's tent, he told me he wanted to give me advice that I should not go further into the country, for that we should certainly get into trouble; that only two white men had ever crossed the country between the Cypress Mountains and the forks of Red Deer and Bow Rivers; and that now we were approaching the country of the Assineboines of the plains, of whom he gave such an account that the men were very much frightened, so much so that at the time these interpretations were going on my secretary laughingly directed me to observe the paleness of Vital's countenance, while listening to the old chief's arguments on the dangers of the country. This night one of their young men died of sickness in the Indian camp. I could not but feel a little uneasy for fear the idea of the sickness being coupled with our presence should enter their imaginations. Returned to camp; remained up all night; more young fellows prowling about the horses.

July 26th.—Hoping to shake off our troublesome neighbours we started at daylight, and it was most amusing to see the hurry and confusion in a camp of 300 tents, endeavouring to get away as rapidly as possible, hurrying down their tents and packing up their traps as rapidly as possible, while we were defiling past their camp. We had now a good start, and halted for noon about six miles S.E. of the river, and in sight of the Cypress Mountains. We remained about two hours here, and had hardly again got under way when the Indians came in; they tried to persuade us to stop, assuring us that we could not possibly reach water before nightfall; nevertheless, we pushed on; they will now hardly travel further to the southward in this longitude, on account of the Assineboines. We made a very long spell, and found middling water, although it was a little brackish; we camped on a dry water-course in the outskirts of the Cypress Mountains, finding water in a few detached pools.

A young Indian and his wife had been out two or three days on an unsuccessful hunt; they came on our track, and followed us up, arriving very late and half-starved in the evening.

July 27th.—Started very early, and made a long spell through a most desolate-looking country, without either grass or water. Make straight for the Cypress Hills, which form a blue line to the south-east of considerable height. Halt for noon in a rocky gully. The men most unwilling to approach any nearer to these hills, which are in the Assineboine country. Felix, who does not know the way well, explored in front of the carts, keeping too much to the westward. The Doctor, instead of going to his dinner, rode up a very high peak flanking the gully to the south-east, to obtain a view, and came up to us late in the afternoon, confirming me in my opinion that we were actually shirking the Cypress Mountains, and in a fair way to leave the country without visiting them at all. Our latitude was now 49° 44′. We were now several miles out of our course, and camped in a gully, where we found a good deal of maple.

July 28th.—Gave general orders to return due east this morning, much to the distress of the men. Mr. Mitchell and the Stoney (Nimrod) ran a grizzly bear on horseback and killed him. Lat. of dinner camp, 49° 45′. An old Indian chief "Father of all" had come all the way from Fort Benton on the Missouri, and taken up the body of his son, who had died and been buried not far from this about seven months ago. He was actually taking him back all the way to Fort Benton. But I dissuaded him, by telling him that it was his duty to think of all the young men of his people, like as if he was a father to them, and how could he think of bringing a partially decomposed body into a camp where they were suffering already from sickness? such a course would only be fatal to more of his children. After a long pause he said, "You have irons for digging: desire your men to dig me a place; I will bury him: you are wise, "and I will do as you bid me." The men then took the spade and shovel and dug the son's grave. The father and his soldiers buried him.

Started again in the afternoon, resuming our eastern course, but unfortunately fell in once more with our troublesome friends the Indians. Camped early at a small lake at the commencement of the ascent of the Cypress Hills, where there was excellent grass but no wood. The Indians were camped to the eastward of us about three miles. Sullivan, Brisco, and Mitchell remained in camp with the men, to guard the horses and look after the stores, &c. Hector ascended a detached hill 1,600 feet above our camp. I went to hunt with Bouchi. On our return we saw Hector telegraphing to us; we rode over and joined him; he had seen a bear, but we could not find him: it was getting late when we returned to camp together. The Cypress Mountains formed indeed a great contrast to the level country through which we have been travelling; they are covered with timber, much of which is very valuable for building purposes, the soil is rich, and the supply of water abundant. These hills are a perfect oasis in the desert we have travelled, they form a part of Cateau, and connect with the high hills near the elbow of the south branch of the Saskatchewan, but at this point they terminate to the west, and are separated from the Rocky Mountains by a wide tract of arid country. I did not see the Rocky Mountains from any point to which I ascended, this may, however, be partially caused by circumstances connected with the atmosphere, as they were quite visible from the Hand Hills. But I clearly saw three volcanic peaks called Les Trois Buttes, which are many miles south of the boundary line. On our return to our camp we found the Indians becoming very troublesome, and Felix told me they were planning the murder of the Stoney. Poor Nimrod seemed fully aware of their intentions before we warned him, and was very much alarmed: we desired him to creep into our little tent, where he lay between two of the men that had got in there; once or twice the Indians wanted to peer into the tent, but Hector, Mitchell, and Sullivan prevented them. We were all now armed, on the plea of guarding the horses; most of the Indians were also armed, one of them who was previously unarmed I now saw cocking and uncocking one of our own guns. I desired Daniel, who was in the tent along with the Stoney, to tell him quietly in Cree not to attempt to run, that we would protect him, and shoot the first man dead who pointed a gun at the tent. I sat on the ground at the tent door with my rifle across my knees, and Brisco kept a sharp look-out on the Indian beside me; I then desired Hector to give up his gun to one of the men, and to pretend

afterwards as if he were looking for his own gun, and finally to take our gun from the Indian who had armed himself with it. Doctor Hector after taking successively one or two guns from the men, and returning them, at last came to the Indian, took his gun, looked at it, and went away with it towards the horses for a few minutes, and returned to us. Olivier Munroe, brother to Felix, whom we had all looked on previous to this period as a fool, now began to talk to them in their own language, much to their astonishment, saying, "You do not know these men: they think as much of that Stoney as they think of "me: they think as much of the smallest man of the whole party as if he was one of themselves. "You want to kill the Stoney: well, kill him; but think well! for you will have to kill every one of us; "and as to 'him' (meaning me), he will be the first to fire." Felix translated his brother's words to me in French, and I appeared not to be interested, called for tobacco, and passed the pipe round. All this time the horses were saddled, and fastened close at hand, which meant mischief. At a little after midnight, however, they all rose with one accord, jumped on their horses, and galloped off.

July 29th.—Started on a south-east course, ascending into the heart of the Cypress Mountains; encamped in a magnificent valley running through them. In this valley is a height of land from which waters shed off into the Missouri and into the Saskatchewan. We were now well supplied with wood, water, and grass, a rare combination of happy circumstances in our experience of this season's explorations. From this I now dispatched Mr. Sullivan, accompanied by our servant Beads and Olivier Munroe, to the boundary line, determined to wait here for his return, hunt, and make provisions for our final journey to the westward again. Our longitude 110° 35′; latitude 49° 38′: altitude of camp 3,261 feet.

July 30th.—I sent out the hunters at daylight this morning to hunt for elk and deer; Mitchell and the Stoney (Nimrod) also went off, but in another direction, at about 8 o'clock. Ten or twelve shots were heard fired in rapid succession. Shortly afterwards some Indians galloped into our camp, and told us that our hunters had been surprised and killed by the Plain Assineboines. This I did not believe. Brisco, however, suggested that these Indians might themselves have shot the Stoney, and come to give me a false account of the matter in order to deceive me for awhile. Meanwhile we saw the Indians striking their tents and packing off to the northward as fast as they could. I did not exactly concur in either supposition, and yet could hardly conceive that the firing at a band of red deer could have frightened them so effectually, nor that they had not endeavoured to discover the cause of the firing. Yet, nevertheless, so it was, for about two hours afterwards Felix came into camp to bring out pack-horses and take home the meat, and he told us that he and the other two hunters had come on a band of red deer, fired a good many shots, and killed four. The Indians on hearing the firing never stopped to discover the cause: some of the young men rode down to give me the version stated above, and the rest of the camp got under way for the north again as fast as ever they could, imagining that their enemies, the Plain Assineboines, were upon them. I rejoice to say we saw no more of our friends the Blood Indians.

July 31st, Sunday.—Read prayers; occupied ourselves slicing and drying our red-deer meat.

August 1st.—Descried buffalo: started off to run them: we killed a considerable number, and among them were several in very fair condition. Commenced making pemican in the evening.

August 2nd.—We had now a fine supply of very fair meat, so threw away our tough elk meat; continued making pemican. The Doctor was making preparations previous to starting on his most arduous branch expedition, viz., a journey *viâ* Belly River, Bow River, by the Old Bow Fort; thence crossing the mountains in about latitude 52° he was to endeavour to make his way to the forks of Fraser and Thompson's Rivers, avoiding the valley of the Columbia.

Peter Erasmus, always considered heretofore the Doctor's own man, having been instructed by the latter in the use of those instruments which rendered him very useful as a surveyor's assistant, now, at the last moment, backed out, he, Peter, declaring the journey too desperate to undertake considering the condition of the horses, the rivers that would have to be crossed, and the prospects of food on such a journey. Our servant, James Beads, however, at my suggestion (not by my orders), in the most praiseworthy manner volunteered to go in his place. We were now about to break up our party, and this was the last night we were to spend altogether on the eastern plains: we celebrated this event by the addition of the luxuries of tea and bread for supper at the Doctor's expense, taken out of the scanty little store I had allotted to him for his trip in the mountains.

INSTRUCTIONS from Captain PALLISER to Dr. HECTOR.

DEAR HECTOR, Cypress Hills, August 1st, 1860.

1. You will proceed from this to the Old Bow Fort, enter the mountains again by the pass you explored last year, and endeavour to explore a route practicable for horses to the westward, as far as ever it lies in your power, proceeding by the valleys of Fraser and Thompson's Rivers, and avoiding the valley of the Columbia.

2. You will bear in mind however, that you are to run no unwarrantable risks, or jeopardize the safety of your horses, companions, or yourself.

3. Should the work be too severe for your horses to endure (for they are even now very far from being in as fit condition for such a trip as I would wish), you are immediately to turn back, and to make the best of your way to Fort Colvile, where you will receive further instructions from me on your arrival.

4. In case, however, you do succeed in effecting your western route, you will proceed to the forks of Fraser and Thompson's Rivers, where I shall endeavour to have instructions also awaiting you.

5. In the event, however, of these instructions failing to reach you, you will proceed onward to Fort Langley.

6. In the event of your requiring to purchase horses or any necessary supplies, I now furnish you with a few bills of exchange upon the Paymaster-General, with the clear understanding, however, that you are not to avail yourself of them in any purchases you might make from the Hudson Bay Company or any of their servants.

I am, &c.

J. Hector, Esq., M.D.,
Geologist, &c.

JOHN PALLISER, Captain Commanding British North American Exploring Expedition.

(Doctor Hector's Journal, continued.)

With the above instructions I started on this date for the Rocky Mountains at the Old Bow Fort, my party consisting of Beads, Burnham, McLaurn, Oliver Vanesse, and the Stone Indian Nimrod, my hunter of the previous summer's trip in the mountains, and who had stuck to us through all the Blackfoot country, and brought his wife and child with him, principally that he might again accompany me. I had 18 horses, nine of which carried packs, and my supply of provision, which I meant not to touch till I was well into the mountains, but rather, if possible, to add to them, consisted of 240 lbs. of pemican, 80 lbs. of flour, 50 lbs. of sugar, and a good stock of ammunition. This is about 20 days' provision for the five of the party that are to continue the journey, after Nimrod leaves us in the mountains.

I left the Cypress Hills with much regret, as it promised to be one of the most interesting spots in the country for observing the relations of the cretaceous strata. Returning on the track of the expedition to the N.W., we reached the gully where we were encamped on the 28th. Seeing a large band of cows towards evening, I sent Beads with my best horse to run them: but he foolishly took him among stones at full speed, and got a bad fall, breaking his gun to pieces. Water only occurs as pools in the beds of the creeks in the district N. of the Cypress Hills, and is of very bad quality.

August 4th.—Start ahead of the rest along with Beads, and cross a creek flowing to N., where we came on two buffalo, killed them both, and waited till the others joined us. As we were again starting, we saw a large band of cows, and as we were seeing very few bands of buffaloes now, I wished to secure good loads of meat. As the day was hot, and the animals were lazy, I managed to kill a fine cow, with one of the spare horses, and so saved our better runners that had already done duty this morning. We continued travelling till 6 p.m., crossing a range of hills that run to the N.E., and among which we crossed a deep ravine, in which however there was no water. We then passed over high rolling plains, and had a fine view of *Les Trois Buttes*, which, seven miles before reaching our encampment, bore N. 175° E. Although the grass on these high plains is a little better than that on the chalky soil we had travelled over during the forenoon, we could see no traces of water, and were just thinking of camping without it on account of a thunder-storm that was approaching, when we came to a little swampy pool with good grass round its edge. During the night it rained heavily, with thunder and lightning, and our horses got startled and set off, so that we had to turn out and follow them for a long distance, and at last only found them by the light of the vivid flashes.

August 5th.—We did not get off this morning till nine, as the packing is troublesome work, and the men are not yet used to it. After making 14 miles to the W.N.W., instead of meeting Belly River, as I had expected from Felix Monroe's directions, we struck a large river, which I had no doubt was still Bow River. The banks were very steep and 210 feet high, and although we had a view for many miles we only saw one small clump of poplars along its margin. In the afternoon we followed up the river for seven miles, and found that the banks became steeper; but along the river there are large flats, on one of which we encamped. The banks are composed of the banded clays covered with drift and boulders. Nimrod seemed uneasy about some tracks we had passed to-day, so we tied up our horses all night, and kept guard.

August 6th.—This morning we again ascended the bank, in order to avoid following the bends of the valley. On a prominent point of the plain, above the river, we found a great pile of stones, which no doubt marks the site of some Indian battle, and forms a very conspicuous land-mark. We then crossed some sand-hills, and at noon reached the point where Belly River joins Bow River. I had understood from Felix that we should have some difficulty in crossing Belly River, and was much surprised when I found we could ford it with great ease. This is the more curious, as I afterwards learned that on the very next day Captain Palliser and his party crossed it 40 miles higher up, and had to swim their horses and make rafts. The place where we crossed is about two miles from its mouth, where the banks are very high and steep, and there is a large bluff of poplars on the right bank. The stream is 99 yards wide, and the water only comes to the horses' girths, but was very rapid. At where Bow River receives Belly River it makes a sudden bend, changing from a S.S.E. to a N.E. course, which latter is also the direction in which Belly River flows.

As to follow up Bow River would take us to the north of a direct course for the Bow Fort, judging from the latitude and longitude of the two places, I determined to take our chance for water, and travel right to the N.W. across the plains. Leaving Belly River we ascended rapidly, and, after 11 miles without any signs of water, we hit on a little shallow pool just at camping time. Almost every evening at present we had a thunder-storm, with enough rain to wet the buffalo dung, and, as we had never had wood to burn since leaving the Cypress Hills, our camp fire was always very miserable.

August 7th.—After all we had killed, we had not carried enough meat along with us, for we are out of it already; and as the pemican is not to be touched we started this morning without breakfast. At noon, however, by great luck we saw a young bull, and soon had his marrow-bones on the fire. This forenoon the horizon was extremely clear, and we got the first view of the Rocky Mountains, distant about 90 miles, in an air line, and at the same time saw *Les Trois Buttes*, bearing N. 145° E., and distant about 70 miles. Only the peaks were seen of any of the mountains, rising clear and sharp above the horizon line, their lower portion being invisible only from the curvature of the earth's surface. In the afternoon we came suddenly on an Indian, as he was cutting up a buffalo he had just killed. He could not speak Cree or Stoney, but by signs and knowing a few Blackfoot words we found out that he was a Piegans, and belonged to a very large camp that was somewhere near. I tried to get him to stay all night with us, as I knew that if he got to his camp we should have a whole troop of them bothering us next day. However, his desire to tell the news was too great, so just as we were going to encamp he rode off in a great hurry. I let him get out of sight, and then we started again, and went as hard as we could till it was quite dark. There seemed to be no water anywhere in this part of the country, excepting a few small pools of the rain-water that had fallen in the forenoon. At one of these, not more than three feet across, we encamped, making no fire and keeping the horses close.

August 8th.—Being anxious to avoid the Indians, we started when it was dawn. We had not gone more than two miles when we saw a long line of black objects, which at first we took for buffalo. I soon made them out with the glass, however, to be the Indians, travelling to the N.W.; and as Indians

never usually start so early, we guessed at once that they knew of our approach, and trusting to our having encamped where our friend had left us last night, had already shifted into our track, and were going on most likely to where they expected we would encamp next. At once, therefore, before they could have seen us well, I changed our course, so as to appear as if we were travelling to the S.W., and so to cut across their track; and had hardly effected this manœuvre when about 40 of them came up with us from behind, along with our friend of the previous evening, and who, judging from their foaming horses, must have led them all the way back to where he supposed we were encamped. They looked rather surprised when they found that we had gone on so far last night, and yet were off again so early this morning. Some of them that now joined us could talk Cree, so, with Beads to interpret, I soon found out all about them. They were a camp of Piegans, numbering 300 lodges, belonging to the American territories; and having heard through the Blackfeet of our party, and of all the presents of tobacco, &c., that had been given to them, they now thought that they had struck the "lode," and would get their share of the good things also. Luckily before starting, I had put a few pounds of tobacco in my holsters, so, without halting, I was able to carry on the palaver, and give the customary little pieces of "Pas-tah-lan" (tobacco) to all the principal men. However, they soon began to troop from the camp towards us, till at last we had a cavalcade of several hundred around us, but luckily including some of their big chiefs. They did all they could to persuade me to stop, and camp with them, and trade horses, and give the tobacco, and so on. But as my horses were all picked animals, I was not likely to get better from them. My principal reason for refusing to stay, however, was seeing the evident wish of some of the young men to do Nimrod a mischief. They tried all they could to edge him away from the party, but I made him stick close by me, while we kept steadily on at a jog trot, driving the pack-horses in a band before us. At last, after a couple of miles with this rabble at our heels, when they found that I could or would give no more tobacco, they began to drop off, and the only ones I regretted to part with were the chiefs, as there still remained behind a horrid rascally-looking set. Beads, however, had struck up an acquaintance with one that had been a great deal among the Crees, and I got him to hold on with us by the promise that when all the rest had gone he would get a large piece of tobacco. All his anxiety was now to get rid of the tail that continued to follow us. He harangued them, but with no effect on any but the well-disposed, as the 20 or 30 scamps that were among them were not to be so easily guided. He then advised me to stop and have a smoke, so after talking to my men I said I would, if they would all stop with me. I only kept Beads, however, and when we had got off our horses and sat down in a ring, as is usual, according to arrangement, Burnham, McLaurn, Oliver, and the Stoney began slowly to drive on the horses again, without attracting attention. I explained this to the Indian by saying that the horses were tired, and would go slowly till I came up with them, and then told them all about the Captain being behind me with lots of tobacco and presents for them, if they would only wait till they saw him, but that I was only sent on ahead, and had nothing for them. While talking 8 or 10 of the scamps jumped on their horses and followed my men. I heard afterwards that on coming up they tried by signs to make Burnham understand that I wished them to turn back, but he was far too wide-awake to do that. One of them then seized McLaurn's knife from his belt, and was rather surprised by having a revolver clapped to his head, so he returned it. They then caught hold of the pack-horses, and one of them jumped off his horse, and commenced to undo the pack cords; but Nimrod pulled off his gun cover, and cocked the gun, and, as the scamps are generally cowards among the Indians, this made him change his mind. After riding for about 10 minutes, trying all they could to provoke the three men, who, with Nimrod and his wife, were coolly driving along the loaded horses before them, they turned back and rejoined the party where I still remained with Beads, and commenced talking in a loud and excited manner. Our Cree friend at once told us that they were not pleased, and that we should be off. After a little time I prepared to go, and told Beads to tighten our girths, when the scamps now began to press round us, wanting to look at every thing we had, and tried to fire off our guns. However, I had put the caps in my mouth, and made Beads do the same, so that was no go. One of them then plunged his hand into my shot pouch, and took all my ball out, but laughing all the while I made him give them back, for although I felt as ill at ease as ever I did in my life I knew that the only chance was to look unconcerned. At last we got free from them, and being well mounted told our Cree-speaking friend to make a turn and join us beyond some hills that we were just going to enter, and then set off at such a sharp pace that the Indians only followed us a little way, when seeing they were getting far from their own people, who all this time had been moving in the opposite direction, they began to drop off and turn back. When the last of them had gone, we drew rein, and waited for the Indian that had done us such good service, and made him a very handsome present. He told us not to go straight, nor to stop till late, as he heard that some of the young men were going to try and steal our horses in the night. We soon rejoined the horses, and found Nimrod and his wife still of a kind of ashy-grey colour from fear; but like the rest of us in a high flow of spirits from the sense of relief. We went 24 miles without stopping, and then halted to rest the horses, but without water. As night came on we made seven miles more, and then having got among hills where there was short grass that did not show the horse tracks so well as the dry dusty plains, we finished by making a great turn and camping beside some excellent water, but without daring to make a fire. Of course we kept the horses close, and watched them all night, but they were so tired with their long march without rest or water, that they gave no trouble. Our Piegan friends, if they did come after us, must have lost our track, for we saw nothing more of them.

The country we had passed through since leaving Belly River has been very arid, and yet we have had a good deal of rain, but it is quite lost on the hard-baked clay soil, as it at once evaporates when the shower passes.

At Belly River sections showed the sandstone clays, with lignite, resting on dark brown sandy clays. The hills at which we arrived after leaving the Indian, and in which we encamped that evening, seemed to be formed of the banded clays, as their chalky surfaces and white muddy flats are exactly the same as those to the north of the Hand Hills. It was noon when we halted, and I found the latitude to be 50° 13′ 5″ N. To reach where we encamped we made an ascent of 600 feet, and the hills seem to rise about 200 feet more.

August 9th.—In the morning I had a fine view from the top of one of the hills. At their base lay a flat valley, four miles wide, with large swamps, and the channel of a stream winding through it. To the west, this valley was bounded by a range of hills, similar to those we were now upon, and over them appeared the tops of the Rocky Mountains, still looking very distant. We have been in fact rather travelling parallel with them than approaching them directly. A descent of 600 feet brought us to the bottom of the valley, where there was some good grass, and in the swamps ducks and geese. There was no timber, however, excepting a few low willows. At noon we halted, upon entering the western range of hills, at a small lake, with ledges of sandstone cropping out along its margin. The latitude here was 50° 23′ 39″ N.

In the afternoon we crossed the hills, and descended to the west to extensive plains, seeing Bow River in the distance. As we went along we saw another bull, which I killed. The pasture is now much finer than before, but still there is no wood. At night we reached a considerable stream, flowing to the north, and through a pleasant-looking valley, with good grass, but no wood. The nights are very cold now, and the ground every morning covered with hoar-frost.

August 10th.—After 11 miles to the north-west we again struck Bow River. The pasture, though still poor, is much improved on the plain; but the change is most marked in the valley of the river, which is now rocky, with high cliffs of sandstone, like the upper part of the North Saskatchewan, and with a good growth of pines and large poplars. The valley is wide, with large wooded flats, but the river itself is narrow and rapid, and the channel occupied with shingle islands. The water is beautifully clear, and of a light green tint, which shows that we are now to the west of all the soft cretaceous clays which render the river so turbid in the lower part of its course. Along the banks there is great profusion of wild fruit; and during two hours that we halted, where we struck the river to rest the horses, and to bathe and refresh ourselves with the gooseberries, cherries, and service berries, we saw in the woods, on the opposite side of the river, seven wapiti, one grizzly bear, and several bands of small deer, and in the afternoon Nimrod shot a Virginian deer, and saw another bear, so that this part of the country must abound in game.

In the afternoon we kept along the top of the bank, which is nearly 300 feet high, and composed throughout of sandstone, with beds of clay and carbonaceous streaks, like the strata at the Rocky Mountain House, and on the upper part of all the river, indeed, as the mountains are approached. As we travelled along we saw two Indians on the opposite side of the river, and, lying close, watched them with a glass. Suddenly Nimrod, when he had looked attentively for some time, gave a great shout, and, in a high state of excitement, told us they were Stoneys of his own tribe. Making signals to them, he and I descended through a dense thicket of berry bushes to the river, and had a long talk with them. They were from a camp about ten miles up the river on the same side with us. We encamped in a most beautiful spot by the river, among large trees. When exploring the woods round our camp we came to a wigwam, carefully closed, and having logs laid up against it for security. Slashing a hole in it with my knife, I found that it contained a corpse, supported in a sitting position, just as if alive. The inside of the tent was in great order, and filled with offerings of buffalo robes, and other furs, tobacco, paint, dresses, and other Indian valuables. It was probably the remains of some great Blackfoot chief, as the Indian bags, mocassins, and other worked articles were those of that tribe.

August 11th, Thursday.—A few miles brought us to the "Stoney Indian" camp, which was situated in one of the prettiest spots I have seen in the country, at the mouth of "Ispasquehow," or "High-wood" River. There were only 35 tents, which, though a small number compared to the camps we had seen on the plains, was a much larger band than is usually seen of the Rocky Mountain Stoneys. They had been travelling south along the base of the mountains to meet the Kootanies, when they crossed to the plains; and as they returned they had come so far out of their way in the hopes of seeing buffalo, and as they were close to the Blackfoot country, they therefore formed a large party for protection.

Their wigwams were pitched in a grove of large poplar trees, at the base of high rocky banks. The Ispasquehow River is a clear stream, 40 yards in width, rising in the Rocky Mountains, and flowing N.N.E., to the point where it joins Bow River. Like Bow River it has a valley depressed 200 feet below the prairie level. A little above its mouth there is a place where Bow River can be forded in low water; the depth at this time being only 2½ feet. The latitude at the Stoney camp was 50° 43′ N. As I wished to change some horses with the Indians, who had many good animals in their band, which they had just obtained from Kootanies, and were, therefore, likely to be better suited for the work in the mountains than some of mine, I remained with them two nights. I had seen most of these Indians before in different parts of the country, and as they all looked on me as an old friend, I had no difficulty in effecting six good exchanges. I wished Nimrod to leave his wife here, but as he said that we were going so far into the mountains that he would not be able to rejoin this band alone, I agreed rather to let him not only take her, but also engaged another capital Indian named *William*, who was also to take his wife; but on the condition that they were never to expect me to broach the stock of pemican under any circumstances, but were to trust altogether to hunting as long as they were with us.

The "Stoneys" were much disappointed when they heard from us that there are no buffalo for many days to the eastward, and were, therefore, off every day hunting along the river valleys for deer and bears. At nightfall on the 12th, a party of 19 hunters that had started in the morning were still absent, and the camp was much alarmed for their safety, as some one had seen fresh horse tracks, and it was also said strange Indians, at a few miles to the south. We therefore spent the first part of the night on the alert, but about two o'clock most of the hunters returned, loaded with elk and bears' meat. They had killed three grizzly bears, and one of the party had been wounded in the encounter, so that he had to remain behind with three of his companions to take care of him. They said he was not badly hurt, only very stiff and sore from his wounds.

I had a long talk with the chiefs about what was likely to become of them and the other Indian tribes. They said that every year they find it more difficult to keep from starving, and that even the buffalo cannot be depended upon as before, because being now only in large bands, when one tribe of Indians are hunting then the other tribes have to go without until the band migrates into their country. The Stoneys are all Christians, and some of them can read and write in their own language, using the Cree syllabic characters, which were invented by the Wesleyan missionaries. They are very

very desirous of having tools and a few simple agricultural implements; and, as they are very steady, I have no doubt that if they were supplied with these, and direction given to their efforts, the best part of them would soon settle down, and leave their vagrant mode of life. Their chiefs at least seem to be quite in earnest about the matter.

August 13th.—We started at noon to-day; our party now increased to nine in number, including the two squaws. At the same time the whole camp started, and as the long straggling train of men, women, and children, ditto the loaded horses and drags, wound up the zigzag trail that leads from this pretty little valley to the level of the plain above, the scene was very picturesque. We made about 15 miles before we encamped, still keeping along the right bank of the river. The pasture is now very fine everywhere, and timber plentiful in many places, as we have now entered the belt of fine country that skirts the base of the mountains. Three miles before we encamped Beads recognized the place where Captain Palliser and his party had camped the Bow River on his trip to the boundary line the previous summer. As the evening was dull and overcast, and the river looked favourable, some of us tried fishing with the very rough tackle we possessed, which consisted only of some common twine and a few large unmounted cod-hooks, without gut, hair, line, rod, or any of the civilized appliances. Nevertheless, in one and a half hours we had caught altogether 36 trout, none of which were less than three-quarters of a pound weight, and most of them from one to one and a half pounds. They were of two kinds, the one with silvery scales and with firm salmon-tinted flesh; the other brightly speckled, but the flesh white, soft, and watery. In Ispasquehow River we had seen a third species, the shape of which was different.

August 14th.—It rained so heavily the whole of this day that we did not resume our march. We killed an antelope within a mile of our camp.

August 15th.—The morning was very cold and raw, but it cleared up about nine o'clock, when we started. After a few miles we reached Swift-water Creek, and as Bow River between the Old Fort and this place makes a great bend to the north, we left it to our right, and followed up the valley of the creek in full sight of the mountains, which were completely covered up with the snow of the recent storms. The country is here exceedingly beautiful, having a rich black soil supporting good pasture, with a large proportion of vetches, while the low hills are covered with clumps of wood which have almost the appearance of artificial plantations; among these we saw many bands of the Virginian deer, but did not succeed in killing any. It is almost no exaggeration to say that the bands of small deer are as plentiful in this part of the country as in a deer park, but they are very wild. By evening we had reached a high plateau covered with long grass and willows, and where we encamped beside a small lake.

August 16th.—The night was very cold, and in the morning the water was frozen over, and the ground quite white with hoar-frost, reminding us of the mornings in October near Fort Carlton. We started at eight o'clock, and after two miles reached Dent Creek, which flows to the north, and the banks of which were composed of the same dark shales, with ironstone nodules, that were seen on the North Saskatchewan. The country now became very broken, and we had to cross several lofty ridges. After 13 miles we reached White Earth Lake, where I found the latitude 51° 8′. We then struck to the north, and making a rapid descent for about 800 feet, struck the Bow River, where we found a capital ford, after crossing which, by following up the left bank for several miles, we reached the old Bow Fort. Here we found that a party of Americans had started only the day before from this place to cross the mountains by Kananaskis Pass. Before starting they had broken up their carts and waggons, and we found the ground strewn with the fragments, some of which we applied to repairing of our pack-saddles. Before arriving here "William" took me about two miles to the north of the river, and showed me a garden, which he and another Stoney had made that summer, in which some very fair turnips were growing. It was very small, and surrounded by a rude fence; he pulled up a few to take to the camp, and I was amused at his blazing a tree, and writing on it with charcoal the number and out of whose rows he had taken them.

August 17th.—I spent this forenoon making observations on the boiling point, and arranging the packs so as to suit them better for carriage in the mountains. At two o'clock we started, following the same track by which I had entered the mountains the previous August. At night we encamped by the Bow Lakes at the same place as before, and as we went along Nimrod killed a fat buck.

August 18th.—After four and a half hours this morning we reached the large prairies to the west of Grotto Mountain. Hitherto we had been making a drink like tea from the twigs of the Missasktomina, or service-berry bush, but that had now failed us, so we tried the tops of spruce trees instead. This afternoon "William" killed a black-tailed deer, and I killed a Virginian deer, and had a shot at a black bear. I intended to camp here all next day in order to ascend the mountains to the north.

August 19th.—I started alone at six a.m., three miles through the woods to the N.E. brought me to the base of the mountains, which I found to be very steep. I climbed slowly, examining the strata as I went along, and reached the top at one o'clock. The mountain is formed of successive beds of limestone, which are almost vertical, but have a slight dip to the W.S.W. The first bed was of cream-coloured limestone with cherty nodules and obscure encrinite stems. The next group of beds were of blue crystalline limestone, without fossils, followed by a compact earthy limestone, with veins of calcspar, and three kinds of fossil coral in great abundance, of cyathophyllum, favorites, &c.

The top of the mountain forms a sharp ridge, quite precipitous for about 1,000 feet to the north-east, and in the opposite direction presenting a slope of 35°. It did not rise more than two-thirds of the height of the mountains on the opposite side of the valley, and I estimated the ascent I made from our camp to the top at a little over 3,000 feet. The scene from the summit was very remarkable, the great distinctness with which the eye was able to follow the gigantic and complex plications giving it more the look of a magnified geological model than a natural view. There would not be the slightest difficulty, with time and provisions, in working out completely the structure of this portion of the Rocky Mountains, and, perhaps, from the clear manner in which the enormous faults and foldings of the strata are displayed, obtaining most valuable inductions for application to the general principles of geological science. We have indeed in these mountains a perfect desertion of the complicated disturbances, the nature of which, in other regions, the practical geologist has to grasp and picture in his mind from detatched and superficial observations. Their structure is not here at least obscured by outbursts and intrusions of igneous rocks,

which in other mountain chains renders the study of their structure so hopelessly difficult. When preparing to descend, I wounded a white goat that had two kids with it, but of different sizes, but, as usual, they took refuge in an inaccessible place. I also saw a large band of big-horns, but did not follow them. It was nearly seven o'clock in the evening before I got back to camp, and the mountain was so steep and smooth that I found the descent more fatiguing than the climb.

August 20th.—This day we got to the Cascade Mountain, but by a different route from that which we followed last year. We kept along the river on the slope of the shingle terraces, instead of going to the little prairie; encamped by a small stream a few miles higher up the valley, crossing the stream from the Big Lake, at its mouth. The shingle deposits here attain a very great thickness, and contain a larger proportion of calcareous matter than I thought from what I saw of them last summer. The wonderful mass of rock which forms the Cascade Mountain appeared even more striking than it did on the first visit; and I found that in the year's interval my recollection of the heights and distances had grown less than the reality.

The correction for my aneroid barometer, as obtained by the boiling point, still amounts to very little, being about −0·5 inches, where the reading is 26·08, so that, when approximate results are only looked for, I consider the readings I obtained both this year and last are, to some extent, reliable, but as they have been grouped and discussed in a special report, it is not necessary to notice any but exceptional cases in this journal. Likewise, the bearings of the different mountains which were taken have been only detailed in the itinerary as data for the construction of the map.

August 21st.—The weather we have is very regular, the heat being very great during the day, but at night the thermometer always falling below the freezing point. This morning the minimum thermometer registered 19°, and at sunrise stood at 23°; barometer reading 25·72.

In the forenoon we reached the angle of the valley where we also halted last year. To the right of the trail I observed some warm mineral springs which deposited iron and sulphur, and seemed to escape from beds of limestone.

The mountains which compose the second range form three parallel groups, the most easterly of which is craggy and bald; the central one wooded nearly to the summit: while the third forms the "Sawback Range," which has a very rugged east, and presents a smooth, naked, and almost perpendicular escarpment to the west. The strata on the south or right side of the valley include a great thickness of soft earthy shales, but on the opposite side they appear to consist wholly of limestones. The strike is also different, those to the south having a S.S.E. trend, while those on the north trend N. and S., so that this transverse valley is probably a line of cross fracture. The change in our course on entering the second great longitudinal valley, which is bounded to the east by the "Sawback" range, and to the west by the massive cubical mountains, included an angle of 30°. The nature of the junction, which is marked by the position of this valley, I did not clearly see, but it is continued to the S.W. by a depression of the mountains, in which were seen masses of strata dipping at 40° to the E.N.E., and as it were lying up against the edges of the horizontal strata to the west. The valley, probably, marks a great line of dislocation between the limestone and quartzose formations; but as Bow River passes through it obliquely, it crosses it so as to pass to the west of Castle Mountain, which really belongs to the west side of the second great valley, although situate on the left or east side of the river valley. We encamped after passing the Long Muskeg, where we got a supply of the muskeg tea (*Ledum palustre*), which makes a capital beverage in absence of a better.

August 22nd.—Morning clear and sharp. Minimum thermometer, 22°; thermometer at sunrise, 25°; barometer, 25·52. The mountains looked very beautiful, and soon after starting we crossed a hill about 400 feet high, from which we had a splendid view; among others I saw the top of Mount Ball peeping through a valley to the south-west, and shaped like a truncate pyramid, with a low cone of snow resting on it. All the mountains to the west were snow-clad, and we saw right through the Vermilion Nick. About two p.m. we reached my crossing-place for the Vermilion Pass, and halted to hold a council with the Indians. With the exception of one meal which I had been forced to serve out, the night we spent at the old Bow Fort, our stock of pemican was still intact, but, as yet, we had done nothing to increase our stores. Now, if I followed the Vermilion Pass, my experience of the want of game last year would make me leave the Indians here; but as my object was to keep as much as possible to the north-west, I thought that I might as well keep along the east side of the watershed for as far as I intended to go north, and trust to finding a pass from the bend of the North Saskatchewan, which would allow me still to take the hunters, and besides saving the pemican perhaps be able to add to it. William said that if we left the Bow River and went by Pipe Stone Pass, which is more to the east, and leads from Bow River to the North Saskatchewan, at the Kootanie Plain we should get plenty of sheep, and besides have a better trail; so I determined to adopt that route. I knew that if I could get across the watershed to the west slope before the 10th of September, I should not meet with snow for a month later at least, and, indeed, from what I have seen and heard, I doubt if there would be any great difficulty for good travellers to cross safely with horses until the end of January. Along the eastern slope of the mountains, further north than this, there is very little snow, so that last winter, in February, I took horses up almost to the divide from Jasper House. Then again, in Wide Valley of the Kootanie River large bands of horses are kept without the slightest danger from the snow throughout the whole winter. It seems, from the best information I could gather, that it is only for the first part of the descent of the western slope, in the narrow and confined valleys, that the snow attains any great depth, and where it is described as 15 to 20 feet deep, that only applies to the actual heights of land, such as at the Committee's Punchbowl, where the greatest condensation of moist air of course takes place, and falls among dense woods that preserve it throughout the winter.

As the amount of snow will depend on the condensation of the moisture carried from the westerly winds, we can to a great extent judge of the probable localities where it will be deposited in greatest abundance by observing the vegetation, which the same cause favours at other seasons. Now the great luxuriance of the shrubs and plants, which has been so often remarked by travellers across the mountains, does not extend far down the western slope (except to the north, where I suspect that the mountainous region is much broader), but on reaching the Kootanie valley, all the rank vegetation has disappeared, and is replaced by the flora of a more arid region, characterized by bunch-grass, sage, and large pine

trees. Excepting in exceptional spots, this character prevails all the way west until the west slope of the Cascade Mountains is reached, when the rank vegetation and the spruce forest again cover the country, but in this case extend continuously to the sea-coast. And so also it must be with the snow-fall, which is found to be much deeper on the Cascade Mountains than on the Rocky Mountains; for as the mean altitude of the two ranges is nearly the same, the second produces condensation of the moisture of the previously cooled wind only at its summit level, and that to a comparatively small amount. We therefore continued to follow the left bank of Bow River, and camped opposite to the north end of Castle Mountain.

August 23rd.—Min. ther. 30°; ther. at sunrise 35°; barom. 25·30. Our encampment was in a small opening in dense woods, and during the night our horses wandered off, so that we had trouble in finding them. At noon we reached a large tract of burnt woods, and, as the position of the moon was favourable, I camped here in order to get a lunar distance for longitude; but shortly after I got the latitude at noon, 51° 19′ 5″ N., it became overcast. After taking a boiling-point observation, I ascended the mountain to the N. for about 2,000 feet. I first passed over masses of rock, which have been derived by a great slide from the cliffs above. They consisted principally of a blue gritty limestone, with a very angular fracture, and without fossils. At 1,500 feet above the bottom of the valley, I found patches of a skirting deposit of shingle and calcareous mud; and the south side of the valley, which is densely wooded to the height of 2,000 feet, presents a smooth slope probably formed of the same material. From the elevation I gained, I saw the pass by which I returned from the west side of the mountains last year; and I now saw that the distance between it and the Vermillion Pass is not more than 15 miles along the valley of the river. We had a sharp fall of snow in the afternoon, which however did not lie in the valley.

August 24th.—Min. ther. 27°; ther. at sunrise 31°; bar. 25·20. The morning fine and clear, with a light west wind blowing down the valley.

At noon reached lat. 51° 22′ 26″, being five miles E. of where Nimrod killed the moose last year, and where we met in with the "Stoney Indian camp." Nimrod and William are both off hunting, and, as this is the place we are to turn up a side valley to the right, we are detained all afternoon waiting for them. They returned, having wounded a moose, but he escaped across the river from them.

August 25th.—Min. ther. 26°; ther. at sunrise 31°; bar. 25·16. A few miles after starting we crossed Pipe Stone Creek, and then struck into the woods for eight miles, when we again met the stream where it becomes hemmed in by a rocky valley, but still with a wide flat bottom, along which we had no difficulty in following by a well-beaten trail. We ascended very rapidly, so that the woods became spare, and the vegetation assumed an alpine aspect. After making 21 miles, we encamped opposite to a very wide valley leading to the west, and on one side of which is a very singularly shaped mountain formed of a large block of the limestone or quartzite strata, which remain perched on the softer shales, and so much resembling a large tooth that we named it Mount Molar. All the mountains in this district have more or less the character arising from the same cause. William killed a young moose to-day.

August 26th.—Min. ther. 29°; ther. at sunrise 31°; bar. 24·15. The valley now narrowed rapidly, and the bottom occupied by morasses. The sides were still well wooded for at least 1,000 feet above us, but long stripes of bright green grassy slopes marked where the forest had been swept away by land-slips. The summits of the mountains are precipitous; but between the upper limit of the woods and the foot of the steep rocks there is generally a fine grassy slope of 600 or 800 feet, on which we saw herds of the white goat. Seeing five of them very low down the mountain, I went with William to get a shot, and we succeeded in killing them all. There were three old ones and two kids. The kids we carried off bodily, but of the old ones we only took the skins and fat. At noon we reached within a few miles of the "divide" we had to cross, and camped opposite to a waterfall which forms the source of Pipe Stone Creek, and where the stream leaps and rushes down a gutter-like channel, from a height of 450 feet. The latitude here is 51° 38′ 5″ N. A series of boiling-point observations gave the barometer reading as 23·69 inches, and I found that the aneroid only required a correction of −0·19 inches to be applied. I ascended the mountains to the right of the valley to a height of 2,800 feet above our camp, or about 9,400 above the sea level, and reached the level to which I saw several small glaciers descending. I collected about 50 species of plants, noting the altitude of each as given in the list elsewhere. The highest plant I saw was saxifrage (*S. daburica*), a delicate-looking plant which grew among the loose blocks of rock. The mountains are composed of limestones and shales, from which I obtained orthis, lingula, euomphalus, and lithostrotion. I also killed three of the large marmots, one of which was the biggest I have seen, and of a fine grizzled gray colour, but the hair is coarse, and worthless as a fur, although largely used by the Shouswass Indians for making robes. In the forest as I descended I saw a solitary larch fir, which was easily distinguished by the light green tint of its leaves. I have not elsewhere remarked it on the slope of the east side of the mountains: near the Rocky Mountain House it is abundant, but there it grows in low moist places. This may perhaps be a different species, which has straggled from the west side of the mountains, but the specimens which I took of it have been lost. William told us at night that two years ago he killed a buffalo cow at this place, and that he saw at the time a band of seven,—two bulls, four cows, and a calf. They were of the thick-wood variety, which are larger and blacker, and with more spreading horns, than those of the prairies. They run swiftly through the woods, and are quite as wary and difficult to hunt as the moose deer.

August 27th.—Very cold this morning. Min. ther. 14°; ther. at sunrise 18°; bar. 23·61. The ground was quite white with hoar-frost when we started to ascend to the height of land by a steep rocky path that led at some places close by snow that was still lying from last winter. After five miles we got above the woods, and passed over a fine sloping prairie, with high bald mountains on either side. Plants with esculent roots were very abundant here, and many parts of the sward looked as if it had been ploughed, where the bears had been rooting them up like pigs. One spot on this prairie was found quite covered with a large species of onion in full flower (*Allium Schœnoprasum*, L.) the stem of which grows here to a height of 18 inches, with a root the size of a walnut. Two miles further we passed over a bleak bare "divide," where there was no vegetation, and elevated about 2,000 feet above last night's encampment; but the aneroid had reached its old limit at 21·20 inches, and refused to indicate a further rise. We saw a large band of big-horns as we were ascending to the divide, and following them led me fully 1,000 feet above the highest point over which the horses passed, and there I found the

range overhanging the valley, of which I reached one of the highest points, is very much lower than another which lies further to the west, and separated from where I stood by a shallow valley. The mountains in that direction have the valleys all filled with snow, and contain several fine glaciers. A very high peak that I saw, must, I think, be the same that I saw from the west last summer, and which I named after Sir Roderick Murchison. It did not strike me as being so much higher than those around it, as when viewed from that direction, but this may be due to the craggy aspect the mountains present to the east.

However, I am inclined to think that none of the Rocky Mountains rise above 13,000 or 13,500 feet, and that my estimate of the height of Mount Murchison, which I made last year, is too great. (Outline No. 32 gives the appearance of Mount Murchison as seen from above yesterday's encampment.)

After crossing the highest point, we made a gentle descent for five miles over a bleak moorland, in which "Sifleur" River, a tributary to the North Saskatchewan, takes its rise to flow to the N.

We then came to the brink of a densely wooded valley, through which the same stream continued to flow, and to reach its bank we had to make an abrupt descent through the woods, but over very rocky ground, for 900 feet, which exactly resembles the nature of the other divide that I crossed last year from Bow River to the North Saskatchewan. The rocks at the height of land consisted of purple and green shales, with beds of fine quartzose conglomerate that sometimes at first sight looked like a coarse feebly-cemented granite; to the west, the mountain's great quartzite and limestone cliffs all snow-clad; and to the east, the shelving rocks of the Sawback range, consisting of pale blue limestone with soft shales, all dipping at a very high angle to the W.S.W.

Close to our camp I found a fresh buffalo track, but was not able to follow it in the rocky ground myself, and both the Indians were off hunting sheep. They returned at night, having killed a very large he-goat, the skin of which I got the squaws to procure for me. (Now in the Edinburgh University Museum.)

August 28th.—Minimum thermometer 19°; thermometer at sunrise 21°; barometer 23·70. During the day descend along Sifleur River, which is a very rapid stream. We are travelling by a path cut through dense woods; we see nothing of what is around us. At nightfall, after crossing to the left bank of the river, passing a large tributary from the S.W., we reached the wide open valley of the North Saskatchewan opposite to the Kootanie Plain, but still many miles distant from that river itself. Just as we were encamping we started two moose deer, that at once swam the stream and escaped us. We had seen many tracks to-day of moose, wapiti, and bears.

August 29th.—Minimum thermometer 17°; thermometer at sunrise 25°; barometer 25·02. While the men were loading the horses, I made a rough measurement of a remarkable precipice that seemed to overhang our camp, and found it to be 3,300 feet high and almost perpendicular. The woods straggled up it clinging in the cliffs to the height of 2,300 feet. Although it seemed to be quite close to us, yet its base I found to be more than a mile distant, and the men had been guessing its height at from 800 to 1,000 feet. It took us 4½ hours' march to reach the Saskatchewan; at first through very tangled woods, but for the last five miles over the shingle terraces, which ranged step above step to the height of 500 feet, and where the great difficulty arose from the rapid descents and the difficulty the pack-horses had of obtaining a footing on the loose surfaces of the slopes. The terraces are here covered with a beautiful pine tree, the foliage of which has a slender tufty appearance and a light grey-green colour. It has a tall slender trunk, and grows to about double the height of the so-called cypress with the spinous cone. It is also quite different from the pine which I observed on the opposite side of this valley last year, which is very sturdy, with rough contorted branches and coarse foliage. I saw no cones on these slender pines.

When we arrived at the river we saw several large bands of the big-horn sheep feeding on the Kootanie Plain, but they soon winded us, and set off up the mountain. After we encamped Nimrod returned, having wounded a moose deer and killed three sheep, having come on a band of several hundred a little way up the river

August 30th.—Minimum thermometer 25°; at sunrise 29°; barometer 25·80. In two hours this morning we reached the plain where Nimrod had killed the sheep, just opposite to Pine Point. The latitude at this place is 51° 58′; and the longitude from reckoning I found to be nearly the same as I made it last year, viz., 117° 2′ W. The Indians went off hunting again to-day, and not only killed the moose that had been wounded, but also an elk and two more sheep. A band of sheep also came to the rocky cliff beside which we were encamped, and we managed to kill two of them, so we were now well stocked with meat, which we set about drying and preparing for carriage, as I now meant to leave the Indians and go on alone.

August 31st.—Minimum thermometer 25°; thermometer at sunrise 31°; barometer 25·62.

September 1st.—Minimum thermometer 25°; thermometer at sunrise 35°; at 2 p.m. 72°; and in the sun 90°; at sunset 65°; mean of barometer for the day 25·61. By this evening we had made two small bags of pemican, one wholly of sheeps' meat and fat, and the other of the dried moose meat and the fat of white goats. The Indians were away hunting all day, and saw a good deal of game, but killed nothing. They tracked a large bear to within 50 yards of our camp, where he must have passed during last night.

September 2nd.—Minimum thermometer 29°; thermometer at sunrise 39°; barometer 25·68. This morning we moved five miles further up the river in search of better pasture for the horses. This evening we had a slight fall of snow.

September 3rd.—Minimum thermometer 30°; thermometer at sunrise 30°; barometer 25·62. Continues cold and raining all forenoon. I now gave the Indians a supply of ammunition, and by giving them some of the horses paid them in part for their services, and for the rest I gave them an order on the Company's post at the Rocky Mountain House or Edmonton. I also wrote letters by them to the latter place.

As Nimrod said he knew the commencement of the pass leading from the bend of the North Saskatchewan, I persuaded him to leave his wife with William, and to come on alone with us for a couple of days to show it to us, and at two o'clock our party, thus diminished in number, started, still ascending the right bank of the Saskatchewan.

We had no trail, but nevertheless got along the margin of the river without much difficulty, excepting at one place where there was a good deal of fallen timber, and one of our pack-horses in trying to get round a bog fell into the current, which was deep and swift, and nearly got drowned. Going along I shot 4½ brace of spruce grouse, which are abundant here.

We also started a black bear, and saw the fresh track of a second, also the fresh tracks of six different moose and of various wapiti and small kinds of deer; so that this district of the mountain seems to deserve the reputation as a hunting-ground that it has among the Indians. On reaching the place where I crossed to the left bank of the river last year in descending the valley, we were preparing to camp, when Nimrod started after a couple of moose, and in about 20 minutes tracked them up, and fired two shots, but had only wounded one when it became so dark that he had to return. Nimrod was very dull and sulky this evening, so that I suspected that he did not like the idea of going further with us with the prospect of returning alone.

September 4th.—Minimum thermometer 19°; thermometer at sunrise 25°; barometer 25·58. Instead of going with us, Nimrod said that, as I knew the trail, he would go to hunt, and meet us at night at the mouth of the glacier branch of the river. He only took his gun with him, and went on foot, and somehow when he left I could not help thinking that we had seen the last of him. So it proved, for although at night we encamped at the appointed place, he never again joined us. I have since heard of after movements from the Earl of Southesk, who met him ten days afterwards in the mountains on Bow River. Lord Southesk came out to the country to enjoy the hunting, and early in the previous summer had started with a party of men from Red River, and, travelling by the Saskatchewan and Fort Edmonton, and then through the thick wood country to the west, entered the Rocky Mountains by McLeod's River to the south of Jasper House. He then turned to the S.E., following the valley of Walpatheek River, where he had excellent sport among the big-horn sheep, until he struck the Saskatchewan at the north end of the Kootanie Plain. Here he crossed the river and travelled to the south by Pipe Stone Pass, following the same trail that I had done coming north. He observed a date and latitude-mark I had placed on a tree at one of my encampments, and found that I had passed only ten days before.

It is rather curious that the only two travellers, excepting Indians and a few employés of the fur companies, that have ever been in this district of the mountains, should have so nearly met, and without the least knowledge of each others' proximity.

Through the improvidence of his men, Lord Southesk's party had run out of provisions when he reached Pipe Stone Pass, and had to hurry on and traverse it in a violent snow-storm. When he reached Bow River he met with William and Nimrod, who had got this far on their return, after leaving me. He then engaged them as guides and hunters, and following down Bow River left the mountains at the Old Fort, and returned by the cart trail to Fort Edmonton, and reached Carlton before the winter set in. From thence he travelled on the snow to Red River and St. Paul's, and reached England in March 1861, having been absent only a year, but having performed a very arduous journey with a rapidity that vies even with those of the late Sir George Simpson, who was remarkable for the speedy trips he made through these territories, of which he was governor for more than 40 years.

September 5th.—We were encamped on the middle fork of the Saskatchewan, opposite to the mouth of the river that rises from the glacier I visited last year.

Min. ther. 25°; ther. at sunrise, 30°; bar. 20·10. We were now wholly dependent on ourselves for obtaining any food beyond what we carried, which consisted in all of about 320 lbs. of pemican, 90 lbs. of which, being made with goat's fat, we only carried along as a last resource. Our party now consisted of myself and the four men, each of whom had his horse to ride and two to drive, while my duty was to go before and act as guide: so that I was now not only the directing but also the actual explorer of the country: and it needed all the little experience I had picked up of the Indian's tact in threading through forest country in a given direction: and I daresay that, without knowing it, we often followed a roundabout and bad line of route, when a better existed.

After going nine miles on shingle flats, which occupy the full width of the bottom of the valley, the sides of which are almost perpendicular mountains, rising for 5,000 to 6,000 feet, we reached a point where the river is formed by the joining of three large branches. The question now was, by which of these was the pass to the Columbia we were in search of. Leaving the horses to feed on a fine meadow of the "Prèle" or goose-grass (a species of Equisetum), of which they are very fond, I started to explore the valley to the west, while I sent Beads up that which led to the south. We returned in about two hours, both having found "blazed trees," showing that some one had passed, but no regular trail. As my valley looked the most likely of the two, and led in the direction we wished to go, we determined to try it first, and after a good deal of hewing and climbing through dense woods, we made four miles by sunset, when we encamped about 700 feet above a roaring torrent, upon a narrow strip from which the forest had been cleared by a land-slip, and where our horses could manage to pick a little: but among the angular blocks of rocks we found it by no means easy to find a place to stretch ourselves.

September 6th.—Min. ther. 20°: ther. at sunrise, 32°; bar. 24·17. At daylight I started with Beads, to see where the valley leads to, and after five miles through very thick woods, we suddenly emerged at the foot of a great glacier which completely fills the valley, and showed us that there was no hope of getting through with the horses by this route. We ascended over the moraines, and had a slippery climb for a long way to reach the surface of the ice, and then found that it was a more narrow but longer glacier than the one I visited the previous summer. The upper part of the valley which it occupies expands considerably, and is bounded to the west by a row of high conical peaks that are completely snow-clad. We walked over the surface of the ice for four miles, and did not meet with many great fissures. Its surface was also remarkably pure, and clear from detritus, but a row of large angular blocks followed nearly down its centre. Its length I estimated at seven miles, and its width at one and a half to two miles. We got back to the horses by noon, and I found the latitude 51° 46′ N. The sides of the glacier valley were formed in part of deep blue limestone, from which I obtained specimens of *Atrypa reticularis*, a characteristic Devonian fossil. By 3 p.m. we had returned to our halting-place of yesterday, and now proceeded to try Beads' valley.

For three miles we followed up the stream to the south, till we found that it suddenly rose from a

glacier in a high valley to our right. However, as the valley before us continued to look wide and spacious, with a flat level bottom covered with dense forest, we left the river and continued a southerly course, sometimes seeing little swampy streams, which showed that the water was still flowing to the Saskatchewan. After three miles we observed a small creek issuing from a number of springs, to flow in the direction in which we were travelling: but we could hardly believe it to be a branch of the Columbia, and that we were now on the west slope of the mountains, seeing that we had made no appreciable ascent since leaving the main Saskatchewan, and had encountered nothing like a height of land. We camped here beside a small lake and beautiful open woods, where the timber is of very fine quality. Both here, and also up towards the glacier we had visited in the morning, I had noticed a number of the plants of the western slope, such as the large blaeberry, the barberry or Oregon grape, the cedar, &c.

September 7th.—Min. ther. 14°; ther. at sunrise 18°; bar. 24·92. At daylight I took Beads with me to search for a trail, and had a hard walk through the woods, during which our attention was much divided between our work and the blueberries and raspberries, which grow in the greatest abundance. These blueberries grow on bushes about two feet in height, and exactly resemble in appearance and flavour those in Scotland, excepting that they are about the size of small musket-balls. Having notched the line for the track for some miles, we returned to the horses, and again started by 10 a.m. The valley now begins to descend rapidly, and very soon finding that the timber was too dense, I kept along the slope of the west or right side, without seeing very well where we were going to. At noon, however, we emerged on an open strip, and found that we were about 700 feet above the bottom of the valley, and just on the brink of a deep rocky chasm, through which boiled and leapt a large stream issuing from a glacier above us. We were thus forced to descend, and as the clearing on the side of the mountain had been quite choked up by a growth of alder (*Alnus viridis*) eight to ten feet in height, we found this no easy task. At last, with much sliding and tumbling, we reached the river at three o'clock, having had our horses a good deal bruised and cut in the descent. We found that at this place the stream from the height of land is joined by one from each side of the valley, and thus becomes a river of good size, flowing in a violent current through a rocky channel. Not a vestige of grass, or anything that horses could eat was to be seen, although the vegetation was very luxuriant. The woods were formed of large trees of several kinds, and had a dense under-bush of young cedar or blaeberry bushes. We followed down the stream as fast as we could in search of a more hospitable spot till nightfall, when we were at last obliged to camp on a small gravel bar of the river, on which grew a few shoots of goose-grass (Equisetum), which our horses cropped in a few minutes, and was all they had to eat that night; to make matters worse it rained all night, and the river rose so that our limited camping-ground was still further reduced in size, and in the morning some of our horses had crossed to the other side of the river, and the rest were so cramped for space, that during the night they were stepping over us as we lay on the ground.

September 8th.—Min. ther. 42°; ther. at sunrise, 48°; bar. 25·58. After the cold weather we had been accustomed to on the east slope, this morning felt stifling until we crawled out of our blankets, and then the continued rain and raw damp air made us feel actually colder than we did yesterday morning, when the thermometer was 30 degrees lower, and we were at 1,000 feet greater elevation.

During last night we had a storm of thunder and lightning, and a break in the clouds for a few minutes enabled us to see that the higher mountains were quite covered with a fresh fall of snow down to within 600 or 800 feet of our level. The dense watery clouds did not appear to form a thick stratum, but above there was clear sky, with light fleecy clouds drifting to the S.W.

Our general course was now a good deal to the east of south, and at noon a short glimpse of sunshine enabled me to get the latitude, 51° 40′ N. Besides the lofty mountains on either side of the valley, there are low crags of quartzite and gneissoid slates, dipping to the N.N.E. at a high angle, which form the floor upon which the strata that form the mountain rest. The weathering of these strata sometimes gives singular forms to the tops of the mountains. For instance, that which the previous summer I named Mount Balfour, from this side presented two peaks, one of which resembles a lofty irregular obelisk.

In the afternoon we passed a large stream from a glacier to the right of the valley. This glacier is very steep, and descends lower than I have ever seen any other in the mountain, as it reaches to within 500 feet of the bottom of the valley, which I estimate is about 3,800 feet above the sea. We encamped on a fine level flat, where at last our horses got something to eat. I now began to observe traces of the terraced deposits, but the valley of this river is too contracted and rugged for them to have been well preserved.

September 9th.—Minimum thermometer 25°; thermometer at sunrise 27°; barometer 25·89. Sending off two of the men to cut out a trail, I crossed the river, and with Burnham ascended the side of the valley to the west for 1,500 feet. It was very steep, and we had to scramble up a cleft in the slate rocks; but, after all our trouble, we got no view, owing to the dense fog, which even prevented my seeing for how much further the woods extended. The mountains are composed of blue limestone and white cherty slates with quartz veins. At night the two men returned, having cut their way to the best place where there was pasture for the horses.

September 10th.—Minimum thermometer 22°; thermometer at sunrise 25°; barometer 26·18. In five hours and a half to-day we made only five miles, even with the help of the previous chopping. In the evening I went 800 feet up the mountains, and found that they rise about 3,500 feet above the valley, and are wooded almost to the top, excepting where craggy. All the rocks I passed over, where too steep to bear heavy vegetation, were covered with a close compost of moss, which shows the difference from the climate of the east side of the mountains, where it is very rare to see any moss at all on the rocks.

The trees are now very fine, some of the cedars and pines reaching a height of 120 feet. The under-growth is very dense, consisting of cedar, white maple, and alder. The depth of decomposed vegetable mould is also great, and the forest had evidently remained undisturbed for ages. The half-rotten trunks of fallen trees are the favourite spots where seedlings of the surrounding trees take root, and I observed them in all stages, and sometimes even the young tree had grown to the diameter of six or seven inches,

and thrown root stems into the ground, grasping round the body of its nurse, before the old trunk had altogether decayed away.

September 11th.—We finished our first bag of pemican this morning, and I found that our consumption had been about 9 lbs. a day for the five of us.

After three miles this morning, we passed through a narrow chasm, and emerged in a wide valley, running to the south-east, the north-west end of which is closed by a large glacier. We now got along on the shingle flats of the river more rapidly, and in all made 16 miles this day, and camped where the river commenced to leave this wide valley, and break through its west wall, which again made the road very bad.

In the woods behind our camp the mooseberry (*Viburnum*), blueberry of three kinds, the large-leafed raspberry, and several others; also a plant with large broad leaves at the top of a thin prickly stalk, which grows in moist places to the height of three to four feet (*Panax horridum*). Besides the *Abies alba* and *balsamea*, there is a third spruce, which has the foliage silvery beneath, but has a rough coarse bark (*A Douglassii?*). There is also a good deal of hard wood now, principally maple and mountain ash.

September 12th.—Minimum thermometer 28°: thermometer at sunrise 31°; barometer 25·75. Go very slowly all day, and after crossing a high ridge, get entangled in the heavy woods of a low flat bottom along the river margin. At evening reach an open space, where the timber is principally small pine. We saw a horse-track to-day that is not older than last summer. We had seen no tracks or signs of game since crossing the height of land.

September 13th.—Leaving the men to come on with the horses, I started alone to see where the valley was leading us to. I carried nothing but my gun, so as to pass easily through the woods, and to avoid a round, struck right across a high rocky point, composed of feruginous shales and quartzose beds, traversed by quartzose veins. The fallen timber was very bad, but of course formed only a slight impediment, as I had no horse. Some of the fallen trunks were of large size, being four and five feet in diameter, and I saw, for the first time, some specimens of a pine, the cones of which were nine inches in length (*Pinus Lambertiana?*). By wading the river several times I got on pretty fast, and, after 16 miles, seemed at length to get out of the mountains, but in reality had only reached a very wide valley, running to the north-west, while the mountains that had hitherto bounded the narrow valley of Blueberry River (as we called it), now retired to a considerable distance.

Passing a large and boisterous tributary from the east, in the bed of which were numerous fragments of milk quartz, I came to where the river spread out into many channels, among white mud and shingle flats, on either side of which rise the terraces, covered with low pine woods. I saw a great number of fresh panther tracks, and a few of small deer. After 22 miles I reached a low range of hills, which lies in the centre of the wide valley, and through which the river escapes in a narrow cañon. From here I saw that the western side of the great valley was distant six miles, and seemed quite unbroken; so I concluded that I was at last in the valley of the Columbia, and commenced my return to the men. I had only retraced my steps about four miles when night came on, so I made a fire, and roasted a couple of grouse I had shot, and waited till morning.

September 14th.—It was a very thick fog, and I wakened up wet through, stiff and sore, and started when it was grey. In four hours I met the men with the horses, and found that they had come about six miles the day before and that morning. Turning with them, we reached a large stream I had crossed yesterday. Where we encamped were some large juniper trees (*Juniperus Virginiana*), which grow 25 feet high and 10 inches in diameter.

September 15th.—This afternoon we reached the cañon where I turned from two days before, and all set off in various directions to find a track.

Some days ago our goat pemican got so rotten that we had to fling it away; and to-day, when we opened our remaining bag, which was buffalo pemican that had been made at the Hand Hills, we were horrified to find, that, although it had been well enough prepared to keep in the dry prairie country, the damp weather which prevails on the west slope had already destroyed the greater part of it; and, instead of the 90 lbs., there was only a mere shell, amounting to about 40 lbs., that it was at all possible to eat, the central part of the mass being perfectly rotten. On half rations this would last us nine days. We shot several grouse to-day of darker plumage than those I had seen before; they sat so close that I killed one as it sat on the ground by hitting it with a stick.

September 16th.—As the men are off cutting the track, we do not start till I get the latitude at noon, 51° 30′, so that in our tortuous course down this valley we have taken nine days to make 16 miles of latitude, and without altering our longitude much.

We only made three miles in the afternoon, when we were again at fault; and as we were at a good feeding-place for the horses, we encamped rather than run a risk of causing them to pass the night without food by going further. The hills we passed over this day are composed of white talcose slate, limestone, and quartz veins. Burnham says it is just like the California gold rock, so some of us hunt gold, and the rest seek for a track to the Columbia River. We got a few specks of what was thought to be gold, but I had my doubts on the subject. The others returned, having found that we were within two miles of the Columbia River, so that they were in great glee at being at last out of our difficulties as we supposed.

September 17th.—Early this morning we reached the Columbia, and followed down for a few miles to a good feeding-place. We found here plenty of horse-tracks, but no sign of a trail; and immediately beyond this the river winds close under wooded hills, where the forest is on fire, and there is so much fallen wood that we would not be able to make two miles a day. The valley is from four to six miles wide, and the mountains to the west are very steep, but do not appear to be higher than 3,000 feet. The river opposite to our camp is divided by a large island into two channels, each 180 yards wide, very deep and sluggish. Along the banks we found a good many dead salmon, which had, no doubt, been worn out by their long ascent from the sea.

We afterwards saw them all the way to the source of the Columbia at the two lakes, or at a distance from the mouth of the river of 1,100 to 1,200 miles, and at an altitude of 2,600 feet above the sea.

The latitude here was 51° 25′ N., longitude by account 117° 30′ W. The barometer reading from

the mean of boiling-point observation for two days was 27·41, and I estimate the altitude at 2,300 feet above the sea level, which also has been our descent from the height of land at the source of the North Saskatchewan.

We now had almost constant rain, with only short glimpses of sunshine. The temperature was much lower than I should have expected, generally falling below the freezing point every night; but my thermometer had become deranged, and a few days after this I broke it in attempting its repair, so that I have no more records.

September 18th.—Having now only half rations of pemican for six days, and most of our horses being tired and feeble, I saw it would be useless to attempt to push our way through such dense woods to the boat encampment, where the main part of the exploration for this year would only commence, which was to find a route for horses between the Columbia and Frazer Rivers. The only thing I could have done, was to abandon the horses, or send them by three of the men to meet Captain Palliser at Colville, and with one man to descend the Columbia, if we could find a canoe of any kind, as far as the boat encampment, and then to make the traverse to Frazer River on foot. I seriously thought of this plan, but, had I adopted it, I should have settled nothing, as the Shonswap Indians, I know, could leave Thompson River, and by some such route reach Jasper House, carrying heavy loads, in 14 days; whereas, the great object I sought to effect, was to pass with horses, there being but few places in the Rocky Mountains where an active and determined man cannot pass on foot. The alternative was to follow up the Columbia, although the woods looked about as bad in that direction, but then I knew that after I reached its source, the country is open and inhabited by the Kootanie Indians, who, having large bands of horse, would be sure to have good trails. With great reluctance, therefore, we started for the south, which we all felt was very much like a retreat. Recrossing Blaeberry River at its mouth, we passed through dense woods till we reached a chain of great swamps, which occupy the whole width of the valley, excepting the river channel. The river, which is deep and sluggish, winds very much, and in the present state of the water is contained by high banks, like natural levées, covered with a dense growth of willows, and behind which are the low flats, and which, no doubt, during floods, are fed by back-water from the river. These swamps also have their edging of willow thicket, and from these the side of the valley rises at once clothed with dense forest. The choice of road was thus between scrambling and log-hopping along the rocky hill-side; cutting, hewing, and squeezing through the willows; or plunging and splashing through the swamps. We tried them all in turns during the following ten days, and could hardly tell which was worst. As we went along to-day we killed several grouse and a skunk, which animal Beads prepared for supper in a most skilful manner, so that it was really very good eating.

After we encamped we heard some one calling out down by the river, and found that a couple of Shonswap Indians had heard us firing and had come up the river in a rough "dug out" wooden canoe, in search of us. We were very fortunate, as it proved to be Capôt Blanc, the chief, who was for a long time the Jasper House guide for crossing the mountains. The other Indian was his son, and they looked the most miserable dirty pair of Indians I had seen. They staid with us all night, and in exchange for some tobacco and ammunition gave us some of the flesh of a black bear they had just killed on the bank of the river as he was feeding on the dead salmon. We also got some dried sifleurs and goat's flesh, but which was of no use to us, as it was rather high flavoured for any stomach but a Shonswap Indian's. Capôt Blanc, who spoke a mixture of French, Cree, and English, said that it would take three days to go down stream in a canoe to the boat encampment, and that from there he knows a road by which he thinks horses could be taken to the head of Thompson's River (Kamloops, he called it), but that it was so bad with fallen woods, that it could not be done this season before the snow. He told us that we would sleep six times before we reached the Columbia Lakes, where we were now bound for, and that the road was bad, and it might take us longer, as no one ever passes it with loaded horses. The Shonswaps have a few horses, which they sometimes bring as far down the river as where we turned from, but they drive their horses through the woods like deer, and carry all their things in canoes by water.

September 19th.—Constant rain. Only make six and a half miles to-day, and camp on an island in the river covered with pines, birch, cedar, hemlock, spruce, juniper, cherry, and service-berry trees. Some of the timber is of large size. The rain continued so heavy and the fog so dense all the 20th that we did not move from camp.

September 21st.—Still rainy, but not so bad as yesterday. Leaving the river, we ascended for 600 feet, and gained a level shingle terrace, along which we passed a little more freely, till after five miles we reached Kicking-horse River, which here joins the Columbia from the N.E., I suppose about 15 miles below the point where I struck it last year at the mouth of Beaufort River. We found it deep and difficult to ford, and the current was so strong that it swept down one of the horses for a long distance before he managed to get ashore in safety.

The terraces were well marked along the sides of the valley at this place, and I observed a section, which shows that the material composing them consisted of stratified beds of white calcareous mud, moist sand, and gravel, which had been disturbed and tilted at an angle before they were moulded into the horizontal terraces. The underlying rocks are slates. We saw in several large lakes in the valley, to-day, geese, swans, and other wild fowl, but could not get a shot at them. Every evening large flocks of geese pass on their way south through the valley.

The strata which form the mountains to the west of the valley seem to be very little disturbed, but otherwise resemble much those of the eastern part of the mountains. Each day's march up the valley of the Columbia was much the same until the 29th, when we reached what old Capôt Blanc had expressly described as a "rub-a-dub" track, which meant, so good that the horses could trot.

On the 23rd our latitude was 51° 9′ N., and on the 25th 51° 2′ N., and as our course was to the S.E., it may be judged from this how slow our progress was. We generally travelled all day, but, perhaps, might have gone a little faster, only the rotten pemican and the constant wading in the swamps made some of us ill for a few days, and, as we were attacked with boils, walking was hard, and riding impossible.

The features of the valley remained the same, the sides being rugged and furrowed by deep channels worn in the shingle deposits, which had nearly destroyed their terraced form. The timber also con-

tinued dense, with a predominance of spruce-fir, and underwood of plants of a northern type. Gradually the forest was less dense, however, as we approached the slight angle which the valley makes about latitude 51°, changing its direction from N.N.W. to N.W. On passing this point, in the forenoon of the 29th, the change was very marked. The wide swampy bottom of the valley was now occupied by dry level terraces, which supported a growth of pine, free from underwood, and gave the horses a hard firm footing, so that we got along at a good pace. We soon came to a group of old lodge poles, which, with the well-beaten track, showed that we were now in the country of the Kootanie Indians. We camped in a small clump of spruce, which grew around some calcareous springs.

September 30th.—Two Shonswaps joined us this morning, having seen us from the river the previous day. They made us understand that their camp was some days' travel further up the river yet. They rode on with us till noon, and, as they were riding good fast horses, I made a bargain with them, and changed three of ours that were very tired for the two fresh ones. The latitude here was 50° 47′.

The open appearance of the country was very pleasant to us, and even seemed to put new life into the horses. The ground was dusty, and the bunch-grass is more sparse than turf, but in other respects it was like riding through the open glades of a deer park, and if we had only been supplied with a sufficiency of good food at the time, there are few spots in the country that would have left a pleasanter impression than the upper part of the Columbia Valley. The trees are principally the same kind of rough-bark spruce-fir that we first saw at the Bow Fort, and known as the prushe, although it is not the real hemlock of Canada, but has a larger cone, and falcate leaves. The mountains are composed of limestone, from which I obtained carboniferous fossils. They do not rise more than 1,500 to 2,000 feet above the valley. Those to the west are only very little higher, and are wooded nearly to the top, but they present an almost unbroken wall. During the afternoon we crossed several creeks, which had wide deep valleys cut through the shingle deposits. The sage (*Artemisia tridentifolia*) now became very common, being the first time we had seen it almost since leaving the Cypress Hills. Elk or wapiti must at one time have been very numerous in this district, as we saw a great many antlers lying on the ground, and sometimes the Indians had piled them in heaps of 50 or 60 together; but the open nature of the woods, and the limited range, excepting up and down the valley, must have made them an easy prey to the Indians as soon as they acquired firearms. We have not seen a single track of an elk yet in the valley, and but only a few of the smaller deer.

October 1st.—We are now having splendid weather, with clear hot sunshine all day. The terraces are composed here almost entirely of the calcareous mud, and it has frequently given way below the surface, and the water finding its way through cracks, has produced large caves. Sometimes a cliff 200 feet high bounds the river, and some of the chalky material is hard enough to withstand erosion, and so give rise to pinnacles and grotesque forms.

We passed for some miles close along the river margin this morning, and I was surprised to see it still of such large size, but with only a current of about one and a half miles an hour. We saw a number of the great fishing eagles perched on the tops of dead trees that overhang the river watching for salmon. By carefully approaching through thickets I got two shots within the distance of a mile, and killed both birds. They were nearly of the same size, five and a half feet stretch of the extended wings, and two feet nine inches from beak to tail, but the one had a white crest on the head and a white band on its tail, while the head of the other was brown and the tail black. Both were males, and the difference in plumage must have been due to the age.

At noon we reached a succession of open prairies, and passed the end of the trail from the Vermillion Pass, in latitude 50° 29′ N.

There are some large specimens of the "prushe" here, but the thickets are formed of the silver spruce.

We found in the evening that we had passed the Lower Columbia Lake, where there is a Shonswap camp, without observing it, owing to the woods. The trail now resembled a well-beaten cart road, the parallel horse tracks forming deep ruts like those produced by wheels.

October 2nd.—Early this morning we reached the Upper Columbia Lake, and to pass along its eastern shore required us to ascend about 400 feet above its waters, and wind along the face of the precipice of cherty carboniferous limestone resting on slate, both dipping to the N.E., but the latter at a very high angle, by a rocky and different path. The opposite side of the lake, however, is low and flat for a considerable distance, and a wide valley branches off to the S.S.W., thus cutting through the mountains which bound it in that direction. The stream which leaves the lake is of good size, and is the source of a mighty river that has to flow about 1,200 miles before it reaches the sea. The lake is six or eight miles in length, and on reaching the upper end of it, which is the real source of the Columbia, I found the latitude to be 50° 7′ 35″ N., and the converted temperature of the boiling-point of water 27·219 inches. The valley in which we have been travelling S.E. by S. for so many days does not terminate here, but is continuous with that of the Kootanie River, which flows in the opposite direction to the Columbia, and is separated from the upper lake by a level tract two miles broad covered with open timber, the trees being of a kind of pine I had not before observed, and which proved to be the *Pinus ponderosa* of Douglas. The Kootanie River breaks into the wide valley from the N.E. through a rocky gorge, and, where we met it, is a swift stream of 100 yards in width. We found two families of Kootanie Indians here drying salmon, which they had caught in the Columbia Lakes, there being none in the Kootanie River, as they cannot pass the great falls that occur close to where it joins the Columbia.

A few miles after fording the Kootanie River, we encamped in a forest of noble trees, principally of the pine I have mentioned, and of a gigantic larch (*Larix occidentalis*). I measured one of the former of average size, and found it to be 120 feet in height, and 11 feet in girth at the height of four feet, but the sturdiness of the trunk and branches gives it a much more massive look than their proportions convey the idea of. Its bark is dull red, and divided into oblong plates of large size separated by deep fissures. This bark is four to five inches thick, and makes splendid fuel, as it contains much resin. It is indeed almost the only fuel to be got in travelling through forests of this pine, as there is rarely any smaller wood, and were it not for the great sheets of bark lying about the traveller would often have to go without a fire, although in the midst of a forest. The leaves are in threes, with long silky sheaths; the cones three to four inches in length; the scales closely packed at the base, at the apex large and

open. The larch is a taller and more slender tree, but some I saw were five feet in diameter. The bark is smooth and of a light red colour. We also saw groves of the cypress.

October 3rd.—We were now following a well-beaten trail, the same as that travelled on by Captain Palliser the previous summer. It leaves the river, and passes to the east of a rocky hill that rises in the centre of the valley. At noon our latitude was 49° 50′ N.

In the afternoon we made up with a family of Kootanie Indians, one of whom talked Cree fluently; his name was Alick, and he was the same Indian who guided Blackiston through the South Kootanie Pass last year. He had just been up at the Vermillion Plain, and told us that he saw my horse-tracks and our encampment of the previous summer. The Indians camped with us, and we had a long talk with Alick about the best way of getting down to Colville. He says there are two roads, the shortest of which, if it were not for the fallen woods, could be travelled in seven days. The other has a good clear trail all the way, but is rocky, and so circuitous that it takes five days longer.

Alick knows the country to the west of the Columbia, and has gone from the boat encampment to Thompson's River, and thinks that there would be no difficulty in taking horses excepting from the fallen timber. There once was a good trail from the Columbia Lakes to the west, but no one has travelled it for many years, and he thinks it must now be blocked up with fallen trees. He knows of no snowy mountains to the west of this excepting up towards the boat encampment: all those south of that point being wooded hills, but which are steep and high. During the night we had very hard frost.

October 4th.—Eight miles further down the valley brought us to a Kootanie camp of 20 tents, where we met the old chief Mitchell, who traded the young ox to Captain Palliser's party. They were just starting to pitch their tents six miles further down the valley, so we continued on, and encamped with them. They had a band of about 500 horses, many of them being beautiful animals and as wild as deer. They have also 10 or 12 cows, and in the evening we got them to lasso one for us to milk. The encampment was prettily situated, at a considerable elevation above the river, in an open pine forest; and as soon as the tents were pitched the women crouched round us to give us meat and berries in exchange for some needles, thread, awls, and small trinkets I had with me. Their principal food consists of cherries and service-berries, which they beat up into a paste, and then dry in cakes. They had also some fine dried flesh of the moose and buffalo, which they had procured on the east side of the mountains, from whence they had only just returned. We soon got a good stock of provisions from them, enough, at least, for six or eight days; only it consisted of rather an excessive proportion of the dried berries, which did not look a very inviting kind of food.

These Kootanies are very fine Indians, being remarkably free from all the usual bad qualities of the race. The women are rather comely, and the men, though small, are well built. However, they were in good condition, having plenty of food at present; for Captain Palliser described them as being last summer the most miserable tribe he had seen. They are all very religious, having been converted by the Roman Catholic priests. Frequently, and at stated times, a bell is rung in the camp, and all who are within hearing at once go down on their knees and pray. This well-meant custom had rather a ludicrous effect on us once, for, in the evening, when a couple of Indians were holding a cow they had lassoed for us, and Beads was busy milking it in spite of its kicks and struggles, the little bell was heard, and down popped the Indians on their knees, letting go their hold of the cow without any warning to poor Beads, who was, of course, doubled up in a twinkling, but without any damage beyond the loss of the milk.

We were now opposite to the ford for the short trail to Colvile by Chos-coos Creek, and at first I got Alick to promise to go so far with us as guide, for both he and Mitchell said that the first day's journey was much blocked by timber, and we would require to make a round, and fall on the track further on, and this we could not do very well alone, without a risk of again getting entangled in woods, and that neither the present condition of our horses or larder would warrant us doing. However, Alick drew off from his promise, and strongly advised us to follow the trail by the Kootanie trading post, so I thought it as well to take his advice. I was sorry for this afterwards, as, if I had gone by the short trail I would have completed the little piece which Sullivan left untravelled, and would have exactly met him on the height of land of that stream, where he encamped on the 6th, while I was only 20 miles to the east of him.

October 5th.—We went for two hours to-day, still accompanying the Indians down the valley, and again encamped with them, as I was negotiating for a change of some of our horses. There is very fine pasture in some parts of this valley, and they say that there is hardly any snow on these prairies in the winter, although the cold is severe, so that the horses do not lose their condition even in spring.

October 6th.—Leave the Indians, and travel rapidly, having got two fresh horses in place of them that were tired and footsore. At noon, in latitude 49° 24′ N. Our friend Alick stuck with us most of the day, but we got about five miles beyond where he encamped by evening.

October 7th.—After going an hour this morning we crossed Elk River, close by where it joins the Kootanie. We then passed through fine open forest land, growing on the shingle terraces, which are cut up by ravines. At where I thought the 49th parallel must cross the valley it is rather contracted, and we passed along the slide of an abrupt slope to our left. We then reached a second wide expanse of prairies, the first being where we left Mitchell camp. Crossing them at 1.30 we reached the Kootanie post. It is merely a little log cabin, and we found Mr. Linklater, the Company's clerk, who is here alone, in charge of this place, being in a canvas tent. He only arrived with his goods from Colvile 10 days ago, having taken 19 days to make the trip, as his horses were in bad condition. The goods are brought here, packed on horses, in the end of summer, and distributed to the Kootanie Indians, who bring in their furs in return by the beginning of March, and then before the snow melts they are conveyed down to Colvile in the manner the goods were brought. The return trip at so early a season is justly considered one of the hardest and most fatal to horses that is made in the country: but if it is not effected before the floods commence, the rise of the rivers and lakes is so enormous that the country becomes quite impassable until the end of July. The furs got at this post are of good quality, and generally amount to 200 bears (principally black and brown), 600 martens, 300 beaver, &c.

Linklater was glad to see us, and very kindly supplied us with a few luxuries, which I am afraid he could ill spare from his slender supplies. Among these was tea, which we now tasted for the first time

for more than two months, during which we had tried a variety of abominable substitutes for that best of luxuries to the traveller.

October 8th.—The latitude of the Kootanie Post I found to be 48° 55′ N., or five miles south of the b undary line. Its altitude above the sea is about 2,300 feet, or nearly the same as the plains next Fort Edmonton.

Linklater told me about the party of Americans who so unwisely started in the beginning of last October from Edmonton, to cross the mountains by the Kootanie Pass. They arrived in a sad plight at this place in December, one of their number having slid over a precipice on a snow bank and been killed, and several of the others having lost parts of their feet, and been otherwise injured by frost-bite. Those of the party in this state remained with Linklater till spring, and the rest tried to push on to Colvile on snow shoes, but only two of them got there, and not till long afterwards. The rest, four or five in number, straggled about the different Indian camps they met with in a dreadful state of privation, living even on the bark of trees. At least one more of the party died, but it is thought that the rest got down to the settlements. The disastrous consequences of this fool-hardy journey, which they attempted in opposition to the advice we gave them at Edmonton, did not arise from any great difficulty which they encountered more than is incident to all winter travelling, which no one used to the country is mad enough to attempt without a suitable equipment, but with which they were totally unprovided. From what I have heard and seen of the country, I believe it would be no great feat to travel from Fort Edmonton to Fort Colvile by the Kootanie Pass in 30 days, using dogs and snow shoes, but any possible display of pluck and energy would not take through a party of travellers inexperienced in the ways of the country and encumbered with horses. However, I do not think that the party of Americans got any of their horses as far as the Kootanie Post.

Just as we were starting this afternoon, an Indian arrived with a foaming horse, bringing the news that a party of eight Americans were crossing by the south Kootanie Pass, having come by Fort Benton on the Missouri. He said that their horses were tired out, and their provisions had failed, so he had come to get food and fresh horses for them.

Gold has been worked from the bed of the Kootanie River at this place, but as yet not in large quantities, the experiment having just been made from curiosity.

The great valley through which we had followed the Columbia to its source, and then down the Kootanie River to this place, appears to be continued to the south-east by extensive prairies, and in following down the left bank of the Kootanie River, we now, with a course to the south, broke through its eastern boundary. The trail, which has been long used by the Hudson Bay Company, though well marked, is rocky and bad, passing through a very confined valley We therefore got on very slowly, compared with the rate we had been travelling for the last few days On the 10th, at noon, we were in lat. 48° 40′, and here we met a party of Lower Kootanie Indians, paddling up stream. Their canoes were of a most singular shape, somewhat resembling the recently proposed "sugar boat." They are made of a large sheet of the bark from a particular kind of spruce-fir, which is sewn up at both ends, but sloping outwards at each end, so as to form a conical point. The length of the bottom is, therefore, about 10 feet, while the space within the gunwales is only seven feet. They are sewn and gummed together, and have light gunwales and ribs of split willow. They carry a fair load for their size, and are most easily paddled by only one person, who, sitting at the extreme end, sinks one conical point that acts as a tail, while the other is canted out of the water. The round smooth surface then presents the smallest possible resistance to the water. The point, being strongly bound with wattles, will stand a severe blow, and therefore acts like a beak to ward off the rocks in running rapids. From their shape they are, of course, more easily upset than any other kind of canoe; but in skilful hands are well adapted to the work. As I knew that we would have to cross to the right bank of the river next day, I tried to engage one of the Indians to return down the river in his canoe to the crossing-place to save us making a raft, but they got sulky and refused, because I would not make some ruinous bargain of horses which they proposed, for, besides those in the canoes, there was also a party travelling by land. However at night after we were encamped, the old chief "John" and his wife overtook us, and said that they would cross us at the right place next day, at the same time making us understand that they were ashamed of the conduct of the young men in refusing to help us.

October 11th.—Twelve miles further to the south brought us to the crossing-place, where the river abruptly changes its course to the W.N.W. It is very deep, but with a feeble current. With the Indians' assistance we soon got all our things over, and, as the whole of the timber and grass had been burnt from the valley, we were obliged to go on for nine miles further. The vegetation in this narrow valley was again very like that of Blaeberry River, showing that it is not the elevation, but the climatal condition, which causes the marked difference in the flora of different parts of the mountains. The sides of the valley rise into wooded ranges of hills to the height of 1,500 to 2,000 feet, and these ranges, rising in S.S.E. direction, are successively broken through by the river valley. They are composed of dark argillaceous and cherts, with quartz veins, thrown into flexures parallel with the mountains. In the wide valleys, between the different ranges, there is some fine land, but, as it consists of terrace levels, it is always light and gravelly. In passing through the cañons the track is always very bad. At noon on the 12th, the latitude was 48° 30′ N., when we halted in the first of the wide valleys. The weather was very cold now, and we had a good deal of snow, which, however, only lay on the mountains, and not in the valleys. On the 13th we passed through a second cañon, in which there occurs a fine fall, where the river ripples over a shelving rocky channel, and then plunges into a deep chasm, bounded by perpendicular rocks, where the water seems to lose all motion. In the bed of the stream I found some fragments of coal, but we were hurrying on too fast to enable me to make any examination of the country.

On the 14th we turned to the north-west, and followed a wide valley, where the terraces are finely developed to the height of 400 or 500 feet above the river. We had in consequence much trouble in crossing the gullies which joined the valley, and where the spring floods had generally cut through the soft shingle to a depth of 700 feet.

On the 15th we came to more open country, where the valleys are occupied by extensive swamps, like those of the Columbia. In the afternoon we reached the Paddler Lakes, which are swampy lakes of this description that do not communicate with the river. As the Kootanie River turns about directly north from this point, we again required to cross to its left bank, and by good luck we found a party of

Indians here, who for a little tobacco soon ferried us over. The river is 160 yards wide at this place, deep, with a steady current of about three miles an hour.

From this place we struck to the south, and following up the right bank of a small stream to its source, and then descending along another which flows to the south, on our third day we reached Kallespeline Lake, all the way passing over good hard country, with fir timber. One night only, being caught by a snow storm in a dense forest, we were obliged to camp without any grass for the horses. Some of the timber we passed through was of great size, the cedars sometimes reaching eight feet in diameter. On the 18th, when we reached the lake, the snow was four inches deep, but it disappeared again in the course of the day. Kallespeline Lake is said to be 45 miles in length, and, excepting the north-west shore, along which we skirted, is closely hemmed by rounded mountains of granite. The extraordinary height of the spring floods is shown by a clearly-marked white line on all the trees and rocks that border the lake, 11 feet above the present level of its waters, which is an enormous rise for a lake which has a superficial area of 80 to 100 miles. We passed over some fine meadow land which skirts the lake, but it must all be deeply overflown in spring, at which time the lake communicates with extensive swamps and morasses in the forest, so that the country is perfectly impassable till the water recedes, and allows a passage along the shore.

The facility for navigation upon this river and lake has been pointed out by Dr. Suckley, in his report. (Pac. Rail., vol. 1, p. 292.) That explorer in 1853 made a most remarkable trip, starting from St. Mary's, on the Bitter Root River, with three men in a skin canoe, which, when it rotted, he changed for a more substantial craft. In 53 days he reached Fort Vancouver, a distance of 1,049 miles by the river. In this distance he only required to make three important portages, one above Kalispilin Lake, of 1,300 paces, one at the Dulles, of 800 paces, and one at the cascades, where there is a wooden tramway, of 1½ miles.

We followed down Clark's Fork, which flows from the Kalispilin Lake for 12 miles, when we were again so fortunate as to meet with Indians, who ferried us across in their canoes. The river is sluggish and deep thus far, and is said to continue all the way to St. Ignatius Mission, which is 20 miles lower down. We here met in with some travellers from Fort Colville, bound for the Flat-head country, and they advised us to go round by the Spokane Plain, as there was snow on the Kalispilin mountains, over which the ordinary and shortest road passes.

On the 20th we rode hard all day to try to reach the Cour d'Alem River, where there is a farm where we expected to get some provisions. The trail leads through beautiful level open wooded country, till we reached the Spokane Plain, which is evidently an ancient lake-bottom. We skirted along its western margin, where it is bounded by rounded hills of gneiss, and when night overtook us had to camp without water for the horses, or supper for ourselves.

Ten miles further, next morning, brought us to Plant's Farm, where we obtained some flour, and a little further on we met with some Indians, from whom we got a fine dried salmon. Our course now turned to the N.W. over great lava-flows, which form the mass of the country to the south of the Kalispilin Mountains.

On the 23rd we struck the American Military Road, 66 miles from Colvile; and, leaving my men to follow slowly, I rode on alone, and reached that place on the same evening, and found Captain Palliser and Sullivan both there, and just dispatching letters for England. My men arrived two days after me, and were paid off, with the exception of Beads, and they at once started for the Smillcomen Gold Mines, which are about five days' journey to the N.W. I found all the arrangements made for descending the Columbia to the sea, a description of which journey is given in the general journal.

Captain Palliser's Journal, continued.

August 3rd.—On this day our party broke up: Captain Brisco and Mr. Mitchell started for the south, en route to Fort Benton on the Upper Missouri. Doctor Hector shortly afterwards started for the Old Bow Fort, accompanied by our servant Beads, Burnham, M'L and Oliver, and the Stoney hunter. Dr. Hector's object was to connect the passes which he had previously explored across the Rocky Mountains with the Forks of Frazer's and Thompson's Rivers in British Columbia by a northerly route, avoiding the valley of the Columbia.

August 4th.—Travelled along a sandy plain, interspersed by a few insignificant swamps and pools, most of which were salt. Passed to the northward of the three remarkable American hills, known in the maps by the name of "Trois Buttes:" they were about 40 miles to our south. Owing to the level nature of the intervening country and the detached structure of these hills, they appeared like the tops of three distinct rocks seen over a sea horizon. Here our well-worn carts, so often previously patched up, began to give way altogether, and the first total smash occurred; the cart was actually crushed beyond hope or any efforts to repair. Made about 24 miles. In the night we had heavy rain, and consequently enjoyed good water.

August 5th.—Started early, pursuing our course along the boundary line. Another cart broke down, and we had to distribute its load among the others; we were now reduced to five carts. I cut off the shafts, and took away other portions which might prove useful in repairing future accidents. At noon we came upon a large perfectly dry river-bed, about 500 or 600 yards across; my Blackfoot half-breed assured me there had been no water in it since the time of the flood, and it was in consequence of a different order of things, that the Missouri now flowed instead. I did not argue the point, but agreed with him that the waters from this singular river once flowed into the Missouri. We had great difficulty to descend into this ravine, and had to follow along the crest of the left bank for several miles, before we could effect a descent, where the general height of the banks was from 180 to 240 feet. We travelled along this river-bed back to the southward. Found a cluster of small springs, containing excellent water. Breakfasted a little before 12, in latitude 49° 25′ N.: made 17 miles.

August 6th.—Made 12 miles before breakfast over an arid plain. A violent thunderstorm came on, which lasted till 1.30 p.m. After this it cleared up, and we still saw the "Trois Buttes" bearing to the E. of S. of us, looking wonderfully clear considering their great distance. We were travelling over an arid prairie, so level as to be devoid of any points by which we could continue our direction unvaried. The sun became overcast, and we had frequent recourse to our compasses. The day was

very cold, accompanied by wind. We camped without water, but it fortunately came on to rain in the night.

August 7th.—We were in sight of the Rocky Mountains. We now guarded the horses no more; from the point where we all separated the dangers arising from horse-thieves were daily diminishing as we progressed to the westward. Started a little after 6; stopped at 11, where there was a little water, both brackish and sulphureous. Killed an antelope while the others were camping, not expecting to find water; the pursuit of the animal took Felix and me over some miles of country, in crossing which we came upon a fresh-water swamp. Felix returned to camp to apprise the men, who came up with me a little after dark. Latitude 49° 47′ N.

August 8th.—Started at 7; made 10 miles; arrived at Belly River and had some difficulty in finding a crossing-place; the men had proposed deferring the crossing till to-morrow, as it was now late, I overruled this however, and promised to serve out tea and sugar if the crossing was effected that evening. All worked hard, we rolled up the tents into the form of bowls, used them as boats to transport the baggage, and swam the horses across. I preferred doing this late in the evening, as we not only gained time, but were enabled to go into the water at a higher temperature than if we had waited till morning. Our tea and sugar were now rare luxuries, which we enjoyed only on Sundays and particular occasions.

August 9th.—Started for the Porcupine Hills, which we had visited about this time last year, when on our branch trip from Slaughter Camp to the boundary line. We had now traversed the level and plain through which the 49th parallel runs, and had suffered a good deal from scarcity of good water and grass. The few small swamps and marshes on which we were forced to depend, were all more or less impregnated with sulphates, and the grass in their neighbourhood scarcely sufficed to feed our horses. In the evening of this date we arrived on a tributary of Belly River, where we killed some deer. Lat. at noon, 49° 44′ N.

August 10th.—We began to shape our course to the northward, in order to strike the entrance of the Kootanie Pass. The ground was much burned, probably by a party of Kootanies on their return to their country west of the mountains after their summer hunt. Lat. at noon, 49° 37′ N.

August 11th.—Occupied the greater part of the day in hunting; killed two deer, providing food for crossing the mountains.

August 12th.—Hunted all day; killed some ducks and two grizzly bears. The country was rich, undulating, and grassy. We were now in the mountains, the carts had arrived at the last point which was practicable for them to reach. The berries at this altitude, of about 800 feet, were still eatable, although past the season below. Lat. 49° 36′ N.

August 13th.—Laid out our luggage and property into two lots; one to take on with us across the mountains, containing our provisions, bedding, and some articles with which to give boot in exchanging tired horses; the other lot to go back in carts to Edmonton. We then made a present of the two best carts to the men, to take their things and also our own useless baggage back to Edmonton. We then proceeded to break up the other carts, and make pack-saddles out of the wood they supplied, and the raw hides of the animals we had killed. Late at night my hunters returned unsuccessful.

August 14th.—Settled accounts with the men, who returned to Edmonton, paying them in horses, and in orders on the Hudson's Bay Company's store at Edmonton. Shortly after, we started with 20 horses for the height of land. We made about eight miles, when it came on to rain, and we encamped for the night.

August 15th.—Fell on the Kootanie track on the left bank of a small stream, tributary to Moocoman River. On each side of us were steep thickly-wooded mountains, the undergrowth very dense. Here we lost one of our horses. After a laborious search, and much delay, we abandoned the animal. About this time we met a band of Kootanie Indians upon the trail, on their way to the plains to hunt buffalo. Started again in the afternoon, and travelled three hours and a half, crossing the flanking, or Curtain range of the Rocky Mountains, about 2,000 feet above the level of the plains, and descended to a swampy well-wooded valley, and camped on one of the numerous little tributaries of Bow River. I have already given a description of this, the British Kootanie Pass, having recrossed the Rocky Mountains in the beginning of September 1858 by that Pass on my return to Edmonton from my exploration of the Kinnonaskis Rocky Mountain Pass.

August 16th.—Before we had started in the morning an Indian came into camp, driving before him the horse we had lost the day before. He had seen his track beyond the entrance of the pass, when the animal had been returning to the plains, he had followed him up, and recovered him. Subsequently he learned from the Indians, from whom he had separated in order to hunt that morning, that the horse had been lost by our party; and the man immediately started off, travelled all night, crossed the Curtain Range, and overtook us before starting. The horse was a valuable one, and the poor fellow could easily have taken possession of him without my ever having discovered the thief, and had undertaken an arduous and somewhat dangerous night journey to restore the animal. I, therefore, rewarded him very handsomely, giving him a blanket and 50 rounds of ammunition. We now started, and for the first three and a half hours pursued our way through wood and swamp, and stopped to breakfast at the base of the last and most lofty ascent, that which I conceive to be the watershed of the continent. Our path was a zigzag through woods, which became stunted as we obtained an increased altitude, and a little before sunset we reached the height of land, whence we saw the waters which descend to the Pacific. Here the view of the mountains, especially to the northward, was magnificent; we were now on a mass of mountain more than 6,000 feet above the level of the sea, contemplating snow-clad masses in the north-west horizon of more than double that altitude.

August 17th.—Started after an early breakfast, and after a very severe day for the horses came out of the mountains along the left bank of Wigman River; did not halt for noon, and camped at six. There was not much obstruction from fallen timber; the wood was dense, consisting of several kinds of pines and fir, also larch in the hollows.

August 18th.—Started early, and arrived at two Kootanie tents. These people possessed cows, as well as oxen and horses, and had milk in abundance. We exchanged some tired horses with them, and traded a very lean young bullock, as our provisions were nearly exhausted; remained in camp the whole of the 18th and 19th, making inquiries concerning the different modes of proceeding to Colville,

and exchanging some tired horses, giving boot in ammunition, clothing, tobacco, or anything else we could spare. We learned that there was a trail direct to the Paddlers' Lakes, but we were dissuaded from trying it, and concluded to follow instead the Hudson's Bay Company's trail, following the valley of the Kootanie River. The description of this route was very discouraging. Old Joseph told us we should follow the left banks of the river for four days, and then cross on to the right bank, and follow on to the Paddlers' Lake, which would take four days more, and from thence to Colville eight days more. My intention had been from this place to have turned to the northward, followed up the Kootanie River to the entrance of the new "pass," which I established the year before, and thence to have endeavoured to cross the country, keeping north of the 49th parallel as far as the Columbia River; but we learnt that there were no Indians then fishing on or near the source of the Columbia, nor to the northward of us on the Kootanie River, as they had gone to the Columbia Lakes; so not having sufficient provisions, nor seeing any probability of getting a supply, I determined on taking the Hudson's Bay Company's trail, through the United States' territory, to Colville, there to change horses, lay in a stock of provisions, flour and pork, and renew the explorations from thence.

August 21st.—Travelled all day from sunrise till a little after 11 o'clock, when we stopped to breakfast, then travelled on till sunset, and camped. Made about 22 miles. The track was very bad indeed.

August 22nd.—Started at seven; travelled till noon over a very bad piece of track; started again at four, and travelled till six; made about 18 miles. Both these days we have been travelling in thick pine woods, without much undergrowth, and the soil rather good, but light and sandy. The banks of the river were tremendous; we literally passed between chains of mountains. These have been the highest river banks I have yet seen. It rained in the night.

Arrived at the crossing-place on the Kootanie River; latitude 48° 28′; longitude 105° 5′. Made a boat of the tent, and constructed a raft besides with logs of wood and horse lines, the river was very deep, and water icy cold. Rained in the night.

August 24th.—Travelled till 12; stopped to breakfast. Started again at 3. The track, which had hitherto been very bad, was now much improved. Camped a little before six; made 12 miles. Where we breakfasted we saw some elder bushes of great luxuriance, exhibiting shoots of this year's growth nearly 12 feet long. The banks of the river still mountains, and last year's snow lying on them in some places.

August 25th.—Lost a great deal of time hunting up the horses, which had strayed very far; the track was very bad indeed. Our horse which carried the ammunition fell over the cliff into the river and was drowned; we fished him up however, and recovered the ammunition. Shortly before camping passed a magnificent succession of falls on the Kootanie, a rapid bend in the river causing it to assume the appearance of issuing from an alpine height at the back of the scene, while in the foreground the water roared through two spaces compressed by a triangular island rock. Track very bad all day.

August 26th.—Started early. Here again I had the misfortune to lose another horse, once the finest of my whole band, my own horse Carlo, brought by me from Red River in my spring trip of 1858. He was now unable to go any further, and unable any longer to make his way across the rocky precipitous track we were following. We tried hard to force him onwards to where the poor animal could stay in a spot where there was grass, but could not succeed. I therefore left him behind, and sent back two of my men to shoot him, considering that as being a more merciful way of terminating the faithful old animal's existence than leaving him to endure the more protracted agonies of starvation. We stopped to breakfast at 10 a.m.; made about four miles of desperate climbing. As we were at breakfast an Indian and his family came up; he seemed an intelligent fellow, and did a little business for the H. B. Company. We started again at three, and travelled till after six o'clock.

August 27th.—Started early, and stopped to breakfast; after breakfast the track was far better, and we made a good day.

August 29th.—Had considerable trouble in finding the horses; arrived at Paddlers' Lakes. These Indians were encamped there; they are quite amphibious; spend the greater part of their lives in their small canoes, which, unlike the generality of canoes, are longer at the bottom than the top; they are very frail little crafts, skilfully put together, though far inferior to the birch-bark canoes of the Canadian voyageurs. As soon as we arrived at the river bank several canoes put off and took us and our baggage across.

The canoes are generally paddled by two Indians, who both paddle on the same side, first giving a few strokes on the right, then changing to the left side at the same time. They live principally on fish, which seems to agree with them, particularly the women, who are remarkable for their comeliness, clear complexion, and the symmetry of their limbs. At this point of our journey I determined to purchase a canoe, and proceed to Colville by Kootanie River and Flat Bow Lakes to the junction with the Columbia, and thence down Columbia River to Colville. I traded a canoe on credit, promising to send back, by the two Indians that accompanied me, a sufficiency of calico to dress his wife and two children, and a little ammunition for himself.

Leaving Mr. Sullivan in charge of the men and horses to go round by land, I started with my two Indians in the canoe; our course was N.W. In the evening camped along with two Indians, who, with their wives, were fishing. I killed some ducks on the river.

August 30th.—Started after breakfast; found myself at noon in latitude 49° 18′; about three hours after arrived at the portage; in about the same latitude got into a wide rushy lake after sunset, with quantities of wild fowl and very beautiful orange water-lilies. Traversed this lake, and arrived at a very ingeniously constructed fish weir, at which a large number of Flat Bow Indians were encamped.

August 31st.—Remained almost all day at the Indians' camp; was quite unable to induce my two Indians, who, by the way, were only intelligible to me by signs, to proceed on our journey. Latitude of the weir 49·15 S.; we had nothing more to eat but a few berries.

September 1st.—Our course was north for two hours through a dense fog; when fog cleared we made westwards; sun cleared just in time for me at noon to take our latitude, 49° 36′. Here we eat a meal of pemican, which I had preserved all along, for fear of illness from eating berries. Started again on a west course, and arrived at the western extremity of Flat Bow Lake at four o'clock; here we found

another camp of Indians, where my men eat so voraciously of fresh fish that they were unable to stir for the rest of the day.

September 3rd.—Again on the Kootanie River; made two severe portages across the rocks, one of which was about two miles long; halted for a dinner on berries; took observations for latitude, rubbed out. After dinner made a short portage, and made a few miles down the river; commenced a long portage; made half of it, something under two miles; camped in the wood. I killed a duck and a goose, and we finished the whole at supper.

September 4th.—Finished our portage, reloaded canoe, and travelled steadily; met Indians returning from Columbia River; had a fine feast of salmon, for which I exchanged a shirt for two salmon, one four feet, the other four feet four inches long. Made a long day, and camped not far from the entrance of the Columbia River.

Started before sunrise, and soon turned into the Columbia River. Arrived at Fort Shepherd, near the mouth of the Pendoreilla River, and saw where miners had been working for gold, both on the Columbia and on the Pendoreilla Rivers. Fort Shepherd is a very well built establishment of the Hudson's Bay Company, but unprotected by pickets. I took an observation here in latitude about 49° 1′, and the mouth of Pendoreilla River is about three-quarters of a mile within the British territories. While I was observing, a circle of Scotchmen, Americans, and Indians, surrounded me, anxiously awaiting my decision as to whether the diggings were in the American territory or not; strange to say the Americans were quite as much pleased at my pronouncing in favour of Her Majesty, as the Scotchmen; and the Indians began cheering for King George. In the afternoon I started again down the Columbia for Fort Colville; in the evening stopped at the Horse Guards, about 12 miles from the fort.

September 5th.—Arrived at Fort Colville. I found Mr. Sullivan had arrived here the day before; they had suffered a good deal from want of provisions, and had been for several days compelled to live on nothing but berries. They were looking ill, and assured me that they had been suffering greatly from dysentery, when, fortunately, they arrived in the settlement of the Colville Valley, where they were most hospitably received by Mr. , a Scotch settler there, whose hospitable treatment soon recovered them from the pernicious effects of the berries.

It will be remembered that on the 18th of August, or about three weeks before this time, when we had just finished our western descent of the main chain of the Rocky Mountains, I had been obliged to abandon my project of continuing my western course through British territory, on account of want of provisions in a country almost without game, and also on account of the absence of all the Indians, who were then fishing on the large Columbia Lakes; had we persevered then, we should have left ourselves without any means of procuring any fish or exchanging our tired horses. I was therefore anxious to lose as little time as possible in renewing our explorations, with a view of ascertaining the practicability of a route over the country westward of the main chain of the Rocky Mountains, and through British America, as far to the westward as the season would permit. With that view I fitted out a branch expedition, which I entrusted to Mr. Sullivan, with directions to ascend the Columbia to Fort Shepherd, and then to force his way as he best could to the eastward, until he arrived at the western exit of Kamenaskis Pass; and reserved for myself the task of exploring to the westward; also making Fort Shepherd a starting-point from whence to force my way towards the Pacific as far as the lateness of the season would permit.

The following is a detailed account of the branch expedition under the charge of Mr. Sullivan, in a letter written to me after his return, and already printed in the "Further Papers relative to the Exploration of British North America" in the Parliamentary Blue Book of 1860.

Mr. Sullivan's Despatch.

To Captain Palliser.

Fort Colville,
October 1859.

Sir,

Your instructions of 8th September 1859, directing me to start from Fort Shepherd, and explore the region of country to the northward of the 49th parallel of north latitude, and to the eastward of the fort, have been carried out, and I am rejoiced to say with a result far more satisfactory than at first sight I was led to anticipate. I beg to submit for your information the following detailed account of my branch expedition; also a sketch map showing the route we pursued.

On September 11th I started from Fort Colvile, lat. 48° 37′ 46″ North, and arrived at Fort Shepherd on the evening of the 13th. At this place I engaged three Sanihk Indians, and despatched two more of the same tribe in search of the only Indian who was said to know the country that I was about to explore. Previous to starting also I obtained observations for latitude, and found the fort to be three-quarters of a mile to the north of the frontier line; consequently, the point at which the Pendoreilla joins the Columbia River is in British territory. Having crossed the Columbia on the 15th, we then proceeded up the valley of the Pendoreilla for twelve miles, and encamped to await the arrival of our Indian guide. An observation at this place gave latitude 49° 0′ 36″ North. Six miles still further up the valley, and we struck the mouth of Salmon River, a small tributary of the Pendoreilla. Up to this point the whole of the river valley is in British dominion, but beyond the Pendoreilla is in American soil. The gold mines on this river are at present confined to this small portion of the valley, and the miners are engaged in mining the flats and bars of the river only. They realize from 15*s.* to 20*s.* per day with the rocker, and from 35*s.* to 40*s.* with sluices. They are prevented from reaping rich harvests, owing to the quantity of water in the stream, as well as the absence of capital for the purposes of ditching and carrying water to advantageous places in the neighbouring mountains.

Every prospect is in favour of the country being auriferous; the gold becomes coarser the further the miners advance into the bed of the stream, and the adjacent mountains possess every indication of containing gold. The bed rock on the Pendoreilles, as well as that on the Columbia, between Colvile and Fort Shepherd, is a blue slate, with a large admixture of quartz veins. The immediately overlying

rock is a very hard grey granite. In many places, mica is in great abundance, and up the Salmon River especially, mica is largely distributed. On our arrival at this river, I "prospected" myself in the stream, and washed out $2½ in one pan of dirt, and $2 in another. One of my Indians, more fortunate than I, picked up in the crevice of the rock a piece of gold which valued 15*s.* 6*d.* Here our party experienced great difficulty in pushing through the masses of fallen timber and dense undergrowth, which latter was so tightly interlaced as almost to defy the power of the axe altogether.

My Indians were in favour of returning to the fort. I told them that it was my determination to advance, and at once packed the horses with all the articles that were not absolutely necessary for the journey, including about half the provisions with which we had left Fort Colvile, and sent them back to Fort Shepherd under the charge of a half-breed, who was mining at the mouth of the Salmon River. Then, dividing the remainder of our provisions and baggage into as many parcels as there were people in the party, I told the Indians that both Mr. Margary and I intended to carry the same weight as they, so that the sooner we started the sooner the journey would be done. Mr. Margary, the gentleman belonging to the Hudson's Bay Company's service, whom Mr. Blenkinsop had desired should accompany me, was of great assistance on this as well as on many subsequent occasions; he explained to the Indians my determinations, and took to his pack as cheerfully as he would have done to a more pleasant occupation. It was with reluctance, at very best, that the Indians followed our examples; at length, all our loads strapped, we forced our way through the woods, and enjoyed a good supper and a most comfortable night's rest at the forks of Salmon River. It would be needless to journal the account of each day's march here, and it will suffice to inform you, that in five days from this point, by following the more easterly branch of the Salmon River, we had attained the summit of the dividing ridge, between the Columbia and the Kootanie, or Flat Bow River, at an elevation of 1,500 feet above Fort Shepherd. An observation for latitude here assured us that we were still in British territory, it being 49° 5′ 24″ N.; and judging from our course, I consider that we did not dip to the south of the 49th parallel throughout the whole of the distance from Fort Shepherd to the height of land. The ascent to reach this highest point of the dividing ridge is very gentle, and there is not the slightest obstacle to prevent the accomplishment of an excellent road. The descent, on the contrary, to the stream which is tributary to the Kootanie or Flat Bow River, is rather abrupt; but, fortunately, it is only for about 300 feet, when the river valley is reached. At the height of land I was in hopes that we had struck an Indian trail, when suddenly our guide informed me that we had been travelling for the last half hour, not upon an Indian, but a carriboeuf road, and that now we were forced to leave it. Carriboeufs frequent this part of the country in large numbers, as the woods are traversed by their beaten tracks. They are induced to visit this tract of country in order to feed upon a very large leaf, which grows in great abundance on the moist lands high up in the mountains. From this place a most extensive view of the country was obtained; the rugged mountains to the south-eastward, which border the right bank of the Pendoreilles, in the American territory, rising to an elevation of about 2,500 feet, and clothed to their summits by dense pine forests, seemed to bid no hopes to strangers passing there; while the gentler undulations from the Columbia valley up to this point, offered no impediments but those resulting from decaying masses of vegetation, the young scrub pines which had risen on their ruins, and the stunted undergrowth, obstacles which disappear entirely before the woodman's axe. On September 24th, we made a very long and tedious journey in our descent towards the Flat Bow Lake, crossing and recrossing the stream to avoid fallen timber, and such obstacles as could be avoided at the expense of a little wetting, which, considering the quantity of rain that fell for a few days previous, was productive of little inconvenience. At nightfall of this date, the rain commenced in earnest. We were very comfortable, however, having constructed an excellent shelter with the branches of the cedar, and being provided with as much wood as we were disposed to burn.

On the 26th September we arrived at the Flat Bow Lake, and an observation showed us to be in lat. 49° 13′ 7″ N., or 15 miles to the north of the boundary line. We were all glad to have come to the end of our journey, (as far as walking was concerned), for we were all more or less fatigued, and needed mocassins. I should remark here, that that piece of country extending from the summit of the dividing ridge to the shores of the Flat Bow Lake, presents much greater difficulties than the slope towards the west; but at the same time I consider that with a sufficient number of men for the purpose of clearing, and the time necessary for such an undertaking, I might have succeeded in making a very practicable trail for my horses. The greatest obstacles throughout the road from Fort Shepherd, eastward to the Flat Bow Lake, is fallen timber; and great advantages for a road exists, since the traverse of this piece of country was effected, by the valleys of two rivers, the whole of the way. The land to the southward of the Flat Bow Lake is flat and swampy, and preserves this character to the distance of 25 miles to the south-eastward of its southern extremity, where a range of mountains extend along the course of the Kootanie River, and prevent its continuation. The river itself has no current in this part of its course, and on either bank there are numerous sloughs and swamps teeming with wild ducks, geese, and other aquatic birds, that make these marshy lands a special rendezvous in the fall of the year, when they desert the less genial climate of the north. From these swamps also, the Kootanie Indians obtain the klusquis, or thick reed, which is the only article that serves them in the construction of their lodges, and the klusquis is an article of barter with them to the other tribes, whose lands do not produce this necessary. As soon as we arrived at the lake, we were met by the Kootanies, and treated very hospitably. They inquired as to the object of our visit, and furnished me with a large amount of information relative to the country to the eastward. By referring to the sketch map accompanying my letter you will observe that I have laid down a road as "Kootanie trail to the Columbia Lakes (abandoned)." This road has been for many years out of use, it is altogether in British territory; but according to the accounts of the Indians, two very precipitious mountains have to be crossed before arriving at the origin of the Columbia River. I expressed a desire to travel this road, and was assured that at present it is entirely impracticable for horses. The Kootanie chief said, "If "you take all the young men of my tribe and furnish them with axes, they will cut through but "a very small piece in a day, your camp fire of one night will be in sight of your camp fire the "night following; the fallen timber is too bad; the trail that once was clear is now blocked up by "reason of the fires." The next road laid down, and which I have called "Mr. Sullivan's trail," is the one which the Indians described as very practicable, and which, for many reasons, was the one

adopted. I made a few presents to the chiefs and principal men, and obtained from them the loan of four horses, and the services of two young men as guides. Our Sanihk Indians we left at the Flat Bow Lake, and supplied them with ammunition, with which to support themselves during our absence. Our provisions were very small, consisting of 30 lbs. of flour, (all my meat had been consumed,) 15 lbs. of which I turned over to the two Kootanies, and retained 15 lbs. for Mr. Margary and myself. At noon of September 30th, we left Flat Bow Lake, and keeping a south-easterly course for a few miles, crossed the Kootanie River, in lat. 49° 3′ 6″ N. by observation, and encamped here for a whole day, having lost one of the horses. Pursuing our south-easterly course for about nine miles, we struck the road laid down in the sketch map as "Mr. Sullivan's trail," and after making an ascent of 500 feet, we descended, and encamped at nightfall in a small prairie affording excellent water and grass for our horses. The following morning our horses had strayed backwards on the track towards the Kootanie camp. We were accordingly delayed from starting till 2 p.m. The day was cloudy, so that I was prevented from obtaining the latitude, but from my dead reckoning I consider that our encampment was about one or two miles to the north of the 49th parallel. By reference again to the sketch map, you will observe that there is a tract of country indicated by "Practicable trail." I wish to remark that this trail is not really in existence, but from the nature of the country, I am inclined to believe that a road may be made in that direction with no degree of trouble, and which would have the material advantage of throwing the whole road altogether into British dominion, as well as the secondary advantage of escaping the ascent of 500 feet alluded to above; indeed, the mountains here may be penetrated in many directions; they do not assume impracticable shapes, the highest does not exceed 2,000 feet, many do not attain the altitude deserving the appellation mountain, and their gently sloping sides with wide valleys between, seem to offer facilities for roads in many ways. On the evening of the 4th of October we struck a tributary to the Kootanie River; going off to the south, and proceeding a little distance up the stream, we encamped on a fine prairie close to its right bank. October 5th, we were off before sunrise, and followed up the stream through a most beautiful valley, offering no obstacles whatever to our progress, water and fine grass everywhere, and we passed the best camping-places that I have seen to the west of the Rocky Mountains. The Kootanie Indians resort to this part in search of beaver and carribœufs; and from the indications at their old camps, a large party of them had preceded us by about four or five days. An observation for latitude showed us that we were keeping to the north of the frontier line, being lat. 49° 6′ 48″ N. October 6th, we reached the highest point since leaving the Flat Bow Lake. At noon an observation for latitude was 49° 15′ 14″ N.; and at our night camp of this date we were at least 10 miles still further to the northward, for we made a very long journey from our dinner camp. Here we had arrived at the most easterly of the two small lakes from which the tributary stream issues to join the Kootanie or Flat Bow River. I estimate the elevation to be 3,300 feet above Fort Shepherd. Our Kootanie guides now gave us the welcome intelligence that we were only one day's journey from the crossing-place on the Kootanie River, where the Indians traverse the stream on their road to trade at the small Kootanie Post, situated near the western base of the Rocky Mountains, and at the distance of five miles to the south of the 49th parallel. I ascended a mountain, and saw the heights which border the right bank of the Kootanie River, and I estimated the distance at 12 miles, to which point a broad open valley extends without any obstruction. Up to this point, since leaving the Flat Bow Lake, we had travelled a most practicable piece of country; a good horse trail exists, and with the greatest ease a waggon road may be accomplished. Indeed, in the event of the requirements of commerce, as far as my experience of the mountains is concerned, I could not point out so extensive a tract of country where a railway may be brought with comparatively so small expense. There is no one place on the whole of the trail between the Flat Bow Lake and the borders of the Kootanie or Flat Bow River where a sudden ascent of 150 feet is requisite.

The whole ascent of the lakes is small and very gradual, and the valley of the tributary river is wide, open, and flat. Our provisions were entirely exhausted on our arrival at these two lakes, and the Indians told us that, for the next day's journey on to the Kootanie River, a large quantity of burnt timber was lying across the road, and there was a possibility on this account that we should require two days to cut our way through; but they assured me at the same time that it was only timber that would be troublesome to us, nothing besides lay in our way. Great dependence, as you are aware, can be placed on the word of an Indian of this tribe: the Kootanies never steal, rarely lie, and are decidedly the best converts to Christianity of all the Indian tribes among whom our travels have led us. I was very reluctant to abandon this 12 miles of country, but under the circumstances there remained but one alternative, viz., to retrace our steps. We had been living on two meals a day on the upward journey, and as our Indians were certainly gifted with most extraordinary appetites, their small supply of flour was soon consumed, and they made demands on our own little store, which we could have easily managed without their assistance. So now we were entirely dependent on the few small pheasants which chance might throw in our way. I should certainly not have returned were it not that I was thoroughly convinced of the entire practicability of a road from that point on the Kootanie River, where the Expedition penetrated in September 1858, right up to Fort Shepherd in the valley of the Columbia, more than three-fourths of which might be rendered available for a railway; and considering the stupendous triumphs of engineering art in modern times, I should be sorry to add that the remaining fourth is beyond the bounds of practicability. We returned to the Flat Bow Lake on the 10th of October, very hungry, having fasted two days, and found our Sanihk Indians anxiously awaiting us. The following day I hired two bark canoes, crossed the Flat Bow Lake, descended the Kootanie River, from thence into the Columbia, and arrived at Fort Colville on the 15th October.

In conclusion, I beg to express my sincere thanks to Mr. Margary for his most friendly society and cheerful assistance throughout a trip which I shall ever remember with unspeakable pleasure; and I trust that hereafter, I may hear of him occupying a high position in the service of the Hudson's Bay Company, for which by his intelligence, energy, and management of Indians he is eminently fitted.

I have, &c.

(Signed) JOHN W. SULLIVAN,
Secretary.

Captain J. Palliser,
Commanding Exploring Expedition, &c. &c. &c.

Having given Mr. Sullivan's account of his explorations from Fort Shepherd to the eastward, connecting that post which is north of the boundary line with the western extremity of the Kannanaskis Pass, I will resume the account of my explorations from Fort Shepherd to the westward, continuing my way north of the boundary line until I arrived within 13 miles of the Okanagan Lakes, or at the point from which the Hudson's Bay trail between Colville and Fort Hope bears to the N.W., and entirely within the British territories.

September 14th.—Started for Fort Shepherd, there to recommence on the 49th parallel, and endeavour to make my way to the westward until I fell on the trail of the Hudson's Bay Company, which bears to the northward, passing over the Cascade range at Manson's Mountain. I secured the services of an old Blackfoot half-breed hunter, together with two of his own horses, which were in much better condition for the severe journey I was undertaking than mine; and was accompanied also by an Indian: we three started on horseback, and carred our provisions on two pack-horses.

On the 17th September we left Fort Shepherd, crossing a country of wooded hills, the first three ranges of which we crossed without much difficulty. I could not ascertain their exact height, having no barometer, but they probably averaged between 800 and 1,100 feet. We then camped on the edge of a small lake of an insignificant size, and where we had a sufficiency of water. To reach this lake I had to cross the 49° N. about half a mile to the south. Distance made, seven miles.

September 18th.—Started at 7 a.m. After breakfast returned a little to the northward and pursued a western course through the hills. Latitude at noon 49° 0′ 15″ N. After this we had to cut our way with axes through a country which, although not impassable to horses, presented great difficulties in the accomplishment of a road. We worked till 6 p.m., when we camped, having found water, but no grass for the horses. Made three miles.

September 19th.—Breakfast early; started at 7 a.m.; the chopping and climbing very severe; day cloudy; could not take the latitude, which, from our course, was to the northward of last night's camp. We continued alternately chopping through 20 or 30 yards, then jumping and driving up the horses, but, before we arrived to where there was grass, the Indian's horse failed, and could proceed no further; but soon after this we came to a small swamp, where, by great exertion, we brought and left him. In the afternoon one of the mares rolled down a precipice, pack and all; we climbed down and carried up her load, and, by taking a circuitous route, brought her up again. Here the Indian declared he could not stand the work longer; took off his coat and shirt (payment made in advance for the trip), threw them back to me, and departed. We allowed the horses to feed for a short time, then descended a deep ravine, where we found no grass for the horses. Here we camped, having made four miles.

September 20th.—We breakfasted before sunrise, commenced to chop through the fallen timber, which was terrible; we had to ascend a mountain about 1,200 feet high, which was both steep, rocky, and densely piled with fallen timber; we reached the summit a little after five; came down an easy descent and along a valley, and camped about 8 p.m. Made five miles, finding both grass and water. Here our Indian returned to us; I received him kindly, restored his property, and he continued faithful to me throughout.

September 21st.—Rained hard all night. The horses suffered so much from want of food that I determined to remain there a day to recruit them. Lat. 49° 3′ 10″ N.

September 22nd.—Our labours not so severe; the mountains not so steep, and the fallen timber not so heavy as heretofore. Passed the horses over one very bad place, across a face of rock. This place at first appeared impassable for horses, but by availing ourselves of the slate shingle, which we levelled with our hands, building it up in some parts, and rolling it over the precipice in others, we made a causeway, and passed triumphantly. Camped on a little tributary to the Columbia, called Sheep River. Made seven miles.

September 23rd.—We had some difficulty in crossing Sheep River; after which very heavy timber to cut through. Found grass at noon. Camped; made one mile; but proceeded to chop for to-morrow's journey. Lat. 49° 2′ 44″ N.

September 24th.—Crossed the second fork of Sheep River; ascended about 1,100 feet of mountain, very grassy in many places; rode along the crest of the hill in a north-westerly direction, afterwards in a westerly. Made nine miles, and camped at half-past 4 p.m. Here there was grass, but no water. Lat. 49° 5′ 19″ N.

September 25th.—A good deal of chopping and climbing in the latter part of the day, but evidently the worst of the journey was then over. Made about nine miles.

September 26th.—Started very early. It had rained all night; made more than three miles before breakfast. Our course continued to wind through a valley considerably to the north of west, and then to ascend a grassy hill to the height of about 900 feet. Proceeding along the crest of this hill for several miles, we at length came in sight of a lake, called by the Indians Lake Nichilaam, to which they repair to fish late in the autumn from the south, and to which an Indian trail forks off from the Colville road. My companions were greatly rejoiced to find themselves once more within a mile or two of a known piece of country. My two mares here broke down for want of food, want of water, and the constant jumping over the fallen timber. One of them from the first start was not previously in sufficiently good condition for the trip, the other, unfortunately, owing to the constant jumping, flung her foal; we were obliged to abandon them. We had now but Pichena's two horses remaining, and we endeavoured to descend the mountain to the lake that evening. Not being able to accomplish this, we were obliged to camp in the cliffs without water, and consequently without anything to eat; having nothing but flour we could not cook it. Made 11 miles.

September 27th.—It rained very hard last night, and we rose very wet and miserable, the mountains above us were covered with snow. We continued our descent of the high grounds about Lake Nichilaam, and reached its southern extremity at about 8 a.m., when we cooked and finished the last of our flour. I could not obtain the latitude at noon, owing to the cloudy state of the weather. This lake (Nichilaam) is about seven or eight miles long, and from two to three and a quarter wide, surrounded by mountains rising above its surface from 700 to 1,000 feet in height.

After breakfast struck on an Indian trail leading south, which we rightly guessed would take us to

the Colville track, at about 50 miles distant from the fork. We had now been compelled to abandon two horses, and the two which remained we allowed to run loose with the light packs, now only consisting of a couple of blankets and buffalo robes, axe and kettle, sextant, &c., while we walked, driving the horses before us on the track. Travelled for about eight miles in a south-east direction; stopped near the junction of the Indian trail and the Colville track. Took observation of pole star, and found ourselves about four miles south of the lake in lat. 48° 58′ N. I had been fortunate enough to discover a fine caché (concealed store) of dried salmon, that an Indian had made for the subsistence of himself and family during the winter. I broke into it, and took out enough for supper for us three, and also for breakfast to-morrow morning, and leaving my black silk handkerchief, and a dozen charges of gunpowder, with a handful of duckshot, I carefully reclosed the Indian's caché.

September 28th.—Started very early, walking hard and driving the horses before us. Met an Indian with his wife and two children, travelling, as I rightly guessed, with the object of taking up his caché, that I had supped from the night before. I invited him and his family to a part of our breakfast, which he partook of, but evidently suspected where it came from. At last I told him the salmon was his own, that I had taken it, and also what I had left to replace it. He said, "I wish I always had you for to "steal from me." I engaged him for a reward to try and recover the two mares, which he undertook very unwillingly, on account of the desperate nature of the country. He ultimately succeeded in recovering one of them, about a month afterwards. After breakfast started again, and in the evening camped within four miles of Colville.

September 29th.—Started early, swam the horses across the river with the assistance of the skiff, and arrived to breakfast at Colville.

October 5th.—Started in order again to return to my explorations from Lake Nichilaam to the westward. I took with me Vital, one of my half-breeds, who had joined the Expedition, and come up with our servant James Beads from Red River in the spring. I was likewise accompanied by another half-breed of the name of Gadois, together with the Indian who had recently been travelling with me. We had swum the horses, crossed the river, and proceeded about five miles, when I met Lieut. Palmer, of the Engineers, who had travelled from Fort Hope with Mr. McDonnell, the officer who had been in charge of that post, and was on his way to relieve Mr. Blenkinsop at Fort Colville. They had travelled the Hudson's Bay Company's trail over Manson's Mountain, and Lieut. Palmer made a reconnaissance of the route, and confirmed me in my belief that, from the camp of the Americans now stationed at Little Okanagan Lakes, the Hudson's Bay Company's road is altogether within the British territory. Leaving the men and horses, with directions to camp soon, I walked back with them to the fort, where we dined together; and Lieut. Palmer, at my request, presented me with a sketch of the route he had travelled, from the Okanagan Lakes to the eastward, part of which was in British and part in American territory. In the evening crossed the river in the skiff, and started to join my men, whom I found easily from the bright fire they had lighted, about eight miles up the Columbia, and on Colville River.

On the 7th October again reached the southern portion of Lake Nichilaam, where I had left for Colville on the 27th. I had not been able to observe at noon on that day, but now I had a chance on a clear night by pole star, and found ourselves in lat. 49° 4′ 30″.

October 8th.—Started on foot to ascend the hills on the west of the lake, carrying with us a couple of days' provisions, and sending the horses round by the trail (which diverges to the south of west) to meet us at a point north of the 49th parallel, and on the north fork of the Colville or Ohailpitku River. My reasons in sending the horses round were not because I deemed the section of country with which I was engaged impracticable for horses; but the fallen timber was very dense, and required more time to chop it through than I at that time thought I could spare. We had a great deal of scrambling through this timber, and passed along a valley in direction W.N.W., and at 4 p.m. reached a height of land commanding a fine view of prairie country, affording a choice for continuing a road in several directions. Slept in a ravine after coming in view from the heights above of the north fork of the Colville River.

October 9th.—Started almost without sufficient light to pick our steps through the broken and fallen timber, and by nine o'clock descended to the Ohailpitku, a little below the north fork of the river. About two hours afterwards the horses, which I had sent round with Vital the day before, arrived, and sufficiently early to enable me to take the observation at noon for latitude, 49° 2′ 20″.

October 11th.—Started early, pursuing our western course again along the river, and shortly after caught sight of a soldier in American uniform in pursuit of some wild ducks on the river. He informed me that the surveying party of the United States' Government, in connexion with that of the British Government, under Colonel Hawkins, were not more than two miles further, in a S.W. direction. A little further on, and I came in sight of the observatory, containing the zenith telescope,* used by the Commission for laying down the boundary line. On riding into their camp I was most hospitably received by the scientific gentlemen employed on the survey, and invited to pass the day with them, an invitation which I gladly availed myself of. There are three parties on the American boundary survey; each party consists of an observer, computer, and topographer, protected by an officer and company of regular soldiers. The scientific gentlemen of the party that I had the pleasure of visiting were civilians, and Mr. Harris, the gentleman in charge, was an able and experienced man. Messrs. Hudson and Major were his assistants and his topographers.

October 12th.—Mr. Harris very kindly prevailed on me to spend another day with their party, and told me the chief commissioner, Mr. Campbell, was expected; and in the afternoon that gentleman arrived, accompanied by his secretary, Mr. Warren, Lieutenant Parke, of the United States, topographical engineer, sextant observer, and Mr. Gibbs, topographer to the reconnaissance party.

* The zenith telescope is an American invention, used in observing pairs of stars, one north, one south of zenith, but of nearly the same declination. A far greater number of results can be obtained in a given period than by means of the transit instrument formerly in use for obtaining very accurate latitudes. This instrument can determine to an accuracy of 12 feet.

No. 7.

Itineraries.

Itinerary 1. July 18.

Date.	Distᵉ.	Course.	Time.	Remarks.
1857.				
July 21	18	S. by E.	12 to 6	Started from Upper Fort Garry, crossed the Assineboine River, and proceeded up the left bank of Red River, through dense thickets of small poplar and scrub oak for 10 miles, whence we emerged on country clear of woods, and continued our march eight miles further.
„ 22	10	S.	6.15 to 9.30	During the march passed through slightly wooded country,
„ „	10	„	3 to 6	with occasional patches of pasture land. At 5.30 we crossed La Rivière Graté.
„ 23	12	S. by E.	9.30 to 1	Twelve miles of splendid meadows of natural hay, and at
		S.	4.15 to 7.30	1.15 we struck a lagoon near the river.
„ 24	9	S. by E.	10 to 1	Arrived at the Hudson Bay Company's post "Pembina." The land in the neighbourhood of this place is peculiarly fitted for agriculture.
„ 28	18	W. by S.	9 to 3.30	Halt at a saline lake.
„ „	14	SW.	5.40 to 8.40	Arrived at St. Joseph, after passing over prairie land through oak copse, and again over prairie with salt lakes.
„ 30	14	NNW.	8.30 to 12.30	Country much the same as that described yesterday.
„ „	10	W. by NW.	4.30 to 7.40	Towards evening we crossed a creek at Point d'Allard.
„ 31	4	S. by W.	9 to 11	Two miles of open country, and then through a belt of
„ „	9	W.	3 to 5.30	oak copse. To this succeeds a stretch of land covered with conical mounds and deep pot-like depressions; also numerous boulders of limestone and granite.
August 1	4	S. by W.	9 to 11	Reach Pembina valley, depth 247 feet.
„ „	9	W.	3 to 5.30	Eastern boundary of what the half-breed hunters call "La Grande Prairie."
„ 2	10	„	9 to 12	Passing over bare prairie struck the valley of Long River.
„ „	5	SW.	4 to 5.30	This stream runs north to the first of the Pembina lakes.
„ 3	10	W.	10.45 to 2	From this camp the three principal points of Turtle Mount
„ „	6	„	5 to 7	bore as follows:—
				A. (Bearing of) most southerly W. 297° N.
				B. Head of mountain - „ 230° „
				C. Heart of „ - „ 347° „
„ 4	15	SW.	8.15 to 12.40	Cross the White Earth River valley, 100 feet below the
„ „	9	„	4 to 7	prairie: flows N., and is tributary to Pembina River. Struck a fine wooded prairie on the outskirts of Turtle Mount, now four miles distant.
„ 5	3	„	6.30 to 7.30	Arrived at Turtle Mount. Nothing more than a dense forest, covering a great swell in the prairie, from 250 to 300 feet above the general level.
„ 6	8	NW.	9.30 to 12	At noon arrived at a small creek running to the north and
„ „	4	WNW.	4.30 to 6.30	losing itself in swamp.
„ 8	14	W.	9.45 to 2.30	Arrived at a deep gully, on the east side of which we encamped. Six miles to our north is the White Lake. Its bearing from two miles east of our camp: E. end of, N. 3° E.; W. end of, N. 291° E.
„ 9	6	„	10 to 12.15	Reach a large valley, through which flows a small stream.
„ 10	10	NW.	8 to 11.15	Crossed a narrow slip of level plateau, and then made a
„ „	12	„	1.30 to 6	rapid descent of 150 feet, traversed a bare plain; four miles from last night's camp crossed a small creek, which flows easterly, and falls into White Lake. Here we made a considerable rise, so as to pass over a broken ridge which runs in a westerly direction. The woods which skirt the Souri River visible from this point, and on reaching the first bluff of these we halted.
„ 11	3	„	8.15 to 9.30	Skirted the Souri for some miles to find a fording place.
„ „	2	NE.	9.45 to 10	The shallowest part of river here was four feet. The
„ „	5	N.	4.30 to 6.15	country to north of this river is covered with conical sand-hills, from 60 to 70 feet in height.
„ 12	13	E. by N.	5.30 to 9.45	Cross a swamp which forms Snake River that falls into
„ „	13	NW.	3 to 6	the Souri River a few miles to the east of this place, and six miles from the mouth of that river, where it joins the Assineboine. We were now five or six miles from the valley of the Assineboine, passing through bluffs of wood which belong to this valley.
„ 13	16	W.N.W.	6.15 to 11.15	Since leaving the Snake Creek we have had the advantage
„ „	10	NW.	3 to 6	of the Hudson Bay Company's trail to Fort Ellice, which cuts from "point" to "point" of poplar woods. No other tree grows here.

Date.	Distᵉ.	Course.	Time.	Remarks.
1857.				
Aug. 14	12	W. by N.	7.15 to 10.45	At 10.45 struck Forked Gully.
„ „	12	WNW.	3 to 6.30	
„ 15	24	NNW.	7.30 to 2	Arrived at Fort Ellice, after crossing several gullies depressed 200 feet below the prairies, and having the breadth of half a mile. A dense growth of small wood is sheltered in these localities. The Assineboine valley here is 250 feet below the plains, and is at least three-quarters of a mile wide. About five miles above the fort the river Qu'appelle joins the Assineboine. The Assineboine at this point averages 10 feet in depth, and is 60 yards across.
				The expedition remained here till August 25th, but a branch expedition proceeded to "La roche percée."
„ 17	10	SSW.	12.30 to 2.45	Kept along the west side of Beaver Creek, crossed it at the point where it issues from a marsh. We then came to a succession of well-marked ridges, trending N.W. and S.E., whose summits were clothed with poplars, and having creeks and swamps between them. At the third poplar ridge we stopped for the night.
„ „	10	„	4.15 to 7	
„ 18	9	„	5.25 to 6.10 6.40 to 8	Crossed Pipe-stone creek, as it is called here, but it is the same as Snake River or Creek, which we crossed on 12th.
„ „	13	„	10.45 to 2	It rises from the north flank of Moose mount, and flows
„ „	10	„	4.30 to 7	easterly till it joins the Souri. Its banks here are 160 feet high, and 10 miles below this point it emerges on a flat plain, where it loses itself in enormous swamps, and from which it again issues under the name of Snake River. Arrived at Moose Mount, where we camped in poplar clumps.
„ 19	9	SW.	5.40 to 8	During this day we passed Moose Mount, and entered on
„ „	13	SSW.	10.45 to 2	extensive prairie with no wood. Dined at Moose Mount
„ „	10	SW.	4.15 to 6.40	Creek, which flows S.E., and joins the Souri about 20 miles lower down.
„ 20	- -	- -	5.5 to 8.25	
„ „	- -	- -	11.30 to 4	Reached Souri River.
„ 21	- -	- -	10 to 12	The valley is 170 feet deep, and the stream is 20 yards wide.
„ 22	15	N.	10.10 to 1.35	
„ „	12	NNE.	3.55 to 6.40	Camp on prairie.
„ 23	8	„	5.15 to 7.15	
„ „	18	„	10.10 to 2.45	
„ „	11	„	4.65 to 7.15	Near camp of 18th.
„ 24	10	NE.	5.15 to 7.25	
„ „	14	NNE.	10 to 1.20	
„ „	13	NE.	4 to 6.45	Five miles to N. of camp of 17th.
„ 25	15	N. by E.	5.45 to 11	Again arrived at Fort Ellice.
Sept. 7	6	W.	6 to 7.30	Camp at swamp source of Scizzors Creek.
„ 8	12	„	7.30 to 12	Through poplar woods. Good pasture and small lakes.
„ „	6	„	3 to 5	Long Lake in thickly wooded hilly ground.
„ 9	9	W. by S.	9 to 12	Cross high wooded ridge. Road very bad.
„ „	10	„	3 to 6	Small lake. Still in the woods.
„ 10	18	W.	8 to 1	Cross a broken country without wood. Pass a creek flowing to the N. after 13 miles, and reach the Weed Hills.
„ „	8	SW.	4 to 6.30	West of Weed Hills.
„ 11	10	W.	7.30 to 11	Pass Wolf Hills, five miles to our left.
„ „	12	„	2 to 6	Bare plains. Cross a deep ravine, and camp at Stoney Lake.
„ 12	12	„	8 to 1	Through broken wooded country, ascend rapidly, and reach Qu'appelle post, 16 miles S. of the Qu'appelle lakes at the Mission.
„ 14	11	„	1 to 5	Squirrel Hill. Winding among poplar bluffs.
„ 15	5	W. by N.	6 to 8	Camp at last point of woods.
„ „	8	W.	10 to 1	
„ „	9	„	3 to 6	
„ 16	10	W. by N.	6 to 8.30	Cross bare plains, halting first at a small swamp, and then at Manybone Creek which flows to the N.
„ „	12	„	11 to 2	
„ „	13	„	3.30 to 6.15	Reach Moose-jaw Creek, and turn a little to the S. before camping.
„ 17	5	S.	10 to 6.30	Swamp in the bare plains N. of the Coteau.
„ „	17	W.		
„ 18	14	„	6 to 10	Plains, lat. 50° 26′.
„ „	10	„	2.30 to 6	Sand-hills N. of the Coteau.
„ 19	10	„	7 to 11	Plains N. of the Coteau, lat. 50° 28′.
„ „	14	NW. by W.	1 to 6	Small swamp six miles N. of Coteau.
„ 20	10	NW. by N.	5 to 9	Swamp in broken ground.
„ 21	7	„	6 to 8	Tail of Eyebrow Hills.
„ „	23	N. by W.	10 to 5	Sage Creek. Elbow of S. Saskatchewan.

Date.	Distᵉ.	Course.	Time.	Remarks.
1857.				
Sept. 24	13	W. by S.	9 to 1	Crossing place of S. Saskatchewan.
„ „	3	SW.	5 to 6.30	
„ 29	10	NE.	- - -	Follow down left bank of river.
October 1	6	N.	4 to 6	Dirty water swamp.
„ 2	7	„	6 to 8	Reach Red Deer lakes, depressed 150 feet, with a creek flowing to the E.
„ „	8	„	10 to 1	
„ „	5	„	3 to 6	
„ 3	7	„	6 to 8	S. Saskatchewan, lat. 51° 24′.
„ „	16	„	12 to 4	Reach the woods. Old Buffalo Pound.
„ 4	11	„	6 to 9.30	Rabbit Point, lat. 51° 46′.
„ „	13	N. by E.	12.30 to 4	Cross woods.
„ 5	8	NE. by N.	8 to 11	Swamp, lat. 52° 3′.
„ „	2	„	2 to 3	Small lake.
„ 6	13	NE.	8 to 12	Over burnt ground.
„ „	6	N. by E.	3 to 5	Poplar bluff.
„ 7	13	„	6 to 10	"Duck Lakes."
„ „	9	N. by W.	12 to 3	
„ 8	8	„	7 to 9	Five Mile Gully.
„ „	6	N.	12 to 2	Fort Carlton.

Date.	Distᵉ.	Course.	Lat. and Long.	Place.
1857.				
Dec. 14	20	10° W. of S.	- - -	Enasquinas Hill.
„ „	13	W. 13° N.	52° 42′	West end of Minitchenass Hill.
„ 15	15	W.	- - -	East side of the Big Plain.
„ 16	16	„	- - -	Small Lake. Commencement of White Lake.
„ „	14	WNW.	- - -	Indian camp. White Lake.
„ 17	18	W. by N.	- - -	West side of Pike Creek.
„ „	17	W.	- - -	McMurray's post, Pike Lake.
„ 18	14	„	- - -	Indian camp at Sand Hills.
„ „	4	„	- - -	Six miles east of Horse Knoll.
„ 19	25	NW.	53° 16′	East side of English Creek.
„ „	16	NNW.	53° 28′	East side of Red Deer Hill.
„ 20	25·5	NW. / SW. / NW.	- - -	River Saskatchewan.
„ „	14	„	53° 34′ N. / 109° 8′ W.	Fort Pitt.
Total off 12 miles=199.				
Dec. 24	10	W.	- - -	Christies' Lake.
„ „	20	W.	- - -	Vermillion River.
„ 25	12	W. by S.	- - -	N.E. of Vermillion River.
„ „	10	W. by N.	- - -	West side of hills near Indian pond.
„ 26	7	„	- - -	Indian Camp Point.
„ „	12	„	- - -	Dead Pine Lake.
„ „	12	„	- - -	First lake of the chain.
„ 27	13	W.	- - -	Source of Vermillion River.
„ „	12·5	NW.	- - -	Le Bubi Noir.
„ 28	12	W.	- - -	West side of plain.
„ „	17·5	W. by N.	- - -	Le Jolli Bois.
„ 29	14	„	- - -	Blackfoot Creek. Beaver Hill.
„ „	20	WSW.	- - -	The Pines, Beaver Hill.
„ 30	19·5	SW.	53° 30′ N. / 112° 52′ W.	Fort Edmonton.
Total 191 miles.				
1858.				
Jan. 9	11	- - -	- - -	White Mud Creek.
„ „	6	S. by W.	- - -	„
„ 10	13	„	- - -	Clump of pines.
„ „	13	W.	- - -	Bad Beaver Dam.
„ 11	17	„	- - -	Woodpecker Creek.
„ „	10	S. by W.	52° 41′	West side of Battle River.
„ 12	20	S. by E. / W.	- - -	East of Gull Lake.
„ „	6	„	- - -	Two miles west of Gull Lake.
„ 13	22·5	W. by S.	- - -	Medicine River.
„ „	8	SW.	- - -	Cabriers' Hill.
„ 14	26	„ / W. by N.	- - -	Muskeg Lake.
„ „	5	W.	52° 29′	Rocky Mountain House.
Total 157 miles.				

Date.	Dist^{e}.	Course.	Lat. and Long.	Place.
1858.				
Jan. 26	15	N.	- - -	Saskatchewan River.
„ „	12·5	„	- - -	„
„ 27	20	„	- - -	„
„ „	21	„	- - -	„
„ 28	21	N. by E.	- - -	„
„ „	30	E. by N.	- - -	„ Goose camp.
„ 29	21	„	- - -	„
„ „	30	E.	- - -	„
„ „	24	„	- - -	„
„ 30	15	NE.	- - -	„
„ „	2	N.	- - -	Fort Edmonton.
Total 211·5				
Mar. 15	17	NE. by N.	- - -	Saskatchewan River.
„ „	11	„	- - -	„ Freeman's crossing place.
„ 16	14	N. by E.	- - -	„
„ „	16	ENE.	- - -	„ Near Vermillion Creek.
„ 17	16	E.	- - -	„ Near Snake Creek.
„ „	15	„	- - -	„ White Clay Creek.
„ 18	17	„	- - -	„ Above Upper Snake Portage.
„ „	18	„	- - -	„ Below the Bout Portage.
„ 19	19	„	- - -	„
„ „	3	„	- - -	„
„ „	18	„	- - -	„
„ 20	18	E. by S.	- - -	„
„ „	5	„	- - -	„ Dog Rump Creek.
„ „	22	E. by N.	- - -	„ Middle Creek.
„ 21	20	SE. by S.	- - -	„ Vermillion River Island.
„ „	4	SE.	- - -	„ Commencement of the Trail.
„ „	18	E. by S.	- - -	Fort Pitt.
Total 251 miles.				
„ 30	8	E.	- - -	Mouth of Red Deer Creek.
	3·5	SE.	- - -	
„ „	12	ESE.	- - -	Bull Swamp.
„ 31	14	N. 110° E.	53° 16′	English Creek.
„ „	13	„ 95° „	- - -	Horse Knoll.
April 1	16	„ 93° „	- - -	Fine View Hill.
„ „	7	„ 70° „	- - -	Jack Fish Lake.
„ 4	10	„ 315° „	- - -	S.E. end of Jack Fish Lake.
„ 5	12	„ 80° „	- - -	N. of Jack Fish Lake.
„ „	12	„ 70° „	- - -	Clump at E. end of Hills.
„ 6	13	„ 65° „	- - -	The Springs.
„ „	13	„ 65° „	- - -	W. of Bear Lake.
„ 7	10	„ 110° „	- - -	Red Berry Creek.
„ „	13	„ 280° „	Bk.	Salt Lake.
„ 8	13	„ 259° „	Bk.	Horse Guard.
„ „	5	ESE.	- - -	Fort Carlton.

To Jack Fish Lake - - - - - 73 miles
To Carlton from Jack Fish Lake - - - - 101 „

Total Distance - - - 174 „

ITINERARY: SEASON 1858. FROM FORT CARLTON.

Date.	Dist^{e}.	Course.	Time.	Remarks.
1858.				
June 15	5	SW.		Five Mile Gully.
„ 16	12	„	10.30 to 12	Pass over stone, Indian Knoll, and to west of swamp where we camped before reaching Carlton in October last. Halt among high broken hills in a line with first poplar ridge.
				Bearings—Stone, Indian Knoll - - N. 25° E.
				„ Top of Minitchenass - - „ 285° „
				„ North end of ditto - - „ 300° „
„ „	15	SSW.	2.10 to 6	Skirt the river. Camp at Birch Gully. Prairie covered with immense limestone boulders. Prairie level at camp 248 feet above river. Gully quarter of a mile long; ends abruptly.
				Bearings—Top of Minitchenass - N. 327° E.
				„ Redberry Lake Hills - „ 270° „
„ 17	10	S. by W.	8.45 to 12	Elbow of N. Saskatchewan. Kept half a mile from river, to avoid gullies. River very straight; course N. 190° E. to elbow; here with a sweep of four miles it changes its course 90°. Valley wide, sloping, well wooded.
				Bearings—Down the river - - - N. 10° E.
				„ Up ditto - - - - „ 275° „

Date.	Distᵉ.	Course.	Time.	Remarks.
1858.				
June 17	6	SW. by W.	3.15 to 6.20	Pass over poor soil, very bare plain, and camped at Cross Woods among immense hills of blown sand. Gentle slope to the river; distant 3½ miles; banks only 12 feet high. Course up river 255°, down 65°.
,, ,,	6	W. by S.		Bearing—North end of Eagle Hill - N. 275° E.
,, 18	5.5	,,	7.50 to 9.20	Pass over high ground to Eagle Hill Creek, which is 10 yards wide, and shallow, flowing through a rugged valley three-quarters of a mile wide and 180 feet deep. It enters the Saskatchewan three miles to the N.
				Bearings—Eagle Hill, N. end - - N. 292° E.
				,, Ditto S. end - - ,, 222° ,,
,, 19	14	,,	8.45 to 1	Ascend gradually the eastern slope of the Eagle Hills, over very stony ground with numerous salt lakes. Halt four miles from the Bear's Head, a prominent hill.
,, ,,	6	SW.	3.30 to 6	Ascend rapidly to the west hill; gaining the top of the
,, ,,	3	NNW.		hills we turned to the north, through wooded country, with numerous fresh-water lakes. Camp at one of these which is two miles long and a half broad, Eagle Hills, an irregular plateau, abrupt to the east, sloping gently to the west, their crest covered with poplar clumps. Many spots of rich fine land, but no good timber.
				Camp at lake. Lat. 52° 17′ 59″ N. Long. 107° 28′ 15″ W.
,, 22	9	WSW.	9 to 12	After two miles reached south end of Lizard Lake, from which place we have to carry wood. Two miles of hilly country, then four of level plain bounded to the N. by hills, which again sweep across our track when we halt at Stony Lake. Lat. 52° 14′ N. Long. 107° 35′ 4″ W.
				Bearings—South end of Eagle Hill woods N. 96° E.
				,, North end of ditto - - - ,, 320° ,,
,, ,,	12	,,	3.50 to 8	Pass over level, poor prairie, and cross a small creek flowing to the south. After six miles camp at a small swamp.
,, 23	11	,,	5 to 8.15	Cross a succession of level plains, separated by ridges running N. and S. Soil and pasturage everywhere poor. Camp at a swamp within two miles of a salt lake, about four miles in circumference.
,, ,,	17	WNW.	12 to 5.45	Pass over an extensive plain bounded by hills to the N. At five miles came to a swampy creek; four miles farther to two small lakes; and after 16 miles reached a deep ravine, like a rent in the prairie, a quarter of a mile wide, with steep banks 110 feet high, the bottom being occupied by deep salt lakes, some of them several miles in length. Camped at a small swamp in the prairie to the west; wretched water and miserable grass.
				At noon. Lat. 52° 14′ 37″ N.
				At 9 a.m. Long. 108° 11′ 33″ W.
,, 24	10	W. by N.	8.45 to 12	Made for a range of hills, and after six miles began to ascend rapidly, and then came to a valley four miles wide and lying at the base of the Ear Hills, where we halted.
,, ,,	7	WNW.	3.15 to 5.15	Pass over hilly ground to a considerable elevation. Plain covered with oleaster copse, and several new plants found (*e.g.* Arnica ——?) Camp at a stream running to the N.
				At 7 a.m. Lat. 52° 16′ N. Long. 108° 27′ 27″ W.
,, 25	10	,,	9 to 3.30	Pass over arid plains intersected by deep gullies generally containing salt lakes. These ravines ramify in every direction and are generally about a mile wide and 110 feet deep, with precipitous banks, the northern exposures being clothed with small poplar. In one of these, called the Wich-que-tin-a-su or Grand Coulée, we encamped at springs at the base of the high banks. Besides poplar, a few clumps of maple at this place. To the S.W., six miles distant, a hill 440 feet high, from which Bearings—
				Ear Hills - - - - - N. 95° E.
				Long Wooded Hill - - - ,, 305° ,,
				Lat. 52° 28′ 39″ N. Long. 108° 52′ 10″ W.
July 2	9	W.	9.45 to 1	Passed over very broken ground, round bare hills, intersected by deep gullies, the general depression of which is 170 feet, while some of the hills rise to 450 feet. Halt at an old Indian camp.
,, ,,	6	WNW.	5 to 6.30	Passed through a belt of woods bounding a rich alluvial tract about two miles wide, and covered with a white-berried oleaster, and through which Ambush Creek runs N.E. to flow into Manitoe Lake.

Date.	Dist.	Course.	Time.	Remarks.
1858. July 3	17	WNW.	6.45 to 12	Crossing the creek, passed through wooded country among sand-hills, then entered an irregular plain dotted with salt lakes, halted at the foot of a high hill densely wooded on its eastern slope.
,, ,,	8	NW.	3 to 3.30	Crossing the point of the hill entered a rich but small valley, and camped at Eyebrow Creek. From this camp 10 miles N. broken wooded country, then Eye Hill Creek flowing to the N.E., and bounded to the N. by the Pass Hills, from which Bearings—Eye Hill, 20 m. dist. - - N. 225° E. ,, Moose Hills north of Battle River - - - - ,, 335° ,, ,, Mouth of Eye Hill Creek - ,, 10° ,, ,, Wolf Hills - - - ,, 20° ,, Distance of Battle River, 18 miles. At noon lat. 52° 34′ 25″ N. ; long. 109° 23′ 45″ W.
,, 5	15	W.	8.30 to 1.30	Cross rolling plain, and camp in woods at the side of a high hill, from which Bearings—Course back - - - N. 65° E. ,, Low Blue Hill, 25 m. dist. - ,, 140° ,, ,, Neutral Hills, 20 m. dist. - ,, 170° ,, ,, ,, west end - ,, 210° ,, ,, Eye Hills, south end - - ,, 320° ,, ,, ,, north end - - ,, 355° ,, ,, Poplar Hills, north point - ,, 20° ,,
,, 6	12	,,	11.30 to 6	Pass over sparsely wooded plain, and after 10 miles reached Nose Hill Creek, which is 25 feet wide, and flows through a miry flat. Camp in poplar wood beside small lake.
,, ,,	9	W. by N.		
,, 7	11	,,	8.30 to 12	Pass through a valley filled with sand-hills, and after crossing a chain of small lakes lying N.W. and S.E., at 11 a.m., ascend rapidly over broken ground, and halt near where we kill a moose deer.
,, ,,	9	,,		Continue over irregular country, thickly clothed with poplar. After five miles reach Battle River, which flows through a valley two miles wide, and depressed 270 feet. Cross the river, which is 40 yards wide and two to three feet deep, with a soft muddy bottom, and not very swift. Sides of valley well wooded with poplar. After ascending left bank, camp at a small lake. Have a view down the valley for seven miles to N.N.E., and up the valley for 3½ miles S. by E. Bearings—Flag Staff Hill - - - N. 220° E.
,, 8	13	WNW.	3 to 6.45	Pass over undulating prairie with clumps of poplar, and after 10 miles reached north flank of Flagstaff Hill, which rises as a cone 380 feet above the prairie, and three miles further on encamp by a small lake. Bearings from Flagstaff Hill of two lakes to N. W. end - N. 322° E. ,, ,, E. end - ,, 21° ,, ,, E. Nose Hills (Neutral Hills ?) ,, 109° ,, ,, W. ,, ,, ,, 125° ,,
,, 9	10½	W. by S.		After five miles, from near a lake, Flagstaff Hill bore N. 53° E.
,, ,,	12	WSW.	4 to 7.30	Reach Battle River, and encamp on left bank. From this point Battle River runs with large bends to SE. by E., and after nine miles receives a large tributary from the S.W. called Vermillion Creek, which is said to rise near Bull Lake : and 14 miles further, where it receives Rib-stone Creek from the south in lat. 52° 17′ N., it turns sharply to N. by E. ; which direction it preserves for 22 miles with five large bends to reach our crossing-place of the 7th. As far as the elbow its banks are very ruinous and barren, displaying sections of tertiary and cretaceous strata. Bearings from the Elbow : ,, Neutral Hills - - - N. 105° E. ,, Minetonas Hill - - - ,, 205° ,, ,, Flagstaff Hill - - - ,, 340° ,, Bearing from camp Flagstaff Hill - ,, 105° ,, Depression of valley at this place, 155 feet.
,, 12	16	,,	11 to 4	Cross Battle River for the second time, and make for a range of blue hills to the W. through willow copse. Camp at Lost Eagle Creek, which runs to N.E. to Battle River.
,, 13	5	SW.	1.30 to 3 p.m.	Camp at Beaver Dam Creek, which flows to N. to Battle River.

Date.	Distᵉ.	Course.	Time.	Remarks.
1858. July 14	8	WSW.	8 to 10.30	Through poplar clumps over sandy hills, having to our south bare prairies as far as the eye can reach; to the north hills surrounding Bull Lake, and rising to about 200 feet. Reach "Dried Meat Camp." Bearings from a high hill (*a*) three miles from camp :— „ Camp - - - - N. 290° E. „ N. end Bull Lake - - „ 300° „ „ S. „ - - „ 270° „ 20 miles south of the encampment, a large lake, nine miles by five, lies E. by N., surrounded by flat marshy country, with good pasturage, but no timber. Bull Lake is of quadrilateral form, with long tortuous arms from each corner; it is surrounded by high hills and is 12 miles across. From a conical hill 150 feet high, one mile from S.E. shore (*b*) Bearings—(*a*) Hill above mentioned - N. 79° E. „ E. corner Bull Lake - - „ 11° „ „ N. „ - - „ 337° „ „ W. „ - - „ 292° „ „ S.W. „ - - „ 236° „ From a hill nine miles from camp of 17th, one mile S.W. of lake, (*c*) Bearings—Camp - - - - N. 90° E. „ (*b*) Hill - - - - „ 30° „ „ Island in lake - - - „ 10° „
„ 17	14	W. by S.	3 to 7.30	Encamped S.W. of Bull Lake.
„ 19	13	„	9 to 12.45	Through broken country and across Tail Creek, which flows into Red Deer River at one mile to the south of the track. Pass N. flank of a high hill overhanging Red Deer River, and by which the Blackfoot trail leads out to the prairie. From this hill (*d*) Bearings—(*c*) Conical hill - - N. 30° E. „ (*a*) „ - - „ 20° „ „ W. margin Bull Lake - „ 15° „ „ E. „ - „ 25° „ Red Deer River flows from the south-west with large bends. The reach to the south of the hill is due east for two miles, when the valley changes its course at right angles, and the river flows towards the south. To the S.W. is a range of hills at some distance across Red Deer River, called the Nick Hills, of which Bearings—S. end - - - - N. 210° E. „ The Nick - - - - „ 225° „ „ N. end - - - - „ 233° „
„ 20	8	SW. by W.	3 to 5.30	Pass over a range of low hills with small lakes and poplar thicket. Encamp at Dead Man's Creek, one and a half miles from where it joins Red Deer River. The country to the west of the Dead Man's Creek is very irregular. From a hill 10 miles W.S.W. of camp Bearings—Mouth of Dead Man's Creek N. 34° E. „ (*d*) Hill (W. side of Tail Creek) - - - - „ 45° „ „ Nick Hills (S. end of) - „ 203° „ „ „ (N. end of) - „ 248° „ „ Tho Nick - - - - „ 236° „ „ Two conical hills - - „ 270° „
„ 21	„	SSW.	8 to 11.30	Traverse the Dead Man's Creek and reach the Red Deer River three "points" above, where we cross to the S. side. River deep and swift, immediate banks 120 feet high. Breadth of river at crossing-place, 130 yards.
„ 22	17	W. by S.	10.30 to 4.15	Keep along at the top of the second level of the river at a distance of one mile from the stream. The river banks are 120 to 160 feet high, and on the south side form a high mural precipice of sandstone, which weathers into fantastic forms, with a sparse growth of spruce fir clinging in the crevices. Leaving the river to our right we ascend considerably, and encamp at a small swamp at the base of the Nick Hills.
„ 23	14	SW.	7.15 to 11.15	Make for the Nick, and gaining it by a rapid descent of 310 feet, find it to open into a wide flat valley of great extent, through which flows Red Deer River. To the north it is bounded by the Medicine Lodge Hills, distant 30 miles, and to the south by a high table-land, sending spurs to the north, the most prominent of which is the

Date.	Dist.	Course.	Time.	Remarks.
1858.				
July 23	14	SW.	7.15 to 11.15	Antler Hills. First view of Rocky Mountains, which range from N. 205° E. to N. 245° E. The highest mass subtends an angle of 11′ from its apparent base to its summit. The Nick Hills run N.W. and S.E., and are cut through by Red Deer River four miles N. of the Nick. Cross 10 miles of swampy ground, and halt at Antler Hill.
,, ,,	9	,,	4 to 6.30	Descend a swampy plain, and camp at foot of Hunter's Hill, which forms a high conical mass to N.W.
, 24	16	,,	7.45 to 11.15 and 4 to 5.30	Pass over Hunter's Hill and across a bare prairie, through which winds a deep valley, till we reach the "edge of the woods." Encamped, "Câche Camp."
,, 26				12 miles to N.W., with a considerable descent, leads to Red Deer River, at where it receives Little Red Deer River from S.W., and, 2½ miles further up, Medicine River from N.W. Red Deer River can be forded at this place, and its banks are low, with very rich pasturage. The trail from Edmonton to Bow Fort, crosses it at this place. Country in this neighbourhood exceedingly rich and well timbered along the rivers. From a hill four miles from camp Bearings.—Camp - - - - - N. 74° E. ,, Rocky Mountains (S. end of) ,, 182° ,, ,, Devil's Head - - - ,, 213° ,, Apparent angle subtended by Devil's Head Mountain 21′. "Câche Camp," lat. 51° 52′ 50″, N. long. 114° 10′ 15″ W.
,, 29	15	SE. by S.	9 to 1.30	After passing through willows for a few miles, emerge on the Great Prairies; grass tolerably good; halt at a small lake without wood.
,, ,,	7	,,	4.30 to 6.20	Encamp at Stoney Coulée, where there is very little wood, and a small creek flowing to E.
,, 30	16	,,	12.30 to 6	Over level prairies, broken by slightly elevated ridges. Encamp at a creek flowing to E., having a well-marked hill 5 miles to our N.E.
,, 31	15	S. by W.	5.30 to 7.30 to 12	Course very irregular, owing to a buffalo hunt. Camp at a small creek flowing to E., and said to join Red Deer River; no timber whatever. "Slaughter Camp," 51° 20′ 47″ N., long. 113° 50′ W.
Aug. 3	15	WSW.	10.15 to 4.30	Cross the creek, and continue over bare prairie with undulations rising 200 feet. Camp at a swamp.
,, 4	13	WNW.	8 to 12	Reach a large swampy lake at the foot of a range of hills.
,, ,,	7	,,	3.10 to 5.30	Ascend rapidly, after crossing a small stream which issues from the lake and flows northward, and encamp beside a rocky ravine, which winds through the hills. Depth of this ravine 224 feet. A few rough-bark poplars at this place.
,, 5	4	,,	11.5 to 2.5	Over very broken country, having to cross several high ranges of hills; halt at a small lake.
,, ,,	7	SW.		
,, ,,	7	WSW.	5.20 to 7.40	Reach a wide valley with a stream going to N.W., where there is a hummock of woods known as the "Point of Woods," lat. 51° 21′ N.
,, 6	13	WSW.	2.30 to 7.20	Cross an elevated plateau for five miles, when we come in sight of Bow River; then traverse two deep valleys, separated by ranges of hills, running parallel to the Rocky Mountains, and rising to the altitude of from 600 to 800 feet. By a deep gorge we then pass through a third range, and encamp at the foot of Dream Hill.
,, 7	10	SW. by W.	7.30 to 12	After 3 miles arrive at Dead Man's River, which we cross at the point at which it joins Bow River. Great difficulty in getting the carts along. Follow left bank of Bow River, the valley of which is wide, and occupied by gravel terraces.
,, ,,	7	,,	3 to 6	Continue to follow up the river by a very bad trail for the carts, owing to the numerous steep creeks we encounter. Camp near the site of the Old Bow Fort. Lat. 51° 8′ 46″ N., long. 115° 4′ 30″ W. Abandon the carts.

Start from Bow Fort, August 11th, 1858.

,, 11	6	SSW.	4.30 to 8.45	Follow up left bank of Bow River, and camp at *Lac des Arcs*.
,, ,,	2	W. by S.		
,, 12	3	,,	4 to 6.40	In the 1st range, lat. 51° 1′ 44″ N.
,, ,,	4	NW.		Pass over the "Crate," from Grotto Mountain, and enter the first longitudinal valley. Camp opposite to the "Three Peaks." Lat. 51° 2′ 26″ N.

Date.	Distᵉ.	Course.	Time.	Remarks.
1858.				
Aug. 14	13	NW.	2.15 to 7.15	Keep along the shingle terraces, and camp at Cascade Mountain, where the valley breaks through the 2nd range. Lat. 51° 9′ 18″ N.
„ 17	9	WSW.	9 to 1	The valley is narrow, and the trail confined by rocks at some points. Halt at the angle, where we again reach a wide longitudinal valley.
„ „	8	NW.	4 to 7	Valley much expanded, with the Saw Back range to the east. Cross much soft "muskeg." Camp by the river; good grass.
„ 18	7	WNW.	8 to 11	Through burnt wood. Trail level, and otherwise good. "Moose Camp."
„ „	5	„	4 to 6.30	Trail much blocked with timber. Camp at a small creek under Castle Mount, and opposite to Vermillion Creek.
„ 20	12	SW.	9 to 3	Cross Bow River, 60 yards wide, and up to one's girths; Ascend a steep bank, the piece of a shingle terrace, and then through dense timber, over ground sometimes rather soft, to the height of land, Vermillion Creek being to our left, at first in a deep valley with steep banks of the shingle deposits, but rising from a small clear lake, at the west end of which is a divide of a few hundred yards from the source of the West Vermillion River.
„ 21	6	SW. by W.	8 to 12	Descend the valley of Vermillion River, which is moderately open, but the forest compelling us to cross and recross the stream. Come to where a creek joins it from the west. Halt in lat. 51° 6′ N.
„ „	5	SE.	- - -	Pass the Vermillion plain, about two miles in extent, being in an angle of the valley. Its surface is without grass and wholly composed of yellow ochre. After two miles reach the junction of a large stream from a glacier to the S.W. where the course of the valley changes to S.E. Camp on left bank of river.
„ 22	6	„	8 to 11	Halt at a large stream from the snow mountain to our left (Mount Ball), in lat. 51° 2′ 45″ N.
„ „	8	„	2.30 to 8	Valley gets a little rocky, and much fallen timber, so that after two miles cross the stream to the right bank. Ascend the slope and get into heavy cedar forest. Camp in an "opening."
„ 23	4	SE. by S.	8.30 to 10	Descend again to the river level, as we find we made a mistake in leaving it. Valley opens out very much, and receives a large stream from the N.E. (Simpson's Pass?) The river then changes its course again to S.
„ „	8	SSW.	2.30 to 6.30	High waters of limestone here in the valley at this point forming "The Gorge," but not so closely as to make any difficulty in passing. Beyond this point enter a very wide thickly-wooded valley running N.W. and S.E. Camp at a swamp.
„ 24	4	„	10 to 12	Turn up the wide valley of the Kootanie River, which is wide and spacious, and keep along high terraced levels of shingle. Timber very dense. Lat. 50° 52′ N.
„ 25	8	W. by N.	10.30 to 1.45	Keep up the valley on the high level for some miles, and then descend 300 feet by three different steps to the Kootanie, which is a small sluggish stream winding through a wide bottom of green morass with bluffs of wood. Halt at one of these on south side of river.
„ „	7	WNW.	4.15 to 7	Recross the stream, and pass a large tributary from the N. Camp in burnt woods near a large "muskeg."
„ 26	8	„	9 to 12	Reach two large white mud lakes, very shallow and several miles in extent, from which the Kootanie River takes its rise. Lat. 51° 0′ 37″.
„ 27	6	NW.	9 to 12	The bottom of the valley occupied with soft muskeg, with clear deep lakes and small streams that run in opposite directions. Terraces give way to more irregular slopes on the sides of the valley. Halt at a large creek from a glacier to the N.E. (in Mount Gordier.) Great deposits of moist sand and gravel. Descent of the valley to the N. W. very rapid.
„ „	5	NW. by W.	2.30 to 6	Very rugged. The bottom of the valley too soft, and the side much blocked with fallen timber of large size and lying on the slope. Very hard on the horses. Camp on a beautiful green meadow by the river (Beaver Fort River) which is now large and very swift.
„ 28	4	NW.	9 to 11.30	Halt at a muskeg. Fallen timber very bad; try ascending the side of the mountain to avoid it without success. The terrace deposits much furrowed. Lat. 51° 9′ 30″.

Date.	Dist.	Course.	Time.	Remarks.
1858.				
Aug. 28	2	W. by S.	2 to 4	With great difficulty descend to the river, and camp in a labyrinth of fallen trees by the river.
„ 29	3	NW.	10 to 11.30	Reach a very large stream from the north, above where it joins Beaver Fort, making an angle almost back on its previous course, with a fine fall of 40 feet. Mountains high and precipitous on either side. Down the valley of the combined rivers seems to be confined and rocky. (Kicking Horse River.)
„ 31	3	N. by W.	10 to 1	Cross Kicking Horse River and follow up its right bank.
„ „	2	N. by E.	3 to 4.30	Camp under a high cliff in a cañon like "The Gorge" on Vermillion River.
Sept. 1	6	N.	8 to 12	Valley wide and expanded receives four large branches. Lat. 51° 16′ 30″ N.
„ „	6	NE.	2 to 6	Cross a large branch from the north, and then over a high rocky point, when we enter a profound cañon, the sides of which are nearly perpendicular, and 4,000 to 5,000 feet in height. Camp on the shingle flat that occupies its whole width.
„ 2	3	N.	9 to 10	Follow up the stream over the shingle flats through the cañon to where it ends in a steep heavily-timbered slope.
„ „	7	ENE.	10 to 5	Ascend very rapidly by a rugged trail. In one mile rising 1,000 feet. The stream descends by a series of cascades; very rocky and dangerous for the horses. At last reach more level ground, and passing through open woods camp at the height of land, where there are two small lakes. To the right and left mountains covered with glaciers.
„ 3	6	E.	10 to 12	Through fine open woods in a wide flat valley till reaching a large stream from the west (Noores Creek), which follow down to the Bow River, which we cross. In sight of Castle Mountain opposite the entrance to Vermillion Pass. Lat. 51° 22′ 40″ N.
„ „	2	N.	3 to 4	Pass back into the woods to where we had killed a moose, to save carrying the meat.
„ 4	5	NW.	- - -	Move to the "Stoney" Camp at the base of the mountains on the north side of the valley.
„ 8	6	W.	9 to 11	Return to Bow River opposite to Goat Mount, where there is a large branch issuing from a lake fed by a glacier. Lat. 51° 28′ N.
„ „	6	NW.	1 to 5	Ascend the right bank of Bow River. Stream very small now. Pass round east flank of Goat Mount, and camp on the west side of it.
„ 9	5	„	8.15 to 11.15	Follow up the valley, which rises very fast. Trees soon get stunted and the aspect alpine. After five miles the valley changes its direction. The mountains become higher and more overhanging, and the river dilates into two lakes. Much moraine matter scattered in the bottom of the valley, over which it is difficult to pass. The first lake is small, and has been caused by these accumulations. The second is two miles long, and is closely bounded by precipices along its western shore, except at one point, where a glacier descends through a rugged valley reaching the water's edge. The east shore is flat, and along it we passed to a fine open plain that slopes up from the head of the lake to the height of land. Down this slope a small stream winds, having its origin in mossy springs, the source of the South Saskatchewan. Lat. 51° 40′ N.
„ „	4	N. by W.		
„ „	6	NW.	2.15 to 5.30	The descent to the west very rapid. Keep along the right side of the valley, and then with difficulty reach the bottom by a descent of 1,000 feet, and keep along a large stream (The Little Fork) till it reaches a lake under the mountains on the west side, where we camp. Lake fed by a glacier.
„ 10	8	„	9.45 to 1	Pass two lakes and cross the river three times.
„ „	8	„	2.45 to 7	Keep along the left side of the valley, crossing many debachles of angular breccia, and then cross a heavily wooded point to reach the North Saskatchewan, where we encamp on striking a large pitching trail.
„ 11	6	W. by S.	7.30 to 9	Follow up the right bank of the North Saskatchewan. Channel very wide with large flats of shingle. Reach a point where the river is divided into two branches. After an hour lost in seeking for a trail, follow up the left branch by passing over a high point through dense wood. Halt in an "opening." Lat. 51° 54′ N.
„ „	2	W.		
„ „	2	„	2 to 4	Reached a large lake that completely fills the valley. Had to camp on account of the fallen timber.

Date.	Distᵉ.	Course.	Time.	Remarks.
1858.				
Sept. 12	5	W.	9 to 10.45	Keep along the lake, and at its west end find a flat plain with good grass, where we camp about one mile from the foot of a great glacier which fills the upper part of the valley. Mountains on each side form precipices about 2,000 feet high. Lat. 57° 52′ 16″ N.
				Spend two days on the glacier.
„ 14	8	E. by N.	7 to 9.40	Return to the North Saskatchewan down the glacier lake valley. Then ride four miles up the middle on shingle flats, and back to white mud camp on the main stream, two miles above our camp of the 10th. Lat. 51° 56′ 30″ N.
„ 15	11	„	8 to 11	Keep along right bank of N. Saskatchewan, and find the trail pretty good throughout. After three miles cross the Little Fork at its mouth. Halt at where the valley, which is wide, makes a bend, in order to look for a ford.
„ „	14	E.	2 to 6	Cross the river, which is 130 yards wide and almost too deep to ford. Go very fast along the left side of a very wide valley, through dense woods, till on reaching "Pine Point," where we crossed over a rocky promontory and turned sharply to the north and west four miles along the river on the Kootanie Plain. Valley very much expanded. Saw Back range to the east. Large branch seems to come from the south.
„ 18	14	NNE.	8 to 11.30	Follow the left bank of the river, and after ten miles cross a large branch from the N.N.W. (Wapektelek River), and then we turn down to the E. to cut through the first and second ranges. Lat. 52° 18′ N.
„ „	10	NE.	2 to 5.30	At 4 o'clock, having crossed a rocky point, pass out of the mountains, having been in them 38 days. Follow down the left bank of the river, and camp at a creek from the N.
„ 19	6	„	1 to 3	Pass over broken ground, and reach "Bighorn Creek," where we encamp for seven days. Lat. 52° 23′ 45″ N., mean of four observations. This stream and one from the south drain the valley between the main range and "Brazeau's range."
„ 27	10	E. by N.	10.30 to 1.40	Leave the North Saskatchewan River to our right, and pass over high ground thickly wooded, making for a valley through Brazeau's range, more to the N. than that by which the river passes it, which is very rugged. Reach a very deep clear lake, two miles long and one broad. Halt at its east end.
„ „	5	E.	3 to 4.30	Pass through soft muskegs with light timber, and camp in the valley of the outer or Brazeau's range, where there is a fine prairie, and a small stream commences to flow to the E. (Miry Creek.)
„ 28	10	„	8 to 11.30	Keep along the creek, which increases rapidly in size. Cross it several times. Halt in Lat. 52° 30′ N., when we are again in the open country, but still well wooded.
„ „	13	„	1.15 to 5.45	Follow the creek through dense forest, till after five miles we again strike the river, to reach which we descend 270 feet through a rugged valley, in which "Miry Creek" flows. Follow the river for two miles, and and again strike up the bank into the woods to avoid the bends. Camp at a pine swamp.
„ 29	5	E. by S.	7.30 to 9.35	Through dense woods and long "muskegs" high above the river level. Halt in lat. 52° 26′ N.
„ „	20	E.	12.30 to 5.30	Descend again to the river and keep along it, cutting across the large bends through poplar woods and small prairies. Camp at one of them, where there were old Indian tents.
„ 30	18	E. by S.	9 to 1	Forest much burnt, so that our progress is impeded by the fallen timber. Still keep along the river through a rich flat country.
„ „	17	E.	1.20 to 6	Pass through fallen timber for a few miles, and then reach the fine prairies and poplar bluffs that extend all the way to the Mountain House, which we reached, and encamped in one of the deserted rooms. Lat. - - - - 52° 22′ N. Long. - - - - 115° 10′ W.
Oct. 2	16	E. by S.	- - -	Cross the Saskatchewan and then Clear Water River, and follow the Blackfoot track to Last Hill Creek, where we fell on the Winter track.
„ 3	15	NE.	9 to 11.30	Cross Gabriel's Hill, and halt at the lake of the same name.
„ „	23	E. by N.	1 to 6	Cross Medicine River and Blind River, and camp on the high ground to the east of the latter with some Indians. Dress mow.

Date.	Dist^{e}.	Course.	Time.	Remarks.
1858.				
Oct. 4	20	E. by N.	9 to 1	Pass Gull Lake, and halt at Prince Lake. Great storm.
„ „	8	„	2.15 to 4	Pass over the hills and descend to Beaver River, after crossing which we are obliged to camp.
„ 5	20	NNE.	1.30 to 5	Cross Battle River and Pigeon Creek, which latter we had to swim. Cross the Pigeon Hills, and camp at "Weid Creek."
„ 6	10	N. by E.	8.45 to 11.30	Reach the "Bad Beaver Dam," and get the lat. 53° 5′ N.
„ „	10	„	1 to 6	Horses quite tired with the snow. Camp at north end of "Stoney Plain."
„ 7	20	„	7 to 1	Reach the White Mud Creek.
„ „	5	„	2.30 to 4	Reach the Saskatchewan and swim the horses across to Edmonton, having been in the field three months and twenty-six days.
Start from Edmonton, with two men, an Indian, and three dog sleighs.				
Nov. 26	7	S. by E.	10 to 12	Along the Blackfoot track to White Mud Creek.
„ „	11	„	1 to 3.30	Cross the little plain, and camp in poplars.
„ 27	10	„	7.45 to 10.15	Snow very soft and wet. Halt near the Long Lake. The snow is deeper here than near Edmonton. Pigeon Lake Hills bear W. by S.
„ „	14	„	12 to 4	The swamps and small lakes which we pass at last form a creek, which flows to the south to Battle River, through the wide fertile valley between the Beaver Hills and the high grounds to our right. We now reached a second creek on our right, which rises from Long Lake and flows S.E. also to Battle River. Camp among pines to the west of the track. Broken hilly ground in all directions excepting towards the S.E., where there is an extensive plain.
„ 28	8	S.	8.45 to 11	Follow the west branch of the Blackfoot track over the broken ground. From the top of a high hill over which the track passes— Bearings—N. end of Musquachis Hill - N. 200° E. „ South do. - „ 170° „ „ Direction of Blackfoot track „ 130° „ „ Course back - - - „ 315° „
„ „	13	S. ½ W.	12.45 to 4	Leave the track and strike across the plain to the south end of the Musquachis, where we encamp in thick poplar woods. The grass on the plain very long, which has kept the snow loose, so that it is very difficult to walk upon.
„ 29	10	S. by W.	8.15 to 11.45	Pass through dense thicket, with short openings that are probably swamps in summer, and then descend a good deal into fine prairies with clumps of wood. Halt at some Indian tents (Stoneys). Lat. 52° 46′ 26″ N.
„ „	8	SW.	1.30 to 3.45	Descend by a gentle slope through most inviting country, with long rich pasture standing above the snow till we reach Battle River. In cutting off a bend it makes to the south, cross some broken country, and camp on the north side of a lake that is about one mile in length.
„ 30	10	S. by W.	8.15 to 10.45	After two miles reach Battle River, which is 30 yards wide. Crossing it on the ice, we followed a shallow valley to the S., having Wolf Creek on our right. To the S.E. are hills heavily wooded with poplar, and to the west also high grounds, but which are almost free from wood. Rise rapidly, and halt at the last bluff of wood that we see on our track in the direction we follow. We are following the "Wolf's Track."
„ „	10	„	12.15 to 3.30	Not finding wood on the trail, we struck to the west, and encamped in a bluff sheltered among high hills beside some good sized lakes. From the high grounds can now see the Wick Hills, and the banks of the Red Deer River.
Dec. 1	10	„	7.45 to 11.45	Over high broken ground, and strike Red Deer River just below the mouth of Blind Man River. A stream of good size from the N.W. The bank of Red Deer River 220 feet high, but sloping. Halt in burnt woods close to the stream on the south side. Lat. 52° 18′ 13″ N. Thermometer falls to 37° Fahr.
„ 2	9	SW.	8.45 to 11	Follow along Red Deer River on the ice, which is rough and open at many places from the rapidity of the current. Halt in a splendid "point" of pines on the right bank. Lat. 52° 12′ 36″ N.
„ „	10	W. by S.	12.45 to 3	Still follow the river. Banks now abrupt and very high, and well wooded. Camp at a small creek from the N. From the high ground behind the camp the Antler Hills bear S. E. by S.

Date.	Distᵉ.	Course.	Time.	Remarks.
1858.				
Dec. 3	16	SW.	9 to 12.45	Ice very good. Banks of the river retire, and are more sloping again. Pass the track of a large camp of Indians, who must have passed to the Mountain House a few days before.
„ „	6	W. by W.	7.45 to 3.30	Reach the usual crossing place, just below the mouth of Little Red Deer River; camping about two miles short of where the cart trail comes down on the river.
„ 4	10	W.	7.45 to 10.30	Pass the Edmonton trail, the mouth of Little Red Deer River from the S.W., and two miles further on Medicine River from the north. Fine pine timber along the river; open rich "points" and luxuriant pasture. The snow not very deep here. Lat. 52° 26′ N.
„ „	6	SW.	1.30 to 3.30	River valley much contracted and gloomy-looking from the dark pine woods. Banks commence to exhibit terraces. "Porcupine Camp."
„ 5	9	WSW.	8.30 to 11.15	The river valley is now much wider, and the stream makes large bends, which we frequently cut off by passing through the woods.
„ „	9	WSW.	12.45 to 3.15	The river makes longer reaches now, and we sometimes get a view of the mountains to the West Camp in pines on left bank. Birch trees seen.
„ 6	6	W.	8.45 to 10.15	Many open holes. Fell into the water, so that we had to halt early to make a fire. Lat. 51° 50′ 28″ N.
„ „	13	W. by S.	12.15 to 3.30	Valley open, and river very wide, with many large islands. At 2.30, bearing of "Devil's Head" N. 192° E.
„ 7	4	W.	9 to 10	The river is rising, and bursting the ice at many places, owing to a partial thaw for the last few days. Reach an Indian track from the south, crossing the river. The water is over the ice so much that we leave the river.
„ „	8	S. by W.	10.45 to 1	Very hard work getting up the bank of the river, which is 250 feet high, and heavily wooded, without a proper track for our sleds to pass on.
				On gaining the high level, pass through open country, with only clumps of brushwood. Follow the track, and come up with a party of "Stoneys" on their way to a camp on Little Red Deer River.
„ „	9	„	2.45 to 5	Came to high grounds capped with shingle terraces covered with pines. The trail then becomes good. Reach the "Stoney" camp (*Chief Samoon's*). Sleep in the tents.
„ 8	5	SE.	9.15 to 11.30	Descend rapidly to the south through fine open timbered country, till reaching the valley of Little Red Deer River which we turn up.
„ „	4	E.		
„ „	11	W. by S.	1.15 to 4.15	Reach Little Red Deer River, and descend on to the ice, when we camp in pines on the right bank.
„ 9	10	WSW.	8.30 to 11.30	Little Red Deer River is here a very small stream, not more than 10 yards across, flowing through a narrow but profound valley, with steep and often precipitous banks, from 200 to 600 feet in height. Halt in lat. 51° 29′ 28″ N.
„ „	8	„	1.15 to 3.30	Pass a large branch from the west, and camp in pines on the right bank.
„ 10	6	„	9 to 4.15	Reach the source of Little Red Deer River by a short turn to the south. It is in lat. 51° 21′ 40″ N. We then entered a wide valley, with several large lakes and extensive swamps. Soon we came to streams flowing to the south, of which we crossed several. The pasture is rich, but wood only grows on the hill sides, which now may be called mountains. The outer range through which we had passed on Little Red Deer River, is about 2,000 feet above the plain which occupies this valley (called Too-mamaske-tai-oo, or Greasy Plain).
	3	S.	Noon.	
	6	S.		
	6	WSW.		
	6	W.		
				Pass through a valley in a range to the west, north of Dream Hill, and reach War-par-oo's Creek, a tributary of Dead Man's River. With great difficulty descend into its valley, and camp. Valley 300 feet deep, but total descent from the mountain valley 700 feet. Our course has been very varied.
„ 11	4	WSW.	9 to 10	Ascend out of the valley, and crossed a flat wooded plain to a small lake near Dead Man's River. Ascended the river for some miles into the mountains without the dogs.
„ 12	5	ENE.	- - -	Return to War-par-oo's Creek, but lower down.
„ 13	10	SE.	9.30 to 4.30	Follow down the stream on the ice for four miles, and
„ „	6	NE.		then by an ascent of 300 feet gain the plain that extends
„ „	8	N.		to the base of Dream Hill, where, after six miles, we fall on the expedition track in the previous summer at the

Date.	Distᵉ.	Course.	Time.	Remarks.
1858. Dec. 13				last camp, before reaching the old Bow Fort. Pass through the valley along the coast trail, which shewed a little in spite of the snow, and then struck North Cut through one of the wide valleys between the parallel ranges, crossing it obliquely so as to gain a ridge, with poplar woods to the east. Camped in these woods.
,, 14	9	N. by E.	9 to 11	Descend rapidly, and come to pine forest, and fall on a track that has been cut through it, wide enough for carts. On reaching Rock Creek, about 10 miles N.W. of the expedition camp on it, camped.
„ 15	7	NNE.	9 to 11	Follow an Indian track, and halt at a large "Stoney" camp. In lat. 51° 25′ 24″ N. Bearings—"Devil's Head" - N. 230° E. „ Valley of Bow river - „ 215° „ „ Dead Man's River - „ 252° „
„ „	8	N. by E.	1.30 to 3.30	After two miles fall on the Edmonton track, which follows the edge of the woods. Camp in a bluff of poplars.
„ 16	12	N.	8.30 to 12.30	Follow the track, which runs along the west side of Edge Creek.
„ „	16	„	- - -	Go on the ice of Edge Creek, which is smooth and good. The stream is 10 yards wide, and winds much, with low banks. After 12 miles leave the creek, and crossing over some high land, strike Little Red Deer River at a large bluff of timber, where there are some old war lodges. Camp.
„ 17	14	NNE.	8.15 to 1.15	Leave Red Deer River to the left, and pass over a high hill, after four miles from which— Bearings—Course back - - N. 160° E. „ Devil's Head - - „ 210° „ „ Medicine Lodge Hills - „ 350° „ „ Valley in Mountains of Red Deer River - - „ 230° „ „ Ki-hi-watchis (*Hawk's Hill*) „ 225° „
„ „	9	„	4.45 to 7.30	Pass over high broken ground, and see the line of woods that runs towards the "Cachi camp." After three miles come to Little Red Deer River again, and descend on the ice. Follow the river, till water all over the ice compels us to camp at the foot of the high bank.
„ 18	6	NE.		Cross over fine rich prairie to the crossing-place of the track at Red Deer River, while the men and dogs follow down Little Red Deer River to the same place, which is just below its mouth. They found it to make a great head to the west, so that the distance was 13 miles. Encamp in the Big Pine Bluff at the ford.
„ 20	21	NNE.	9.15 to 4.15	Cross Red Deer river, and struck across the willow plains to the North Camp, in a thicket of poplars on a high ridge.
„ 21	10	„	5.15 to 9.15	After eight miles reach Blind Man's River, about four miles above its mouth. Commence to cross the plains of the "Wolf's road," and halt at a small bluff of willows.
„ „	19	„	11.15 to 4	Cross the plains, and camp in the "Big Bluff," having again fallen on our old track.
„ 22	18	N. by E.	4 to 9.30	Cross Battle River, and halt at our camp of the 29th November. Snow 16 inches deep on the level plain.
„ „	18	„	11.15 to 4.15	Camp at our sleeping place on the 28th November.
„ 23	13	„	8 to 2.30	Cross the "Bear's" plain, and at 11 reach the "Black-
„ „	11	N. by W.		"foot track." Halt, because of the cold, three miles N. of our camp of the 27th November.
„ 24	21	„	3.30 to 8	Get to camp of 26th November.
„ „	18	„	12 to 3.45	Arrive at Edmonton, having been 30 days in the field.
Start from Edmonton for Jasper House and the Athabasca River, with three men and four dog sleighs. Provisions for 25 days.				
1859. Jan. 12	19	W. by N.	10.30 to 2.30	Reach the Horse Guard.
„ 13	6	W.	10 to 12.15	Keep along the Lake St. Ann's track for six miles, when
„ „	2	N. by W.		we struck off on the Fort Assineboine trail through the woods. Halt at Sandy Lake, after crossing Sturgeon River.
„ „	18	NNW.	1.15 to 6	Follow Sandy Lake, which is four miles long, and then cross five other small lakes, which form part of the same line. Dense woods all over the country.
„ 14	11	NW. by N.	9.45 to 1.15	Pass through very thick woods, and to the right of Lac La Nun, and commence to find the waters flowing to the north-east, being over the water line of the Saskatchewan and McKenzie river systems.

Date.	Dist^{e}.	Course.	Time.	Remarks.
1859. Jan. 14	11	NW. by W.	3 to 5.30	There having been a party with [*sic*] before us, we have a pretty good trail. At 4·15 cross Pembina River, 80 yards wide, and flowing to the N.N.E. This is the point to which boats can be brought for the portage to Edmonton. Camp among cypress pines.
„ 15	12	„	9 to 12	Pass through woods over a regular country, fine, dry, and high ridges, with intervening strips of swamp land. Halt at noon in lat. 54° 12′ 1″ N. Before halting, we crossed Paddle River, a tributary of Pembina River, about 10 yards wide, flowing N.E.
„ „	9	NNW.	2.30 to 5	Pass through splendid forest of birch and other trees good for timber. Camp at "The Two Creeks."
„ 16	14	„	9.15 to 2.15	Trail very bad, with fallen trees. Cross "Pitcher Creek," and then an open plain, followed by a belt of heavy timber, on passing through which we reach the valley of Athabasca. The valley is as large as that of the Saskatchewan, at Carlton. Very steep bank to descend to gain the river level, where we halt.
„ „	8	W.	4 to 6	By the bends of the river, which is 300 yards wide, consisting of several channels among heavily timbered islands. Reach Fort Assineboine, in lat. 45° 31′ 4″. Only a few ruinous log huts. Once a trading post of the Hudson Bay Company, on a fine plain, on the left bank of the river. Camp in one of the huts.
„ 17	10	WSW.	12.30 to 3.45	Follow up the river, which winds a good deal. Banks 200 feet high, well wooded. River, when in one channel and narrowed, 250 yards wide. Camp in pines on the south side.
„ 18	7	SWSW. =4 miles straight.	9 to 11	Pass several rapids where the ice is much broken.
„ „	11	WSW. =6 miles straight.	12.30 to 3.20	Snow 22 inches deep. The valley is becoming more confined, and the channel freer from islands.
„ 19	12	WSW. =7 miles straight.	9 to 12	Much rough ice, showing that the river is very rapid. Sandstone cliffs at every bend. Valley more open, but at some distance back high hills.
„ „	8	WSW.	2 to 4	Valley again confined. Camp in very fine timber. Rough barked poplar 7 feet in circumference. Also large pines and birches.
„ 20	10	W. =6 miles straight.	9.45 to 12.15	The river now makes long straight ridges with the banks on the south side very high seem to be cutting obliquely through a range of hills running N.E. Cliff of sandstone and coal. Halt on right side of river in very fine wood. Balsam poplar 13 feet in circumference, birch 6 feet, and for the first time saw the silver fir.
„ „	4	WNW.	2.45 to 4	The river much confined by heavily wooded banks. Ice rough, and snow 2 to 3 feet deep, and soft. Camp at right bank, at some old Indian lodges, in sight of McLeod's River, a large tributary from the south.
„ 21	9	W. =6 miles straight.	9 to 1	After two miles pass the mouth of McLeod's River, which is 100 yards wide. Break a sled.
„ „	4	NW.	3 to 4.30	Can see nothing for the snow-drift. Camp on right bank.
„ 22	9	W. =6 miles straight.	10.15 to 1	The snow very deep and soft. River valley open, and much fine land and timber on the first level. Halt to make a caché of a log of pemican. Cut off a bend of the river by a straight course through a willow thicket.
„ „	5	W.		
„ 23	11	„ =6 miles straight.	8.30 to 11.30	Low banks with sandstone ledges : many rapids. Halt in lat. 54° 19′ 36″ N.
„ „	10	WSW.	2 to 4	Valley wide with large flats, round which the river makes long reaches. Camp on left bank, and find Jeffray's name carved on a tree.
„ 24	19	W. by S. =10miles straight.	9 to 12 1.15 to 4.15	River now cuts through high ridges formed of sandstone, at which point the banks are 300 feet high, almost precipitous, and clothed with cypress pines.
„ 25	9	WSW. =6 miles straight.	8.15 to 11.45	Snow soft and wet. High hills to the south of the river. Halt in lat. 54° 12′ 24″ N. Camped here, as the snow is so wet.
„ 26	9	SW. =5 straight.	9 to 12	Snow crusted on the surface. River valley again narrow, with high steep banks.
„ „	11	W.	1 to 4	After seven miles reach "Baptiste's River," a tributary from the west about 90 yards wide. Camp where there had been recent Indian "lodges."

Date.	Dist.	Course.	Time.	Remarks.
1859.				
Jan. 27	18	W. by N. =10 miles straight.	9.15 to 11.45 1.30 to 3.45	High sandstone cliffs along the river, the valley being very wide. Large "silver spruce firs" at our camp.
„ 28	12	W. by S. =7 miles straight.	10 to 12.30	River has rock banks, and the ice is very much broken. After two miles come on the fresh trail of Indians. Send off a man to follow them, and go till we camped on the left bank. Country all around, as seen from the high land behind, is covered with dense forest. Indians (Stoneys) arrive.
„ 29	7	S. =5 miles straight.	9.30 to 11.30	Halt in lat. 54° 10′ 51″ N.
„ „	11	S. by W.	12.30 to 4	After 10 miles come to Dead Man Rapid, and two miles further to Old Man River, a stream from the W. Camp in a muskeg on left bank. River without any decided valley now.
„ 30	10	SW. =7 miles straight.	9.30 to 11.45	Reach the "Grand View." Snow is now much firmer, and not so deep.
„ „	17	SSW. =12 miles straight.	12 to 4	Reach the "Grand Buffon." First ascend the right bank and meet with Iroquois, and then cross to their tents 300 feet above the river on the right bank. Banks of the river terraced here. Fine view of the mountains.
„ 31	20	SW.	8 to 12.15	Descend to the river, and, as there is little or no snow on the ice, go without snow shoes. Banks rocky and irregular. Much open water.
„ „	5	SSW.	2 to 3	Have passed through several outer ranges to-day—have now reached the cac a brulé, where the Athabasca receives Freeman's Creek from the west.
„ „	7	S.	3 to 4.30	Traverse the lake, which is bounded to the west by the first range of the Rocky Mountains, rising 3,000 feet.
„ „	6	„	4.30 to 6	Through the woods to the base of the Roche à Myette.
„ „	5	SW.	6 to 7.30	Skirt the spur of the mountains, which compels us at last to cross the Athabasca River, which is rapid, and with no ice except along the margins: wade through the rapid water three feet deep, 70 yards wide.
„ „	2	S.	8 to 8.30	Through the woods to Jasper House, in lat. 53° 12′ 17″ N., Hudson Bay Company's winter trading post within the first range of Rocky Mountains on left bank of Athabasca. It stands on a large wooded plain. The Assineboine or Snake Indian River joins the Athabasca from the west four miles below the fort.
Feb. 10	10	S. by W.	—	Started with Mr. Moberly into the mountains with three men, crossed a lake into which the river is dilated above Jasper House. Pass under Roche à Jacque, and, recrossing the river, camp among sand-hills, within "Colin's range." The trend of all the longitudinal valleys is N. 125° E., which is also the strike of the strata. The valley of the Athabasca cuts the mountains obliquely, on the whole running N., and only very little to the E. Bearings from camp :— Top of Rochét de Smet - - N. 323° E. Valley of Snaring River - - „ 262° „ N. end of Colin's range - - „ 340° „ Up the main valley - - - „ 142° „
„ 11	10	S.	2 to 6	This is also the bearing for Mount Tekarra. Follow the left side of the valley to where it again changes its direction near the site of Myettes House, where we cross the river just above the mouth of the Malene River, which is said to head with Wapa-techk River on the N. Saskatchewan. Camp about 300 feet above the river. Bearings from a hill behind camp :— Pyramid Mount (subtends an ∠ 12° 20′) N. 273° E. Up Caledonian Valley - - - „ 250° „ Mouth of Myettes River - - - „ 198° „ Up Valley of River Malene - - „ 75° „
„ 12	6	S. by W.	—	Cross over a high rocky point thickly wooded. Halt on the top in lat. 52° 55′ 50′ N., from where bearings : Pyramid - - - - - N. 294° E. Toothlike mount up Caledonian Valley „ 262° „ Two lofty snow peaks up same valley „ 250° „ Mount in angle of two valleys opposite to Myettes House - - - „ 205° „ Mount Le Duc - - - - „ 155° „ Mount Tekarra - - - - „ 73° „

Date.	Distᵉ.	Course.	Time.	Remarks.
1859.				
Feb. 12	11	S.	—	Descend into the valley again, which is very wide, pass "Rock Encampment" and camp near the river of "Prairie des Vaches." Bearings from hill behind camp :— Pyramid Mount - - - - N. 305° E. Myettes House (Mount opposite to) „ 275° „ Mount Tekarra - - - - „ 8° „ Mount Le Duc - - - - „ 170° „ Mount Kerkeslin - - - - „ 119° „ Mount Hardesty - - - - „ 104° „ Up valley - - - - - „ 125° „
„ 13	7	„	—	Follow the river on the ice to the mouth of Whirlpool River, which comes from Mount Brown, and up the valley of which the trail runs to "Boat Encampment." Halt here in lat. 52° 46′ 54″ N. From this point, bearings :— Rochêt de Smet - - - - N. 316° E. Pyramid Mount - - - - „ 306° „ Mount Tekarra - - - - „ 333° „ Mount Hardesty - - - - „ 85° „ Kerkeslin Mount - - - - „ 112° „ From a mount one mile east of this point :— Mount Hood - - - - - N. 179° E. Mount Brown - - - - - „ 181° „ Mount to right of entrance to the valley „ 190° „ Do. to left do. - „ 170° „ Pyramid Mount - - - - „ 300° „
„ „	7	S. by E.	—	Follow the Athabasca, and camp below Mount Kerkeslin.
„ 14	11	S.	—	The men return with Moberly, walk up the river through a precipitous cañon, until it becomes quite a small stream.
„ „	25	N.	—	Return to our camp of the 13th.
„ 15	16	N. by W.	—	Follow down the river on the ice, which is much broken. Above Myette's House, much open water ; have to pass through the woods.
„ 16	20	N.	—	Return to Jasper House. JASPER HOUSE, 3rd Feb. 1859. Bearings :— Roche Miette, distant 4½ miles - - N. 30° E. Point of N. Spur „ 2¼ „ - - „ 350° „ Roche Joe - - - - - „ 305° „ R. Ronde - - - - - „ 320° „ Rochêt à de Smet - - - - „ 235° „ Snake River valley - - - „ 275° „ Pyramid Mount, up the valley of Athabasca - - - - - „ 182° „ Top of Roche à Jacque - - - „ 150° „ Up the valley of Rocky River - „ 112° „ From shoulder of R. Miette :— Le Grand Bas-fond - - - N. 8° E. Top of Rochêt de Smet - - - „ 222° „ Upper end of Lac à Brulé - - „ 12° „ Moon River valley - - - „ 300° „
March 19	—	—	—	Start from Jasper House to return to Edmonton, with two men, Tekarra and Louis Cardinal.
„ „	11	NE.	—	Cross the river and pass round Rochet Miette, and halt at the south end of the lake, travelling with a horse.
„ „	9	„	—	With my dogs follow the lake by the N.W. shore. The ice very smooth and the wind very high. Camp after descending the river 1 mile below the lake.
„ 20	20	„	—	Leave the river, and ride straight to the "Grand Buffon," and wait till the others arrive with the dogs. This is where the horses are to be left with the waggons.
„ „	8	ENE.	—	Follow the river ; camp below the Grand Buffon.
„ 21	6	NE.	—	Still follow the river to where we leave it, ascending the left bank, in order to strike straight through the forest to Lac St. Ann's. Fling away the dog sleigh.
„ „	12	E. by N.	—	Pass through the woods over high ground ; snow very deep. Have to carry the things on our backs. Camp in a thicket of spruce.
„ 22	11	SE.	—	Travel for six hours through "muskegs," in which the snow is deep and soft. Very hard work with the snow-shoes to beat the track, owing to the fallen timber and the loads on our backs. Halt on a high hill overhanging McLeod's River.

Date.	Distᵉ.	Course.	Time.	Remarks.
1859.				
March 22	2	SE.	—	Reach McLeod's River ; 50 yards wide ; high banks.
,, ,,	8	E.	—	Follow the river, which winds very much. Camp on left bank.
,, 23	20	ENE.	—	Leave the river, and travel nine hours, cutting off a large bend it makes to the south. Pass "White Mud Lake," and descend along a small stream, by which we encamp.
,, 24	3	SE.	—	Again meet McLeod's River. Timber very large and fine.
,, ,,	17	E. by S.	—	Follow the river for nine hours, but it winds much, and the snow is very deep and much flooded by water from under the ice. Delayed several times from getting our snow-shoes wet from this cause. Camp on the left bank, after passing a tributary from the S.W.
,, 25	12	E. by N.	—	Still continue to follow the river. Travel 10 hours, but go very slow, as the snow is deep and we are hungry. Pass "Brazeau's Caché," and camp on right bank.
,, 26	18	E.	—	Left McLeod's River, and travelled through dense forests of large trees for 10 hours. After 15 miles came to more open country, with lighter timber. Camp in poplars.
,, 27	10	E. by N.	—	After a few miles strike a stream flowing to the east, and from a hill get a view of the mountains. Bearing of a prominent peak, N. 191° E. Camp where Tekerra kills a moose-deer.
March 1	7	E.	—	Cross several small creeks flowing to the N.E., and reach Brazeau's lob-sticks.
,, ,,	10	,,	—	Cross a large creek, and camp in poplars. The character of the forest is changing much, there being but few pines.
,, 2	9	E ½ S.	—	Through poplars and cypress all day. Very hot and close. The walking very hard work, as the snow shoes are wet. Halt on a high hill, forming a portion of a ridge running N.W. and S.E. It is thickly wooded with poplar. To the north is a range of high hills, probably bounding the McLeod River.
,, ,,	11	NE.	—	Crossing the hill follow down a small stream through poplar thickets, and camp within one mile of Bull-dung Lake.
,, 3	10	E.	—	Travel on the lake to its lower end ; it is about 20 miles long, and 5 to 6 wide ; we struck it half way up the western shore.
,, ,,	25	E ½ N.	—	Follow the stream that flows out of the lake, "Buffalo River," for 15 miles. Leaving it to our right, cross high land, with open timber, and camp in pines, most of the wood here being poplar. Very fine pasture everywhere.
,, 4	15	ENE.	—	After five miles cross Pembina River, about three miles below the mouth of the stream we were on yesterday. The banks of Pembina River are high and steep. Sections of coal on fire. Cross high hills that form the watershed to the Saskatchewan, and halt on an island in Lac des Isles, passing Lac Road three miles to our right.
,, ,,	19	,,	—	After travelling 19 miles altogether on the lake (seven miles before halting and after) we passed through dense pine woods for seven miles, and camped on an arm of Lac St. Ann's.
,, 5	10	SE. by S.	—	Follow a trail : we reached the Roman Catholic Mission early in the morning.
,, ,,	24	E. by N.	—	Rested all day till night. With a train of dogs and a man, which had come to meet me, started at 11 p.m., and got to Edmonton at 8 o'clock on the morning of the 6th, having been in the field eight weeks.

ODOMETER LOG : FORT PITT TO FORT EDMONTON.

Date.	Miles.	Course Back.	Remarks.
1859.			
April 26	3·41	N. 15° E.	French Man Knoll, from top of bank. Up river, 3 pts. dist. 280°.
,, ,,	8·38	,, 75° ,,	Dinner place. Camp in Grand Coulée.
,, ,,	6·97	,, 70° ,,	Up Coulée, 285°. Down Couleé, 180°.
,, 27	7·20	,, 60° ,, 1703 m.	Vermillion River. River flows N. 340° E.
,, ,,	4·06	N. 70° E.	River's bank, 10 miles to north across Willow Plain.
,, 28	1·61	,, 75° ,,	Creek flowing to south.

Date.	Miles.	Course Back.	Remarks.
1859.			
April 28	7·50	N. 75° E.	Blackfoot Hills, 15 miles to S., lying E. and W.
„ „	2·78	„ 85° „	Bluff of woods, west side of Vermillion Hills.
„ „	10·28	„ 85° „	Cross Miry Creek.
„ „	3·42	„ 132° „	Strike the winter track to Edmonton.
„ „	4·61	„ 75° „	Dead Pine Coulée.
„ 29	10·4	„ 55° „	Pine Point Creek is from east lake of the chain.
„ „	6·82	„ 65° „	Chain lakes commence, lying N.N.W. Vermillion River flows to S.E. from second lake.
„ „	11·57	„ 45° „	Black Hill, south side of lakes.
„ 30	7·21	„ 70° „	End of chain of lakes.
„ „	6·28	„ 80° „	Pass the Hairy Hail.
„ „	3·72	„ 75° „	Indian camp at Black Muck Hill.
„ 31	12·66	„ 82° „	Edge of woods.
„ „	0·62	„ 90° „	Hay Creek.
May 1	10·17	„ 75° „	Near la [*sic*] Bois.
„ „	12·44	„ 75° „	Beaver Hill Creek.
„ „	10·11	„ „ „	Blackfoot Creek.
„ 2	14·40	„ 50° „	The Long Swamps.
„ „	1·48	„ 45° „	Old Man's Hill.
„ 3	10·80	„ 30° „	Fort Edmonton.

ODOMETER LOG. Route of Expedition, 1859. Start from EDMONTON, June 11th, along BLACKFOOT TRACK to South.

Date.	Miles.	Course Back.	Remarks.
June 11	6·15	—	White Mud Creek.
„ „	4·20	—	Camp on small plain.
„ 12	13·20	—	
„ „	11·20	—	Pine Creek. Flows from Long Lake to Battle River, S.E.
„ 13	12·01	—	In plain east of Musquackis. Battle River crossing-place.
„ „	10·60	N. 290° E.	Camp 2 miles south of Battle River.
„ 14	16·40	„ 297° „	Red Deer Lake, south end of.
„ 15	9·47	„ 295° „	Bearing of Bull Lake Hills, N. 170° E.
„ „	4·23	„ 290° „	Track of Expedition in advance.
„ „	13.80	„ 380° „	Edge of wood.
„ 16	11·60	„ 280° „	Last wood ridge.
„ „	14·00	„ 300° „	Prairie.
„ „	9·2	„ 310° „	Letter Hills.
„ 17	13·2	„ 310° „	Long Lake Hills.
„ „	9·81	„ 345° „	Edge of Salt Lake Plain.
„ „	8·1	„ 375° „	Salt Lake Creek flows to E. (Ribstone Creek ?)
„ 18	9·1	„ 165° „	
„ „	2·2	„ 185° „	Hand Hills.
„ 24	5·07	S. $\frac{1}{2}$° E.	Swamp. Camp on hill.
„ 29	11·82	N. 315° E.	Lake Camp.
July 6	4·15	„ 295° „	Little Lake Camp.
„ 7	11·3	„ 295° „	Bull Swamp. Lat. 51° 14′ N.
„ „	5·3	E. $\frac{1}{2}$ S.	Pond Creek, running S. by W. Lat. 51° 10′ N.
„ 12	6·0	S. by E.	Camp at swamp.
„ 13	10·6	N. 305° E.	Berry Creek. Lat. 50° 53′ N.
„ „	7·6	„ 315° „	Red Deer River. Lat. 50° 57′ N.
„ 14	5·3	E. by S.	„ „
„ „	14.6	E. & 3′ N.	„ „
„ 15	17·3	N.E.	Valley of Red Deer River. Lat. 50° 59′ N.
„ 16	7·7	SE. by S.	Cross Red Deer River to south side.
„ „	6·4	ESE.	„ „ Lat. 50° 50′ N.
„ 17	23·3	ENE.	„ „ „ 50° 54′ N.
„ 19	13·0	9 S. $\frac{1}{2}$ W. 4 S. by E.	Grizzly Bear Swamp. Salt Lake.
„ „	13·0	2 S. by W., 3 E. by S. 3 S., 5 W. by N.	Rattle-snake Lake.
„ 20	10·3	5 SW. by W. 5 SSW.	Bow River crossing-place.
„ 21	8·5	SSW.	Blood Indian camp at swamp.
„ 24	9·05	„	Swamp.
„ „	4·7	S. by E.	Sandy Hill Creek.
„ 25	13·4	S. $\frac{1}{2}$° W.	Lake in sight of Cypress Hills.
„ „	13·0	6 SW. 6 SSW.	Salt Creek. Flows to N.
„ 26	12·7	S. by W. S. $\frac{1}{2}$ E.	Coulée in Cypress Hills. Lat. 49° 48′ N.
„ „	10·5	W. by N.	Maple Coulée.
„ 28	9·1	SE.	Coulée of 26th. Higher up.
„ „	10·3	S.	Cypress Hills, N. base of
„ 29	4·8	—	Great valley of Cypress Hills.

From top of Cypress Hill, Les Trois Butes, N. 196 E.

Date.	Miles.	Course Back.	Remarks.
1859.			
Aug. 3	8·2	W. by N. & W.	Coulée to N.
„ 4	12·4	W. by W. by S.	Lat. 49° 35′ N.
„ „	10·0	W. by S.	Coulée.
„ 5	16·9	WSW.	49° 25′. Cross the Big Coulée, and reach the springs.
„ „	4·7	W. by N.	Swamp. Bad water.
„ 6	11·8	W. ¾ N.	Halt without water on account of a storm.
„ „	17·2	W.	After six miles Les Trois Butes bear W. 238° N. to W. 222° N. No water.
„ 7	17·4	WSW.	Lat. 49° 47′.
„ „	11·9	WNW.	Marsh. Cabna Camp.
„ 8	9·8	SSW.	Lat. 49° 47′ N. Right side of Belly River.
„ „	5·8	WSW.	Crossing-place of Belly River.
„ 9	8·8	WSW. to S. 46° W.	Lat. 49° 44′ N. No water.
„ „	13·6	W. by S.	Branch of Belly River from the N.
„ 10	8·3	WSW.	Lat. 49° 36′ N.
„ „	10·5	S. by W.	Shooting Belly River. Porcupine Mountains.
„ 11	8·3	SW.	„ „
„ 12	14·3	W.	„ „
„ „	8·1	W.	Kootanie Pass.
			Abandon the carts.

PRAIRIES. From CYPRESS MOUNTAIN CAMP, in Lat. 49° 38′ N.; long. 110° 36′ W. Variation of compass, N. 22° E.

Date.	Distc.	Course.	Time.	Remarks.
1859.				
Aug. 3	15	NW.	—	Return to the expedition camp of the 28th.
„ 4	6	W.	—	Halt at Bull Creek, running to the N.
„ „	14	„	2 to 6	After eight miles cross a large gully, with a stream to the N.E. Then over high plains with poor pasture. Camp at a swamp.
				Bearings from a hill seven miles back:— Cypress Mount Camp - - - N. 90° E. East of the Trois Butes - - „ 175° „
„ 5	14	WNW.	9 to 1	Reach Bow River. It is flowing to the N.N.E. Valley very deep and making three-mile bends alternately to the N. and N.E.
„ „	3	S.	4 to 6	Without reascending to the plain, follow round the river. The valley is only twice the width of the channel, or one-third of a mile.
„ „	4	W.		
„ 6	10	SW. by W.	9 to 12	Follow the river for passing a large pile of stones, being an Indian landmark. Pass over sand-hills, and strike Belly River two miles above its junction with Bow River. Belly River flows N.E. Lat. 49° 42′ N.
„ „	11	NW.	4 to 7	Over high plains. Camp at a swamp.
				Bearing from seven miles back from camp. W. of the Trois Butes. N. 145° E.
„ 7	11	„	9 to 12.30	Plains very level. Halt at a rain-pool, in sight of the Rocky Mountains. To our north, distant three miles, a creek flows to the E.
„ „	8	„	6 to 8	No swamps or permanent water. Camp at a rain-pool.
„ 8	24		6 to 12	Reach a range of hills running to the N.E. Lat. 50° 13′ 5″ N.
„ „	7		3 to 5	Camp at a little lake before commencing the descent of the west slope of the hills.
				Bearings:— Chief mountain (?) - - - N. 211° E. Lodge des Corbeaux (?) - - „ 225° „ Three marked depressions - „ 243° „ „ 244° „ „ 245° „ Most northerly mount visible - „ 255° „ Hills across Bow River, 18 miles distant - - - - - „ 335° „
„ 9	12	„	8 to 12	Descend 700 feet, and cross a wide valley. After nine miles ascend the hills to the west, and halt by a small lake. Lat. 50° 23′ 39″ N.
„ „	7	WNW.	3 to 7.30	Descend to the west of the hills through a valley opening to the N. We then crossed a rolling plain, and camped by a large stream flowing N.
„ „	8	NW.		
„ 10	11	NW.	9 to 12	Reach Bow River, which is flowing E.N.E.
„ „	10	WNW.	1 to 7	Follow along the valley, but descend to the river to camp.

Date.	Distc.	Course.	Time.	Remarks.
1859. Aug. 11	4	W.	8 to 9	Reach the mouth of Ispasquehow River, and find a large camp of Stoney Indians. Bow River flows from the W.N.W. Ispasquehow River from the S.W. Lat. 50° 43′ 8″ N.
„ 13	15	WNW.	12 to 4	Follow up Bow River, and camp three miles above Capt. Palliser's crossing-place, as he went to the boundary line in August, 1858, and four miles below where he crossed as he returned from the mountains in the September of that year.
„ 15	15	„	10 to 2	Cross Pine Creek, and after two miles leave Bow River to follow up Swift Creek, a large stream from the west. Halt in High Hills, Bow River being seven miles north of west. Bearings three miles from camp :— Forks of Ispasquehow River - N. 100° E. Devil's Head Mountain - - „ 247° „
„ „	9	„	5 to 7	Pass over high rolling prairie with willows and fine pasture.
„ 16	13	„	8 to 11.30	Cross a large stream from the S.W., "Tent Creek," and pass over the outer range, which is well wooded. Halt at White Earth Lake, in a deep valley surrounded by mountains 1,000 to 1,500 feet high. Lat. 51° 8′ 19″ N.
„ „	6	NW.	3 to 5	Reach Bow River one mile below the halting-place of the Expedition the day it reached the Old Bow Fort in August 1858. Cross at the "Gooseberry Ford."
„ „	8	WSW.	5 to 7	Reach the Old Bow Fort at the expedition camp of 1858, August 7. From Bow Fort, Bearings:— Valley of Bow River - - - N. 205° E. Kannanaski's Pass - - - „ 173° „ Ford for ditto - - - - „ 197° „ East flank of Earthy Mountain - „ 150° „ 1st nick up Bow River, E. of Pigeon Mt. - - - - „ 207° „ Down Bow River - - - „ 55° „

Rocky Mountains 1859. From Bow Fort. Lat. 51° 8′ 43″ N. Lon. 115° 4′ W. Mag. Var. N. 26° E. Alt. 4,100 feet.

Aug. 17	8	SW.	2.30 to 7	Reach M. Bourgeau's camp, opposite to Pigeon Peak and beside first Bow Lake, in lat. 51° 2′ N.
„ „	6	W.		
„ 18	4	„	10 to 2.15	Pass round the point of Grotto Mountains, and encamp opposite to Precipice Nick, in lat. 51° 2′ N.
„ „	7	NW.		
„ 20	13	„	10.30 to 3	Follow up the valley, and camp one mile S. of Cascade Mountain. Camp in lat. 51° 9′ N. Bearings—Mount Bourgeau - - N. 220° E. „ Simpson's Pass - - - „ 212° „ „ Corner of Terrace Mountains „ 120° „ „ Top of mountain S. of pass to Devil's Head - - „ 35° „
„ 21	10	W. by S.	9.45 to 1	Pass the great swampy lakes, and reach the last year's halting-place at angle of valley in the Saw Back Range. Bearings—Course back - - - N 143° E. „ Mount Bourgeau - - „ 210° „ „ Point of Terrace Mount - „ 70° „
„ „	9	NW. by N.	3 to 7	Pass through the Long Muskeg, and camp at tail of Castle Mount, at the fork of the track to Red Deer River. Bearings—Angle of valley (halting-place) N. 112° E. „ Top of Mount Bull - - „ 215° „ „ Observation Peak - - - „ 270° „ „ S. Peak of Castle Mount - „ 285° „ „ Mount down the valley wither „ 118° „
„ 22	9	WNW.	10 to 1.30	Pass through the burnt wood, and reach old camp at crossing-place to Vermillion Pass at foot of Castle Mount. Bearings—Angle of valley (as above) N. 100° E. „ Vermillion Pass - - „ 225° „ „ Top of Castle Mount, west end - - - - „ 305° „ Altitude of this camp above Bow Fort 373 feet. By observation in 1858 - - - 305 „
„ „	7	„	4.15 to 6.45	Camp in an opening opposite to west end of Castle Mount.

Date.	Dist.	Course.	Time.	Remarks.
1859.				
Aug. 23	7	NW. by W.	8.30 to 10.45	Camp in burnt woods on a creek from the N. of Castle Mount, opposite to a nick for Red Deer River, in lat. 51° 19 N. Bearings—S. edge of Castle Mount - N. 93° E. „ Angle of valley at Simpson's Pass - - - - - „ 106° „ „ The Knob - - .. - „ 111° „ „ Mount to east of Vermillion Pass - - - - „ 138° „ „ Top of Mount Ball - - „ 136° „ „ Top of Observation Peak - „ 247° „ „ Mountains to W. of Kicking Horse Pass - - - „ 285° „ „ Goat Mount up Bow River „ 300° „ „ Up Pipestone Pass - - „ 310° „ „ Nick for Red Deer River - „ 340° „
„ 24	7	„	7.45 to 10.15	Camp at the creek by the rock four miles from lat. stat. in 1858, Sept. 6th, 51° 22′ N., and nearly opposite to Observation Peak. Bearings—Top of Mount Lefroy - N. 157° E. „ Top of Observation Peak „ 190° „
„ 25	5	„	7.30 to 12.20	Cross Pipe Creek, and then follow the valley until we meet the creek again where it emerges from a gorge into the great valley.
„ „	7	N.		Bearings—Top of Mount Richardson - N. 75° E. „ Sharp Peak up the valley - „ 25° „
„ „	8	N. by W.	4 to 6	Camp on left bank of Pipe Creek, opposite to a wide valley, up which is Mount Molar. Bearings—Observation Peak - - N. 175° E. „ Sharp peak, as before - „ 150° „ „ Earthy Mount, Baptiste's Range - - - - „ 200° „ „ Mount Molar - - - „ 300° „ „ Nick before us - - - „ 350° „ „ Nick from the valley to Red Deer River - - - „ 85° „
„ 26	5	NNW.	7.30 to 9	Follow up Pipe River in a valley two to three miles wide; open woods.
„ „	5	NW.	10 to 11.30	Camp at a cascade in left side of Pipestone Valley, before a sudden rise to the height of land. Bearings—Up the valley - - - N. 280° E. „ Down ditto - - - „ Lat. 51° 38′ N. Altitude [*sic*] feet.
„ 27	15	NW. by W.	10 to 3	Ascend rapidly six miles to the height of land, which is above any vegetation, then for five miles descend gently along a wide valley far from wood, and then in three miles make a rapid descent into the valley of Sifleur River, flowing to the North Saskatchewan.
„ 28	11	„	9 to 1 3.40 to 6	Descend Sifleur River through a densely timbered valley, cross it below where it receives a large branch from the S.W., and encamp at the base of cliffs 2,800 feet high, on its left bank, where it emerges into the valley of the North Saskatchewan opposite to the Kootanie Plain. Bearings—Left angle of valley - - N. 265° E. „ Right ditto - - - „ 355° „ „ Up a nick to Clear-water River - - - - „ 110° „ „ First point in Saw Back Range - - - - „ 137° „
„ 29	10	N. by W.	9.30 to 2	Pass through the dense woods that clothe the flat bottom of the valley of the North Saskatchewan; strike that river opposite to the Kootanie Plain camp in 1858.
„ 30	6	SSW.	8.15 to 10	Follow up the river, and camp opposite to Pine Point, where the course of the river changes from the W.; in lat. 51° 58′ N; long. 117° 2′ W.
Sept. 2	5	WSW.	—	Pine Point Ford. Right bank of river.
„ 3	8	W. by N.	2.30 to 5.30	Follow along right bank of river, and camp at the crossing-place in 1858.
„ 4	12	W. by S.	8.40 to 1.40	At noon cross the Little Fork, and halt at the white mud swamps, in lat. 51° 54′ N.
„ ..	3	..	4 to 6.30	Pass the branch from the Great Plain, and follow up the Middle Fork, encamping opposite to Mount Forbes.

Date.	Distᵉ.	Course.	Time.	Remarks.
1859. Sept. 5	9	S. by E.	8.40 to 11	Cross and recross the Middle Fork through a wide deep cañon, and halt at where it divides into two branches. Bearings—Down valley of Middle Fork N. 225° E. „ Nick for Blaeberry Pass - „ 120° „ „ „ for the Long Glacier - „ 225° „ „ „ for the West Glacier - „ 260° „ „ Mountains to left of valley - „ 290° „ „ Mountains between the forks „ 240° „ „ Mountains between glacier and Blaeberry Pass - „ 195° „ „ Mountains up Blaeberry Pass „ 220° „
„ „	4	W. by S.	3 to 6	Follow up the west of the two creeks, first across great shingle flats, and then through dense woods, when we encamped in an opening caused by a slide of stones from the mountain above us, which had swept away the timber. Walk up the valley for six miles, and find its upper part occupied by an immense glacier, extending S.W. by W. for at least eight miles further, when it descends from lofty pinnacled mountains. Return to the camp on the slide by noon, and find the lat. 51° 46′ N. Bearings—Up the glacier valley N. 210° E. „ Peak up West Fork „ 290° „ „ Mount Balfour „ 57° „ „ Blaeberry Nick „ 35° „ „ Mount at our camp „ 155° „
„ 6				
„ „	4	ENE.	1 to 2.30	Return to halting-place of previous day.
„ „	6	SSE.	3 to 5.30	Follow up a small stream through the Blaeberry Nick, through a flat well-wooded valley, after passing a glacier to our right.
„ 7	5	„	—	Keep along the right side of the valley, till, reaching a large stream flowing through a rock chain from a glacier, we make a rapid descent to the bottom of the valley to where that stream joins the Blaeberry Nick.
„ „	4	S. by E.	4.15 to 6.45	Cross and recross the river repeatedly, and encamp on a small gravel point.
„ 8	4	S.	9 to 11	Pass over a rocky angle on the right side of the valley; halt at the first place. Lat. 51° 40′ N.
„ „	4	S. by W.	2.15 to 4	Cross a stream from the east, and at 3.30 one from the west, which was seen to rise in a large glacier. Cross over a large bas-fond on the east or left side of the river, where the valley is much expanded. Bearings—Mount Balfour - - N. 345° E. „ Up the valley to N.E. - „ 100° „ „ Down the valley - „ 155° „ „ Mount on left side - „ 170° „ „ Mount on right side - „ 205° „
„ 10	4	„	10 to 3.30	Pass over another rocky angle in the valley, and camp at the base of high cliffs.
„ 11	7	S. by E.	7 to 10.30	Pass through a rocky cañon into a wide valley, lying N.W. and S.E., the upper end of which is occupied by a large glacier, sending a tributary to Blaeberry River, which flows through great shingle flats.
„ „	9	SSE.	1.30 to 4	Follow the river, and cross where it makes a bend to the right, to escape through a cañon from the wide valley before mentioned, and emerge on an extensive flat, where we encamped.
„ 14	15	S.	—	Pass through a cañon to the S.W., and over shingle flats in a very wide valley, which runs N.W. and S.E. This is the valley of the Columbia River, but a low range of hills has to be passed before we reach that river itself. Camp at the commencement of the gorge through these low hills. Lat. 51° 30′. Course back, N. 360° E.
„ 16	3	S. by E.	—	Cross to the right bank of Blaeberry river, and pass over high rocks, till on meeting a bas-fond we halt to search for the best way to reach the Columbia.
„ 17	2	S.	7.30 to 8.30	Reach Columbia river, and follow it down for a mile. Lat. 51° 25′.
„ „	1	NW.		Bearings—Down Columbia valley - N. 290° E. „ Nick to the W. - - „ 270° „ „ Block of Mountains to N. - „ 300° „ „ N. side of Blaeberry valley - „ 10° „ „ S. ditto ditto - „ 67° „ „ Sharp peak of the valley - „ 102° „ „ Nick to the left up the valley „ 125° „ (Kicking Horse River.)

Date.	Distᶜ.	Course.	Time.	Remarks.
1859.				
Sept. 18	10	SE.	9.30 to 4.30	Pass through extensive swamps up the valley of the Columbia. The river sluggish, 100 yards wide.
„ 19	6	SE. by S.	10 to 3	Through swamps at the base of high banks. Woods very dense. Camp close to the river.
„ 21	6	SE. by E.	11 to 4.30	After three miles cross Kicking Horse River, a large rapid stream, 60 yards wide, almost too deep to be forded. Follow along the margin of large lagoon-shaped lakes. Camp at the end of them.
„ 22	5	SE.	9 to 12	Ascend the side of the valley, to avoid the swamp in the bottom. At noon, in lat. 51° 14′ 49″.
„ „	6	„	2.15 to 4.45	Camp at a mountain torrent from the east. Bearings—Sharp Peak - - N. 325° E. „ Down the valley - „ 125° „
„ 23	7	„	7.30 to 10.30	At noon in lat. 51° 9′ N.
„ „	6	„	2.45 to 5.15	After crossing a small creek, follow the margin of a long crescent-shaped lake.
„ 24	5	„	8 to 12	Through very dense woods.
„ „	3	„	3 to 4.15	Camp on a spot of dry ground between a swamp and the river.
„ 25	6	„	—	Edge of a swamp, lat. 51° 2′ N. The river valley has here a flat bottom several miles wide, and occupied by swamps, through which the river winds in a distinct channel bounded by natural levées.
„ „	4	„	2.30 to 5.30	Wade through swamp all the afternoon, and camp on a narrow levée, which forms the bank of the river.
„ 26	5	„	8.30 to 12	Ascend the side of the valley to avoid the swamps; pass over very broken ground.
„ „	4	„	3.30 to 6	Encamp at a creek on the side of the mountain, 600 feet above the valley; fine open timber, but very rugged gullies to pass.
„ 27	4	„	8.30 to 12.30	Pass again through great swamps. Encamp by the edge of a small lake.
„ 28	7	SSE.	10 to 3.40	Break through the heavy timber, with soft ground all dry. Encamp in a muskeg, within hearing of a great waterfall on the other side of the valley: valley here changes to nearly a N. and S. direction.
„ 29	8	„	9.30 to 12.45	After crossing a large creek from the east, pass through poplar woods, and then swamps, till we come to open timber on terrace levels, where we fell on a well-marked trail, which seems to enter the valley by the creek we have just crossed.
„ „	10	„	—	Along the trail, and pass several old Indian camps.
„ 30	5	„	8.30 to 10	Halt beside the river, in lat. 50° 47′ N.
„ „	16	„	1.30 to 6	Cross several large creeks which have deep valleys channelled out of the shingle deposits. Track good and firm.
Oct. 1	13	„	8 to 11.30	Continue through open timber and bunch-grass plains. Halt half way up the Lower Columbia Lake, in lat. 50° 29′ N.
„ „	12	S. ½ E.	3.30 to 6.30	Trail more rocky and uneven. Camp at a small creek, one mile from the end of the Lower Columbia Lake. Bearings—Up valley - - N. 138° E. „ Down valley - - „ 340° „
„ 2	12	S.	7.45 to 11.15	Pass through fine open timber till we reached the upper lake, which is a fine sheet of water six or eight miles long, and bounded to the E. by rocky precipices, over which the track passed. This place is very dangerous to the horses. The west side of the lake is level, and in the mountains opposite a wide valley runs off to the S.E. Halt at the source of the Columbia, in lat. 50° 7′ 35″ N. Bearings—Valley to the west - - N. 225° E. „ Valley of Kootanie River, right side of - - - „ 165° „ „ Left side of - - - - „ 140° „
„ „	2	S.	—	Pass over a flat of open pine timber and reach the Kootanie River, below the cañon by which it enters the wide valley, which is continuous with that of the Columbia River, and through which it flows to the S.S.E.
„ „	6	„	4 to 6.30	Cross the Kootanie River, and pass through splendid open forest, and camp at several miles distance from the river.
„ 3	12	„	8 to 11.45	Lat. at noon, 49° 50′ N. Bearings—Back to Columbia Lake - N. 328° E. „ West side of - - - „ 320° „
„ „	6	SSE.	3 to 4.30	Pass along the high banks of the Kootanie, over level terraces, and through splendid open timber. Camp with Kootanie Indian "Aleck."

Date.	Distᵉ.	Course.	Time.	Remarks.
1859.				
Oct. 4	14	SSE.	10 to 1.45	Open level plains. Reach the great Kootanie Camp (Mitchell's), or the crossing-place to Choe-coos Track to Colville. Lat. 49° 36′ N. Bearings—Angle of mountain range up valley - - - N. 345° E. „ Course back - - - „ 315° „ „ Sharp peak to the E. - „ 60° „ „ Angle of range to S. - - „ 100° „ „ Nick for Kootanie Pass - „ 107° „ „ Mountain S. of Tobacco Plains - - - - „ 122° „ „ Wooded mountain down valley to W. - - - „ 153° „ „ Up the source of Choe-coos Creek - - - - „ 185° „
„ 5	9	„	—	Travel along with the Indians.
„ 6	11	„	8.40 to 11.50	Lat. 49° 24′ N.
„ „	8	„	2.20 to 5	Camp close to the river.
„ 7	4	SE.	—	Cross Elk River, and reach the point where the track leaves for the Kootanie Pass.
„ „	16	S. by E.	9.30 to 1	Cross the tobacco plains, and reach the Kootanie trading post. Bearings—Co. back to lat. of 6th - N. 320° E. „ Valley of Elk River - - „ 340° „ „ Kootanie Pass - - - „ 350° „ „ Boundary Line Hill - - „ 300° „ „ Down river valley - - „ 185° „ „ S. Kootanie Pass - - „ 75° „ Kootanie River flows past the trading post to S. The mountain ranges four miles distant to the last, SSE. ½ S.
„ 8	6	SSW.	3 to 5	Camp on a small creek in the [*sic*]
„ 9	10	S. ½ W.	10 to 3.45	Continue along left side of Kootanie River.
„ 10	6	S.	8.20 to 11.30	Indian camp. Lat. 48° 40′ N.
„ „	3	WSW.	3.30 to 5	Old camp in an "opening."
„ 11	12	S.	9 to 1	Reach first crossing-place, where the river changes its course at right angles. Very deep, with rocky banks. Swim the horses.
„ „	5	W.	4.30 to 6	Camp on a long point. Good grass.
„ 12	5	W. & N.	10 to 11.30	Reach first wide valley. Lat. 48° 30′ N.
„ „	6	W. by S.	2 to 5	Reach second wide valley. Trail very rocky.
„ 13	6	WSW.	7.30 to 11	Halt below the great falls. Lat. 48° 25′ N.
„ „	7	WNW.	3 to 5.30	Pass through the second great valley, and cross in the third.
„ 14	16	NW by W.	8 to 5	After two hours cross a creek from the N., and then over high terraces along the valley. Camp at a small creek, 300 feet above the river.
„ 15	11	WSW.	8 to 12	Reach the second crossing-place, at Paddler's Lake. Indian camp. River flows N.N.W. from this point. Cross, and go two miles S. to that side of the lake.
„ 16	12	S.	7.30 to 12	Ascend the valley of a creek from the S. through fine open woods. Source of both streams in a long swamp.
„ 17	6	S. by E.	9.15 to 12.15	In dense woods, much obstructed; then through fine open timber to a very large stream, flowing S.E.
„ „	6	„	3 to 6	Cross the stream, and push on through pine forest, and camp at last without food for horses.
„ 18	3	S.	8 to 9	Reach Kullespelme Creek, which is large, and bounded to the S. by granite hills. E. of this point it dilates; to the W. runs as a long arm only two miles wide.
„ „	6	W.	3 to 4.30	Follow the margin of the lake past several points and round bays to near its W. end. Camp on the shore.
„ 19	10	NNW.	8 to 11	Follow the right bank of the Flathead River, or Clark's Fork, to where we thought the crossing-place should be. Indians arrive, and help us to cross. It is a long swim for the horses, but the stream is sluggish.
„ 20	21	S.	8 to 2	Leave the Flathead River, and pass through fine open woods to the S.
„ „	10	SSW.	4 to 6.30	Reach the Little Spokane Plain, which is 20 to 30 miles long, and 15 wide. Skirt the W. side of it, and camp without water.
„ 21	8	SSW.	7.45 to 10	Reach Plant's House, a farm on the Spokane or Cour d'Alene River.
„ „	12	NNW.	—	Camp on the Spokane River, near the old fort.
„ 22	15	NW.	—	Cross the Spokane River where it joins the Cour d'Alene River, and follow it down on the right bank.
„ „	7	„	4 to 6	Cross over a high mountain, and camp at a place called the "Springs," near where the trail joins the military road.
„ 23	6	N.	—	Ride on in advance of my party to Fort Colvile on the Columbia, following the military road. Reach Colvile at dark, having ridden from daylight, 10½ hours.
„ „	7	W.	—	

TABLE of ODOMETER DISTANCES between ST. PAUL and FORT GARRY.

Circumference of wheel - - - - - $13\frac{8}{10}$ feet.
Revolutions per mile - - - - - 382·609

Taken by Mr. W. E. Smith, of Fort Ridgley and South Pass, U. S. Exploring Expedition.

Reading of Odometer.	Place.	Distance in Miles.
0·0.	Saint Paul to	
3,600.	Saint Anthony Falls	9·40
10,930.	Anoka, at crossing of Rum River	28·56
29,480.	Saint Cloud, at crossing of Mississippi River	77·05
39,130.	Richmond, at second crossing of Sauk River	102·27
51,270.	Crow River, crossing	134·00
57,250.	Chippewa River, crossing	149·63
59,590.	White Bear Lake	155·74
66,291.	Little Chippewa River	173·26
69,330.	Rapid River, crossing	181·21
72,960.	Pomme de Terre River, crossing	190·69
78,600.	Lightning Lake	205·43
84,500.	Ottertail River, crossing	220·85
93,260.	Graham's Point, Red River, crossing	243·75
97,619.	Wild Rice River, crossing	255·14
103,271.	Cheyenne River, crossing	269·91
110,365.	Hemlock River, crossing	288·45
133,192.	Goose River, crossing	348·11
162,924.	Salt River, crossing	425·82
178,350.	Pembina River (at its junction with Red River)	466·14
183,120.	" "	478·61
189,350.	Scratchan River, crossing	494·89
201,720.	Stinking River, crossing	527·22
205,220.	Fort Garry	536·37

TABLE of ODOMETER DISTANCES between FORT GARRY and FORT PITT.

Circumference of wheel - - - - - $14\frac{75}{100}$ feet.
Revolutions per mile - - - - - 315·22388

Taken by Mr. W. E. Smith, of Fort Ridgley and South Pass, U. S. Exploring Expedition.

Reading of Odometer.	Place.	Distance in Miles.
0·0.	Fort Garry to	
2,156.	Sturgeon Creek	6·84
7,310.	White Horse Plains	23·19
22,146.	Small stream, course north	70·25
29,560.	Small creek, course north	93·77
49,300.	Rapid River, crossing	156·39
67,650.	Eagle River, crossing	214·60
71,620.	Assineboine River, crossing	227·20
72,910.	Fort Ellis	231·29
79,130.	Cassell River, crossing	251·02
126,330.	Touchwood trading post	400·76
164,800.	Long Creek, crossing	522·80
167,190.	South branch, crossing	530·10
178,400.	Eagle Mountain River, crossing	565·95
184,400.	North branch, crossing	584·98
217,550.	Hudson Bay Company's post, N. side of Jack Fish Lake	690·08

No 8.

Astronomical Observations.

Preface.

The map that has been prepared by Dr. Hector of the country explored by the expedition in the years 1857-8-9, is founded on the appended astronomical observations which were taken by the different members of the party, but chiefly by Mr. Sullivan, on whom also principally devolved the labour of computation.

The instruments furnished to the expedition were as follow :—

Three eight-inch sextants; 2 pocket sextants; 2 mercurial horizons; 1 glass horizon; 3 prismatic compasses; 3 pocket watch-chronometers, pocket compasses, spirit levels, barometers, thermometers, &c.

I. *Latitudes.*—The latitude was obtained if possible every day when on the march, either by meridian altitude of the sun, reduction to the meridian, double altitudes, or at night by stellar observations.

II. *Longitudes.*—The chronometers furnished from Greenwich observatory for the use of the expedition were of the best construction, but being necessarily exposed to much rough usage, they very soon lost that uniformity of rate on which alone depends their value for determining longitudes. When the party reached New York, the chronometers were placed in the hands of a maker to have their rates again compared with those furnished with them when issued from the observatory. Again, upon our reaching Fort William, situated on the North shore of Lake Superior, from the longitude of that plan having been determined exactly by the Admiralty survey, it afforded a still later point for comparison, and with very satisfactory results, as the longitude observed by means of our chronometers differed only $1\frac{1}{2}$ miles from the true position.

When the party commenced to travel on horseback, in July 1857, the continued jolting soon caused the rates of the chronometers to vary largely, and after a short time only one of them could be used daily for the purpose of determining the longitude, and even that one failed before reaching our winter quarters at Fort Carlton.

During the second and third seasons' explorations, the chronometers were only used to measure short intervals of time in the determination of longitudes by "lunar distances."

The longitude was obtained by this method whenever practicable, but as it required a halt of a few days to get the requisite series of observations, and this was often impossible, at the time when the moon was in favourable position, the total number obtained was small.

When stationed for some length of time during the winter seasons at Forts Carlton, Edmonton and Rocky Mountain House, their longitudes were determined by myself and Mr. Sullivan with considerable accuracy, by the average of a large series of lunar distances. At several other places fair averages were obtained, and the longitudes given for the following stations may be considered as the most reliable :—

Fort Ellice.	Site of Old Bow Fort.
Elbow of South Saskatchewan River.	Stray Camp, Kootanie River.
Fort Carlton.	Source of Columbia River.
The Wich-que-tin-ach.	Fort Edmonton.
Dried Meat Camp.	Rocky Mountain House.
Cache Camp.	Hand Hills.
Slaughter Camp.	Cyprés Hills.

The exact determination of these stations served as checks in the construction of the map, being used as centres from which the different routes followed have been plotted off, the intermediate longitudes having been derived by carefully kept itineraries, checked in turn by the frequent observations for latitude and compass variation.

During the last season's exploration, an odometer for attaching to the wheel of one of the carts and measuring the distance travelled by recording the number of revolutions was obtained from a party of Americans, and used until the carts were abandoned at the base of the Rocky Mountains. It proved of great use, and in addition to our own trails measured by this instrument, the American party, who were adventurers bound for the Fraser River gold mines, also furnished us with their own observations taken as they travelled between St. Paul's and Jack Fish Lake, near Fort Pitt. These observations are appended, and the route that they refer to has been laid down on the map.

The sextants and other instruments, excepting the chronometers and mercurial barometers, proved serviceable on the whole, notwithstanding the rough usage they experienced from unsuitable means of transport. Minute care was taken on every occasion when using them that no cause of error arising from the rough motion, should be overlooked, such for instance as the frequent and large alteration of the "index error" of the sextants.

The observations themselves were carefully registered in such a manner that the data have been preserved in case that for any reason it may be thought desirable to have them recomputed.

The tables hereto appended consist of:—

I. The results of astronomical observations, as they have been adopted in constructing the map. (Every place where an observation was made appears in this table, sometimes the latitude and sometimes the longitude, being the result that was obtained, but in some cases both entries are the average results of a series of observations.)

II. Record of observations for longitude.

III. Record of observations for latitude.

IV. Record of lunar distances.

V. Record of observed compass variations.

VI. Table (inserted for comparison) of observations made by Colonel Lefroy, of latitude, longitude, and variation of compass, in Ruperts Land, in the years 1843-4, and furnished by him to the expedition before it left England.

VI. Series of observations made by Mr. Sullivan at Fort Edmonton upon the comet that was visible in September and October 1858.

It may be stated in conclusion that with regard to the general geographical features of the country, we derived great assistance from Arrowsmith's map of British North America, and that we had very frequently cause to admire the singular felicity of judgment with which that geographer had sifted the evidence concerning the geography of localities, when the only information at his command must have been derived from report.

JOHN PALLISER, Captain.

I.—RESULTS of ASTRONOMICAL OBSERVATIONS as adopted in constructing the Map.

Date.	Locality.	Lat. N.	Long. W.
1857.		° ′ ″	° ′ ″
June 13	Fort William, H. B. C.	48 24 5	89 24 50
„ 21	Trembling Portage	48 30 0	89 58 48
„ 22	Dog Portage (W. end.)	48 45 0	89 53 45
„ 22	Dog Lake (S. shore)	48 46 11	89 45 0
„ 23	Dog River (right bank)	48 55 0	89 53 48
„ 24	Prairie Portage	48 56 16	89 45 0
„ 25	Savannah Portage	48 53 0	90 13 46
„ 26	Barrier Portage	48 45 0	90 50 24
„ 27	French Portage	48 40 0	91 11 32
„ 29	Camp Portage	48 25 0	92 27 28
„ 30	On the route	48 27 0	92 30 4
July 1	Fort Frances, H. B. C.	48 36 15	94 33 33
„ 2	La Pluie River	48 47 18	93 59 0
„ 3	Ditto	48 59 0	94 14 19
„ 4	Portage de Bois	49 26 0	94 48 7
„ 4	Lac de Bois	49 33 45	94 48 0
„ 5	Winnipeg River	49 55 0	94 45 30
„ 6	Ditto	50 15 0	95 17 19
„ 6	Ditto	50 21 58	95 50 0
„ 10	Lake Winnipeg	50 33 46	96 33 56
„ 11	Ditto	50 23 0	96 30 25
„ 16	Upper Fort Garry	49 52 6	96 52 27
„ 22	Prairie	49 28 43	97 0 0
„ 25	Post on Boundary Line near Pembina.	48 59 12	96 46 13
„ 28	Prairie	48 52 0	97 17 29
„ 30	St. Joseph	—	—
Aug. 1	Prairie	49 6 53	97 56 0
„ 1	Ditto	49 10 0	98 10 39
„ 2	Ditto	49 7 47	98 20 0
„ 2	Ditto	49 8 0	98 33 45
„ 3	Ditto	49 8 0	98 47 15
„ 4	Ditto	49 8 0	98 48 24
„ 4	Ditto	49 4 0	98 50 0
„ 5	Ditto	49 0 32	99 1 25
„ 5	Turtle Mountain (E. Flk.)	49 0 0	99 16 50
„ 7	Ditto	49 6 0	99 21 43
„ 12		49 36 3	100 5 0
„ 14	Prairie	50 4 20	101 10 0
„ 17	Fort Ellice, H. B. C.	50 24 28	101 48 0
Sept. 11	Prairie	50 23 40	102 10 0
„ 13	Qu'appelle Lakes (12 miles S. of).	50 20 0	103 45 45
„ 18	Prairie	50 26 26	106 30 0
„ 19	Ditto	50 27 59	106 50 0
„ 20	Ditto	50 41 45	107 10 0
„ 22	Saskatchewan (elbow of the S. Branch).	51 1 24	107 37 30
„ 27	Saskatchewan (S. Branch)	50 52 48	107 41 7
Oct. 3	Red Deer Lakes (6 miles N. of).	51 23 45	107 32 0
„ 3	Red Deer Lake	51 20 0	107 32 15
„ 4	Prairie	51 40 0	107 37 51
„ 4	Ditto	51 45 16	107 32 0
„ 5	Ditto	52 3 7	107 21 0
„ 5	Ditto	52 5 0	107 0 5
„ 6	Ditto	52 12 0	106 51 0
„ 7	Ditto	52 31 40	106 30 0
	Fort Carlton, H. B. C. (Winter 1857–8. Astro. Station.)	52 52 30	106 15 39
1858.			
June 21	Eagle Hills	52 17 59	107 28 15
„ 21	Eagle Hills (3 miles S. of the Lizard Lake).	52 16 0	107 28 16
„ 22	Eagle Hills, Stoney Lake	52 14 0	107 35 4
„ 23	Prairie	52 14 37	108 11 33
„ 24	Ditto	52 16 0	108 27 27
„ 25	Ditto	52 21 0	108 44 25
26–7	Wiquatinow (valley of)	52 28 39	108 52 7
July 2	Prairie	52 30 0	109 2 30
„ 4	Ditto	52 34 25	109 23 45
„ 8	Ditto	52 36 0	110 23 45
„ 8	Battle River (1st crossing of)	52 35 39	110 50 7
„ 10	Ditto (2nd ditto)	52 28 23	111 29 45
„ 14	Dried Meat Camp	52 24 29	112 16 10
„ 18	Bull Lake (3 miles S.E. of)	52 23 24	112 34 0
„ 20	Dead Man's Creek	52 19 25	113 3 0
„ 23	Nick Hills	52 12 52	113 40 0
„ 24	Camp	51 55 43	114 0 0

Date.	Locality.	Lat. N.	Long. W.
1858.		° ′ ″	° ′ ″
July 26	Cache Camp (edge of the woods).	51 52 52	114 10 15
Aug. 1	Prairie	51 19 12	113 55 0
„ 2	Slaughter Camp	51 20 47	113 50 0
„ 4	Bow River (1st crossing of)	50 54 46	113 50 0
„ 6	Most N. tributary to Belly River.	50 6 23	113 45 0
„ 7	Tributary of Belly River (1st crossing of).	49 32 31	113 53 0
„ 8	Chief Mountain (6 miles N. of)	49 5 6	113 50 0
„ 10	Tributary of Belly River (2nd crossing of).	49 33 50	113 58 0
„ 13	Woods	50 52 49	114 20 0
„ 15	Old Bow Fort (site of)	51 8 46	115 4 30
„ 19	Kananaskis's Pass in the Rocky Mountains.	50 54 17	115 12 0
„ 20	Ditto	50 45 3	115 12 0
„ 21	Ditto	50 37 1	115 21 0
„ 22	Ditto	50 37 49	115 21 0
„ 23	Ditto	50 38 55	115 27 0
„ 24	Tributary of Kootanie River	50 30 14	115 30 0
„ 26	Forks of Kootanie River	50 27 21	115 43 0
„ 27	Kootanie River	50 19 24	115 40 0
„ 28	Ditto	50 10 13	115 42 45
„ 29	Ditto	50 1 14	115 33 0
„ 30	Tobacco Plain (commencement of).	49 42 41	115 33 0
Sept. 2	Stray Camp	49 58 15	115 27 0
„ 6	British Kootanie Pass (W. end of).	49 11 21	115 22 0
„ 7	Ditto Height of land	49 19 44	114 58 0
„ 9	Ditto (E. end of)	49 32 3	114 30 0
„ 10	Middle Tributary of Belly River, coming from Crow lodge.	49 47 0	114 25 0
„ 11	Most N. Tributary of Belly River (2nd crossing of).	50 12 16	114 21 0
„ 12	High Wood River (4 miles N. of).	50 35 29	114 18 0
„ 13	Bow River (7 miles S. of)	50 57 16	114 10 0
„ 16	Red Deer River	52 4 45	114 13 0
„ 18	Battle River (3rd crossing of)	52 39 44	113 39 0
	Fort Edmonton	53 31 59	113 17 31
1859.			
Mar. 25	Rocky Mountain House	52 22 6	115 10 45
June 12	Hand Hills	51 33 13	111 30 0
„	Hand Hills Lake	51 21 43	111 27 0
July 7	Prairie, near Red Deer River	51 14 19	111 12 0
„ 13	Creek	50 53 7	110 58 0
„ 15	Red Deer River	50 53 52	110 36 0
„ 17	Prairie	50 53 47	110 20 0
„ 19	16 miles N. of Bow River	50 40 22	109 54 0
„ 20	8 ditto	50 34 25	110 20 0
„ 21	Crossing place, Bow River	50 27 42	110 28 0
„ 26	Cyprès Mt. (W. flank)	49 47 27	110 42 0
„ 27	Ditto	49 45 38	110 36 0
„ 28	Ditto	49 44 38	110 35 0
„ 29	Knoll, S. of Cyprès Mt.	49 31 22	110 35 0
„ 30	Milk River	48 58 40	111 0 0
Aug. 1	Cyprès Mts.	49 38 32	110 35 0
„ 1	Cyprès Mts. (W. flank)	49 35 21	111 0 0
„ 4	Prairie	49 35 0	111 0 0
„ 5	Springs	49 25 0	111 41 0
„ 7	Prairie	49 47 0	112 32 0
„ 8	Belly River	49 47 4	112 52 0
„ 9	North of Belly River	49 44 35	113 18 0
„ 10	Hills near tributary to Belly River.	49 36 44	113 50 0
„ 18	Kootanie Valley	49 0 3	115 12 0
„ 22	Kootanie River	48 32 0	115 0 0
„ 24	Ditto (right bank)	48 23 51	115 10 0
„ 26	Ditto	48 26 29	115 30 0
„ 27	Ditto	48 38 33	115 45 0
„ 28	Ditto (Paddler Lakes)	48 41 41	116 0 0
„ 30	Kootanie River	48 57 20	—
„ 31	Ditto	49 15 33	116 36 0
Sept. 1	Large Lake, North shore 5 miles east of western extremity.	49 36 25	—
„ 2	Portage, west extremity of Second Lake.	49 29 50	—

Date.	Locality.	Lat. N.	Long. W.
1857.		° ′ ″	° ′ ″
Sept. 3	Kootanie River - -	49 18 48	—
„ 4	Mouth of Pendoreilles' River	49 0 31	118 0 0
„ 8	Fort Colvile - -	48 37 48	118 12 0
„ 17	Fort Sheppard - -	49 1 7	118 0 0
„ 18	Observation Mount - -	49 0 15	—
„ 18	West of Fort Sheppard -	49 3 10	—
„ 18	Ditto - - -	49 2 41	—
„ 18	Ditto - - -	49 5 19	—
Dec. 14	4 miles E. of Redberry Lake	52 42 0	106 56 0
„ 19	English Creek - -	53 16 0	108 56 0
„ 19	Red Deer Hill - -	53 28 0	109 3 0
„ 20	Fort Pitt - - -	53 34 15	109 18 0
1858.			
Jan. 11	Crossing Place, Battle River, on Mt. Ho. Track.	52 41 0	114 6 0
July 9	Elbow of Battle River -	52 19 0	111 5 0
Aug. 12	Rocky Mts., Bow River, First Lakes.	51 1 44	115 16 0
„ 14	Rocky Mts., Bow R., Nick.	51 2 26	115 30 0
„ 15	Rocky Mts., Bow R., Cascade Mt.	51 9 18	115 40 0
„ 18	Rocky Mts., Bow R., Castle Mt.	51 10 42	116 0 0
„ 21	Rocky Mts., Vermillion R., the Angle.	51 6 0	116 26 0
„ 22	Rocky Mts., Vermillion R., Snow Creek, S. from Mt. Ball.	51 2 45	116 19 0
„ 24	Rocky Mts., Kootanie R., N. of Forks.	50 52 0	116 26 0
„ 26	Rocky Mts., Source of Kootanie R.	51 0 37	116 40 0
„ 28	Rocky Mts., Beaver Foot R.	51 9 37	116 52 0
„ 30	Rocky Mts., Kicking Horse River Falls.	51 10 0	116 55 0
Sept. 1	Rocky Mts., Kicking Horse River, Falls.	51 16 30	116 57 0
„ 3	Rocky Mts., Bow River, Moose's Creek.	51 22 40	116 38 0
„ 8	Rocky Mts., Bow River, above Moose's Creek.	51 28 0	116 43 0
„ 9	Rocky Mts., Source of Bow R.	51 40 0	117 0 0
„ 11	Rocky Mts., N. Branch Saskatchewan, E. end of Glacier Lake.	51 54 0	117 30 0
„ 12	Rocky Mts., N.B. Saskatchewan, W. end Glacier Lake.	51 52 16	117 39 0
„ 14	Rocky Mts., N.B. Saskatchewan, 4 miles above mouth of Little Fork.	51 56 30	117 22 0
„ 18	Rocky Mts., N. B. Saskatchewan, 4 miles below Wapattuk River.	52 18 0	116 46 0
„ 20	Rocky Mts., N. B. Saskatchewan, Sheep River.	52 24 0	116 40 0
„ 28	Saskatchewan, N. B. Miry Creek.	52 30 0	116 10 0

Date.	Locality.	Lat. N.	Long. W.
1858.		° ′ ″	° ′ ″
Sept. 29	N. branch, Saskatchewan -	52 26 0	116 0 0
Oct. 1	S.E. of Mountain House, in woods.	52 23 30	115 0 0
	Bad Beaver Dam - -	53 5 0	113 58 0
Nov. 29	Battle River, Bear Hill -	52 46 26	113 55 0
Dec. 1	Red Deer R., Mouth of Blind R.	52 18 13	114 0 0
	Ditto, 10 miles above last.	52 12 36	114 10 0
„ 4	Red Deer R., 5 miles above Medicine River.	52 1 26	114 20 0
„ 6	Red Deer R., 20 miles above last.	51 50 28	114 40 0
„ 9	Little Red Deer River -	51 29 28	114 45 0
„ 10	Ditto, source of -	51 21 40	114 50 0
„ 15	Edge of Plain, Stoney Camp	51 25 24	114 45 0
1859.			
Jan. 15	Thickwoods, between Pembina and Paddle Rivers.	54 12 1	114 18 0
„ 17	Fort Assineboine - -	54 31 4	114 48 0
„ 23	Athabasca River - -	54 19 36	115 40 0
„ 25	Ditto - -	54 12 24	116 49 0
„ 29	Below Dead Man's Rapid -	53 50 51	117 18 0
Feb. 2	Jasper House - -	53 12 21	118 10 0
„ 12	Maligne River - -	52 55 50	118 12 0
„ 13	Forks of Athabasca and Whirlpool Rivers. Trail to Boat Encampment.	52 46 54	118 6 0
Aug. 8	S. of Bow River - -	50 13 5	112 46 0
„ 9	Small Lake - - -	50 25 39	113 6 0
„ 12	Mouth, Ispasquchow R. -	50 43 8	113 58 0
„ 16	S. of Bow River - -	51 8 20	115 7 0
„ 23	10 miles above Vermillion R.	51 19 0	116 16 0
„ 24	Opposite Observation Point -	51 22 29	116 20 0
„ 26	Height of Land, Pipe River -	51 58 1	116 24 0
„ 30	N. B. Saskatchewan -	51 53 3	116 50 0
Sept. 6	Great Glacier - -	51 46 33	117 30 0
„ 8	Blaeberry River - -	51 40 49	117 25 0
„ 10	R. B. Blaeberry River -	51 36 39	117 30 0
„ 11	Blaeberry River - -	51 34 3	117 35 0
„ 15	Ditto - -	51 30 3	117 35 0
„ 17	Mouth Blaeberry R. -	51 25 50	117 50 0
„ 22	Columbia River - -	51 14 49	117 30 0
„ 23	Ditto - -	51 9 5	117 20 0
„ 25	Ditto - -	51 3 55	117 0 0
„ 30	Ditto - -	50 47 3	116 40 0
Oct. 1	Lower Columbia Lake -	50 29 33	116 26 0
„ 2	Source of Columbia -	50 7 41	116 16 0
„ 3	Kootanie R. - -	49 50 24	115 50 0
„ 5	Ditto - -	49 36 18	115 35 0
„ 6	Ditto - -	49 23 42	115 20 0
„ 8	Kootanie Port - -	48 54 48	115 10 0
„ 10	Kootanie River - -	48 40 28	115 5 0
„ 12	Ditto - -	—	115 10 0
	Second Transverse Valley -	48 30 34	115 20 0
„ 13	Third Transverse Valley -	48 25 25	115 30 0

II.—Record of Astronomical Observations during 1857, 1858, 1859.

Approx. Mean Time at Place.	Mean of Chron. Times corrected for E on Greenwich Mean Time.	Mean of Obsd. Alts. corrected for I. E.	Latitude by Observation or Acc^{t}.	Longitude.
1857.	D. H M. S.	° ′ ″	N. ° ′ ″	W. ° ′ ″
June 13, 8 a.m.	13 1 43 39	68 44 7	48 24 5	89 24 50
„ 21, 9 a.m.	21 2 47 35	88 45 41	48 30 0	89 58 48
„ 22, 9 a.m.	22 2 31 59	83 39 51	48 45 0	89 53 45
„ 23, 8 a.m.	23 2 16 59	78 30 39	48 55 0	89 53 45
„ 25, 8 a.m.	25 2 7 17	74 43 35	48 53 0	90 13 46
„ 26, 5 p.m.	26 10 34 15	64 2 23	48 45 0	90 50 24
„ 27, 10 a.m.	27 4 4 33	109 19 37	48 40 0	91 11 32
„ 29, 7 p.m.	29 13 24 48	11 48 20	48 25 0	92 27 28
„ 30, 7 a.m.	30 1 13 58	53 12 49	48 27 0	92 30 4
July 1, 6 p.m.	1 11 55 8	40 59 27	48 36 15	93 33 33
„ 3, 9 a.m.	3 3 43 36	99 13 31	48 50 0	94 14 19
„ 4, 9 a.m.	4 2 42 42	75 36 39	49 26 0	94 48 7
„ 5, 8 a.m.	5 3 2 4	84 34 31	49 55 0	94 45 30
„ 6, 8 a.m.	6 2 55 52 *	81 31 54 *	50 15 0 50 33 48	95 17 19 96 33 56
„ 11, 8 a.m.	11 2 35 26	72 21 2	50 23 0	96 30 25
„ 16, 8 a.m.	16 2 47 47	74 49 20	49 52 6	96 52 27
„ 25, 3 p.m.	25 10 15 1	73 43 58	48 59 12	96 46 13
„ 28, 3 p.m.	28 10 39 34	65 34 4	48 52 0	97 17 29
„ 31, 4½ p.m.	31 11 5 27	56 51 56	49 10 0	98 10 36
Aug. 2, 4 p.m.	2 10 3 51	76 28 2	49 8 0	98 33 45
„ 3, 5 p.m.	3 11 6 37	56 18 32	49 8 0	98 47 15
„ 4, 8 a.m.	4 1 43 38	45 42 32	49 8 0	98 48 24

Approx. Mean Time at Place.	Mean of Chron. Times corrected for E on Greenwich Mean Time.	Mean of Obsd. Alts. corrected for I. E.	Latitude by Observation or Acc^{t}.	Longitude.
1857.	D. H M. S.	° ′ ″	N. ° ′ ″	W. ° ′ ″
Aug. 5, 4 p.m.	4 10 31 20	67 37 43	49 0 32	91 1 25
„ 5, 5 p.m.	5 11 46 16	43 6 52	49 0 0	99 16 50
„ 7, 5 p.m.	7 11 21 48	50 23 27	49 6 0	99 21 43
Sept. 13, 3 p.m.	13 10 26 33	49 31 28	50 20 0	103 45 45
„ 27, 3 p.m.	27 11 32 31	25 19 17	50 52 48	107 41 7
Oct. 3, 9 a.m.	3 3 43 15	20 27 9	51 20 0	107 32 15
„ 4, 9 a.m.	4 4 44 59	26 43 30	51 40 0	107 37 51
„ 5, 2 p.m.	5 9 28 40	24 18 40	52 5 0	107 21 0
„ 6, 2 p.m.	6 9 43 4	22 11 31	52 12 0	106 51 0
1858.				
June 21, 7 a.m.	21 2 9 22	26 52 32	52 18 0	107 28 15
„ 21, 4 p.m.	21 11 30 33·5	33 23 19	52 14 0	107 28 16
„ 22, 3 p.m.	22 9 46 39	48 40 29	52 14 0	107 55 4
„ 23, 9 a.m.	23 3 15 19·4	42 22 11	52 16 0	108 11 33
„ 24, 7 a.m.	24 2 8 16·4	25 59 17	52 21 0	108 27 27
„ 25, 7 a.m.	25 2 30 14·6	25 59 17	52 21 0	108 44 25
„ 26, 8 a.m.	26 3 49 47	40 54 2	52 28 30	108 51 39
„ 27, 8 a.m.	27 3 50 43	41 1 6	52 30 0	108 52 36
July 2, 4 p.m.	2 11 20 15	35 53 22	52 34 25	109 23 40
„ 4, 8 a.m.	4 3 28 5	36 46 25	52 36 0	110 23 45
„ 8, 7 a.m.	8 2 32 13·5	27 27 4	52 35 30	110 50 7
„ 7, 9 a.m.	7 4 12 44·7	42 9 5	52 28 25	111 29 45
„ 10, 7 a.m.	10 2 55 48·6	30 4 31	52 24 20	112 14 35

TABLE III.

Date.	Obsd double Mer. Alt. corrected for I.E.	Long. by Obsn or Account.	Latitude.
1857.	° ⊙ ′ ″	° ′ ″	° ′ ″
June 13	129 11 16	89 24 50	48 24 5
„ 22	128 51 27	89 45 0	48 46 11
„ 24	128 27 37	89 45 0	48 56 16
July 1	128 28 41	93 33 33	48 36 15
„ 2	128 29 21	93 50 0	48 47 18
„ 4	126 4 53	94 48 0	49 33 45
„ 6	124 6 1	95 20 0	50 21 38
„ 10	122 45 51	96 33 56	50 33 46
„ 16	123 19 28	96 52 27	49 52 6
„ 22	120 56 52	97 0 0	49 28 43
„ 25	120 40 22	96 46 13	48 59 12
Aug. 1	117 4 14	97 56 0	49 6 53
„ 2	116 33 54	98 20 0	49 7 47
„ 4	115 36 50	98 50 0	49 4 40
„ 5	115 12 27	99 16 50	49 0 32
„ 7	113 54 47	99 21 43	49 6 2
„ 12	109 59 37	100 5 0	49 36 3
„ 14	107 49 17	101 10 0	50 4 20
„ 17	105 15 0	101 48 0	50 24 32
„ 21	102 37 40	101 48 0	50 24 24
Sept. 11	87 28 35	102 10 0	50 23 40
„ 18	81 58 55	106 0 0	50 26 26
„ 19	81 9 45	106 50 0	50 27 59
„ 20	79 50 55	107 10 0	50 44 45
„ 22	77 42 7	107 37 30	51 1 24
„ 27	74 5 7	107 41 7	50 52 48
Oct. 3	68 23 47	107 32 0	51 23 45
„ 4	66 54 27	107 32 0	51 45 16
„ 5	65 32 57	107 0 0	52 3 7
„ 7	63 3 27	106 30 0	52 31 40
„ 23	50 56 37	108 10 0	53 2 6
1858.			
June 21	121 48 35	107 28 15	52 17 59
„ 23	121 53 35	108 11 33	52 14 37
„ 26	121 16 45	108 52 10	52 28 39
July 4	120 5 20	109 22 0	52 34 25
„ 8	119 14 30	110 50 7	52 35 39
„ 10	118 59 45	111 29 45	52 28 23
„ 14	118 0 5	112 18 45	52 24 29
„ 18	116 42 55	112 34 0	52 23 24
„ 20	116 6 45	113 3 0	52 19 25
„ 23	115 8 45	113 40 0	52 12 52
„ 24	115 18 0	114 0 0	51 55 43
„ 26	114 31 40	114 10 15	51 52 52
Aug. 1	112 47 55	113 55 0	51 19 12
„ 2	112 14 5	113 50 0	51 20 47
„ 4	112 3 55	113 50 0	50 54 46
„ 6	112 34 30	113 45 0	50 6 23
„ 7	113 9 5	113 53 0	49 32 31
„ 8	113 29 35	113 50 0	49 5 6
„ 10	111 22 25	113 58 0	49 33 50
„ 13	106 56 25	114 20 0	50 52 49
„ 15	105 10 20	115 4 30	51 8 46
„ 19	103 5 25	115 12 0	50 54 17
„ 20	102 44 25	115 12 0	50 45 3
„ 21	102 20 35	115 21 0	50 37 1
„ 22	101 38 45	115 27 0	50 37 49
„ 23	100 55 55	115 30 0	50 38 55
„ 24	100 32 15	115 43 0	50 30 14
„ 26	99 14 50	115 40 0	50 27 21
„ 27	98 48 40	115 42 45	50 19 24
„ 28	98 24 40	115 42 45	50 10 13
„ 29	98 0 0	115 33 0	50 1 14
„ 30	96 54 25	115 33 0	49 42 41
Sept. 2	95 12 55	115 27 0	49 58 15
„ 6	93 49 5	115 22 0	49 11 21
„ 7	92 47 25	114 58 0	49 19 44
„ 9	90 52 15	114 30 0	49 32 3
„ 10	89 44 25	114 25 0	49 47 0
„ 11	88 0 40	114 21 0	50 12 16
„ 12	86 28 30	114 18 0	50 35 29
„ 13	84 59 0	114 10 0	50 57 16
	Obsn of Polaris	114 13 0	52 4 45
„ 18	77 42 25	114 0 0	52 39 44
„ 22	72 52 40	113 49 0	53 31 44
„ 24	71 18 41	do.	53 31 43
	Red. to Mer.	do.	53 32 11
	Red. to Mer.	do.	53 31 59
	Mer alt. of ☽	do.	53 32 13
1859.			
Mar. 25	39 13 0	115 4 0	52 22 6
June 12	61 21 35	111 30 0	51 33 13
„ 30	61 34 32	111 27 0	51 21 41
July 7	61 6 40	111 12 0	51 14 19
„ 13	60 42 25	110 58 0	50 53 7
„ 15	60 23 30	110 36 0	50 53 52
„ 17	60 4 10	110 20 0	50 53 47
„ 19	59 56 30	109 54 0	50 40 22
„ 20	59 51 20	—	50 34 25
„ 21	59 46 11	110 28 0	50 27 42

Date.	Obsd double Mer. Alt. corrected for I.E.	Long. by Obsn or Account.	Latitude.
1859.	° ′ ″	° ′ ″	° ′ ″
July 26	59 24 30	110 42 0	49 47 27
„ 27	59 12 55	110 36 0	49 45 38
„ 28	59 0 5	110 35 0	49 44 38
„ 29	58 59 22	110 35 0	49 31 22
„ 30	59 19 0	111 0 0	48 58 40
Aug. 1	58 8 10	110 35 0	49 38 32
„ 1	57 24 45	111 0 0	49 35 21
„ 8	56 6 50	112 52 0	49 47 4
„ 9	55 52 5	—	49 44 35
„ 10	55 42 30	113 50 0	49 36 44
„ 12	107 19 30	115 16 0	51 1 44
„ 14	105 59 0	115 30 0	51 2 26
„ 15	105 10 0	115 40 0	51 9 18
„ 18	103 10 0	116 0 0	51 10 42
„ 21	101 20 0	116 26 0	51 6 0
„ 22	100 49 0	116 19 0	51 2 45
„ 24	99 48 0	116 26 0	50 52 0
„ 26	98 11 0	116 40 0	51 0 37
„ 28	96 28 30	116 52 0	51 9 30
„ 30	95 0 0	116 55 0	51 10 0
Sept. 1	93 18 0	116 57 0	51 16 30
„ 3	91 38 0	116 38 0	51 22 40
„ 8	87 44 0	116 43 0	51 28 0
„ 9	86 34 0	117 0 0	51 40 0
„ 11	86 36 0	117 30 0	51 54 0
„ 12	83 54 0	117 39 0	51 52 16
„ 14	82 16 0	117 22 0	51 56 30
„ 18	78 45 30	116 46 0	52 18 0
„ 20	76 41 0	116 40 0	52 24 0
„ 23	74 21 0	—	52 23 30
„ 28	70 14 0	116 10 0	52 30 0
„ 29	69 55 30	116 0 0	52 26 0
Oct. 1	67 20 30	115 25 0	52 23 30
„ 5	42 50 30	113 58 0	53 5 0
Nov. 29	30 55 0	115 55 0	52 46 26
Dec. 1	31 10 0	114 0 0	52 18 13
„ 2	31 6 0	114 10 0	52 12 36
„ 4	30 55 0	114 20 0	52 1 26
„ 6	30 47 0	114 40 0	51 50 28
„ 9	30 52 0	114 45 0	51 29 28
„ 10	30 55 0	114 50 0	51 21 40
„ 15	30 7 0	114 45 0	51 25 24

N.B.—In the above Table all altitudes, except those to which the names of stars are prefixed, are double observed altitudes of the sun's lower limb.

Date.	Obsd double Mer. Alt. corrected for I.E.	Long. by Obsn or Account.	Latitude.
1859.	° ′ ″	° ′ ″	° ′ ″
Aug. 18	53 51 10	115 12 0	49 0 3
„ 22	53 0 17	115 0 0	48 32 0
„ 24	52 27 5	115 10 0	48 23 51
„ 26	51 43 0	115 30 0	48 26 29
„ 27	51 9 17	115 45 0	48 38 33
„ 28	50 45 40	116 0 0	48 41 41
„ 30	49 47 22	—	48 57 20
„ 31	49 7 32	116 36 0	49 15 33
Sept. 1	48 24 57	—	49 36 25
„ 2	48 9 40	—	49 29 50
„ 3	47 58 37	—	49 18 48
„ 4	47 54 47	118 0 0	49 0 31
„ 8	46 48 2	118 12 0	48 37 48
„ 17	42 58 17	118 0 0	49 1 7
„ 18	42 35 47	—	49 0 15
„ 22	40 59 43	—	49 3 10
„ 23	40 36 33	—	49 2 44
„ 24	40 10 43	—	49 5 19
1857.			
Dec. 14	*Polaris 108 20 0	106 56 0	52 42 0
„ 19	26 13 0	108 56 0	53 16 0
„ 19	*Polaris 110 53 0	109 3 0	53 28 0
„ 20	Ditto 110 4 30	109 18 0	53 35 0
„ 20	Jupiter 97 46 0	—	53 34 0
„ 22	26 32 0	—	53 34 0
1858.			
Jan. 5	28 26 0	113 49 0	53 34 0
„ 5	*Polaris 109 50 0	—	53 29 0
„ 8	28 0 0	—	53 30 0
Feb. 10	44 2 0	—	53 32 0
„ 11	44 42 0	—	53 30 0
„ 20	50 51 30	—	53 31 0
Mar. 4	59 51 0	—	53 30 0
„ 6	61 26 30	—	53 30 0
„ 7	62 9 30	—	53 31 0
June 11	Jupiter 99 34 0	114 6 0	52 41 0
„ 14	107 53 3	115 30 0	52 22 0
July 9	119 37 0	111 5 0	52 19 0

LUNAR DISTANCES.

Fort Ellice.—Lat. 50° 24′ 32″ N. Jupiter and Moon, mean of 3 sets of observations. Long. 101° 48′ 0″ W.

Elbow, S., Saskatchewan.—1857, September 22, at 4h. 15m. P.M. (mean time at place, nearly.) I. E. +4′ 17″. Mean of chronometer times, September, 22d. 11h. 35m. 51·7s. Mean of observed distances, 52° 29′ 4″. Chronometer, fast on mean time at place, 7h. 16m. 50s. Approx. error on Greenwich mean time, 10m. fast. Objects observed, Sun and Moon.

Lat. 51° 1′ 26″ N. Long. 107° 37 30″ W.

The following Lunars were obtained at *Fort Carlton.*

1857, December 22, at 5h. 30m. P.M. (mean time at place, nearly.) I. E.+5′ 0″. Mean of chronometer times, December, 22d. 12h. 33m. 33s. Mean of distances (Jupiter and Moon's, F. L.), 50° 46′ 53″. Chronometer, fast on mean time at place, 6h. 57m. 21s. Approx. error on Greenwich mean time, 10m. slow.

Lat. 52° 52′ 9″ N. Long. 106° 8′ 30″ W.

1857, December 27.	Jupiter and Moon - -	Long. 106° 10′ 15″ W.
1857, December 28.	Jupiter and Moon - -	Long. 106° 13′ 45″ W.
1858, January 18.	Aldebaran and Moon -	Not computed.
1858, January 21.	Sun and Moon - -	Long. 106° 19′ 15″ W.
1858, April 20.	Sun and Moon - -	Long. 106° 14′ 0″ W.
1858, April 23.	Sun and Moon - -	Long. 106° 18′ 37″ W.
1858, May 18.	Sun and Moon - -	Long. 106° 15′ 0″ W.

1858, May 19, at 1h. 10m. P.M. (mean time at place, nearly.) I. E.+3′ 30″. Mean of chronometer times, May, 19d. 7h. 48m. 33·9s. Mean of distances, 89° 3′ 32″. Chronometer, fast on mean time at place, 6h. 40m. 5·0s. Approx. error on Greenwich mean time, 12m. slow.

Sun W. of Moon - - Long. 106° 21′ 45″ W.

1858, May 20, at 2h. 30m. P.M. (mean time at place, nearly.) I. E.+1′ 55″. Mean of chronometer times, May, 20d. 9h. 11m. 49·6s. Mean of distances, 102° 5′ 43″. Chronometer, fast on mean time at place, 6d. 39h. 37·3s. Approx. error on Greenwich mean time, 12m. slow.

Sun W. of Moon - - Long. 106° 17′ 15″ W.

The mean, therefore, for Carlton is,

°	′	″
106	8	30
	10	15
	13	45
	19	15
	14	0
	18	37
	15	0
	21	45
	17	15
	128	22

Long. 106 14 16 W.

1858, July 4, at 8h. 30m. A.M. (mean time at place, nearly). In Lat. 52° 34′ 25″ N. Mean of chronometer times, July, 4d. 3h. 33m. 20·8s. Mean of observed distances, 85° 19′ 25″ (Sun and Moon). Chronometer, fast on mean time at place, 7h. 7m. 20s. Approx. error on Greenwich mean time, 11m. slow. I. E.+1′ 55″.

Long - - 109° 22′ 0″ W.

1858, July 25, at 10h. P.M. (mean time at place, nearly.) In Lat. 51° 52′ 40″ N. Mean of chronometer times, July, 25d. 17h. 17m. 49s. Observed distance (Mars and Moon's, N. L.), 72° 45′ 53″. Chronometer, fast on mean time at place, 7h. 23m. 55s. Approx. error on Greenwich mean time, 12m. slow. I. E.+2′.

Long. - - 114° 10′ 15″ W.

Site of Old Bow Fort. Lat. 51° 9′ 0″ N.

1858, August 15, at 3h. 40m. P.M. (mean time at place, nearly.) Mean of chronometer times, August, 15d. 11h. 6m. 13·4s. Mean of observed distances (Sun and Moon), 84° 4′ 51″. I. E.+5′ 25″. Chronometer, fast on mean time at place, 7h. 29m. 30s. Approx. error on Greenwich mean time, 15m. slow.

Long. - - 115° 8′ 0″ W.

Site of Old Bow Fort. Lat. 51° 9′ 0″ N.

1858, August 16, at 4h. 39m. P.M. (mean time at place, nearly.) I. E.+5′ 25″. Mean of chronometer times, August, 16d. 12h. 8m. 33s. Mean of observed distances (Sun and Moon), 95° 33′ 31″. Chronometer, fast on mean time at place, 7h. 29m. 21s. Approx. error on Greenwich mean time, 15m. slow.

	°	′	″
Long.	115	4	22
		8	0
		12	22

Mean 115 6 11 W.

The following Lunars were obtained at *Fort Edmonton.* Lat. 53° 32′ 0″ N.

1858, September 21, at 10 P.M. (mean time at place, nearly.) Mean of chronometer times, September, 24 d. 17 h. 22 m. 28 s. Mean of observed distances (Jupiter and Moon's N. L.) 52° 31′ 27″. I. E. + 6′ 12″. Error of chronometer on mean time at place, 7 h. 21 m. 35 s. fast. Approx. error on Greenwich mean time, 13 m. slow. (Mean of 7 sights.)

Long. - - 113° 19′ 15″ W.

1858, September 30, at 9 A.M. (mean time at place, nearly.) Mean of chronometer times, September, 30 d. 4 h. 50 m. 26 s. Error on mean time at place, 7 h. 23 m. 19 s. fast. Mean of observed distances (Sun and Moon) 81° 22′ 17″. I. E. + 6′ 12″. Chronometer slow on Greenwich mean time, 13 m. (Mean of 5 sights.)

Long. - - 113° 23′ 30″ W.

1858, October 28, at 10 A.M. (mean time at place, nearly.) Mean of chronometer times, October, 28 d. 6 h. 14 m. 1 s. Error on mean time at place, 7 h. 21 m. 41 s. fast. Mean of observed distances (Sun and Moon) 97° 26′ 51″. I. E. + 6′ 0″. Chronometer slow on Greenwich mean time, 15 m. (Mean of 9 sights.)

Long. - - 113° 12′ 0″ W.

1858, October 25, at 11 P.M. (mean time at place, nearly.) Mean of chronometer times, October, 25 d. 18 h. 30 m. 47 s. Error on mean time at place, 7 h. 21 m. 44 s. fast. Mean of observed distances (α Pegasi and Moon's F. L.) 89° 15′ 5″ I. E. + 6′ 0″. Chronometer 14 m. slow nearly on Greenwich mean time. (Mean of 5 sights.)

Long. - - 113° 24′ 15″ W.

1858, November 18, at 9 h. 30 m. P.M. (mean time at place, nearly.) Mean of chronometer times, November, 18 d. 16 h. 45 m. 58·6 s. Error on mean time at place, 7 h. 19 m. 44 s. fast. Mean of observed distances corrected for I. E. (Jupiter and Moon's F. L.) 48° 42′ 46″ Approx. error of chronometer on Greenwich mean time, 17 m.

Long. - - 113° 16′ 30″ W.

1859, March 10, at 10 h. A.M. (mean time at place, nearly.) Mean of chronometer times, March, 10 d. 5 h. 10 m. 21 s. Error on mean time at place, 7 h. 11 m. 5 s. fast. Mean of observed distances corrected for I. E. (Sun and Moon) 71° 5′ 20″. (Mean of 7 sights.)

Long. - - 113° 18′ 15″ W.

1859, March 11, at 11 h. A.M. (mean time at place, nearly.) Mean of chronometer times, March, 11 d. 5 h. 34 m. 10·2 s. Error on mean time at place. 7 h. 11 m. 5 s. fast. Mean of observed distances corrected for I. E. (Sun and Moon) 84° 6′ 21″ (Mean of 11 sights.)

Long. - - 113° 9′ 45″ W.

1859, March 12, at about 3 h. P.M. (mean time at place, nearly.) Mean of chronometer times, March, 12 d. 9 h. 19 m. 48 s. Error on mean time at place, 7 h. 10 m. 56 s. fast. Mean of observed distances (Sun and Moon) 99° 23′ 43″. I. E. + 5′ 51″. Chronometer about 20 m. slow on Greenwich mean time. (Mean of 5 sights.)

Long. - - 113° 11′ 30″ W.

1859, March 17, at 8 h. P.M. (mean time at place, nearly.) Mean of chronometer times, March, 17 d. 15 h. 5 m. 34 s. Error on mean time at place, 7 h. 11 m. 0 s. fast. Mean of observed distances (Jupiter and Moon's N. L.) 92° 59′ 32″. I. E + 5′ 41″. Chronometer about 20 m. slow on Greenwich mean time. (Mean of 7 sights.)

Long. - - 113° 8′ 45″ W.

°	′	″	
113	19	15	W.
	23	30	
	12	0	
	24	15	
	16	30	
	18	15	
	23	15	
	11	30	
	8	45	
157	45		

Long. 113 17 31 W. for Edmonton.

1859, April 23, at 6 h. 20 m. A.M. (mean time at place.) Lat. 52° 25′ 6″ N. Mean of chronometer times, April, 22 d. 18 h. 21 m. 42 s. Mean of observed distances, 107° 8′ 5″. I. E. + 4′ 40″.

Long. - - 115° 10′ 45″ W.

At Rocky Mountain House.

Date.	Locality.	Longitudes.	Latitudes.	Variations.
		W. ° ′ ″	N. ° ′ ″	E. ° ′
1857, June 20	Trembling Portage	89 59 48	48 31 5	6 21
„ 21	On Kaministoquoia R.	89 58 10	48 40 0	5 14
„ 22	In Latitude 48° 45′ North	89 53 0	48 45 0	8 54
„ 23	In Latitude 48° 55′ North	89 53 48	48 55 0	9 5
„ 25	Savannah Portage	90 5 0	48 53 0	6 53
„ 26	Lake of the Thousand Isles	90 50 24	48 45 0	3 31
„ 27	Perch Lake	91 12 0	48 35 0	8 14
„ 29	In Latitude 48° 27′ North	92 30 0	48 27 0	9 53
July 1	Fort Frances	93 30 0	48 36 0	9 31
„ 3	In Latitude 48° 50′ North	93 58 0	48 50 0	11 20
„ 4	In Latitude 49° 26′ North	94 48 0	49 26 0	10 17
„ 5	Winnipeg River	94 45 0	49 55 0	15 47
„ 6	In Latitude 50° 15′ North	95 17 19	50 15 0	15 7
„ 10	Lake Winnipeg	96 34 0	50 33 48	14 41
„ 11	Ditto	96 30 25	50 23 0	14 9
„ 23	Red River	96 52 27	49 52 6	12 3
„ 25	Pembina	96 46 13	48 59 12	12 12
August 5	Turtle Mt., East end	99 16 50	49 0 0	18 10
„ 9	Turtle Mt., West end	99 21 43	49 6 0	19 50
„ 20	Fort Ellice	101 48 0	50 24 28	21 34
September 10	Qu'appelle Fort	103 45 45	50 20 0	24 39
„ 22	Elbow, South branch	107 37 30	51 1 24	25 58
October 29	Fort Carlton	106 15 39	52 52 30	23 25
June 17	Eagle Hills	107 35 4	52 14 0	24 10
July 18	Bull Lake	112 34 0	52 23 24	23 50
August 15	Bow Fort	115 4 30	57 8 46	25 50
„ 26	Columbia Lake	116 16 0	50 7 41	26 10
September 1	Kootanie Fort	115 10 0	48 54 48	25 0
1858, Nov. 5	Fort Edmonton	113 49 0	50 31 59	25 20
1859, Mar. 29	Rocky Mt. House	115 10 0	52 22 0	26 20
February 2	Jasper House	118 10 0	53 19 21	26 15
September 8	Fort Colvile	118 12 0	48 37 48	24 20
August 2	Cyprés, Mt. Camp	110 36 0	49 38 0	22 0

INSERTED FOR COMPARISON.

Mean of Variation observed in 1843-4, by Lieut., now Col. J. H. Lefroy.

Date.	Locality.	Long.	Lat.	Hour.	Variation, East.	Remarks.
		° ′	° ′		° ′	
November 4, 1844	Sancte St. Marie	84 34	46 31	A.M.	1 32	Mean of 3.
May 21, 1843	L. Superior Maimanse	84 53	46 58	P.M.	2 15	Place called Point au Cresse.
October 31, 1844	„ C. Gargantua	85 11	47 37	P.M.	0 53	
October 30, 1844	„ Michipicoton	85 7	47 56	A.M.	3 47	
May 23, 1843	„ Near Chienne	85 24	47 52	P.M.	2 22	
May 24, 1843	„ Le Petit Mort	85 49	47 58	A.M.	4 53	
October 21, 1844	„ White River	86 33	48 33	P.M.	2 10	
October 18, 1844	„ Pic	86 31	48 38	A.M.	5 32	Mean of 2.
May 27, 1843	„ La terre platte	87 45	48 48	A.M.	5 34	
May 28, 1843	„ La terre platte	88 32	48 33	A.M.	1 56	Error on local effect.
May 29, 1843 / May 31, 1843	Fort William	89 22	48 24	A.M.	6 46	Mean of 3. This considerable difference requires further investigation.
October 11, 1844	Ditto	„	„	A.M.	5 11	
June 3, 1843	Manoaisi Portage	89 40	48 29	A.M.	5 40	
June 4, 1843	On Chien Lake	89 40?	48 47	P.M.	6 26	
June 6, 1843	Savannah Portage	90 5	48 53	A.M.	8 8	
October 7, 1844	Ditto	„	„	P.M.	7 24	
June 9, 1843	Portage des deux rivières	91 30	48 34	A.M.	10 59	Two stations very near one another.
„ „	Portage des Morts	91 27	48 35	A.M.	11 1	
June 10, 1843	East end of L. la Crosse	92 10	48 24	A.M.	7 53	
June 11, 1843	2nd Portage at west end of do.	92 27	48 15	A.M.	10 16	Query local attraction?
June 13, 1843	Sokon of la Pluie	92 56	48 32	A.M.	11 28	
June 14, 1843	Fort Frances	92 29	48 37	P.M.	10 37	
September 30, 1844	Ditto	„	„	A.M.	8 33	
„ „	Ditto	„	„	P.M.	8 35	
June 16, 1843	North side of L. la Pluie	94 31	48 48	A.M.	13 7	
August 19, 1844	Edmonton House	112 52	53 30	A.M.	24 19	
„ „	Cumberland House	102 19	53 56	P.M.	19 16	
„ 1843	Ditto	„	„	A.M.	20 9	
„ „	Ditto	„	„	A.M.	19 42	
„ „	Near ditto	102 23	53 56	P.M.	19 21	
August 26, 1844	Carlton House	106 13	52 50	A.M.	22 55	
„ „	Fort Pitt	109 10	53 34	A.M.	23 10	
„ „	Ditto	„	„	A.M.	23 11	

OBSERVATIONS OF THE COMET, 1858.

At Fort Edmonton, Latitude 53° 31′ 40″ N. Longitude 113° 17′ 31″ W.

Approximate Mean Time at Place.	Chron. Time of Observation.	Error of Chron. on G. M. T.	Observed Distances.	Object.	Remarks.
	D. H. M. S.	M. S.	° ′ ″		
Sept. 20, 8 P.M. -	20 15 37 34	9 59 slow	34 24 0	Arcturus -	Bright Star under Cor. Borealis.
„ 24, 8 P.M. -	24 15 7 4	- -	127 45 2	Moon - -	Mean of 5 Sights.
„ „ -	16 4 43	- -	102 7 30	α Aquilæ.	
„ „ -	16 8 30	- -	21 16 45	η U. Major.	
„ „ -	16 11 4	- -	22 54 40	ζ U. Major.	
„ „ -	16 14 51	- -	22 7 20	ε U. Major.	
„ „ -	16 18 45	-	56 13 30	Polaris.	
„ „ -	15 24 37	- -	76 7 40	Capella.	
„ „ -	15 19 31	- -	28 43 20	Arcturus -	Bright Star under Cor. Borealis.
„ 27, 8 P.M. -	27 14 43 42	10 8 slow	34 59 40	}	
„ „ -	53 1	- -	32 36 30	}	
„ „ -	54 54	- -	32 11 35	} Observed	
„ „ -	57 17	- -	31 40 25	} altitudes of	
„ „ -	58 21	- -	31 21 30	} Comet.	
„ „ -	15 0 34	- -	30 50 0	}	
„ „ -	3 3	- -	30 15 10	}	
„ 28, 8 P.M. -	28 14 37 45	10 10 slow	36 22 20	}	
„ „ -	40 47	- -	35 33 52	}	
„ „ -	42 17	- -	35 11 0	} Observed	
„ „ -	43 23	- -	34 54 10	} altitudes of	
„ „ -	44 31	- -	34 36 30	} Comet.	
„ „ -	46 2	- -	34 13 25	}	
„ „ -	48 28	- -	33 34 10	}	
„ „ -	50 22	- -	20 6 20	η U. Major.	
„ „ -	54 2	- -	24 37 10	ζ U. Major.	
„ „ -	56 5	- -	24 38 0	ε U. Major.	
„ „ -	15 15 44	- -	59 18 30	Polaris.	
„ „ -	9 15	- -	20 49 50	Arcturus -	Bright Star under Cor. Borealis.
„ „ -	12 47	- -	96 0 20	α Aquilæ.	
Oct. 2, 8 P.M. -	2 15 25 25	10 30 slow	23 59 20	η U. Major.	
„ „ -	27 41	- -	29 52 30	ζ U. Major.	
„ „ -	29 38	- -	31 52 30	ε U. Major.	
„ „ -	34 0	- -	9 40 0	Arcturus -	Bright Star under Cor. Borealis.
„ 5, 8 P.M. -	5 14 56 43	10 20 slow	1 13 50	Arcturus - -	At present changed to North of Comet.
„ „ -	59 46	- -	31 53 0	η U. Major.	
„ „ -	15 3 45	- -	38 14 55	ζ U. Major.	
„ „ -	5 40	- -	40 59 20	ε U. Major.	
„ „ -	7 44	- -	72 33 50	Polaris.	
„ „ -	10 29	- -	104 18 30	Capella.	
„ „ -	12 19	- -	80 23 20	α Aquilæ.	
„ 12, 8 P.M. -	12 14 38 3	10 10 slow	32 39 30	Arcturus.	
„ „ -	40 6	- -	31 44 40	α Cor. Borealis.	
„ „ -	42 1	- -	58 56 50	α Lyræ.	
„ „ -	44 1	- -	62 34 50	α Aquilæ.	
„ „ -	47 8	- -	59 55 30	η U. Major.	
„ „ -	48 59	-	66 35 50	ζ U. Major.	
„ „ -	51 10	- -	70 16 50	ε U. Major.	
„ „ -	53 22	- -	95 32 20	Polaris.	
„ „ -	57 16	- -	134 23 40	Capella.	
„ „ -	15 1 34	- -	110 6 20	α Pegasi.	

N.B.—Index error of instrument + 5′ 58″ to each of the above Observations.

J. W. SULLIVAN, Secretary.
Approved
JOHN PALLISER, Captain.

No. 9.

Indian Tribes and Vocabularies.

Many travellers who have penetrated far into the Indian territories of North America, and studied the manners, life, and habits of the aborigines, are surprised at the inadequate and erroneous ideas they have previously conceived respecting these interesting and remarkable tribes. Yet this can hardly arise from an absence of books on the subject, much accurate and valuable information having long since been in print with reference to these people, especially in the able work of Mr. Catlin on the North American Indians. The real cause of this seems to be that, while these sources of sound knowledge are open to the public, other works of a more imaginative kind, such as the novels of Fenimore Cooper, have led the world generally to imagine the Indian to be a much more romantic personage than he really is. Nor, indeed, is this the only erroneous estimate which has been formed of this people; for they, on the other hand, who have only seen the Indians that live on the borders of civilization, degraded as they are by their begging habits and attachment to ardent spirits, are naturally too ready to conclude that all the tribes are like the corrupted specimens they have witnessed. The only way, therefore, to obtain correct notions of the Indians is to observe them in their native haunts, far from the influence of civilization; thus, and thus only, is there any chance of discerning the prominent elements of the character of these aborigines.

The tribes met with by the expedition during its three years in North America may be considered as either prairie or thickwood hunters; that is, they were either those that hunt the bison in the great plains, or those who pitch their tents in the thickwoods for the purpose of hunting deer, bears, and the valuable fur-bearing animals. Neither of these great classes or groups have, ordinarily, recourse to fishing, because they could not by this means obtain anything that would be esteemed valuable at the trading establishments of the Hudson's Bay Company.

When they are successful in their hunts they visit the trading posts, where the Prairie Indians dispose of dried bison meat, tallow, buffalo robes, and the skins of wolves and foxes, and receive in return European manufactures; while the Thickwood Indians, in like manner, barter the more valuable furs for similar objects. In both classes alike, the office of the men is to kill and cut up the animals, the far more laborious duty of dressing the skins falling to the lot of the women.

As a general rule, the bison hunters do not suffer from want of food; but it frequently happens that the lives of those who dwell in the Thickwoods are chequered by many days of privation and misery.

There is a marked difference between the Prairie Indians and those of the Thickwoods, owing, no doubt, to the dissimilarity of their modes of life. The latter, of necessity, from the scarcity of animals, camp only in small numbers, while the Indians of the prairies are invariably to be found in large bodies, the buffalo supplying them with food, clothing, fuel, and all the requirements of their simple mode of life. It is mainly owing to this that the Prairie Indians have a greater facility for mischief than their neighbours, possessing, as they do, time and means to war upon the adjacent tribes; while, on the other hand, the straitened circumstances of the inhabitants of the woods compel their more especial devotion to the providing for their daily subsistence.

The government among all these tribes is neither rigorous nor well defined, the chiefs exercising great influence in their respective camps, though scarcely able to enforce absolute obedience. In fact, the greatest chief, in his daily intercourse with his own people, commands no respect beyond that which all younger Indians pay to their elders When, however, the tribe sits around the council fire, his opinion has naturally more weight than that of the others. Thus, by long established precedent, he determines the time for pitching or striking the tents, and other matters having a general bearing on the economy of the tribe, while he is also usually the wealthiest of his family, and possesses more horses, more wives, a larger tent, and a more gaudy dress.

It is difficult to obtain reliable information respecting the numbers of the Indian population, their migratory habits, coupled with the vast extent of country over which they are spread, rendering the task of making a satisfactory census almost impossible.

The officers of the Hudson's Bay Company have registered the number of the different tribes who resort to their posts for the purposes of barter; but their reports, taken without correction, only afford a vague and often incorrect estimate of the Indian population with whom they have dealings; for, as the same bands (following in the footsteps of the buffalo) trade at different posts at different seasons of the year, it comes to pass that the same Indians are constantly counted over and over again. According to a document presented to the "Select Committee of the House of Commons on the Hudson's Bay Company," the number of Indians in British North America is given at 147,000; of these 80,000 are to the west of the Rocky Mountains; 3,000 border on Canada; and the remaining 64,000 constitute the Indian population of Ruperts Land. These numbers, however, considerably exceed those of the Indian tribes now dwelling in these districts.

We have, however, made the following estimate of the numbers in the different tribes of Indians we met with on the prairies (exceeding those of Red River Settlement and Pembina), together with a conjectural addition of some that we did not actually come across. We have also given a rough estimate of the remainder of the population of the Saskatchewan country and of the Indians that live n the Rocky Mountains.

ESTIMATE of the Numbers of WHITE, HALF-BREED, and INDIAN POPULATION, seen by the Expedition in the Saskatchewan Country and Rocky Mountains.

	No.	Total Population.
I. *Whites and Half Breeds:—*		
Fort Edmonton and Mountain House	250	
Fort Pitt	60	
Fort Carlton	50	
Fort Ellice	40	
Touchwood Hills	20	
Qu'appelle Lakes	40	
Lac, St. Ann's Mission (Roman Catholic)	400	
Pigeon Lake Mission (Wesleyan)	50	
Lac la Biche Mission (Wesleyan)	70	
Moosewoods	150	
Miscellaneous and Migratory	200	1,330

	No. of Tents.	Total Tents.	
II. *Thickwoa Crees (partly Wesleyan):—*			
Trade at Carlton	30		
„ Fort Pitt	40		
„ Fort Edmonton	15	85	425
III. *Plain Crees:—*			
At Moose Mountain	100		
„ Moosejaw Creek	120		
„ Coteau des Prairies	400		
„ Eagle Hills	200		
„ Moose Woods	200		
„ Jack Fish Lake (scattered)	200		
„ Vermillion River	300		
„ Snake Portage and Lac la Biche	100		
„ Beaver Hills	300	1,700	11,520
IV. *Assineboines:—*			
Seen at La Roche Percée	150	150	1,000
V. *Blackfeet:—*			
Hand Hills	200		
Bow River	500	700	6,000
VI. *Blood Indians:—*			
Forks of Red Deer River	200		
Bow River and Cypre's Mts.	150	350	2,800
VII. *Peaguns:—*			
Bow River	250		
Belly River	300	550	4,400
VIII. *Surcees:—*			
Battle River	180	180	1,100
IX. *Shooshwap (Roman Catholics):—*			
Columbia River	30	30	120
X. *Rocky Mountain Stoneys (Wesleyan):—*			
Ispasquehow River and Rocky Mountains	45	45	225
XI. *Thickwood Stoneys (Roman Catholic):—*			
Athabascah River	25	25	120
XII. *Kootanies (Roman Catholic):—*			
Kootanie River	90		
Kootanie Port	40	130	650
XIII. *Iraquois half-breed Freemen (Roman Catholic):—*			
Jaspar House	30	30	150
Total Number of Tents		4,195	
Total Nomadic Population			28,510

For the sake of clearness we give the following Table of the aboriginal groups into which the Indians of the British Territories have been divided, showing the relationship of the Tribes seen by the expedition.

I. *Esquimaux* :—
Not seen.

II. *Algonquin* :—
Chippeways.
Crees:
Of the Thickwoods.
Of the Plains.
Blackfeet, or Slave Indians.
Blackfoot Tribe.
Blood Indians.
Peaguns.

III. *Iraquois* :—
Principally Canoemen.

V. *Athabascah* :—
Chepewyans.
(Only a few lodges of this tribe were seen near Fort Pitt.)
Surcees.

V. *Dahcotah* :—
Assineboines:
Of the Plains.
Of the Thickwoods.
Of the Rocky Mountains.

VI. *Kootanah* :—
Kootanies.

VII. *Atnah* :—
Shooshwap.

VIII. *Kolooch* :—
Mixed tribes of the West Coast.

Disregarding the Salteaux, or Chippeways, of the district from Lake Superior to Red River on the one hand, and from the lake and wood country as far west as Forts Ellice and Carlton on the other, a tribe of whom the expedition saw little or nothing, we shall notice first, in the plain country, the Cree Indians, both from their greater number and also from their being on more intimate relations with the traders than any other of the tribes in the Saskatchewan prairies. This nation (which is closely allied to the above-mentioned Salteaux) is divided into two great groups, the Muskego or Swampy Crees, and the Saskatchewan Crees. The former inhabit the country from Hudson's Bay to Lake Winnipeg, living during the summer on the lakes and rivers, and in the winter hunting moose and reindeer in the morasses covering this tract of country. It is to this that they owe their name of Swampy Crees. They do not use any horses for transport, but travel by canoes in summer, and in winter with dogs, or on snow shoes.

Thickwood Crees of the Saskatchewan district, for so they are termed by the traders, inhabit a belt of country to the west of Lake Winnipeg, stretching along the northern border of the Saskatchewan Country, as far west as Longitude 113°. They are most numerous in the vicinity of Fort Pelly and Fort à la Corne, but they also trade at Forts Ellice, Carlton, Pitt and Edmonton.

They travel about in small parties, using horses and dogs for transport in summer; both of these animals carry their loads on their backs, but in winter the dogs draw a long light sleigh over the snow. These Indians have regular tracks cut through the woods, wide enough to allow a pack-horse to pass. During the open weather, they live by the chase of the moose-deer, carriboo, or thickwood reindeer, the wapiti, small deer, and bears; but in winter they are compelled to depend chiefly on rabbits, which are very abundant in some parts of the country. Though occasionally in autumn they make short excursions to the plains for baffalo, when the herds come close to the edge of the woods. They often suffer great privation during their long winters, as they are then confined to the dense woods, and are employed in trapping the marten, minx, fisher, and other fur-bearing animals. To secure these animals they construct rude fall traps of a few short poles, enclosing a space in which the bait is so adjusted that on the animal tugging at it a heavily weighted log falls on its head.

As a rule these Indians are hard working and docile, and in manner silent and self-possessed. They are extremely hospitable, though it is seldom they have more than the barest necessities of life. They trade their furs and dressed deer skins for ammunition, tobacco, and clothing; and but few of them care to waste the fruit of their hard toil on liquor. Those, however, who are nearest to Red River, form an exception to this statement, as the free-traders from that settlement have caused the introduction of ardent spirits among them.

The Thickwood Crees are simple in their dress, and seem to have none of those noisy and gaudy superstitious ceremonies to which those that dwell in the plains are so partial. They offer a most likely field for missionary enterprise, and advancement in civilization; and there would probably be little difficulty, under proper management, in inducing them to cultivate plots of land from which they might derive a more sure supply of food when trapping furs. North of Fort Pitt there are a few families who have adopted this plan, independently of any missionary station, at which, as might be expected, the first step is always, if possible, to establish farming operations.

Prairie Crees. These have the same appearance and speak the same language as those in the woods, but they differ greatly in disposition and mode of life. They move in camps of from two hundred to four hundred tents, each of which contains one family at least, and often several. The average number of persons to a tent is about six, but the size of the tents varies much. Their only employment, as is the case, too, with all the Indians of the plains, is the chase of the bison; hence they are constantly moving about as they follow the migration of the herds of these animals.

In the latitude of Fort Ellice they sometimes pitch their tents as far west as the elbow of the South Saskatchewan, and from that point their country may be bounded by a line carried to the Neutral hills, south of Battle River, and thence to the Beaver hills and Fort Edmonton. During the summer their favourite camping grounds are along the Qu'appelle River to the Missouri Coteau, where they border on the Assineboine and Sioux Indian. They are also found in the Bad and Eagle hills between the two branches of the Saskatchewan, and also Battle River to the south of Fort Pitt or to the south-east of the Beaver hills. At all these last-mentioned places they are in contact with the country of the Surcees and Blackfeet tribes, with whom they are frequently at war. During the winter, as the herds of buffalo seek the shelter of the partially wooded country, the Plain Indians tent nearer the North Saskatchewan and towards the Touchwood hills and Fort Carlton. In winter these Indians construct "pounds" for capturing the buffalo in great numbers in order to procure their skins for the manufacture of robes for the Hudson's Bay Company.

These pounds are strongly fenced enclosures, generally hid in a small bluff of woods; the herd is guided into them by black spots of brushwood, or other substance, laid in converging lines for miles over the snow. The frightened animals not liking to pass these bushes, are constrained to enter the pound by an inclined road, ending in a sudden jump of six or eight feet, so that they are unable to return.

The prevalence of this method of hunting among the Prairie Crees is leading to the rapid extinction of their only source of support. The great plains of the North Saskatchewan, which, within the last fifteen years, were every winter teeming with buffalo, have now only a few large bands, numbering, it is true, tens of thousands, but no longer to be found all over the country as in former times. The large bands, indeed, in which these animals are now met with, are a sure sign of their being over hunted, and the result is already being felt. Thus, in 1857 the buffalo were very plentiful between Edmonton and Fort Pitt, while the Indians and Company's servants alike, at the Mountain House and at Carlton, were starving. In the following winter the case was exactly reversed, the buffalo having come on this occasion within easy distance of the latter places; while at the former it was almost impossible to feed the people, and towards spring some of the more aged Indians were starved to death.

The Prairie Crees possess large bands of horses, but of neither the number nor the quality of those kept by their neighbours, the Blackfeet. In moving about they use the "travaille," a triangle formed of two poles, each 12 feet long and connected by cross bars, which bear the load, while the apex rests on the horse's neck. For dogs they have an exactly similar contrivance, but on a smaller scale. A travelling party is a curious sight, as the women are perched generally on the horses that have the "travailes" attached, while a long straggling chain of loaded dogs brings up the rear. Their women are very hard worked, and seldom have the slightest trace of beauty, their scanty dress being always dirty and untidy. The men, too, are very different from the Thickwood Crees, being idle and dissipated, and much given to gambling, begging, and drinking whenever they can get the liquor. They have little regard for personal finery, and devote themselves to their ceremonies, feasts, and superstitious medicine dances in a listless, half earnest manner as compared with that of the other Indians. They are, however, intelligent and hospitable, and have less of the barbarian's cunning, trickery, and deceit than any of the other Plain Indians. They show few signs of industry and design in the production of ornaments or implements of any kind, and even their skins, buffalo robes, and dried meats are considered inferior to the same articles as prepared by the Blackfeet.

It was not thought necessary to prepare an original vocabulary of the language of the Prairie Crees as it is so nearly allied to that of the Muskego Crees, of which several excellent grammars and vocabularies have been published, and which has had a system of syllabic characters adapted to it, which the natives learn with great facility both to read and write. It was invented some years since by the Reverend Mr. Evans, a missionary at Norway House, who has printed several small books and parts of the Bible in these characters. The Cree language is the most universal in the country of the eastern plains, and a person conversant with it will always find some one in every tribe that can understand him, even among the Kootanies on the west side of the Rocky Mountains.

The Cree nation was at one time very numerous, and as they were the first of the Rupert Land Indians to obtain fire-arms, they overran and made a temporary conquest of the greater part of the country, the tradition being that they even crossed the Rocky Mountains and reached the Pacific coast. They are still the most numerous tribe of the Saskatchewan country, and number in all, perhaps, about 12,500 souls. They are, however, rapidly on the decrease, as the small-pox and other diseases annually sweep them off in great numbers.

Rocky Mountain and Thickwood Stoneys. Almost the only other Indians on the east side of the Rocky Mountains, and within the district we are dealing with, who trade solely with the British Fur Company, are known by the name of the Rocky Mountain and Thickwood Stoneys. These are a detached portion of the Assineboine branch of the Sioux or Dacotah tribe, and having been separated a great distance from their kindred, they have naturally been much modified in their character and mode of life.

At one time the Plain Stoneys or Assineboines were a very powerful tribe in the Saskatchewan district, and inhabitants of the country between Carlton and the Missouri Coteau; indeed, even so late as when Franklin first visited that country in 1821, they were the terror of the traders from their daring attacks and plundering propensities. But when the small-pox commenced its ravages among the aborigines of this part of North America, it seemed to single them out for more severe visitation than any of the other tribes, till at length they were almost extirpated, the northern part of their country being occupied by the less mischievous Crees. They still, however, dwell in the plains along the boundary line to the south of Fort Ellice, at which post they trade in the winter, as also at the American Mandan Forts in the Missouri; and along this latter river they yet form a numerous tribe. Those in the British territory still preserve their old character of being the greatest scamps and horse stealers of the prairies. The expedition only met with one small band of them, numbering about 1,000 souls, but ascertained that their present haunts were to the west, along the boundary line, nearly to the Cypre's hills.

It is to these Assineboines, then, that the Thickwood and Rocky Mountain Stoneys belong; but so great is the difference between them, that were it not for their language being almost identical we

should not suspect the relationship on first seeing them. These dwellers, indeed, in the forest form but a very small tribe of scarcely more than 100 tents or 500 souls. They have, without exception, been converted to Christianity, as from their small number and mode of life (which is the same as that of the other Thickwood Indians) they were from the first more easily accessible than any other tribe. Those that live in the Rocky Mountains (who form the largest and best portion of them) were adopted and taught by the Rev. Mr. Rundall, a Wesleyan missionary, who spent many years at Fort Edmonton, and penetrated into remote parts of the Rocky Mountains in his well organized and satisfactory endeavours to reclaim these Indians. In fact, although it is nine years since Mr. Rundall left them, and though only a year previous to our visit that they had the attention of his successor, Mr. Woolsey, yet we found them still influenced by the good impressions that had been made on their habits and moral character by their first teacher.

Being Thickwood and Mountain Indians, and living in the most precarious manner, they are often in a destitute and wretched condition compared with that of other tribes ; yet a visitor to a camp of Rocky Mountain Stoneys will never fail to be at once struck with their quiet and respectful manner, and with their unobtrusive hospitality in sharing that which can generally be ill spared in their tents. Neither is there any begging or crowding for the purpose of forcing a ruinous trade on the hard-up traveller, which is too often a source of great annoyance on entering an Indian camp.

In addition to these good qualities, in a camp of these Indians you may leave anything lying about without fear of its being pilfered, unless, indeed, there is a possibility of its being eaten, when it is certain to become a prize to the dogs, and the Stoney dogs exceed all others in their digestive capacity.

The members of the Stone tribe are hard workers, as their life is one requiring constant exertion and foresight. They travel in the mountains or in the forests along their eastern base, in parties of six or seven families. The young men are always off hunting in search of moose or other kinds of deer, or of the Rocky Mountain sheep. The old men busy themselves cutting out the travelling tracks through the woods, while the women pack and drive the few horses they use for carrying their small supplies.

They generally use skin tents stretched on a conical framework of poles, but their wigwams are much smaller than those of the Plain Indians. The women dress all the skins of the animals they kill into a soft leather, which, when smoked, is the material used throughout the whole country for making mocassins, most of the fine leather being obtained from the Stoneys. They are excellent hunters, and though as a rule small and feeble in body, are probably capable of more endurance than any other class of Indians. They make trustworthy guides, and, with a few exceptions, after some acquaintance with this tribe, you no more expect to be deceived, or told lies, as a matter of course, than you would in a community of white men.

In the neighbourhood of the Pigeon Lake Mission they have cultivated small patches of land under the superintendence of Mr. Woolsey, but the want of proper implements is a serious bar to their advancement as gardeners or agriculturists. There is little doubt, however, that the majority of this tribe might easily be induced to quit their wandering life if they had other means of subsistence. The tract of country in the neighbourhood of Mountain House, which forms their present camping ground, and southwards to the Bow Fort, contains land admirably suited to the growth of barley, oats, and all kinds of vegetables, and the natural pasture and winter fodder cannot be surpassed. With these natural advantages no more fruitful field for missionary enterprise could be wished for than among these Indians, who are already disposed to adopt the habits of civilized men. Nor in stating this are we merely re-echoing the opinions of the missionaries, for we have heard the same views expressed by their own chiefs when sitting round their camp fires. Indeed they pointed out to us a small garden they had made in the neighbourhood of the Bow Fort, with rude implements of their own manufacture, having an evident pride in showing that their land as well as that of the white men could grow turnips, which was their only crop.

Many of the Stoney Indians can read and write in their own language, using the Cree syllabic characters, which are easily adapted to it ; and every morning and evening all the members of their camp meet to pray and sing as they were taught by Mr. Rundall, though, it must be confessed, that their music is rather uncouth, and bears strong resemblance to their pagan medicine chants. We may add that the Earl of Southesk, who was in that country at the same time as the expedition, bears a similar testimony to the good character of these Stoney Indians, in an address to the Red River settlers.

It may be thought that a tribe, numbering at the most only three hundred or four hundred souls, would afford but a small field for the employment of the missionary, especially when there are so many ever wandering over the plains ; but diffuseness of effort will be fatal to any attempts to elevate the condition of the Indian tribes in the Saskatchewan district or elsewhere. The number of converts gives no clue to the effect the teaching has had on the minds of Indians, who, though according to our ideas ignorant, are often an intelligent, thinking, and in some senses of the word a polished people.

It would prove far more effectual to concentrate the means of improving the condition of one small well-disposed community like the Mountain Stoneys, the example and advanced condition of which would offer the most powerful means of influencing the other tribes. The establishment of a nucleus formed of an industrial community, consisting almost wholly of pure Indians, would not have the same destructive effect as a colony of white men invariably has on the surrounding and still savage tribes.

The proper field for missionary enterprise should for this reason commence far away from the influence of white settlers, so as to allow time for the gradual elevation in condition of the Indians without their being thrown into an unequal competition that must and has always proved fatal to them. An Indian tribe can never fulfil the relations of a peasant or labouring class to a white community in a recently settled country, as they possess among themselves all the elements of the different grades in society, and the attempt to render them so has always ended in their rapid degradation and final extinction.

Meanwhile, to revert to the condition of these Stoneys, their conversion to Christianity, however flattering to our missionary efforts, and perhaps at first beneficial to them, yet if unaccompanied by some effort to improve their permanent condition, will really tend only to their extermination ; for the diffusion of the doctrines of docility and weakness will only render them more defenceless and less fitted for that struggle for existence which they must maintain till they are supplied with more civilized means of live-

lihood. If such means are not speedily supplied to them, so that they shall have made some progress towards independence before the influx of white men, who will inevitably, sooner or later, occupy the fertile country of the North Saskatchewan, these Stoneys, along with the Thickwood Crees, will share the fate of all other border Indians, a fate which, however, a little present expenditure might probably avert.

Are we warranted in looking on these vast territories merely as outlets for our surplus population, without considering the claims of the Indians to our aid and protection as British subjects? And are we to regard these natives as we should so many wild beasts, the natural evils of a new country which are in time to be removed in the process of settlement.

Hitherto, while indignantly denying the latter alternative, the policy of the dominant races has unvariably produced that result. On the other hand, our opinion, derived from some study of the Indian character, is, that any attempt to reclaim them, when in close proximity to the advancing line of civilization, will be of no avail at all, but that to be permanently improved in their condition they must be aided and governed while yet in their simple and primitive condition, and that therefore it is the duty of Government to take the initiative even in the most remote districts, in a work at present left to the feeble and often ill-directed efforts of missionary societies.

Where the Hudson's Bay Company have the sole sway over the Indians, they have been very successful in introducing that kind of discipline and government among them which is favourable for the purposes of the fur trade; and though that trade perpetuates the wandering and precarious modes of life, which it should be the first duty of the civilizer to eradicate, the sway of the Hudson's Bay Company, if it has done no other good, has at least shown that the Indians are capable of being governed. We may add, that what we ourselves saw of the Rocky Mountain Stoneys has led to the foregoing remarks, which may, however, be applied with almost equal truth to the Thickwood Crees, and to any other Indians dependent on means of subsistence similarly precarious.

The Thickwood Stoneys are a small branch of this same tribe who inhabit the country to the north west of Lake St. Anne's and along the Athabasca River. They have been for many years attached to the mission at Lake St. Anne's, and are all nominally Roman Catholics. To what extent they have been improved by their connexion with the mission is uncertain, as they were only seen once by some of the expedition on the Athabasca River; they were then destitute and wretched in the extreme, but notwithstanding very desirous of gambling with what little they possessed, so that on the whole they did not leave a very favourable impression.

Slave Indians.—All the remaining tribes which were seen by the expedition to the east of the Rocky Mountains and the Saskatchewan country are included in one large group, called the Slave Indians by the traders and Crees. They all speak the Blackfoot language, and during the summer roam over the great prairies along the South Saskatchewan and Red Deer River, in winter retiring to the north-west, where they tent along the edge of the woods between Rocky Mountain House and Bow Fort. In this group, however, is included a tribe with a distinct language of its own, called the Surcees, a branch of the great Chippewayan family, who inhabit the Athabasca district far to the north of the Saskatchewan, having broken away from their own relatives and changed their habits of life from that of Wood to that of Prairie Indians. This language is guttural and harsh, so that the Blackfeet, though always living with them, are rarely able to learn it, while the Surcees have no difficulty in acquiring, not only the soft flowing Blackfoot tongue, but also that of many other tribes. The mode of life of the Surcees is the same as that of the Blackfeet, but their habits and appearance denote that they are a degraded race. Their constitutions are enfeebled, and it is a curious fact that "goitre," so rare among other Indians, is almost universal among them. The only other persons in that country who are afflicted with this disease are the half-breeds resident at the Company's forts, who are influenced by depressing causes that enfeeble the constitution without actually producing disease.

The Surcees trade at Fort Edmonton; and as we saw many articles of American manufacture among them, they probably got these from their allies the Blackfeet, as they rarely themselves go so far southward as the Missouri. They generally camp in summer towards the Hand Hills, and in winter near the elbow of Battle River; sometimes joining in one large camp with the Blackfeet, though more generally living apart by themselves.

The Blackfoot Tribes.—These comprehend the Blackfeet Blood Indians and Peaguns, who all speak the same language and have the same habits of life. They trade chiefly with the Americans, as they share in the subsidies granted according to the Indian treaty by the United States Government, a portion of that territory lying south of the boundary line as well as to the north within British rule. The Blackfeet themselves trade a good deal at the Rocky Mountain House, principally bartering provisions for rum, tobacco, and ammunition; and they all prefer the goods supplied by the Hudson's Bay Company as superior in quality to those from the American forts.

In the summer these Indians form large camps along Red Deer River or Bow River, far out into the arid plains, but where there is always enough grass in some spots to support their large bands of horses. They are the real Bedouins of the prairies, having always parties on the move in every direction, making rapid journeys, sometimes to the British, and sometimes to the American trading posts, for the sake of gathering news concerning other Indians, or of the buffalo. They have large bands of horses, and some of fair quality. Their only food is the buffalo, and most of them will go a long time hungry rather than eat ducks, rabbits, and any kind of small game.

As part of their subsidies they receive flour, sugar, and coffee; but they care very little for such articles of food, which they say make them sick. Like the Crees, when moving about they use the "travailles," but their tents are much larger than those of this latter people, it being not uncommon in a Blackfoot camp to see them of forty or fifty buffalo skins sewn together, the more usual size only requiring from twelve to twenty skins. They are always conical, with triangular lappets at the apex for directing the smoke as it escapes. As they travel so much over bare plains, where there is no timber, their tent-poles are made of light dry wood, so that they are easily conveyed by attaching them to a horse with their ends trailing on the ground. The smallest tent requires thirteen poles.

The Blackfoot tribes are fond of fine dresses for themselves, and gay trappings for their horses. Their chiefs have state robes of ermine fur and of other skins, and their medicine-men have dresses

adorned with eagle feathers. The women of this tribe are often comely, and they always dress neatly with ornamented tunics and leggings of cloth or deerskin, worked with beads and porcupine quills.

They have many mysteries and ceremonious dances, in which they make great use of drums, rattles, and shrill whistles. Their chanting on these occasions is more harmonious than that of the Crees, and they seem to join in these rites with greater sincerity than other Indian tribes. They are of wilder nature and more treacherous than the Crees, and yet have certain ideas of honour to which they rigidly adhere.

The young men are great horse thieves, but are more under the control of their seniors than is the case with the other Indians. They are constantly at war, either with the Crees, Assineboines, or Crow Indians; horse-stealing on one side or the other being generally the cause of all their quarrels.

The Roman Catholic Missionary at Lac St. Anne's, M. Le Combe, has made one tour among these Indians with a view of establishing a mission, but, as we have already remarked, it will be much more difficult to effect any real improvement among these tribes than among those that dwell in the woods. Their constant communication with the Americans, their frequent migrations and free mode of life, and their sole dependence for food on the chase of the buffalo, are all against their adopting those habits of industry without which there can be little real advancement in their condition.

According to their own notions, it would be better for them if we would leave them alone, as their only fear for the future is caused by their perceiving the rapid decrease in the numbers of the buffalo, owing to the active trade forced on them for robes and provisions. Unfortunately, nearly all their trade at the establishments of the British Fur Company is for rum, the only luxury they cannot get at the American posts; and their love for this spirit is so strong as to induce them to store up provisions to barter for it. It is only by supplying the Blackfeet with rum that the Hudson's Bay Company can induce them to prepare an excess of provision beyond their immediate wants, and though this again tends to ruin the future prospects of the Indians by gradually exterminating the buffalo, it is certain that, without this supply of provisions, the fur trade, as at present prosecuted, could not be carried on. The brigades that at present bring down the furs and take up the goods for trade to the different sub-arctic districts, by the tedious portage routes, are supplied with pemican made from the buffalo of the Saskatchewan country, but there is much reason to doubt whether, as a question of economy, even with the apparently low cost of the provisions thus obtained, it would not be cheaper to draw the required supplies from an agricultural population by a more civilized style of commerce.

The Blackfoot tribe have never yet suffered much from the small-pox, which has been such a scourge to the other Indians, but at present there is a very obscure form of disease which commits great ravages among them. It commences with a state of collapse, which attacks the Indian, generally young persons, suddenly, and if not fatal within a few hours, they sink into a low typhoid fever, from which they seldom recover. Their medicine-men use no means to recruit the sufferer's strength, but continue their attempts to cure him by beating drums and shaking rattles over him without intermission, relays of them keeping it up day and night in the case of an important patient, it is needless to say with what result. It is only when the sick Indian happens to be a man of little importance, and his friends are consequently unable to pay the medicine-men, that he has the slightest chance; indeed, the only cases of recovery we heard of were when we were able to persuade them to keep the poor sufferer clean and to give him nourishment and simple stimulants.

In the course of four days we spent near a Blood Indian Camp of two hundred tents, there were at least twenty or thirty deaths from this disease, and the wailing and lamentations of the relations were almost continually ringing in our ears. One night a chief was stricken down, and the whole camp, which was at a distance of less than a mile from ours, joined in keeping up wild and unearthly wailing till daylight.

What will become of these wild Plain Indians it is not difficult to foresee; but it is to be hoped that their inevitable extermination will not be hastened, as on the western frontiers of the United States, by ruthless warfare. At present they have a most friendly feeling towards the British, by whose representatives, the Hudson's Bay Company, they have been always fairly treated. On the other hand, along the Missouri, within the American frontier, where an active competitive trade has sprung up, the thirst of gain has developed the worst features of the white man's character, and has led the Indians, who are a very observant race, to draw the most unfavourable conclusions with regard to the white man in general.

There cannot be a shadow of a doubt that if settlers are allowed to push their way into the Saskatchewan country, as has been the case in the western states, before any form of government has been established which would consider the interest of the Indian subjects of the Queen as well as that of the settlers, it will be almost impossible to preserve this friendly feeling towards the English, and secure the country from acts of incursion and rapine on the settlers, which, if once commenced, must necessarily end in a bloody war of retaliation and extermination against the Indians. Such wars have ever proved expensive and mischievous, in that they retard the progress of the young settlement, and are, moreover, apt to raise too soon questions of assistance from, and dependence on, the mother country, and so produce jealousies and ill will. For this reason, besides the crying injustice to the Indian possessor of the soil (who in sharing his land with our surplus population, should at least have the benefit of the same laws as are passed or maintained for the good of the settlers), any measures taken in time to prevent the usual sequence of evils in the first settlement of Indian country, would prove a great saving to ourselves.

The Saskatchewan country is peculiarly favourable for making the attempt to introduce this fairer method of settlement, as it will not yield any sudden source of wealth to tempt an unsettled population, or make any return to mere "cuteness" or unprincipled speculation. Having the advantages and defects of a temperate climate, with a great extent of good and varied soil, it is well fitted for colonization by an industrial population, who, by toil and intelligence, will obviate the defects to which the climate is liable, for the sake of the small but solid measure of prosperity they are sure to enjoy in return.

So long as the colonial gold fields hold out their strong allurements to emigrants, it cannot be expected that a field of profit so humble, though probably more lasting, will be chosen by them in preference; and we may therefore be sure that even if the Saskatchewan country were at once thrown

open for settlement, and provision made for its government, there would be ample time for the system to exercise an influence in improving all classes of Indians, before those yet in their primitive state have been reached by the white population—an influence which would affect even the Blackfoot tribes, so far at least as to prepare them for becoming peaceful neighbours.

The Kootanie and Shooshwap Indians.—The expedition did not see much of these tribes, which are both small and inhabit a limited portion of country. The Kootanie Indians live generally in the wide open valley through which the river of that name flows, when parallel to the Rocky Mountains. They are all Roman Catholics, but no missionary resides among them; those that live at the Cœur d'Alleur Lake and Flathead mission stations only making occasional visits among them. They are a fine race of Indians, and seemed to us quite as well disposed as the Rocky Mountain Stoneys. They often make excursions across the Rocky Mountains to hunt buffalo, but, as a rule, tent in the large plains in the valley of the Kootanie River. They have larger bands of horses in proportion to their numbers than any other tribe we met with; and these animals, though small in size, are very swift and hardy. This arises, no doubt, from the dry gravel soil of their feeding grounds, and also from their being less frequently used than those belonging to the Plain Indians.

These Indians have several cows and oxen among them; the first of which they procured from a party of Red River emigrants, who crossed the mountains with the late Thomas Sinclair, who was afterwards killed by the Cascade Indians. They make no use of these animals; but they lassoed the cows for us, when we wanted to milk them, though they did not seem to care to milk them for themselves.

They make a few attempts at agriculture; but these, like those of the Mountain Stoneys and Thickwood Crees, are very imperfect. Their principal food is small fruit, such as cherries and the service berry, which they dry and make into cakes, and also a lichen from a species of pine tree; they also get deer and mountain sheep, and occasionally buffalo, as before mentioned.

As it is likely the Kootanie country will prove to be auriferous, perhaps in a few years these Indians may be submitted to the hard test of contact with the white man, and this, too, just at a time when his passions are most excited, and when he is least disposed to consider the claims of Indians for lenient, or even just dealing. It is to be hoped they will then migrate, as they are much superior to the tribes nearer the Pacific coast, and better worth being preserved.

The Shooshwap or Carrier Indians occupy the country of the Upper Columbia to the east to Jaspar House, where they sometimes trade, and west across the watershed to Kamiloop's Fort on Thompson's River. They are Canoe Indians, and make long journeys over the mountains, carrying heavy loads on their backs. Though small and miserable in appearance they are wonderfully strong at this work.

With them the dog is used only for hunting and never as a beast of burden, as with the other tribes. Only a few of them have horses, which they keep at the Columbia Lakes, as they have no tracks through the dense woods of the valleys further to the north. Their food is salmon (which ascends the Columbia all the way to its source), the mountain goat, and sheep, and the Siffleur or marmot, the flesh of all which they use dried and smoked. They also sometimes get a moose or rein-deer, or a bear; but no large game is plentiful on the Western Slope of the Rocky Mountains.

The other tribes of Indians seen by the expedition to the West of the Rocky Mountains, were all within the American territory excepting those at Vancouver's Island, to whom it is not necessary to allude in this report.

The vocabularies now offered were collected by Mr. Sullivan, with the exception of that of the Gros Ventres Indians, which was presented to the expedition by Mr. Denig, who collected it when resident in the Upper Missouri country.

They have all been prepared on the same plan, however, with regard to the method of syllabification, which is that adopted by the Smithsonian Institute of the United States, by which learned body many of the languages and dialects of the North American Indians have already been published.

Vocabularies of the Indian Languages.

English sounds of the vowels in syllabification.

ai. To express the sound of *a* in fate and of *ai* in aim.
ah. „ „ *a* in father.
au. „ „ *a* in fall, *au* in auction, &c.
a. Followed by a consonant or between two consonants to express the sound of *a* in hat.
ee. To express the sound of *e* in me and *ee* in feel.
e. „ „ *e* in met.
i. „ „ *i* in pine, when standing as a syllable by itself, or preceded by a consonant.
i. To express the short sound of *i* when followed by a consonant.
o. To express the sound of *o* in note and of *oa* in moan, when standing by itself, or preceded by a consonant.
oo. To express the sound of *o* in move, *oo* in pool, and *u* in rule.
o. „ „ *o* in not, when followed by a consonant.
u. „ „ *u* in nut.

N.B.—I have adopted the above method of English sounds of the vowels in syllabification, known as the Smithsonian, for want of a better. It is evident that however near we may approach to the various sounds in the Indian tongues, yet we cannot be said in the majority of instances to represent the exact sounds. In the Cree language the use of English letters has been superseded by the invention of syllabic characters, and at present a great portion of the scriptures has been translated into that language and these newly invented characters adopted.

J. W. Sullivan.

English.	Gros Ventres.	English.	Gros Ventres.
God	Mi-shie-ma-co-ka-ma-ho-pa.	Oar	Ech-oak.
Devil	Mi-shie-ma-ho-pa-ish-ea.	Paddle	do.
Angel	Unknown.	Shoe	Who-pa.
Man	Roch-pau-ka-nu-wet-za.	Legging	Whop-sie.
Woman	We-a.	Coat	My-e-to-chie-hamp-pie.
Boy	Man-ka-rish-ta-bet-sy.	Breech-cloth	Ma-rie-ip-shuck-a.
Girl	Man-ka-rish-ta-we-a.	Sash	Ma-ip-e-shan-ky.
Virgin	Unknown.	Head-dress	My-i-pock-a.
Infant or child	Man-ka-rish-ta.	Pipe	Ik-kip-pie.
Father, my	Ma-un-too.	Wampum	Ma-tuck-e-sheep-e.
Mother, my	E-cush.	Tobacco	O-pah.
Husband, my	Mank-e-rah.	Shot pouch	Ar-ro-po-ru-we-ish-e.
Wife, my	Ma-tar-a-wea.	Sky	A-pa-rie.
Son, my	Ma-nan-ka-bet-say.	Heaven	Log-ar-aut-ty-at-e.
Daughter, my	Ma-nam-ka-we-a.	Sun	Map-e-mi-nie.
Brother, my	Mat-sow-ka.	Moon	Man-ku-di-die.
Sister my	Mat-a-ke-shaw.	Star	E-cau.
An Indian	Roch-pan-ka.	Day	Ma-ni-pi.
A white man	Mush-e.	Night	O-i-a.
Head	Aunt-tow.	Light	A-waugh-aunt-e.
Hair	Mar-a.	Darkness	O-pa-sha.
Face	Ne-ta.	Morning	Aunt-ta.
Scalp	Aunt-tow-a-ru-ruch-hi-pie.	Evening	Min-nie-duck-a-we-re-a.
Ear	A-coch-i.	Mid-day	Min-nie-ma-pa-ra-pi-he.
Eye	Ish-ta.	Midnight	Mak-ow-room-at-its-haw.
Nose	Ma-pa.	Early	Ker-rak-kow-ta.
Mouth	Me.	Late	Mank-o-ti-a.
Tongue	La-je.	Spring	We-a-me-co-ta.
Tooth	E-sha.	Summer	Am-a-ra.
Beard	Ne-ke.	Autumn	Ma-ta.
Neck	Ta-how.	Winter	Ma-a-la.
Arm	Ha-ra.	Year	Ma-law-am-pie.
Shoulder	Ha-ra-puch-how.	Wind	O-see.
Back	Ma-e-shet-a.	Lightning	Car-it-scaw.
Hand	Ma-shuck-e.	Thunder	Ta-ho.
Finger	It-e-wobe.	Rain	Hal-ets.
Nail	Ma-such-ech-pow.	Snow	Mam-pie.
Breast	E-wak-e-row.	Hail	Ma-cuch-ma-it-a-rie.
Body	Ma-ich-ho-wa.	Fire	Mir-a-a.
Leg	E-rike.	Water	Mi-ne.
Navel	E-tel-lep-a.	Ice	Bir-ouch-i
Thigh	Mal-el-sa.	Earth	A-much-ki-it-a
Knee	Mach-wach-a.	Sea	Mi-ni-it-le-a.
Foot	Met-see.	Lake	do.
Toe	Met-se-nat-a.	River	Aun-gy.
Heel	Met-set-a.	Spring	Ma-ha.
Bone	Her-row.	Stream	Aun-gi-a-rook-a-rish-ta.
Heart	Nat-a.	Valley	Tar-rout-tee.
Liver	A-pish-a.	Hill	Am-a-ri-a.
Windpipe	Lot-ish-ka.	Mountain	Am-a-ha-me.
Stomach	A-pat-a.	Plain	Am-a-su-ka.
Bladder	O-shik-ur-ucha.	Forest	Mer-a-sha-e.
Blood	E-rie.	Meadow	Am-a-much-la.
Vein	Ich-ho-e-rie.	Bog	Am-a-kuck-a.
Sinew	A-caun-gy.	Island	Mi-ne-ta.
Flesh	My-ich-how-erow-her-row.	Stone	Me.
Skin	E-ho-o-ruch-pie.	Rock	Mish.
Seat	Mosh-i-la-ta.	Silver	Who-mit-sa-a-tuck-e.
Ankle	Mil-sy-row-shoak-a.	Copper	Who-mit-sa-she-re.
Town	At-ti-or-an-ky.	Iron	Who-mit-sa.
House	At.	Lead	do.
Door	At-mir-ra.	Gold	Who-mit-sa-she-re.
Lodge	At-sou-a.	Maize or corn	Oough-at-e.
Chief	Bet-sy-at-sy.	Wheat	Unknown.
Warrior	Bet-sy-re-rie shaw.	Potatoe	Me-she-kack-shaw.
Friend	Mir-ra-qua.	Turnip	A-hee.
Enemy	Mi-e-haw.	Rye	Unknown.
Kettle	Bir-ruch-a.	Bean	Am-ash-a.
Arrow	Mi-ra-ru-ish-ta-shaw.	Melon	Cack-ou-it-sa.
Bow	Bir-ruch-ha-per-room-e.	Squash	Cack-ou-i.
War-club	Ma-o-puck-e.	Tree	Mak-ou.
Spear	Me-rat-a-root-a.	Log	Me-ra-tit-sish.
Axe	Me-pit-saw.	Limb	Me-rak-am-e.
Gun	O-mit-say-ruch-a.	Wood	Me-ra.
Knife	Mat-sy.	Post	Ip-se.
Flint	Mish-shaun-ky.	Stump	Me-ra-ou-tee.
Boat	Maun-ty.	Pine	Maut-see.
Ship	Unknown.	Oak	Me-ra-ka-wek-a.

English.	Gros Ventres.
Ash	Mish-pa.
Elm	Mi-ra-e.
Shrub	Mi-ra-sheep-e.
Leaf	Mi-ra-ka-ka.
Bark	Mi-ne-shee.
Grass	Muk-aw.
Nettle	Ma-hop-e.
Thistle	Mat-sou-kee.
Weed	Ma-ap-har-e.
Flower, rose, lily, &c.	Car-a-push-e.
Bread	Mar-ach-hep-a.
Indian meal	Map-i.
Flour	Kouch-ought-i-tap-a.
Meat	Er-ouck-shit-e.
Fat	Er-i-pish.
Beaver	Bir-rup-a.
Deer	Seat-a-tuck-i.
Bison buffalo	Met-a.
Bear	Auch-pit-say.
Elk	Mar-oak-a.
Moose	A-put-a-pash.
Otter	Me-ra-pock-e.
Foxs	Ech-hock-a.
Wolf	Cha-shee.
Dog	Ma-shoun-ga.
Squirrel	Sep-sap-so-pie.
Hare	E-tuck-kie.
Lynx	Seat-a-pouch-e.
Panther	It-too-paung-it-e-ash.
Musk rat	Set-see-rook-a.
Mink	Nuck-su-a.
Marten	Nank-ush.
Mole	Ap-a-husk-ish.
Polecat	It-too-pa-pow-she.
Hog	Mish-e-it-a-rush-pish-ish.
Horse	It-show-ma-shoun-ga.
Cow	Mish-a-it-a-wit-a.
Sheep	Mish-a-it-aug-e-te-a.
Turtle	Ma-tuck-e.
Toad	Shauk-ka--roush.
Snake	Ma-pock-sha.
Lizard	Ma-kuck-pa.
Worm	Ma-pock-sha.
Insect	Ma-pock-ker-it-e.
Fly	Ma-posh-e.
Wasp	Co-wock-e-al-saun-te.
Ant	Ma-sker-et-te.
Bird	Sick-aunk.
Egg	Sick-aunk-a-naun-kuts.
Feather	Mauts-oak-e.
Claw	Ma-it--ick-pow.
Beak	Sick-aunk-a-pa.
Wing	Eck-pa.
Goose	Meal-a.
Duck	Me-auch-aunk.
Swan	Ish-shwo.
Pigeon	Ma-ra-ka-it-ca.
Plover	O-she-at-ca.
Crow	Ma-ar-ish-a.
Raven	Par-et-skuck.
Robin	Lo-ke-wa-ke.
Eagle	E-put-tuk-e.
Hawk	O-shit-tuk-e.
Snipe	Ka-wik-ka.
Owl	Yak-e-pish.
Woodpecker	Mat-e-eash-y.
Fish	Bo-a.
Sturgeon	Bo-a-up-ar-lach-e.
Catfish	Bo-a-cant-a.
Sucker	Bo-a-et-e-kip-ish.
Minnow	Bo-a-rank-ets.
Fin	A-pi-et-scaw.
Scale	Et-e-cant.
Roe	E-nang-kuts.
White	E-who-tuk-e.
Black	Ship-e-shaw.
Red	E-shee.
Green	To-e-esht.

English.	Gros Ventres.
Blue	To-a.
Yellow	Ser-re.
Great	It-e-a.
Small	Car-ish-ta.
Strong	Sat-so-kits.
Weak	Hash-uts.
Old	Hay-ats.
Young	Car-ish-ta.
Good	Sack-its.
Bad	Na-she-ets.
Handsome	Sack-its.
Ugly	Na-she-a-kaut-ta.
Alive	In-its.
Dead	Ta-ats.
Life	He-ra-ba-couts.
Death	Ta-ra.
Cold	Se-re-ets.
Hot	Ar-ets.
Sour	Se-cou-a.
Sweet	Sic-cou-a.
Bitter	Ar-a-hits.
I	Me.
Thou	Ne.
He	He-re.
She	He-re-we-a.
They	I-it-sa.
Pepper	Mir-uch-on-pa-it-a.
Salt	A-much-hot-a.

The following English sounds of the vowels have been adopted for the vocabulary of the Blackfoot language; but it must be observed, that in the vocabulary of the Surcee, whenever *r r* commences a syllable, it represents a sound from the depth of the throat, and whenever *h h* occurs, it is a signification of a very strong aspirate. In this latter tongue also, I have adopted the symbol ᵕ for a peculiar chuckle, which I could not find letters to represent. This peculiar chuckle may be well likened to that, uttered by a person in the act of being choked.

In the vocabulary of Rocky Mountain Stoney, like that of the Surcee, all the English vowel sounds are as those adopted in the Blackfoot, and the following symbols in the Rocky Mountain Stoney should be observed, viz. :—

- over a syllable signifies the French nasal, as in *ment*.
ᵕ over a *g*, signifies *g* soft.
' signifies an aspirate.

English sounds of the Vowels.

a. As in father.
ai. As in fate.
eo. When together, *yo*.
ohc. Long aspirate, followed by *k*.
ahc. " " "
ohk. Short " " *k*.
ahk. " " "
i. Followed by *h*, as in fire.
i. Followed by a consonant, as *e* in met.
ee. As in meet.
ō. Thus marked is pronounced long.

English.	Surcee.
God	Tsin-is-chai.
Man	Kă-tin-nee.
Woman	It-si-ka.
Boy	It-si-tăi.
Girl	It-si-tat-sa.
Father, my	I-tă-ih.
Mother, my	I-nă-ih.
Husband, my	Si-ka-la.
Wife, my	Is-tsi-a.
Son, my	Si-rra.

English.	Surcee.	English.	Surcee.
Daughter, my	Si-zat-si.	Island	Noo.
Brother, my	Sa-tli-ki.	Stone	Tsah.
Sister, my	Sit-ta.	Tree	Ti-chee.
An Indian	Tin-na.	Wood	Koh.
A white man	Ti-ka-aih-yee.	Bark	Ka-lai-tŭn-na.
Head	Sit-zee.	Grass	Ko-tlo.
Hair	Sit-să-ah.	Fat	Kah.
Face	Sin-nee.	Beaver	Tsaw.
Scalp	Koot-sis.	Buffalo bull	Un-ni.
Ear	Sit-si-rra.	do. cow	Un-ni Ma-ka.
Eye	Sim-ne-rra.	do. calf	Til-ta-ga.
Nose	Sit-si.	Black bear	Ni-ni-gă-til-ko-shi.
Mouth	Si-zŭk-ka.	Grizzly Bear	Ni-ni-gă.
Tongue	Sit-so.	Elk	Chuz-zai.
Tooth	Soo-wa.	Moose	Tin-ni-chi.
Beard	Sit-tah.	Otter	Na-mi-yee.
Neck	Sihk-ka-sap.	Red fox	Chuk-ōl-ko-ee.
Arm	Sik-kŭm-na.	Black fox	Chuk-ōl-ko-ee Til-ko-shi.
Shoulder	Sis-a-mish-ha.	Cross fox	Chuk-ōl-ko-ee Til-chet-si.
Back	Siz-zai.	Wolf	Maw-si-na.
Hand	Sai-rre-tluk-ka.	Dog	Ili.
Finger	Sil-la.	Horse	Chis-tli.
Nail	Sil-la-kŭn-na.	Domestic bull	Until-klish-ee.
Breast	Si-chuk-a.	do. cow	Un-ni-ma-ka.
Body	Si za-al-ti-sut-tee.	Egg	I-rre-za.
Leg	So-woos.	Goose	Ah-chee.
Navel	Sit-suk-ka.	Duck	Tsees.
Thigh	Choo-os-choo.	Swan	Toŏl-kỳ-ee.
Knee	Sit-sis-tak-i-ta.	Partridge	Ni-ta-ga.
Foot	Sik-ka.	Great	Ni-chow.
Toe	Si-kut-sis.	Small	Nit-si-tlih.
Heel	Si-kus-ta.	I	Sin-ni.
Flesh	A-li-ni.	Thou	Nin-ni.
House	Naz-hee-lai.	He	Tin-ni.
Door	Ta-mil-lai.	Who	It-ti-ga.
Lodge	Sah-rra.	Near	Quil-ta-wa.
Chief	Uk-ki-chee.	Far off	Kooz-zaw.
Kettle	Us-sa.	To-day	Tat-si-nis.
Arrow	Ilt-tŭn-nai.	To-morrow	I-tlat-si.
Bow	Ti-chi-taw-nai.	Yesterday	Ihhil-ka.
Axe	Chilth.	Perhaps	Ihhil-ye-ko.
Gun	Il-til-taw-nee.	To eat	Is-chu.
Knife	Muss.	To drink	Toos-ta.
Flint	Tan-it-sa.	To laugh	Chi-ni-tlo.
Boat	Tun-ni-kus-si.	To cry	Si-ni-to.
Oar	Ma-kit-si.	To love	Mi-kut-si-nis-ĭkli.
Shoe	Si-ka.	To walk	Ish-hul.
Legging	Sis-tla.	To run	Ti-il-tlush.
Coat	Si-ki-yee-chi.	To see	Iso-hi.
Shirt	Si-ki-chis-i-tun-i-rra.	To hear	Iz-hilt-sai.
Breechcloth	Si-chŭn-na.	To speak	Ut-sa-ko-tin-nut.
Sash	Sis-kus-sa.	To think	In-ni-sim.
Pipe	Mis-to-tee.	Gunstock	Tan-it-see.
European pipe	Mis-to-tee Til-kul-lai.	Ramrod	Tich-in-chuk-i-rra.
Tobacco	Ka-chi-na.	Trigger	Mit-sus-tlo-tla.
Shot pouch	Kose-tla.	Percussion cap	Tan-it-sa-ha.
Sun	Cha-tur-ra.	Powder	Tuss.
Moon	Il-nur-ra.	Ball	Ki-til-tun-ni.
Star	Soh.	Powder horn	It-tak.
Day	Chi-ni-see.	Book	Tut-li-shi.
Night	It-tla-rri.	Glass bottle	Nis-tin-ni.
Lightning	Cha-tlish.	Mirror	Mi-ja-chi-tin-ni.
Rain	Cha-tee.	Comb	Tsa-hi-kit-see.
Snow	Suss.	Box	Kal-ta-gă.
Hail	I-ni-lo-e.	Button	Til-til ti-cot-ti.
Fire	Koh.	Medicine	Tlo.
Water	Toh.	Bridle	Chis-til-i-goo-ti-la.
Ice	Nist-in-ni.	Skunk	Naz-e-rra.
Earth	Koo-tlis.	Come here	Toos-ti-a.
Lake	Too-choo.	My native land	Si-nil-ka.
River	Tsis-ka.	Your native land	Ni-kil-ka.
Stream	Tsis-ko-wit-sa-kla.	He has it	I-ga-gil-hi.
Hill	Tsuts-sik-la.	Just so	Ek-ko-to-ko.
Mountain	Tsah.	Jumping deer	Na-kish-i,
Rocky Mountains	Tsah.	Put on some wood	Quk-a-til-a.
Plain	Tlo-kwa.	Across	Oo-nas-tin-a.
Forest	Ti-chi-tla.	This side	Is-tul-i-rra.
Bog	Ko-ti-tlut-chi.		

English.	Surcee.
I fear the wolf -	Maw-sun-na Nus-chee.
Thou fearest the wolf	Maw-sun-na Nil-chee.
I will kill the wolf -	Maw-sun Nult-za-zis-ka.
I am satisfied -	Kos-nis-tli.
There are no buffalo	Un-ni Nin-to.
I smoke - -	Is-to.
I see many jumping deer.	Na-kish-im-tla Iss-hai.

The following are their Numerals.

1. Klŭk-a-za.	17. Chis-chi-i-ti-mi-tih.		
2. A-ki-a	18. Klihse-ti-chi-mi-tih.		
3. Ta-ki.	19. Ti-ko-lih-mi-tih.		
4. Ti-chi.	20. A-kut-ti.		
5. Ko-zil-ta.	21.	Do.	Klak-i-mi-tih.
6. Koos-tun-i.	22.	Do.	A-ka-mi-tih.
7. Chis-chi-tai.	23.	Do.	Tăhc-ki-mi-tih.
8. Klihse-ti-chi.	24.	Do.	Ti-chi-mi-tih.
9. Ti-ko-li-ga.	25.	Do.	Ko-zil-ta-mi-tih.
10. Ko-ni-zaw-ni.	26.	Do.	Koos-ta-mi-tih.
11. Koos-ta-mi-tih.	27.	Do.	Chis-chi-i-ti-mi-tih.
12. A-ka-mi-tih.			
13. Tăhc-ki-mi-tih.	21.	Do.	Klihse-ti-chi-mi-tih.
14. Ti-chi-mi-tih.			
15. Ko-zil-ta-mi-tih.	29.	Do.	Ti-ko-lih-mi-tih.
16. Koos-ta-mi-tih.	30. Tah-ti.		
	40. Tish-ti.		
	50. Ko-zil-ta-ti.		
	60. Koos-ta-ti.		
	70. Chis-chi-ti-mi.		
	80. Klihse-chis-ti.		
	90. Ti-kŏ-lih-ti-mi.		
	100. Ko-ni-zut-ti.		

Vocabulary of Rocky Mountain Stoney of the Thickwoods.

English.	Rocky Mountain Stoney.
God - - -	Wa-kūz-zai.
Devil - - -	Wa-ka-i-nin-ga-za.
Man - - -	Cho-ka-wa-zi-na-za.
Woman - - -	Wa-kūz-za.
Boy - - -	Cho-kun-na-zāi.
Girl - - -	Wi-chi-un.
Infant - - -	Ta-ow-sheun.
Father, my - -	A-dai.
Mother, my - -	I-na.
Husband, my -	Mi-hi-na.
Wife, my - -	Mi-tow-wi.
Son, my - -	Mi-cheek-si.
Daughter, my -	Mi-chōng-ksin.
Brother, my - -	Mi-sōng-un & Mi-tung-un.*
Sister, my - -	Mi-tōng-sin.
An Indian - -	Wa-chuss-ta.
A white man - -	Mi-ni-a-da.
Head - - -	Ma-pa.
Hair - - -	Ma-nan-to.
Face - - -	Mai-hin-tai.
Scalp - - -	Pa-ha.
Ear - - -	Ma-no-hai.
Eye - - -	Mih-his-ta.
Nose - - -	Ma-poh-rrai.
Mouth - - -	Mih-hiss-kai.
Tongue - - -	Ma-chaiz-zai.
Tooth - - -	Is-kai.
Beard - - -	No-tai-mih-ish-mutz.
Neck - - -	Ta-hoo.
Arm - - -	Mih-hiss-to.
Shoulder - -	I-id-dai.
Back - - -	Ma-chūm-ka-oo.
Hand - - -	Ma-num-bai.
Nail - - -	Ma-sha-gai.

* Elder and younger respectively.

English.	Rocky Mountain Stoney.
Breast - - -	Ma-huz-zai.
Body - - -	O-wass.
Leg - - -	Ma-chai-ğa.
Navel - - -	Ma-chep-ta.
Thigh - - -	Chai-ğoue-dai.
Knee - - -	Ta-hūng-gai.
Foot - - -	Ma-si-a.
Toe - - -	Ma-si-pōng-gai.
Heel - - -	Ma-si-a-dai.
Bone - - -	Oo-hoo.
Heart - - -	Ma-chun-dai.
Liver - - -	Cha-ho.
Windpipe - -	Ma-no-dai-soo.
Stomach - -	Ma-ni-rrai.
Bladder - -	Ta-niz-zai.
Blood - - -	Wai.
Vein - - -	Kā.
Sinew - - -	Ta-kā.
Flesh - - -	Ta-no.
Skin - - -	Mā-hā.
Seat - - -	Ma-si-cha.
Ankle - - -	Mih-his-kōu-a-rrai.
House - - -	Ti'-wa-zai.
Door - - -	Ti'-o-ba.
Lodge - - -	Ti'-bi.
Chief - - -	Ong-ga.
Friend - - -	Mi-tow-wi-a-dai.
Enemy - - -	Wa-gin-he-auch.
Kettle - - -	Chai-rra.
Arrow - - -	Wi-himp-tai.
Bow - - -	In-daz-zai-bi.
Spear - - -	Wo-kiz-za.
Axe - - -	Mas-pai.
Gun - - -	I-upe-ta-ha.
Knife - - -	Min-na.
Flint - - -	Chūng-ki-a-pa.
Boat - - -	Wa-da.
Oar - - -	Wak-man-ğa.
Shoe - - -	Hain-ba.
Legging - -	Oos-ka.
Coat - - -	Ik-noo-ai.
Shirt - - -	Sis-zai-bāng-noo-ai.
Breechcloth - -	Choke-nūng-gai.
Sash - - -	Ip-pi-a-gih.
Pipe - - -	Pa-hoo.
Tobacco - -	Doo-kab-bi.
Shot pouch - -	Ho-ho-zoo-ha.
Sky - - -	Wūng-kun-dó.
Heaven - - -	Má-pi-a.
Sun - - -	Ow-wi-um-ba.
Moon - - -	A-heb-i-ow-wi-um-ba.
Star - - -	Ya-yūng-gun.
Day - - -	Um-butch.
Night - - -	A-hai-bitch.
Light - - -	Is-ka-nanch.
Darkness - -	A-haib-bai-hatch.
Morning - -	A-kai-natch.
Evening - -	Same as darkness.
Mid-day - -	Cho-gōug-to-yin-gatch.
Early - - -	Ais-sin.
Late - - -	Tosh-nūng-gutch.
Spring - - -	Wai-dootch.
Summer - -	Mi-no-gai-dootch.
Autumn - -	To-ga-wa-nutch.
Winter - - -	Wa-nai-dootch.
Year - - -	A-gūng-ga-boo-wa-zi.
Wind - - -	Ka-noo-zutch.
Lightning - -	Ing-to-ga-za-zum-bi.
Thunder - -	Mo-bi-sah.
Rain - - -	Wa-patch.
Snow - - -	Wah.
Hail - - -	Wa-sootch.
Fire - - -	In-ka-to.
Water - - -	Mi-ni.
Ice - - -	Cha-rra.
Earth - - -	Ma-kun-do.
Sea - - -	Shmantz.
Lake - - -	Mi-nai.

English.	Rocky Mountain Stoney.
River	Wa-pi-ti.
Stream	Wa-pi-ta-nutch.
Valley	Mih-ya-ohks-si-a.
Hill	Pa-ha.
Mountain	I-yá-hai.
Rocky Mountains	I-yá-hai.
Plain	Tin-da.
Forest	Chih-a-da.
Bog	Sin-da.
Island	Chā-soo-da.
Stone / Rock	O-pa-bim.
Silver and gold	They apply the Cree names to these metals.
Copper	Soo-da-cha-zi.
Iron	Soo-da.
Lead	Tan-choo-dai-snow-a-bi-zi.
Grain of any kind is called by them	Ya-ho-wa-bi.
Potatoe	In-chak-i-a-bi.
Tree	Cho-wa-ha-tūng-a.
Limb	Má-sa-hunt-ch.
Wood	Cho-wa-zi-bi.
Stump	Cha-seg-ğa.
Pine	Cho-wa-ba.
Leaf	Wa-zōug-ta.
Bark	Wa-hoh-pitch.
Grass	Pai-zhi.
Hay	Pai-zhi-pa-rrai-ğo-bi-ğai.
Weed	A-bih-yai.*
Flower	Wá-pai-ōug-ği-a-bi-ğai.
Meat	Tan-no.
Fat	Was-na.
Beaver	Cha-ba.
Buffalo bull	Ta-tūng-a.
do. cows	Wi-yai.
do. calf	Chin-ğun.
Black bear	O-zin-ğa.
Grizzly bear	Wa-kez-za.
Cinnamon bear	Wink-chin.
Elk	Pa-chid-in.
Moose	Tah.
Otter	In-tai-bi-ğ
Red fox	To-kum.
Black fox	To-kus-sa-bi.
Cross fox	To-ka-ho-din.
Wolf	In-ğak-nóse-sa.
Dog	Shōng-ga.
Squirrel	Piz-ziu.†
Wood squirrel	An-gash-a.
Hare	Maish-taim-tūng-a.
Lynx	In-ko-moug.
Panther	Ink-mōng-tūng-a.
Muskrat	Some-tai.
Mink	Tokes-sinğ-ğa.
Fisher	Sind-ai-kap-pai.
Marten	Nip-ta-gai-chan.
Horse	Sho-a-tūng-a.
Domestic bull	Wi-ya-nek-nai-rra.
Do. cow	Ta-tūng-rra-nek-nai-rra.
Do. calf	Nek-nai-rra.
Frog	Ta-bai-a-tūng-a.
Snake	Snow-hen.
Fly	O-na-rrin.
Wasp	Toom-na-ti.
Musquito	Cha-pōng-a.
Ant	Wa-mi-noos-ka.
Bird	Sik-tan.
Egg	Chah-pa.
Feather	Wa-i-a-ga-zi.
Claw	O-zhin-da-sa-gi.
Beak	Sko-batch.
Wing	Wa-i-uze-za.

* This is the name of the weed which is used by them for smoking.

† This word is more properly the common marmot of the plains, Arctomys Hoodii.

English.	Rocky Mountain Stoney.
Goose	Na-wa-dis-kun.
Duck	Pa-rron-da.
Swan	Ko-ko.
Partridge	Si-chah.
Pigeon	Kun kai-ğa.
Crow	Ka-rri.
Eagle	A-no-kas-sa.
Hawk	Pai-as-sa.
Snipe	Wa-moon.
Owl	Hi-hash-a.
Woodpecker	Tohs-kun.
Fish	O-rra.
Trout	Ome-nus-kun.
Sturgeon	I-moch-tan.
Pike	Ome-nas-kan.
Fin	Ti-wun-ki-sa.
Scale	Soo-da-ak-tai-tōng-bi-sa-zai.
Roe	O-chin-cha-ğun.
White	Sean-utch.
Black	Sah-ba.
Red	Shatch.
Green and blue	To-atch.
Yellow	Seetch.
Great	Tūng-atch.
Small	Choos-kin-atch.
Strong	Sah-kutch.
Weak	Wun-ka-nutch.
Old	Wa-nin-ga-zha-da-hutch.
Young	Kose-katch.
Good	Wais-taitch.
Bad	Tai-rritch.
Handsome	In-dai-wass-daitch.
Ugly	In-ing-utch.
Alive	Ninch.
Dead	Iatch.
Life	Nim-be-ğai.
Death	Ki-sninch.
Cold	Ose-a-ninch.
Hot	Ka-nooze-hutch.
Sweet	Squi-utch.
Pepper	Sinda-ha-za.
Salt	Ta-shoo-za.
Bitter	Si-gum-nutch.
I	Mi-ya.
Thou	Ni-yai.
He	Ni-hish.
All	O-wass.
Part	To-kum.
Who	Too-wai.
Near	Ass-kan.
Far off	Tai-utch.
To-day	The same as the word *day*.
To-morrow	A-ki-gi.
Yesterday	Ah-tan-ni-a.
Yes	Ha-ch.
No	I-ya.
Perhaps	Hun-do-kai.
Never	To-ūng-ta-han-i-gas-tus.
Above	Ai-cha-gain.
Under	Wung-gun-doo-ği.
Within	Ma-kun.
Without	Pa-na-tah.
Something	Tūng-gun.
Nothing	Ta-go.
To eat	Ta-go-snitch.
To drink	Wam-na-tak-tucth.
To laugh	Mi-nim-na-tūng-tulch.
To cry	In-wak-hutch.
To love	Mis-ti-mung-tutch.
To burn	Wak-pūng-a-sitch.
To walk	Spow-wats.
To run	Ma-wa-nink-tutch.
To see	Im-ma-nung-hutch.
To hear	Wa-min-nag-hutch.
To speak	Na-wa-honch.
To strike	I-wa-hutch.
To think	A-wa-putch.
To wish	Ai-pi-chatch.

English.	Rocky Mountain Stoney.
To call	Wa-ching-hutch.
To live	Wa-huntch.
To go	Wa-nitch.
To sing	Ek-tam-na-tutch.
I come	I-mootch.
To dance	A-wa-nu-natch.
To die	Wa-Wa-ki-chitch
To tie	Pow-wa-tutch.
To kill	Wa-he-atch

N.B. It should be here observed that from "to eat" to "to kill," or, in other words, all the verbs given in the infinitive mood in English are translated in the opposite column by the third person singular, nominative case. As far as we know the infinitive form of verbs does not occur in the North American Indian languages.

The following are the NUMERALS of the ROCKY MOUNTAIN STONEYS.

1. Wa-zi.
2. Nome.
3. Yam-ni.
4. Tōng-sa.
5. Sap-ta.
6. Shak-pi.
7. Sha-gong.
8. Shak-no-rra.
9. Nam-cho-nūgk.
10. Wi-chim-na.
11. A-gai-wuz-zi.
12. A-gin-ome.
13. A-gai-am-ni.
14. A-gai-tōng-sa.
15. A-gai-sap-ta.
16. A-gai-shak-pi.
17. A-gai-sha-goug.
18. A-gai-shak-no-rra.
19. A-gai-nam-cho-ūngk.
20. Wi-chim-na-nome.
21. Ditto. A-gai-wuz-zi.
22. Ditto. 12 repeated.
23. Ditto. 13 ditto.

&c. &c.

30. Wi-chim-na Yam-ni.
40. Ditto. Tōng-sa.
50. Ditto. Sapta.
60. Ditto. 6 repeated.

&c. &c.

100. O-būng-wa-gai.
200. Ko-to-bōng-o-rrai-nome.

N.B. It is very difficult to get beyond 200 with any of the Indian languages I have met.

VOCABULARY of BLACKFOOT of the PLAINS.

English.	Blackfoot.
God	Is-po-ma-ta-pe.
Man	Ma-ta-pe.
Woman	A-kee.
Boy	Sa-ko-ma-pee.
Girl	A-ke-kwun.
Child	Po-kow.
Father, my	Nin.
Mother, my	Nik-sis-ta.
Husband, my	Nōme.
Wife, my	Ni-to-kee-man.
Son, my	No-choe.
Daughter, my	Ni-tan.
Elder brother, my	Nis.
Younger brother, my	Nis-kan.
Sister, my	Ni-nis-ta.
An Indian	Ni-tse-ta-pe.
A white man	Na-pai-quawn.
Head, my	No-to-kan.
Hair, my	Ni-to-co-yee-ki-sim.
Face, my	No-stoke-sis.

English.	Blackfoot.
Scalp, my	Nit-sa-to-mo-ow.
Ear, my	O-tohc-is.
Eye, my	Ni-wa-pisp.
Nose, my	Nohc-is-sis.
Mouth, my	Ma-hoy.
Tongue, my	Nat-si-na.
Tooth, my	No-pi-kin.
Beard, my	Ni-mo-ee-o-e-yo.
Neck, my	No-ko-kin.
Arm, my	Notc-sis.
Shoulder, my	Notc-si-kis.
Back, my	No-ka-kim.
Hand, my	Ni mee-eet-si-kin-is.
Finger, my	No-keet-sis.
Nail, my	Ni-to-wo-ta-no-keet-sis.
Breast, my	No-nee-kis.
Body, my	No-sto-mee.
Leg, my	Och-at-sin.
Navel, my	No-to-yees.
Thigh, my	No-wa-pis-suck.
Knee, my	No-tohc-sis.
Foot, my	Nohc-kats.
Toe, my	Nohc-keet-sis.
Heel, my	No-toh-tone.
Bone, my	Och-kin.
Heart, my	Nose-kit-sa-pa-pee.
Liver	Kin-a-kin.
Windpipe	Oke-sis-tone.
Stomach	No-kin.
Bladder	Wa-pa-kis.
Blood	A-a-pan.
Vein	Ose-chee.
Sinew	A-si-pis.
Flesh	Ma-ta-pee-eek-si-sa-ko.
Skin	O-to-kis.
Seat	No-to-pai-suk.
Ankle	Ni-tahc-ko-ki-na-keep.
Town	O-kow-wow.
House	Na-pai-o-yees.
Door	Keet-sim.
Lodge	Mo-yees.
Chief	Ni-na.
Warrior	E-ka-pa-pe.
Friend	Na-pai.
Enemy	Ni-kah-tome.
Kettle	Is-ke.
Arrow	Ahp-see.
Bow	Na-mee.
War club	
Spear	Sa-pa-pis-tat-sis.
Axe	Kat-sa-kin.
Gun	Na-mo-a.
Knife	Is-to-ween.
Flint	Si-sai-ke-tau.
Boat	A-ki-oke-sa-chis.
Ship	O-mo-ta-ka-mee-ispe.
Sail	Na-che-kin.
Oar or paddle	Naht-sis.
Shoe	Na-che-kin.
Legging	Naht-sis.
Coat	Ni-so-ka-sim.
Shirt	Nit-sis-tak-si-so-sa-sim.
Breechcloth	Nit-so-ki-ohc-sa-sis.
Sash	Ni-mihp-sim.
Pipe	A-kwo-ni-man.
Tobacco	Pis-tah-kan.
Shotpouch	Ats-o-ee-aht-si-man.
Sun	Na-toos.
Moon	Ko-ko-mi-ki-soo.
Star	Ka-ka-to-see.
Day	Sis-chee-coe.
Night	Co-co-ee.
Light	A-pin-a-ko.
Darkness	Is-ki-ni-cheo.
Morning	A-pin-a-ko.
Evening	O-ta-ko.
Mid-day	Tak-si-ki-eek-sis-che-coe.
Midnight	Tak-si-ki-eek-e-co co-ee.

English.	Blackfoot.
Early	Es-ka-na-to-ni-o.
Late	At-ta-ko.
Spring	Mo-ko
Summer	Ni-po-ee.
Autumn	Mo-to.
Winter	Is-to-yee.
Year	O-ma-kohe-po-tan.
Wind	So-po-ee.
Lightning	A-ka-nat-seo.
Thunder	Sis-che-kome.
Rain	So-tahn.
Snow	Kone-sko.
Hail	Sa-ko.
Fire	Ist-chee.
Water	Oh-kee.
Ice	So-ko-ko-to-ni-kun.
Earth	Sa-kōme.
Lake	O-mahe-si-ki-mee.
River	Nee-ee-tan.
Stream	A-see-ee-tahe-tan.
Hill	Ni-to-mo.
Mountain	Mis-tuk.
Plain	Sou-kee.
Forest	A-chee-wos-ko.
Valley	Ka-wuk-ko.
Bog	Pak-si-ka-ko.
Island	Me-nee.
Stone or rock	Oh-ko-toke.
Copper	Oh-tih-kim.
Iron, Lead, Gold	The Blackfeet have no distinguishing names.
Metal	Meek-skeem.
Wheat or flour	Ta-pih-yeen.*
Vegetables of all kinds	Ju-si-man.
Tree	Mis-ta-va-mo.
Wood	Mis-tchis.
Limb	Wa-tse-pai-is.
Post	Is-tahe-sim.
Bark	O-tokes-kee.
Grass	Ma-to-yees.
Weed	Kuk-see.†
Flower	Soo-o-puk-kee.
Meat	Ik-see-sa-ko.
Fat	Po-mis.
Beaver	Kik-sta-kee.
Deer	Po-no-kow.
Buffalo bull	Sta-mik.
Ditto cow	Is-ki-na.
Ditto calf	O-mis-tahe-see.
Bear	Kai-yew.
Elk	Po-us-kow.
Moose	Sik-tsis-shoo.
Otter	A-mo-ni-see.
Fox	O-ta-to-yee.
Wolf	A-pis-se or Ma-co-ee.
Dog	E-mi-ta.
Squirrel	O-mahe-ko-ka-ta.‡
Hare	O-ma-kat-sis-tow.
Muskrat	Mi-sohp-skee.
Wood squirrel	Mais-chis-so-yee-ka-yeo.
Fisher	Pi-no-to-yeo.
Mink	As-so-yee-kih-yeo.
Marten	As-sin-o-tih-yee.
Mole	Ka-nas-ki-now.
Horse	Po-no-ka-mi-tow.
Cow	A-potes-ski-nee-ee.
Frog	Ma-tse-ka-pis-sa.
Snake	Pi-tse-ekes-si-man.
Fly	A-chim-o-soo-ski-seo.
Musquito	Soo-ski-seo.

* This word appears to me to be an imitation of the French word "la farine," rendered by them as in the vocabulary, owing to the absence of the letters *l*, *f*, and *r*, in their language.

† This is the weed used by them for smoking. It is the leaf dried of the common "bear berry plant."

‡ This is the marmot of the plains, "Arctomys Hoodii."

English.	Blackfoot.
Bird	Sist-tses.
Snow bird	A-pi-na-ko-sis-çhee.
Egg	O-wow.
Feather	Ma-min.
Claw	O-kit-sikes.
Beak	Oke-si-sis.
Wing	O-mins-sai-kin.
Goose	Aps-pi-nee.
Duck	Mik-si-kat-see.
Swan	O-mulk-kih-yew.
Partridge	Kit-o-kee.
Pigeon	Ka-ko-ee.
Crow	Mih-sto.
Raven	O-sai-sto.
White headed eagle	Ksai-kai-ki-ki-nen.
Owl	Si-pis-to.
Woodpecker	Pa-paks-ki-see.
Fish	Ma-meo.*
Salmon	O-ma-kus-ksis-ta-kee.
Fin	O-mai-nis-ti-kin.
Scale	Tsai-po-pats-aite.
Roe	O-kōse.
White	Chuk-si-nat-see.
Black	Sik-si-nat-see.
Red	A-moke-si-nat-see.
Green	Otes-kwe-nat-see.
Blue	Kih-sis-tai-nat-see.
Yellow	O tah-kwee-nat-see.
Great	O-mahk-ka-pee.
Small	I-nak-tse-sim.
Strong	Mis-ka-peo.
Young	An-is-ki-seu.
Good	Ahk-seo.
Bad	Ma-tahk-seo.
Handsome	A-nat-si-num.
Ugly	Mat-si-po-ma-peo.
Alive	Ai-ta-peo.
Dead	Ai-neu.
Life	Ka-mo-tows.
Death	O-mo-ki-ak-ki-ta-pi-was-pi.
Weak	Ka-tih-yai-seu.
Old	A-peo.
Cold	Its-si-nai-pits.
Hot	Nick-si-sis-tote-sis.
Sour	Is-cheek-si-po-ko.
Sweet	Ai-kai-nis-seo.
Pepper	Ai-pis-ta-kih-po-ko.
Salt	Is-tsi-si-po-ko.
I	Nis-to.
Thou	Kis-to.
He	Wis-to-yee.
On the tree	Its-paw-peo.
In the house	Its-se-paim.
To eat	Ni-tow-ee.†
To drink	Ni-tai-si-nee.
To laugh	Ni-tai-ee-me.
To cry	Ni-tow-wa-see.
To love	Ni-ta-ko-maitse-si-man.
To burn	Nite-sak-so-ee.
To walk	Ni-tokes-kas.
To run	Nites-iks-kas.
To see	Nites-ee-no-a.
To hear	Ni-tih-ohe-to-wow.
To speak	Ni-tih-si-chee-pis-sa-tow.
To strike	Ni-ta-wih-a-kee-ow.
To think	In-tust.
To wish	Ni-chuk-she-mist.
To call	Ni-tow-wa nis-tow.
To go	Ni-tak-ki-ta-po.
To sing	Ni-tai-ni-kee.
To dance	Ni-tih-ee-pee.
To die	Ni-tih-nik.
I know	Nik-skee-neep.

* They have no distinguishing names for different species of fish, except the salmon.

† From "to eat" to "to die" inclusive, are verbs, 1st person singular, indicative mood.

English.	Blackfoot.
I don't know	Ni-mat-ski-ni-pan.
I flee	Ni-tse-chee-mo-ta.
Thou fleest	Kit-see-it-si-motc.
He flees	Ote-si-mo-to.
They flee	Ow-tsi-mo-tin-yow.
We flee	In-tse-tsi-mo-ta-pi-nan.
I fled	In-tow-tsi-mo-ta.
Thou fledest	Kit-si-it-si-mo-ta.
He fled	It-si-mo-tih-is-kiks.
He kicks	Sai-ee-kat-sew.
I spit	Ni-ta-si-ko-ta.
He spits	So-ko-tat.
He licks	As-tats-tew.
Leaf	Sih-yo-puk-kee.
Eye brow	O-ma-pi-man.
Eye lid	O-to-kee-a-pi-nan.
Pipe stem	Po-kuk-ee-man.
Steamboat	Is-tee-a-keo-sa-chis.
Spoon	I-noho-so-ee.
Medicine	Sa-ahm.
Rum (or any spirit)	Na-pee-o-kee.
Telescope	Is-sa-pee-at-sis.
Book	Is-si-nak-sin.
Watch	O-mo-tahc-tsi-tsi-ko-meep.
Road or trail	Po-totes-ko.
Here	A-mo-ta-pohtes.
There	Ō-mim.
Where	A na-che.
Like	Ni-toc.
He bites	Ih-siks-tak-keo.
Comb	Ma-kin-nee-ohc-sa-kis.
Beaver hat	I-nik-sis-to-mo-kan.
Cloth cap	Is-to-mo-kan.
Fur cap	I mo-yis-to-mo-kan.
Grey crane	Si-kum.
White crane	Pa-pi-sait-si-man.
Pig	Aik-si-nee.
Big horned sheep	Ai-mahk-ki-ki-na.
Mountain goat	A-po-mahk-ki-ki-na.
Mountain siffleur	O-ma-ko-kit-so-ma-ko-ka-tow.
Stirrup leather	Is-che-ka-po-ko.
Girth	Is-che-si-peo-ta-chis.
Whip	Is-tse-pi-si-mat-sis.
Doghead of gun	Ko-kee-a-pi-tan.
Trigger	Ak-si-pin-ak-see.
Ram rod	Is-tahc-si-mat-sis.
Gun-stock	O-tohc-tai-kin.
Ball	A-wak-so-pan.
Powder	Sat-so-pa-sis.
Powder horn	I-totes-ki-nam.
Percussion cap	Mik-ski-mik-sai-ki-tan.
Gun flint	Kis-sih-ki-tan.
Wood ashes	Maks-kait-see.
Soap	Is-sis-ki-o-sas-kis.
Bear's grease	Kai-ih-o-pōm-is.
Chair	As-so-pa-chis.
Box	Na-pai-so-kih-is.
Glass bottle	Sa-ko-to-tus-ko.
Button	Os-tan-nis-see.
Pin or needle	A-to-nowk-sis.
Thread	Nai-pis-te-sa-pis.
File	Si-si-na-tan.
Mits or gloves	At-sait-see.
Vermillion	Na-pi-san.
Fire-bag	A-so-ahc-ko-ee-ni-man.*
Turtle	Is-po-pee.
Clasp-knife	Us-tuk-ee-a-pit-see.
Buffalo horn	Otes-ki-na.
Louce	Ski-nas.
Peace	Ai-nas-teo.
Pistol	Okes-to-kan.
Snow-shoe	O-wame.
Come here !	Pokes-a-pote !
Bring some fire-wood	Pohcs-a-pi-pit-a-kit Mais-chis.

* This is a bag used by the Indians and Half-breeds for carrying their flints and steels, touchwood, smoking-weed, &c., better known as "sac à comis."

English.	Blackfoot.
Indians have arrived	A-neek-si-yee-ma-ta-pee You-o-to-yow.
Give me a buffalo robe.	A-a-ow Ko-kit.
My foot is sore	Ni-mee-eet-si-si-ko-pee-ist-so.
I cut some fire-wood	Ni-ti-ak-a-ki-ak Mais-chis.
My native land	In-tow-wahc-si-nee.
Your native land	Ki-to-wahc-si-nee.
His native land	O-tow-wahc-si-nee.
To tie	Ni-tih-ak-si-nōs.
To kill	I-tih-ak-si-ni-tow.
I sleep	Ni-tih-oke.
Thou goest	Ki-ta-ki-ta-po-pa.
He goes	I-ta-po.
I think	In-tust.
I possess it	Nit-si-nam.
Thou possessest it	Kit-si-na-nee.
He possesses it	Na-nee.
He is there	A-neem.
Come with me	Po-ko-mo-kit.
Go with him	Po-ko-mis.
Instantly	An-ohc.
Take some water	A-wa-tote-sit Oh-kee.
He gave me some water.	Ni-to-ko-ko Oh-kee.
Bring me some water.	Oh-kee Ta-kee.
What is it?	Chan-ses-tap-peo ?
My husband	No-ome.
Thy husband	Ko-ome.
Her husband	O-me.
I shall come	Ni-ta-ya-ka-to-to.
Where is the cord ?	A-na-tsa-pis ?
How many ?	Chan-eets-o-was-chow ?
I have lost my horse.	Ni-tat-sa No-tas.
Put on some fire-wood.	A-to-tote Mais-chis.
How many tents are there ?	Chan-eets-o Mo-yees ?
Grizzly bear	A-poh-kih-o.
Jumping deer	O-wa-kas-seu.
Prairie antelope	Sou-ki-ow-a-kas, or A-wa-to-yee.
Badger	Mi-sin-sqoo.
Ermine	Emow.
Blanket	A-pih-pis-chee.
Pillow	Kis-kat-sis.
Bed	A-kis-sin.
Mirror	A-see-pi-at-sis.
Window Glass	Chis-ti-ko-mis-tan.
Matches	I-tus-tse-mope.
Bridle	Is-co-ee-pis-ta-chis.
English saddle	Na-pee-ai-tan.
Indian saddle	Kote-sa-kee-ai-tan.
Stirrup	Sa-pee-ka-kee-at-sis.
I found a beaver lodge.	Kik-sta-kee-ko-wow Ni-to-ko neep.
How far is it from here to the Belly river?	Chan-sets-oke Chis-chi-coee Mo-ko-an-see A-ki-to-tas?*
He has married a wife.	Ih-ōme-yea A-kee.
Is she a good wife?	Ahk-see Wats?†
Does she love him?	A-ko-mi-mi- Wats?
Does he love her?	Kit-tuk-o-mi-mow Wats?
He has given her a dress and ear-rings.	Kit-to-ko-tow As-so-kas-simo Too-kee-pis.
He wants to go	A-ki-ta-po.
It is true	Nit-sai-man.
Are you (plural) going there?	Ki-tih-ya-ki-ta-po-po-wow Wats?
Go seek him	Ote-sa-me-yoke.

* Like the Crees, they are obliged to say how many days' travel from here to any place, distance being unknown to them. Sometimes, also, they represent distances by the number of encampments made on the journey.

† The word "*A-kee*" (wife) is understood.

English.	Blackfoot.
Two things alike	Ni-to-man-is-chee-a.
On the other side	A-pa-mohtes.
On the other side of the river.	A pa-mohtes Nai-ai-po-tih.
On this side of the river.	A-no-to-tohtes Nai-ai-po-tih.
Last winter he (or she) was born.	Is-chik Isto-yee Ai-chee-po-ka-wa-seu.
Last summer he (or she) died.	Is-chik Ni-po-ee Ain-new.
I am still indebted	Ni-sai-kai-sin-nak.
I never get indebted	Ni-ma-ta-yak-si-now Wai-si-nak.
When I rise	A-po-wow-ai-ni-kin.
The tent fell down	Mo-yees A-nis-seo.
The horse leapt	Ahk-si-ko-pai-pee-yew Po-no-ka-mi-tow.
The bird flies	Pi-ki-sew Ai-poh-tow.*
The dog barks	E-mi-ta How-keo.
Name this child	A-mo-po-kow Ni-ni-ka-toke.
He is lean (spare)	Peeks-in-new.
It is dirty	Ai-si-ka-aa-ni-kim.
I am angry	In-chus-che-tuk.
He is angry	As-chek-ta-kew.
He is in the middle	Tat-si-kak-see.
He is fat	A-wa-poh-sew.
Long ago	Ih-sa-ma.
Very long ago	Mi-sa-me.
Holes in the ice	O-to-ki-ahc-kis-sin.
I am sick or ill	Ni-tih-a-pus-chee-mees.
Thou art sick	Ki-tih-o-toh-kohes.
He is sick	Ih-o-toh-kohe-so.
They are sick	Ih-o-toh-kohe-si-ow.
I am wet	In-tsi-tse-aik-sik-saists.
Thou art wet	Kit-a-chuk-saists.
He is wet	A-chuk-saists-cheo.
We are wet	Mo-te-ee-pai-eests.
You are wet	Ki-to-ka-na-chuk-saists.
They are wet	Ow-chuk-saists-che-ow.
Sit down	Ap-peet.
Are you sitting?	Kit-see-to-pi-pa?
Do you wish to eat?	Kit-tih-ak-so-ee-pa?
Will you barter?	Kit-tih-ak-o-po-ma-pa?
I am come from afar	Nit-si-pi-a-to-to.
Do you know me?	Nit-si-ki-ni Nisto?
Yes, I know you	Ha. Nis-to Nit-ski-neep.
Where did you see me?	Isi-ma-chee-no-keep-na?
I saw you once at the Battle river tenting.	Kit-sit-si-no Ki-nak-si-sa-tih Kit-si-to-ki-ka.
And after that I met you among the Kootanie Indians.	Kin-ee-nich-yee Kit-si-to-taht-sim Koo-tun-nih-o-tow-wuhk-sin.
Have the Kootanies any fine horses?	Koo-tun-nih-o Ah-kih-yim O-tas Ahe-see?
Yes, they have, but they are not liberal of them.	Ha. Ai-ta-see-ow A-kak-we-yeo.
Is there peace with the Crees and Assineboines?	As-sin-now-a Sih-yeu Ai-nas-teo Wats?
He is a very small man.	A-mo-a-nuks-tsum.
She is a very small woman.	A-mo A-kee A-nuks-tsum.
That is a very small tree.	A-mo A-nuks-stum Mais-chis.
My companions	In-tak-kow.
How many are killed	Isa-ni-chum-ee-ni-taks?
Did you go to war	Kit-sa-ta-poh-pow O-chi-chee-aitsk.
I don't love fighting	Ma-tak-sit-si-pa.
Go with them to the lake.	O-ma Po-ko-mis-sow O-muhc-si-ki-mee.
Sing a war song	Ak-si-ka-to-nai-ni-ki-ope.

English.	Blackfoot.
Large pheasant of the Mountain	O-mahk-si-ko-to-keo.
Porcupine	Kas-kahp.
Plate	A-pik-si-tsi-man-kōse.
Scissors	A-po-ta-pik-sis-tow-ee.
Black cloth	Sa-kih-pis-cheo.
Skunk	
Prairie dog	Si-no-pow.
Awl	Mōke-sis.
Vest	Ka-ko-kin-so-kas.
Trousers	A potes-che-soke-sa-chis.
Handkerchief	Kin.
Cross fox	Kit-tsi-po-ta-to-yeo.*
Black fox	Si-ko-ta-to-yeo.

The following are their Numerals

1. Ni-tohe-skum.
2. Na-to-kum.
3. No-ohe-skum.
4. Ni-so. } †
5. Nis-to. } †
6. Nai-ow. } †
7. I-keet-si-ka.
8. Na-ni-so.
9. Pi-ki-soo.
10. Ki-po.
11. Nit-si-ko-po-to.
12. Nat-si-ko-po-to.
13. Ni-ko-po-to.
14. Ni-si-ko-po-to.
15. Ni-si-si-ko-po-to.
16. Nai-ko-po-to.
17. I-keet-si-ko-po-to.
18. Na-ni-si-ko-po-to.
19. Pi-ki-si-po-to.
20. Nat-si-po.
21. „ Nit-si-ko-po-to.
22. „ Nat-si-ko-po-to.
23. „ 13 repeated.
24. „ 14 „
25. „ 15 „
26. „ 16 „

&c. &c.

30. Nee-ee-po.
40. Ni-si-po.
50. Ni-si-si-po.
60. Na-ow-po.
70. I-keet-si-po.
80. Na-ni-si-po.
90. Pi-ki-si-po.
100. Ki-pi-po.
1000. Ki-pi-pi-po.
1001. Tohe-skum ki-pi-pi-po.
1500. Tohes-ki Ki-pi-pi-po Ni-si-si-pi-po.
2000. Na-to-kih-ow Ki-pi-pi-poe.
3000. No-okes-kih-ow Ki-pi-pi-poe.

&c., &c.

The following is a translation of the ten commandments into Blackfoot.

The method by which I obtained this may be some excuse for not vouching for its great accuracy. I took the ten commandments translated into the Cree tongue and read a short sentence, desiring the Blackfoot half-breed who assisted me, to render each phrase into the Blackfoot language, and I then wrote each syllable as he pronounced it. It will be observed that in many places I have run three or four words into one, but that was unavoidable; nevertheless all the syllables have been preserved, and when the Blackfoot language becomes better known, there will then be no difficulty in arranging the individual words.

Is-po-mai-ta-pe A-nai-o A-mōs-chee-at-si-mo-ee-ka-ni-ow Ma-tan-neo.

1. Ki-ma-tih-ya Kōts-i-po-a-wats Nis-to-a-in-che-tum-ma-tōse.

* This is the general name for the species bird.

* O-ta-to-yee is their word for the species fox.

† It should be observed here that 4, 5, and 6 of Blackfoot are exactly the same words as are used by the Crees to denote 2, 3, and 4.

No. 10.

Geological Report.

Museum of Practical Geology, 28, Jermyn Street,
London, May 13, 1857.

Instructions addressed to Dr. Hector, the Geologist of the American Expedition commanded by Mr. Palliser.

Provided with the general geological sketch maps of North America by M. Marcou and by Professor H. Rogers, which will convey some idea of the relative boundaries of the rocks, and also possessing the small map of the United States by Lyell, and the little map of North America by Mr. Isbister (given by me to Mr. Palliser), you will perceive that in the first instance you will have to traverse *un*fossiliferous rocks, with ores, &c., part of the Lawrentine system of Logan, and next a considerable breadth of Lower Silurian rocks of the same author, with their limestones and fossils.

You will, if practicable, put yourself in personal communication with Sir W. Logan, the Director-General of the Canadian Survey, or obtain from him copies of those sheets of his geological maps which form a part of the territory you have to pass through.

As far as our present knowledge goes, such Lower Silurian rocks are not succeeded on the west by the Upper Silurian, *i.e.*, Wenlock or Niagara limestones, &c., nor even by the Devonian rocks; both of which prevail in the United States. You must therefore look sharply to the order of succession, or what the next strata may be composed of, which follow or overlie the older Silurian deposits.

Richardson and other observers, who have turned northwards before they reached the edge of the Rocky Mountains, have noticed in their progress the occurrence here and there of coal; and fossils (*Productus*, &c.) have been collected which would refer such strata to the true or old coal period. This point must be well ascertained, and any real outcrops of fuel must be accurately laid down,—the thicknesses of the coal measured, and the angles of inclination of the strata carefully noted, specimens of the coal being brought away or tested *in situ*, and the fossils associated therewith being particularly noted. Any information on this point is of great statistical importance, particularly if obtained in the neighbourhood of the only "prairie" tract which (as is said) has been left to Britain by the last boundary line.

The tracts watered by the affluents of the Saskatchewan may possibly be found to offer some explanation on these subjects.

As yet we are unacquainted with the existence of any secondary rocks in the region you will traverse; but as M. Marcou has laid down on his map a broad area of cretaceous rocks, and has even marked deposits of jurassic (oolitic) age on the eastern flank of the Rocky Mountains, in New Mexico, you will be on the watch for the character and fossil contents of any strata which may succeed to those palæozoic rocks among which you will have been so long travelling.

Another point, and one of considerable theoretical importance, you can determine without much difficulty. It has been affirmed that a zone of tertiary deposits, including certain lignites, ranges from N. to S. in a depression between the chief eastern masses of land and the Rocky Mountains. If you should hit upon such a zone, you will, of course, collect the fossil leaves and shells imbedded in it, and mark whether its strata have been dislocated, and to what extent, and how they are related to the older rocks.

In approaching the more crystalline masses of the Rocky Mountains, you should observe where the stratified deposits show signs of metamorphism, and see also if there be no traces of rock salt, or any signs of a northward continuation of the same saline phenomena which characterize the eastern flank of the Rocky Mountains in the Mormon territory. Note also whether the beds, as is often the case on the flank of such chains, be bent back or thrown into inverted positions.

If any pass through the Rocky Mountains be discovered, you will describe the rocks which you traverse; for a true and accurate section across this chain cannot fail to be one of great interest, chiefly in showing the lithological changes which have been effected in the original deposits. In making this section you will not omit to distinguish the various rocks of intrusive character, and to observe carefully which of them was the last to penetrate or cut through the other masses. Inform us if among such igneous rocks there are trachytes, and if there be traces of sub-aerial volcanic action, either along the summits or slopes of the chain.

It is in this region, also, that you will endeavour to detect veinstones of gold ore, or of argentiferous galena. Should you discover the former, you will observe whether they be in quartz rocks or any other matrix, and also if the gold be disseminated in rocks of igneous origin, whether syenites, greenstones, &c. &c.

Both in ascending the Rocky Mountains from the east and in descending them to the west, look carefully at the detritic accumulations, and observe if there be any rolled gravel in the hollows or valleys, and if the *large erratic blocks* lie upon the surface of such water-worn materials. Do not omit to record the nature of such erratics, and search in the detritus for traces of gold.

Observe if there be any unaltered strata between the crystalline and hard rocks of the mountains and the Pacific, and if any of the carboniferous or cretaceous deposits known in Vancouver's Island occur along the coast of the mainland.

Having made yourself well acquainted with the structure of the adjacent mainland, you will have no difficulty in showing the exact condition of the coal strata of Vancouver's Island, the thicknesses of the fossil fuel, and the relations of those deposits to the cretaceous formations that are known to exist there by the fossils from that region which have been sent here. As the transport of specimens will be difficult, you must use your trimming hammer freely *in situ*, and bring away chiefly organic remains. But a few clean-fractured and characteristic specimens of the most peculiar of the igneous and metamorphic rocks ought also to be preserved, and if each of these be of the size of a *walnut* only, the object will be obtained. Let such specimens be taken from the rocks concerning which you have doubts; for in regard to all ordinary granites, greenstones, basalts, jaspidified strata, &c., &c., it is quite sufficient to note their occurrence.

Affix gum labels, nicely marking the localities and relations upon each specimen in the evening of every march, and be careful to fold each specimen in two folds of tough paper. Having thus directed your attention to those geological researches which will be found, I apprehend, quite enough to occupy the greater part of your time, you will, in carrying out your main object, be that necessarily occupied in making notes descriptive of the physical geography of the countries you traverse, such notes being in fact the basis of your geological and mineralogical notices. As a lover of nature, you will also aid, as far as practicable, in collecting rare plants for your botanical associate, and you will preserve any new species of small land or aquatic animals which may be detected in your path. You will further measure the chief altitudes, and seize every opportunity of making observations on meteorology, thus rendering yourself generally useful in promoting the objects of the Expedition.

RGD. I. MURCHISON,
Director General, Geological Survey

SUPPLEMENTAL INSTRUCTIONS FOR DR. HECTOR.

ALTHOUGH I have adverted to the erratics and detrital deposits, I have omitted to direct your attention to all traces of glacial action, as evidenced by the striation of the crystalline or other hard rocks which you may pass over. The phenomenon is so universal in North America that I presume you would take care to mark well the direction of all such scratches, as indicating the erosion produced by the bottoms of icebergs or floes when the continent was under the sea. It is possible that you may meet with such appearances on the tract between Lake Superior and Lake Winnipeg. Again, it will be very interesting to observe if such striation is apparent at considerable heights in the Rocky Mountains, or if only visible in the valleys thereof.

I have also omitted to request you to look out for any signs of elevation in the presence of raised beaches, and to observe if the watersheds or "divortia aquarium" exhibit signs of having been lines of former elevation.

I need not tell you that the registering accurately the strike or direction of the strata is of much greater importance than the mere observation of their dip,—the precise angle of which (*i.e.*, to within two or three degrees) is of little moment.

RODERICK I. MURCHISON.

GEOLOGICAL REPORT.

EXCEPTING in the maps of Mr. Arrowsmith, which gave very correctly on the whole the great general features of the region explored, which embraced 33° of longitude, and, in some places, 5° of latitude, nothing was known of its topography; so that this essential to sound geological reasoning had to be acquired step by step as the country was examined. I, therefore, submit my observations only as the best I could make under the circumstances, knowing that a re-examination of the country, with the aid of the topographical details which we now possess, would materially alter many of the views I have expressed.

Our previous knowledge concerning the geology of the interior of British North America was confined to the observations of Sir John Richardson, made during his three great overland Arctic expeditions, the first two with Sir John Franklin, and the last in search of that lamented traveller. His published descriptions of the country he passed through are models of minute observation and cautious inference. To him we owe the first discovery of Silurian strata, resting on a primitive axis, stretching to the north-west from Lake Superior to the Arctic Ocean, and overlaid by Devonian strata. He also showed the Rocky Mountains, where he met them on the McKenzie River, to be composed of carboniferous limestones for the most part, which is also their character, we will find, further to the south. From Elk River he brought home fossils, which, although from a group of strata which he classes as Devonian, yet in a foot-note, on the authority of Sowerby, he says have quite a jurassic aspect. That he was right in the latter suggestion is rendered probable by the recent publication of species of ammonites by Mr. Hind, which were procured from that locality by the fur traders, and which Messrs. Meek and Haydon consider to be jurassic. Sir John Richardson also described the existence of a great lignite basin in the valley of the McKenzie River, which he classes as of tertiary age.

The line of route, however, followed by Richardson did not, with the exception of the canoe route from Lake Superior to Lake Winipeg, and again at Fort Carlton on the Saskatchewan, touch on the country which has been explored by this expedition. With regard to the canoe route, I have added nothing to the researches of that traveller, and to the still more minute observations of Dr. Bigsby, which have been some years ago communicated to the Geological Society. In 1855 Mr. A. K. Isbister published in the Geological Society's Journal a useful and concise recapitulation of what had been written concerning the geology of the Hudson's Bay territories, without adding anything, however, in regard to our knowledge of the central district, with which I have principally to deal.

It is to Mr. Hind's publications* alone, who was in command of the Canadian expedition to explore part of Rupert's Land, that I can refer in confirmation of my observations in any part of the prairie region. Mr. Hind, in 1858, travelled over nearly the same ground as that traversed by our expedition during the previous summer, but only as far as the "Elbow" of the South Saskatchewan, and in regard to all essentials our work agrees exactly.†

Mr. Hind's report is valuable from his having had his fossils examined by Messrs. Meek and Hayden, whose labours in the Upper Missouri country and Western States since 1852 has given us most of the knowledge we possess concerning the classification of the strata which compose the great American prairies, and to those gentlemen I shall have frequent occasion to refer.

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* Assineboine and Saskatchewan Exploring Expedition. 2 vols. 1860.

† My first report on this district was dated Dec. 14, 1857. (See Parliamentary Papers, 1859.)

Concerning the mass of the country explored, consisting of the prairies within the British possessions, and the Rocky Mountains between latitude 49° and 53°, and of the country westward to Fort Colville, I am not aware of anything having been published, excepting a few general remarks collected by Richardson from the botanists Douglas and Drummond, or from the fur traders.

The prairie country, which I have principally to describe, may be considered as forming the northern portion of a triangular plateau which occupies the central region of the North American continent, having for its sides, first, the Rocky Mountains, second, the Laurentine axis or intermediate Primitive belt of Richardson, and third, the Alleghany Mountains.

A low indistinct watershed, 850 feet above the sea at its lowest point, and apparently undetermined by any disturbance of the rocky framework of this basin, posterior to the deposit of its more unconsolidated contents, follows a line sometimes north and sometimes south of the 49th parallel of latitude, dividing the waters which flow to the Gulf of Mexico from those to the Arctic Ocean.

The route of the Expedition, starting from Lake Superior, after crossing the eastern axis, traversed the northern part of this plateau to the Rocky Mountains, and thence down the western slope of the continent to the Pacific Ocean.

The McKenzie River, rivalling in its proportions the Mississippi, breaks the apex of this triangle, escaping through the Rocky Mountains to the Arctic Sea, while the Saskatchewan and other rivers of the southern British territory dilate into great lakes at the western base of the Laurentine axis, through which they then escape to Hudson's Bay.

The Laurentine axis of metamorphic rocks, with its fringe of Silurian strata, may be considered as stretching from Canada to the Arctic Ocean, near the mouth of the Great Fish River of Back, in a W.N.W. direction, but it sends off a spur, which encircles the western shore of Lake Superior, and loses itself under the prairies of the State of Minesota.

Lake Superior and Lake Winipeg, according to the surveys of the Canadian Expedition, have nearly the same altitude of 600 feet above the sea, while the rocky district that separates them has double that elevation, or 1,300 feet above the sea; but this is in many places increased to 1,600 feet by the deposits of drift that will be hereafter described.

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 Laurentine 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 McKenzie, leaves the chain, in latitude 53° 12′, it is only 3,300 feet above the sea.* 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 westernly 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 table-land.

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

The mountains, formed of broken plications of strata, as will be afterwards described, are disposed in parallel groups, the great valleys in the length of the chain generally occupying anticlinal fractures. The flexures have been more perfectly developed in the eastern part of the chain than towards the central parts, where the mountains have a massive cubical aspect, the strata having been fractured and upheaved rather than bent by disturbing agencies. This is owing, no doubt, to the mineral composition of the strata, and not to any modification of the disturbing force, for as the western slope is descended slaty rocks are met with, which present perfect flexures. The mean altitude of the Rocky Mountains between latitude 49° and 53° is about 12,000 feet above the sea, but there is a very singular absence of marked peaks.

The chain culminates in latitude 52°, where the mountains are very massive, and traversed by profound valleys, the highest offsets from which are occupied by glaciers. From the Rocky Mountains to the Pacific Ocean the country is extremely rugged, resembling the Silurian and Metamorphic regions in other parts of the world. It forms a great trough, bounded to the west by the Cascade range of mountains, which closely hugs the Pacific coast in this latitude. This range, which is only rarely broken by valleys, and those of comparatively recent date, runs like a wall 4,000 to 5,000 feet above the sea level. At intervals there occur great conical mountains, such as Mount Hood, Mount Baker, and others, which rise to 10,000 or 12,000 feet, and from their isolation, being perfectly unconnected except by the lower range, they present a very grand appearance when viewed from the coast. Owing to the great fall of the rivers, the narrow valleys, and the rapid erosion having continually carried on the re-arrangement of the superficial deposits, the grades in the elevation of the continent cannot be so well discerned on the western slope as on the eastern, although these deposits are found to be greatly developed.

With this brief sketch of the physical features of the country, I now proceed to describe the different strata, reversing the order of their deposition.

* 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 neighbourhood of the great lakes is still icebound.

Superficial Deposits.—These are very extensively developed in every part of the region explored, and their classification involves very interesting conclusions respecting the changes of level of the continent, both posterior and anterior to the great northern drift. Judging from the altitudes at which erratics are found to be dispersed, the continent must have been depressed at that period beneath a sea in direct connexion with the Arctic Ocean to the depth of nearly 3,000 feet, and since then, during its gradual emergence, the prairie region of North America has received its present form of surface by denudation, first, as effected on sea coast lines; secondly, by the coast lines of great inland lakes, which, it will be shown, though still existing, were previously of much greater dimensions; and, thirdly, by atmospheric agencies wearing away the soft strata, aided by streams. The superficial deposits, during and posterior to the drift, are so different on either side of the Rocky Mountains that they must be treated of separately, while those anterior to that epoch will be found to have a common character.

Terraces of the Lake Superior Basin.

In ascending the Kaministoquoia for a considerable distance above the Kakeleka Falls, the country is covered by a deposit of red marl earth, which forms the high terraces of the river. Thus, opposite to 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, and will be referred to in the next group.

Superficial Deposits of the Central Plateau.

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 Winipeg and the lakes of that group, including the marshy country to the 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 freshwater deposit, indicating a time when the Winipeg group of lakes covered a much more extended area than at present, the gradual deepening of the rocky channels through the eastern axis having increased the drainage in modern times. The surface of this deposit is about 75 to 100 feet above Lake Winipeg, 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 Winipeg 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 Winipeg, 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. This ancient lake-bottom extends south of the 49th parallel, into the American State of Minesota, and everywhere presents a rich level prairie, only broken by slight gravel ridges which have formed shoals in the ancient lake, or by patches of the magnesian limestone beds which crop out in the plain, such as at the Stony Hills, east of Fort Garry, and which has evidently been a rocky island at one time.

The banks of the lower part of Rainy River are composed of rich alluvial deposit of a light grey colour, containing a large proportion of white sand. It is distinctly stratified, and has, without doubt, been formed by an extension of the Lake of the Woods back towards Rainy Lake. In the upper part of Rainy River the banks are high and terraced, and boulders show that at this level there is also a deposit of true drift.

At Pembina Mountain, the eastern limit of the second prairie level forms an escarpment measuring 250 feet above the plain at its base. From the point where it crosses the 49th parallel, it sweeps to the north-west, and assumes a more gentle slope, being broken up into three or four subsidiary terraces. It then meets the Assineboine River near the mouth of the Souri, and is continued to the north by the high grounds that lie to the west of Manitoba Lake from Riding Mount to the Basquia Hill, which, however, rise to the full height of the level, that is to 1,600 feet above the sea. At Fort à la Corne, the banks of the Saskatchewan are described as suddenly becoming reduced from the height of several hundred feet to a slight elevation above the river, showing that it is at that place where the eastern limit of this level meets that river. The prairies of the Upper Assineboine, the Qu'appelle River, and those along the Saskatchewan from Fort à la Corne to the elbow on the south branch, and also up as far as the longitude of Fort Pitt, on the north branch, all belong to this level, and which also extends to the base of the Great Missouri Côteau. The composition of this second great steppe is very different from that of the first. Sand is the predominating ingredient. Thus, at St. Joseph, where the banks of the Pembina River present a fine section of it to its base, the material is a coarse red sand, with gravel and boulders. There are no signs of stratification in any part of this deposit as seen at Pembina Mount, but further west, where it assumes a light grey colour, and contains a considerable quantity of lime, it is imperfectly bedded. Near Fort Ellice, and at many other parts of the district to the south and west of that place, this deposit is formed wholly of fragments of the underlying cretaceous shales. At Long River, Forked Creek, and many other places, this deposit was observed to form only a very thin coating to the cretaceous rocks. Notwithstanding that the prairies of this level are often cut to a great depth by the rivers and creeks, very little can be learnt of its nature at different points, as slides in the banks of the gullies are rarely seen. At Fort Ellice, the valley of the Assineboine is 240 feet deep, and about 100 feet of that is composed of this drift deposit resting on the cretaceous beds. In the Qu'appelle Valley, near the mission, a slide exposed the structure of the plain to the depth of 250

feet, showing it to be composed of stiff sandy clay, of light red colour, with patches of blue clay, and gravelly beds. On the whole, the character of this level, as far as regards its mineral composition, is variable and local. Boulders are tolerably plentiful all over its surface, but occur in greatest quantity on the sides and summits of ridges and mounds, which rise in groups to the height of from 50 to 80 feet. Others of a still higher level occur, attesting the immense denudation which has taken place; these generally rise from 1,400 to 1,600 feet above the sea, which latter is the height of this level at the base of the Grand Côteau, Eagle Hills, and Thickwood Hills, all of which form the eastern limit of the next great steppe.

These outlying patches are in two lines, parallel to the general contour of Lake Winipeg, and the next higher level to the west, and were doubtless two consecutive ridges until they were cut through by the different river valleys. Thus overhanging the lakes we have the Pas, Porcupine, Duck, and Riding Mount, and to the west a line of which the Touchwood Hills, Moose, and Turtle Mountains form the principal parts. These have all a common character, rising gently to an ill-defined table-land from the west, while their eastern aspect is extremely rugged, presenting irregularly-disposed ridges of coarse sandy drift, highly charged with boulders. This steep escarpment is generally densely wooded, and encloses numerous small lakes.

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 Souri, Assineboine, 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 1,600 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 Winipeg, or, at least, to convert it into a mere chain of islands. At that time the eastern coast line would leave the Rocky Mountains in latitude 56° N., near Peace River, and would follow what is now the watershed between the Saskatchewan and the rivers more to the north, till it reached the 107° of longitude. From this point, the Thickwood Hills, Eagle Hills, and Thunder-breeding Hills would form the headlands of a great bay, into which poured the waters of the two Saskatchewans, at that time independent rivers, debouching where they now make the acute bends known as their elbows. The coast line was then continued to the south-east, forming the Grand Côteau that dips between the Missouri and St. Peter's rivers. 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 four to six miles. The surface of the slope is extremely rugged, and has evidently been worn into pot-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 the Bird's-eye limestone, which rests on the western flank of that axis.

Near the elbow of the Saskatchewan, a remarkable group of boulders of this kind of limestone, of enormous size, crosses the country in a line parallel with Côteau to the west. This line has been observed at points 30 and 40 miles apart. They occur as great angular masses, consisting of several of the beds of limestone, the coherence of which being very slight proves that they must have been stranded without any great violence. One of these masses contains over 3,000 cubic feet of stone, and rests on the plain obliquely, with its south-west angle buried in the soil. (*See sketch.*) More to the west than this is a line of sand-hills, which has evidently marked a coast line, although their original position may now be much altered, as they are still wind-blown as when during their first production. They have such a clear relation to the ancient level, and are found at the same altitude over such a stretch of country, always at a little distance from the base of the escarpment, that there can be no question as to their origin. Similar sand-hills were observed on the Souris River, at the base of the second prairie level, which must have been formed on the shore of the extended lake. The resemblance which the plains along the base of this great steppe bear to the shore of Hudson's Bay at the present time, may be judged of from the description given by Sir J. Richardson, who says, "The western shore of Hudson's Bay, "between latitude 56° and 58°, is flat, and the depth of the sea decreases very gradually on approaching "them. In seven fathoms of water the tops of the trees are just visible from a ship's deck. Large "boulder stones strew the beach, and form shoals even at the distance of five miles from the shore, which "are very hazardous to boats." In proceeding up the river from this coast, he describes that after a tract of level country, "the banks," consisting, he before mentions, of drift clay and boulders, "rise from "a very narrow river-channel to an elevation of very nearly 200 feet. Their outline is broken into conical eminences "by short ravines, which open into the river at right angles. These banks have "exactly the same form and constituent parts as those which occur on the confines of Lake Winipeg "and the Saskatchewan." As he made the latter remark in allusion to the nature of the underlying rocks at the two localities, without reference to the drift, it is all the more valuable, for the purpose of proving this similarity, which is so striking, between the present state of the coast of Hudson's Bay and the ancient coast line along the base of the third prairie level. In the rugged district of this steppe there are enclosed numerous lakes, some of great size, and all, without exception, more or less impregnated with salts, of which sulphate of soda is the predominating ingredient. In autumn, after the dry summer, these lakes are fringed with crystals, and the soil, in many places, is covered with a white efflorescence. Whether these salts are derived from the superficial deposits of the ancient coast line, or from the cretaceous clays, I am unable to say, but the position of the salt lakes generally at the same altitude inclines me to the former opinion.

The Laurentine axis is covered with a great deposit of drift, consisting of coarse red sand, with many large and small boulders. This deposit forms a flat swampy plain, well wooded towards the west, but towards its eastern margin, as at Cold-water Lake, worn into deep dry gullies, and round pot-holes without any exit. The thickness of this deposit is from 200 to 300 feet, and the highest point of it is about 900 feet above Lake Superior, or on a level with the plains near Carlton. Glacial scratchings were distinctly seen at many parts of the axis, and their direction is generally north and south. Hardly a surface in the granitic tracts did not present distinct scratches. They were seldom, however, to be observed on southern exposures of rock surfaces, if these sloped much, but the more surfaces with northern exposures sloped, the better they seemed to be marked.

As will be seen from section No. 1, 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 favourable spots. These consist almost entirely of fragments of metamorphic rocks, limestone being very rare. I have not remarked the ordinary erratics at a greater altitude than 3,000 feet; and at 3,700 feet above the sea, and 50 miles from the Rocky Mountains, there occur a very extraordinary group of blocks of granite, resting on a high plateau formed of sandstone strata. These blocks are of great size, one having been estimated to weigh 250 tons. Although lying in a line, miles apart, they seem to consist of the same rock, viz., a mixture of quartz and red felspar, the latter predominating, with only faint traces of mica disseminated in very minute flakes. They present smooth surfaces, although, in general, they are rhomboidal in form. Some of them are cracked into several pieces, which are quite detached, but are evidently parts of the same block. If these blocks were derived from the granite belt to the east, as I believe all the erratics of the prairies have been, they must have travelled at least 400 miles. From the fact, however, that they are beyond the western verge of the drift, and the boulders were found, as a rule, to diminish in size in that direction, it may be that the presence of these blocks is due to very different agencies, different at least in the time of their occurrence. No granite was observed on the east flank of the Rocky Mountains within British territory; but the "Trois Butes," south of the 49th parallel, are said to be the granite, and also the Black Hills, but both of those localities are much to the south of where those blocks occur.

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 neighbourhood of the "Ear Hills," south of Battle River, are the best examples of these, but they are found in many other localities. It is difficult to conceive how they can be due to erosion alone.*

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 250 feet deep. The sides of these are in general as regular and formal 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 or 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. At the Rocky Mountain House, where these terraces first attracted my attention in the winter of 1857–8, the North Saskatchewan has excavated a valley in the cretaceous strata which varies greatly in its width, sometimes being hemmed in by perpendicular cliffs of sandstone, and sometimes sloping gently back to the elevated country on either hand, where the strata have been less able to resist the erosion. In this valley there are three terraces extensively developed at 20, 60, and 110 feet above the water level. Until we approach close 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 even better marked on the Athabasca River than on any of those further south. Judging from the accounts of American explorers, these terraces extend along the base of the Rocky Mountains all the way south to Mexico.

One hundred miles east of the mountains, in latitude 49° 30′ N. shingle beds of a similar kind are found to cap Cypress Hills, which have an altitude above the sea of 3,800 feet, or nearly the same as that of the base of the Rocky Mountains. These Cypress Hills are nothing more than the western extremity of the great Missouri Côteau, which, curiously enough, here presents an escarpment to the west, and is separated from the mountains by a tract of flat arid country of the above width. This côteau is composed of cretaceous and tertiary strata, which have remained as a dividing ridge, from the denudation having acted to the north and south of the line which it marks. It is on the west and south exposures of these hills that the shingle occurs formed into terraces like those along the mountains. These are not to be classed however with the river terraces, which are of much more recent formation, having been derived from the deposits along the base of the mountains.† This may not only be inferred from their relative position, but also from the composition of the terraces themselves, which, although all composed of the same pebbles, these in the valley terraces are well cleaned and mixed with sand, while in the terraces along the mountains and Cypress Hills they are often encrusted with white calcareous matter. This sometimes increases so as to form a perfect cement, so hard as to allow of the fracture of the pebbles before that of the matrix, just as is often seen in ancient conglomerates.

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* The ravines mentioned by Sir Chas. Lyell, in his second journey to the United States, as occurring in the Cretaceous and Tertiary strata of Georgia, seem to be very similar to them. He says that, when the woods are cleared from the country, the sun acting on the unprotected surface of the argillaceous strata, produces cracks that are soon enlarged to great gullies by the torrents of rain that fall. We may suppose that in the Saskatchewan, where there is only a small quantity of rain, the winter's frost effects the same result, but with this difference, that in the latter case the successive landslips remaining unremoved, at last form such a gentle slope that vegetation can retain a foothold, and so promoting the further extension of the rent, which is at last represented by a symmetrical valley.

† In latitude 42° at the base of the Rocky Mountains near Fort Laramee, Hayden describes similar "deposits of coarse con-" glomerate 50 to 150 feet in thickness, formed since the scooping out of the present river valleys."—Proc. Acad. Nat. Sci., 1858.

‡ Darwin says of the shingle formations of Patagonia, "the pebbles are imbedded in a white gritty calcareous matrix, very like " mortar, sometimes merely covering with a whitewash the separate stones, and sometimes forming the greater part of the mass." —Geol. of S. America, p. 19.

On approaching the Rocky Mountains, the extreme regularity with which these deposits have been terraced by retiring waters at once attracts attention. At where Belly River leaves the mountains, in latitude 49° 34′ N., Captain Blakiston measured three of them, and found that they were elevated 61, 152, and 202 feet above the river level, which at that point, according to his measurement, is 4,024 feet above the sea. He describes them as being "very marked, appearing as a succession of steps from the "level of the river to the plain above, often in sight for miles, and running horizontally. The tread of "the step is of variable width, but the rise is nearly always abrupt and well marked." From the regularity of these embankment-like terraces in the valley of one river, he named it Railway River. (Further papers, Palliser's Expedition 1860, page 68.)

On Bow River they are also well marked, and there I measured four at the altitudes above the river level of 30, 140, 170, and 240 feet, and traces of one still higher at 350 feet. The valley of Bow River within the mountains is narrow and tortuous for the first 12 miles, and in this part of its course the terraces are hardly preserved. Above this point, where it occupies one of the expanded horizontal valleys conforming to the strike of the strata, they are again enormously developed. Even in gaining the Vermillion Pass, the only steep climb is at first up the face of these terraces for 150 feet, and then a gentle slope leads to the height of land.

The valley of the North Saskatchewan is much wider and more direct within the Rocky Mountains; and there we have not only these terraces remarkably developed, but also their mineral composition much altered, partaking of what will be found to be their character on the western slope of the mountains. At a similar place, with respect to the mountains, to where the terraces were measured on Bow River, four were estimated to have an altitude of 25, 70, 180, and 300 feet above the North Saskatchewan. The shingle, cemented into a hard conglomerate, was here seen to rest on the edges of the contorted strata of grit and shale, with thin seams of coal, as in Section No. 1. 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 100 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 re-arrangement 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 sand, 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 4,500 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 cypres.

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" (*Festuca ?*), which at once catches the eye as different from the grasses of the eastern plains (*Chondrosium?*) The country occupied by the terraces is easily passed through, as the forests are there free from underwood; and the only obstacle to the traveller arises from his having so often 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 applies equally to the valleys on the west side of the Rocky Mountains, where the terrace deposits have a much greater development.

All the valleys between the Rocky Mountains and the Pacific coast, lower than 4,000 feet above the sea, are found to be more or less occupied by deposits, which are terraced with great regularity.

On descending the western slope, these deposits were first observed in the lower part of the valley of Vermilion River, where they are formed of the same glistening white calcareous mud that was seen in the valley of the North Saskatchewan; but it is in the wide valleys of the Kootanie and Upper Columbia rivers where these terraces are best developed in the Rocky Mountains. These rivers run in opposite directions through the same great valley which lies parallel with the mountain axis for nearly 250 miles, and which throughout is skirted by terraces, forming a succession of platforms often to 600 feet above the river. These extend into the side valleys, preserving their horizontal character, but their composition is often changed. At various points these deposits were seen to be distinctly stratified, and in some cases they must have been disturbed between the time of their formation and that of their being finally moulded into terraces. Thus where the Kicking-horse River joins the Columbia, and where both valleys present perfect terraces at five different levels, the highest forming a wide shelf 540 feet above the river, Section No. 2 is exhibited, where the stream has worn away the bank.

The erosion of these deposits, and the production of steep and quickly succeeding terraces, has been much more perfect in the valley of Columbia as far south as latitude 51°, than in the remainder of the Columbia valley, which extends for a degree further to the south, or throughout that portion of the same great trough which is occupied by the Kootanie River; for there the deposits remain comparatively undisturbed, and form great stretches of prairie, only cut through by a narrow but profound channel

* This pine is allied to the *P. inops* of the Atlantic board, and to the *P. contorta* of the Pacific, and yet has distinctive characters from either. It has been proposed to call it Pinus Saskatchewensis.

for the river. The change of appearance in the valley from this cause is very abrupt and striking. North of latitude 51° the terrace steps succeed one another rapidly, with the tread narrow and furrowed, and the traveller's progress is impeded by the dense growth of forest of a northern type, consisting of varieties of a spruce fir, for the most part with dense underwood; but on passing south of the slight bend of the Columbia at that point, the tread of the terrace steps commence to expand into wide level plains, dotted with a forest of the noble *Pinus ponderosa*, or the gigantic *Larix occidentalis*, both of which are trees that find their maximum in southern Oregon. The outlines of the terraces still preserve the same extreme formality and steepness of slope; but on their level surface a rider can gallop in almost any direction, so free is the forest from underwood. Sometimes the trees are entirely wanting, leaving great tracts of open plain embosomed in the mountains, which form the camping grounds of the Kootanie and Flathead Indians, where they raise the enormous bands of horses for which they are famous amongst all other Indians, the dry soil and nutritious bunch-grass producing a breed of superior hardihood and swiftness.

In descending the Kootanie River from the tobacco plains to Colvile, the country is rugged in the extreme; and these terraces are met with, wherever they have been sheltered from recent erosion, in valleys of unusual width, or in recesses of the more narrow ones. On reaching the belt of country where Silurian and metamorphic rocks prevail, the pebbles are often composed of greenstone, quartz, and the other vein rocks which they overlie. On reaching the lower part of the country, near Colvile, the terraces are still found in all the valleys, not only at moderate elevations, but also high up in the mountains. Thus the Columbia at Fort Colvile, in latitude 48° 31′, is 1,000 feet above the sea, and terrace deposits were observed on the sides of the valley at least 1,200 feet above the water level.

The Great Columbian Desert and the Spokane Plain are both covered with the same deposits of shingle, but these resting in the former case on the great lava-flows, and in the latter on granite and metamorphic rocks. The Spokane Plain, which is of comparatively limited extent, has its margin beautifully terraced, repeating on a grand scale the same phenomena as may be observed on the shore line of Shallow Lake after the summer drought. At old Walla Walla, where the Columbia River passes from a wide and flat sandy desert to break through the profound rocky cañon of the Cascade range, the whole country is covered with light blown sand, which renders it almost uninhabitable, being swept in clouds by the high gales that constantly blow either up or down the river through this wonderful chasm. Here in an ancient lake bottom has been found the remains of a mastodon by some American explorers.

To the west of the Cascade range of mountains, along the Pacific coast, terraces of shingle prevail as in the interior. Also on Vancouver Island they were observed near Nanaimo. Near Fraser River and Paget Sound they are very well marked, and at the latter place occur the "Mound Prairies," which, however, I only know of by report. These are level surfaces of terrace, free from forest, and covered with lines of conical mounds 10 to 20 feet high, said to be formed of boulders piled on one another and resting on the surface of the shingle.

Before leaving these shingle deposits, which are so largely distributed throughout the mountain valleys of British North America, I may mention that in California I found these terraces ranging on the western slope of the Sierra Nevada at least to the height of 3,000 feet, and there they are extensively worked by the hydraulic method for the sake of the gold they contain. At Nevada city, and also on the Yuba River, I saw deposits of this shingle conglomerate, 200 and 300 feet in thickness, actually being washed off from the face of the country by this powerful means, which consists in delivering water under great pressure against the face of the cliff, from nozzles like those of a fire-engine. The supply of water for this purpose is in the hands of separate companies from those that conduct the mining, as it is often brought from enormous distances through tunnels and over high level aqueducts from remote and uninhabited regions. The particles of gold are disseminated throughout the whole deposit, but the richest washings are from its base, where it rests on the "bed rock," and is technically known as "pay dirt." The whole water, with the material washed out of the cliff, is directed through long troughs called "flumes," which are constructed of wood like mill-heads, often continuously for six or seven miles. The large stones are thrown out as they pass by men with shovels, to save the wear on the bottom of the "flume," while the finer material is carried on by the rush of water and passes over frequent cross bars called "ripples," where a little mercury is placed to entrap the gold by amalgamation. At Nevada City, where the coating of shingle deposit had thus been cleared from the surface of the coarse-grained and soft granite which underlies it, gigantic masses were exposed on what had once been the rugged shore of an inlet, just as may be seen on a water-worn coast of the same material at the present day. In California fragments of wood are found throughout the shingle in abundance, often carbonized, but in general silicified into a substance exactly resembling asbestos. In the sand and conglomerate of the Kootanie valley I found fragments of wood of similar appearance.

As my observations in California should not properly be introduced in this report, I shall leave them for another opportunity, the object of my having mentioned them being to point out the great similarity between the superficial deposits of the great gold country of California and those within the British territory further north, which encourages me to assert that the whole country up to the Kootanie River and the base of the Rocky Mountains, wherever the ancient terraces prevail, resting on Silurian or metamorphic rocks, will be found to be auriferous. In my party in 1859 I had an expert "washer" who had been at the Californian mines, and he frequently got "colour," as a faint trace of gold is termed, by merely washing the gravel from the beds of the streams, without any regular "prospecting" or "digging." The discovery of what are among the richest "pan diggings" on the Pacific coast in the Similkameem valley, and the existence of gold mines worked since 1855 on the Clark's Fork, half a mile north of the boundary line where it meets the Columbia River, proves that the belt of auriferous country in California and Oregon is continuous with that of Fraser River: and there is no reason to doubt that in a short time the rugged and unexplored country which forms a triangular region north of the boundary line, and drained by the waters of the Upper Columbia and Kootanie Rivers, will be overrun by prospectors, and then by active gold-miners, just as the western part of British Columbia has been within the last few years.

The evidence we have respecting the age of the terrace accumulations is very imperfect. There can be no doubt that those occupying the valleys of the Rocky Mountains, being furthest from the coast and at the greatest elevation, are the most ancient, and that from the time of their deposit till now, the re-arrangement of the same materials has been carried on during the gradual upraising of the continent.

The shores of the intricate channels and inlets on the Pacific coast of British North America, if elevated from the sea, would present but slight difference from sides of the narrow valleys in the Rocky Mountains at an altitude of 3,500 feet. Whether the continent was ever in later times depressed to that extent in the mass, or whether the central upheaval has been much greater than that along its margins, is a consideration of great importance, and would perhaps be settled by ascertaining to what altitude the terraces can be traced on the Cascade Mountains.

The existence of marine tertiaries along the coast, supposed to be of the same age as those on the eastern prairies, and also within the Cascade range at slightly greater elevation, and sometimes overflown by the lava from those mountains, would seem to indicate that the elevation has been very unequal, or in other words that the tertiary formations along the Pacific coast have hardly been raised at all, while those in the interior are elevated several thousand feet.

On the eastern plains we have marine and other tertiaries at an altitude of about 3,000 feet above the sea, and Hayden describes them as "in all cases undisturbed, and not unfrequently resting on the "upturned edges of azoic and granitic rocks" (Ib. p. 17.) But in the prairies these tertiaries, along with the cretaceous strata on which they generally repose, have been enormously denuded, and are found merely as outlying patches forming the tops of hills. It must have been during the period when this denudation of the eastern plains accompanied the gradual emergence of the continent, but acting with very different results on a rocky sea-bottom and on successive ranges of iron-bound coast presented by the western slope, that these immense deposits of shingle were formed and moulded into terraces.

But if this reasoning is to apply to the most ancient of those accumulations, and so place them as more recent than the latest tertiary times, then there must have been a slight depression prior to the steady and gradual elevation of the continent that has continued ever since. Moreover, unless this depression was local and confined to the mountain region, how are we to account for the absence of post-tertiary formations over the high-lying tertiaries of the plains, in sufficient quantity to have allowed time for the production of such a gigantic formation of water-worn stones?

On the other hand it is possible that the production may have commenced in tertiary times, so that they are almost coeval with the great lignite basin of the Missouri, which is an estuarine deposit of Miocene age, resting, according to Hayden, quite conformably on his upper cretaceous beds. He also describes his tetanotherium bed, the lowest of the White River tertiary basin, which has yielded so many forms of reptilian and mammalian remains, as likewise resting without a break of conformity on the upper cretaceous. (Ib. p. 19.)

Thus, if this latter suggestion respecting the age of the most ancient of the terraced materials be correct, they must have been formed in the straits and inlets of an archipelago, or rocky reef, lying to the west of a flat cretaceous continent, in which were forming estuaries and lagoons, choking with rank vegetation, and containing large lakes, which gradually filled up, burying the remains of the gigantic turtles and extinct forms of mammals.

In the Gulf of Georgia there are beds of conglomerate and coarse sandstone overlying the cretaceous strata to all appearance, and which I have thought may perhaps correspond to the more ancient of the mountain terraces, to which they bear a great mineral resemblance, excepting that those in the Gulf of Georgia have been much disturbed, so that they are harder and their bedding better marked. The difference is, however, not greater than we should expect if we consider the one group to have been placidly raised to a great altitude, while on the other the force had been expended in producing plications and faults.

Drift of Pacific Coast.

The glacial markings on the metamorphic rocks of Vancouver Island are better displayed than I have elsewhere seen them. Every surface near Victoria that is either naturally exposed or from which the soil has been removed, exhibits deep parallel furrows, generally with a N.E. trend. They are also seen on the mainland at the entrance to Paget Sound equally distinctly. Erratics are distributed all along the Pacific coast, at least as far south as latitude 46° N., where they occur, but not very plentifully, near Vancouver and in the valley of the Willamette. They are often of great size, and on Vancouver Island are composed of a grey syenite, which Mr. Bauerman told me occurs in the Cascade range. Often in the woods to the south of Fraser River I saw solitary boulders six or eight feet high, resting apparently on the shingle terraces, which are only here 100 to 200 feet above the sea. Certainly at the fourth plain, five miles from Fort Vancouver, there are several large blocks, though not of the above size, that do rest on the gravel terrace which skirts the valley of the Columbia River. On most of the islands in the San Juan Archipelago, and along the coast of Paget Sound, high sections of yellow sand and clay are exposed, forming low sea-cliffs, the shingle terraces being then further inland. From this drift deposit Mr. Bauerman procured casts of *Cardium* and *Saxicava*.

As I never observed drift or boulders within the Cascade range, even in places elevated only 600 to 700 feet above the sea, but as all the superficial deposits in the great trough between that range and the Rocky Mountains clearly are formed from the re-arranged materials of the shingle terraces along with tuffas from the Cascade range, I conclude that the average lowest altitude of the Cascade range, which is somewhere about 4,000 feet above the sea at the present time, exceeded the depression of the continent during the glacial epoch, and presented a barrier to the causes which transported the erratics and scratched the rock surfaces along the Pacific coast. If the Cascade range at that time formed a promontory enclosing a gulf open only to the south, like the Gulf of California, it would exactly fulfil these conditions.

Tertiaries.

The existence of tertiary strata, ascertained to be so by the organic remains, has only been proved at one point west from the Cypress Hills, where Mr. Sullivan obtained *Ostrea velaniana*, associated

with a *Modiola*, and a few other fossils, which Mr. Etheridge, who has named all the neozoic fossils brought home, has been unable to identify. The beds from which these fossils were obtained consisted of friable sandstones, with argillaceous and calcareous concretions, the bedding heavy and irregular, and often passing into incoherent pebble conglomerate. Judging alone from mineralogical resemblance, these beds were recognized over a considerable area, but always forming high grounds in the neighbourhood of the Missouri Côteau, south-east from the mouth of Belly River.

On the Souri River, seven miles north of the boundary line, in longitude 104°, was observed what is, perhaps, a portion of the Missouri tertiary lignite basin. This locality, which is known to the half-breeds as "La Roche Percée," is well up the eastern slope of the Missouri Côteau, and within a degree of latitude of that river itself, at a point where the existence of the lignite of tertiary age has been well ascertained. The Souri River at this point flows through a valley with steep sides, depressed 165 feet below the surface of the plain, which at this place is quite hard, and strewn with an immense profusion of boulders, being at the base of the third great prairie level. The sides of this valley are cut by numerous ravines, which only extend a short way back into the prairie, and exhibit sections of the following strata:—

		Feet.
a.	Drift with boulders	4 to 7
b.	Mud stone	1
c.	Incoherent sandstone, fine grained, with hard concretions impregnated with iron, which weather concentrically	10
d.	Porous calcareous scinter	1
e.	Hard blue ironstone shale, decomposing into deep orange-coloured splinters	2½
f.	Gritty limestone	2
g.	Ash-coloured clay, in thin indistinct layers, very soft, with one bed of lignite, nine inches in thickness	8
h.	Hard blue limestone	
i.	Same as *g*, but with thin seams of lignite, 10, 8, and 6 inches in thickness	15
k.	Gritty limestone	2
l.	Brightly-coloured marls and shales, with selenite in small fragments	10
m.	Coarse-grained incoherent sandstone, more than	20

See Section No. 4.

Excepting a few fragments of plant impression, like stems of sedges, no fossils were obtained from these beds by which their age could be identified. They may, perhaps, be passage beds, representing the highest strata of the cretaceous era, overlaid by the lignite basin, as further south they are so disposed, and with very similar mineral characters.

The lignite does not occur in well-defined beds, but graduates into the shales on both surfaces. It is not visible till a light ashy deposit is removed from the exposed edge of the bed, which has been formed by the soft clay washing down from the strata above. The lignites are of several different varieties, some having quite the appearance of compact cannel coal of fine quality, some like the more glistening bituminous coal, friable, and only to be obtained in small cubical fragments, while some of it can hardly be distinguished from charcoal.

The sandstone which forms bed *c*, is composed of very fine pure grains of quartz, hardly colouring; but in the upper parts of the bed there occur concretions impregnated with clay and iron, and of a reddish hue, that are comparatively hard, and decompose concretionally. This irregular disintegration gives rise to a curious formation of the banks, which has rendered this locality an object of great superstition among the Indians. The lower sandstone wears away from under the hard concretions, that assume the form of compressed spheres, and sometimes long cylinders, like the boilers of a steam-engine, and are left supported on pillars of the white sandstone. The gullies which join the main valley are thus filled with grotesque forms, sometimes exactly resembling the half-buried remains of ruined edifices. The sandstone (*m*) at the base of the section is also very incoherent, but is composed of larger grains of quartz. The strata are not found in the same order and proportion throughout the valley, but yet they always appear to be horizontal. The marly shales (*l*) have a considerable quantity of selenite disseminated as small crystals. La Roche Percée is in lat. 49° 6′ N., and longitude 103° 54′ W.

This formation has, without doubt, been much more extensive, and has overlaid the cretaceous beds as far north and east as the great sandy waste where the track of the Expedition crossed the Souri River, in latitude 49° 30′ N., and longitude 100° 20′ W. At that place the sand-hills rise 70 and 80 feet, so pure, and so feebly bound by the few plants that grow on their surface, that they are constantly wind-blown. Under these, and cut through by the river Souri, was observed a lacustrine deposit, in which one bed was composed wholly of rolled fragments of lignite, overlaid by sandy marls and gravel enclosing fragments of bones, which Professor Huxley refers to the bison, and along with these small land and freshwater shells. This deposit has been found in one of the lakes, which I referred to generally as of quaternary age, when describing the superficial deposits of the prairies. The origin of this one has been from the damming back of the water by the blue hills of the Souri, which are composed of hard cretaceous shales, and through which the river of that name escapes to join the Assineboine by a narrow and profound chasm, which it has gradually cut through the horizontal strata. The place where the sand-hills and the bed of lignite pebbles is found, has been the north shore of the lake, which must have been of very considerable extent.

The great valley of the South Saskatchewan, when it is hemmed in closely by the Grand Côteau at its elbow, opens out, and at the junction of Red Deer River and Bow River, in longitude 109° 30′ W., latitude 51°, the hills retiring many miles from the river, which, however, always preserves its immediate banks of from 200 to 250 feet in height. The prairies are there again covered with a waste of blown sand, which may, perhaps, have had a similar origin from tertiary or upper cretaceous beds, which have been subjected to local denudation. The same iron-shot bands, containing the shells of land mollusca and bison bones, were there observed, but without any traces of lignite.

East from the elbow of the South Saskatchewan, there is also a tract of sand-hills, with quite the same feature; but there I observed masses of sandstone *in situ* resembling the lowest beds at La Roche

Percée. On the opposite side of the Qu'appelle valley, within a few miles of where I was, in the same sandstone, Mr. Hind found the characteristic fossils of the upper cretaceous group.—(Report of the Assineboine and Saskatchewan Exploring Expedition.)

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. At the time I observed the sandstone, I took it for a local variety in the drift. If, on the other hand, it belongs to the tertiary or upper cretaceous groups, it proves them to have a very singular distribution, conforming in a great measure to the present river valleys, as on the opposite side of the river, at a little distance back, the middle cretaceous group rises to the height of several hundred feet.

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 from 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. Here the springs were seen to issue from beds of sandstone and conglomerate, with travertine containing dicotyledonous leaves.

The section is as follows (see Section No. 3.)

a. Banks of valley, composed of drift.
Coarse ferruginous sand, very moist, with beds of blue and buff-coloured clay, the whole having rounded boulders irregularly dispersed.

b. Twenty feet of coarse and fine sandstone impregnated with lime; also gravel and shingle, and bed (*c*) travertine of dicotyledonous leaves.
Ancient valley deposit?
or underlying the drift?

d. Present river level with banks eight feet high of silt and fine sand, forming the "points" and densely wooded islands in the channel.

I was unable to determine whether these beds have been formed like the silt banks of the river at a time when it was much larger than at present, or whether they are beds cropping out from beneath the drift. They are quite consolidated, but this may have resulted from the calcareous nature of the matrix.

It will be seen that the observations I have made respecting the distribution of the tertiaries on the eastern plains are very disjointed and unsatisfactory. As the cretaceous strata overhanging the Winipeg group of lakes appear to dip to the west, again to rise to the "*Côteau des Prairies*," it is probable that the trough which they thus formed was occupied by tertiaries of the same age as those that cover the cretaceous strata on the Upper Missouri, but that, in the immense denudation that has taken place, they have been unable to withstand the erosion so well as the tough clays that underlaid them, which had therefore remained as a shoal further out to sea, while along the shore the more yielding strata were being rapidly ground down under the combined action of currents and stranded ice.

Although it is probable that tertiary basins occur in the plains further west, especially some of the groups that yield lignite, these will be afterwards described along with the cretaceous strata, as there is an absence of data by which to discriminate them.

Cretaceous System.

Nearly the whole of the great area of prairie country from the eastern axis to 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.

The classification of these strata, as they occur in the prairie to the south, has been worked out during the last six years by Messrs. Meek and Hayden with great success, and the results have been published as Memoirs in the Proceedings of the Academy of Natural Science, Philadelphia. The various Pacific railway exploring expeditions also give details and descriptions of the fossil remains which have been found in this group.

Messrs. Meek and Hayden divide the cretaceous system into five groups, but, as my observations were not sufficiently extended to warrant my referring the Saskatchewan strata to those without much doubt, in the following vertical section I have adopted a different method of lettering, only indicating the probable equivalents of their section. In the case of our group however (B), Mr. Meek has identified the strata from fossils submitted to him by Mr. Hind.

Vertical section of cretaceous system as developed in British North America.

A. Arenaceous Clays and Sandstones, with *Scaphites, Nautilus, Ariculu*, and other Marine Mollusca. (No. 5 of M. and Hayden.)	Observed by Hind on South Saskatchewan below the elbow. Lower part of section at La Roche Percée? At elbow of Battle River?
B. Indurated olive-coloured Shales, with bands and fissures filled with Clay Ironstone, *Leda Hindi, Ostrea lugubris*, Scales of Ctenoid Fishes, Annelid tubes, and plant-remains. Also, by Hind, *Natica, Ammonites*, &c. (No. 4 of M. and Hayden.)	Forms the high grounds cut through by Long Creek and the Souri River. Also at the Forked Creeks near the Assineboine.
C. Dark purple and brown laminated Clays, with Ironstone, Septaria, and sometimes crystals of Selenite. Contains *Baculites, Inoceramus, Pholadomyia, Cardium, Exogyra, Astarte, Cytheria, Ammonites.* (No. 3 of M. and Hayden?)	Valley of Assineboine at Fort Ellice, elbow of South Saskatchewan, Eagle Hills, and on North Saskatchewan to Fort Pitt. On north slope of Cypress Mountain, in the Gulf of Georgia, on Vancouver Island, at Nanaimo River, Salt-spring Island, and at Valdez Inlet.

D. Sandstone overlying Marly Clays bounded with the Seams of Ironstone, thin beds of Limestone, and stiff dark blue Clay and arenaceous Shales. *Ostrea cortex*, *O. vellicata*, *O. anomraeformis*, *Cytheria*, *Mytilus*, *Cardina*, *Venus*, *Natica*, &c. Stems and roots of Silicified Trees.	Battle River? Hand Hills, Red Deer River, &c. (Not observed on west side of Rocky Mountains.)
E.* Great Lignite Group, Sandstones coarse and friable, or argillaceous and concretionary, indurated Shales and soft Limestones, Ironstone Nodules, beds of Lignite 3 to 10 feet thick. Silicified Wood, *Taxites*, and sedge-like stems in the Sandstones? (No. 1 of M. and Hayden.) Includes Wealden?	Red Deer River, North and South Saskatchewan, Athabasca, Pembina River, &c. Nanaimo, Vancouver Island, Billingham Bay, Burrard's Inlet, Gulf of Georgia, &c. The position of this group is not clearly made out to the east of the Rocky Mountains, so the sections at the first and second localities are, so far as is known, contradictory. The beds at Battle River, Edmonton, and Lower Red Deer River, may be mixed with those of Upper Cretaceous or even Tertiary.
F. Green Sandstone and Conglomerate at base of Lignite Group at Nanaimo, Tuffaceous Sandstone within 4 feet of Greenstone Conglomerate. Much altered, and containing *Trigonia Emori*, *Cytheria Leonensis*, *Arca* (2 sp.), *Psammolia*, *Exogyra* (2 sp.), *Ostrea* (2 sp.), *Rostillaria picta*, and Jurasin?	Fossil Point, Departure Bay, north of Nanaimo on Vancouver Island.
Bituminous Shales, resting on Limestone, and covered by friable Sandstone. The Shale takes fire and burns spontaneously. The limestone contains fossils that are Jurassic? From these Shales, perhaps, come the two species of Ammonites described by Hind, and obtained on Elk River.	Described on the McKenzie River, by Richardson. Similar bituminous Shales on the North Saskatchewan and on the Athabasca, where it cuts through to outer range of the Rocky Mountains. With a small *Ostrea?*

For comparison with the foregoing section, I give three sections of the cretaceous beds and the tertiaries immediately overlying them, extracted from the Reports of the Mexican Boundary Commission, vol. i. p. 126 *et passim*, where an able digest of their relations is given, prior, however, to the most recent of the researches of Drs. Meek and Hayden.

First.—*Section of Eastern States*—New Jersey.

VIII. Upper Greensand beds. (3rd.)
VII. Coarse and fine Beach Sand.
Nos. 4 & 5 of Meek & Hayden.
VI. Middle Greensand beds. (2nd.)
V. Quartzose Sand, indurated and concretionary, with Oxide of Iron.
Exogyra costata, *Ostrea larva*, *Billemintilla-Pecten*.
IV. Lower Greensand beds. (1st.) Marly Clays.
Exogyra costata, *Ostrea larva*, *Gryphaea*, *Ostrea vesicularis*.
III. Dark-coloured Clays, Greensand in patches.
Ammonites Delawarensis, *A. placenta*, *A. Conradi*, *Baculites ornatus*, *and casts of Cardium*.
In this position should be Nos. 2 & 3 of M. and Hayden.
No. 1. M. & H.
II. Dark Clays with *Fossil Wood*.
I. Fire and Potter's Clay, *Fossil Leaves and Wood*.

Second.—*Section of Strata on Mexican Frontier.*

Tertiaries of west coast. *Miocene*.
Tertiaries east of mountains. Sandstone, Sands, and Conglomerates, like those of the *Mauvais Terres* in Nebrasca.
Calcareous beds, with marine *Eocene* fossils underlying unconformably the preceding strata.
Cretaceous.
1. Argillaceous beds. *Exogyra costata*.
2. Calcareous beds. Buff and lead-coloured, with beds of white Limestone, *Gryphaea Pitcheri*, *Cardium multistratum*, *Toxaster*, *Holictypus*, *Ammonites Texanus*, *Hippurites*, *Nerinea*, *Caprina*, &c.
3. Sandstones of various colours with beds of Clay Sandstone, Carboniferous.

Third.—*Section from the Missouri, westward.*

Tertiary. Indurated Clays, Sandstones, Conglomerate and Limestone. Mammalian and Chelonian remains. Freshwater shells.

Cretaceous.
Nos. 3, 4, and 5, of N. Jersey Sect. C. and D. of Nicollet.

5	Arenaceous Clays, argillo-calcareous Sandstones	80 feet.
4	Plastic Clays, concretionary calcareous Sandstone	250 to 300 feet.
	This is the principal fossil bed of the Upper Missouri.	

* It is possible that the Lignite-bearing Group E, which occurs in two lines, separated by a belt of clays like D, may include deposits of two different ages; the one Upper Cretaceous or Eocene, like the beds at the La Roche Percée, and the other the cretaceous in the position assigned to it in the Section.

A. and B. of Nicollet.	3 Calcareous Marl, *Ostrea cagesta, Inoceramus problematicus*, scales of fishes - - - -	100 to 150 feet.
	2 Clay with few fossils - - - -	- 80 feet.
Nos. 1 and 2 of N. Jersey -	1 Sandstone and clay *Fossil Wood* -	- 90 feet.

"The change from 3 to 4 is always well marked.

"*Inoceramus problematicus*, which is the same as *I. fragilis*, is the characteristic fossil of Nos. 2 " and 3, and, with *Ostrea cagesta*, ranges to Mexico. These latter groups everywhere rest on the sandstone " and clay beds (No. 1.), which are the Jurassic of M. Marcou. With the exception of two species, " the cretaceous fossils of the Mexican frontier are distant from those of the New Jersey section, and " nearly equally so from those of Nebrasca; whereas the latter or Nebrasca section, extending from the " Missouri westwards, has many fosssils in common with those of New Jersey and Alabama. It is " therefore probable that the Mexican beds represent a different epoch in the cretaceous series from those " of the east and north-west. However, from the Mexican frontier no sections were obtained, to show " whether one or more groups were represented."

Group B.

By reference to the map it will be seen, that the first point where the route of the Expedition passed over cretaceous strata was after gaining the great plain of which Pembina Mountain forms the eastern limit, at Long River, latitude 49° 8′ N., longitude 98 .5′ W., a tributary of Pembina River flowing northwards. This stream flows through a deep valley in the high plateau which stretches back from Pembina Mount, and in the gullies, which gives it an exposed section of group B. It is a compact shale of light greenish drab colour, not occurring in continuous layers, but as fragments, with irregular conchoidal surfaces, which has been produced by the desiccation of what was originally thin layers of clay. Sometimes it has more of a slaty character. Among those beds are hard bands and nodules of dark brown clay ironstone, and perpendicular fissures are common, filled up with splintery iron shale; also small calcareous and rust-coloured tubes traverse the strata perpendicularly in large numbers. The same strata were observed at Forked Creek, where a deep gully joins the valley of the Assineboine, in latitude 50° 6′ N., and longitude 101° 18′ W., and these two places are both on a line of high hilly ground, which stretches in a north-west direction, no doubt marking the outcrop of the shales. At Long River they dip gently to the south, and are covered by six feet of pure white sand, very incoherent, and over this lay the drift, consisting of light grey calcareous earth. At Forked Creek they seemed to be strictly horizontal, and were covered by a local drift derived from the subjacent beds. Mr. Hind, who also saw these beds at Forked Creek and other localities, submitted the fossils he obtained to Messrs. Meek and Hayden, and they have referred them to their second highest group. He gives the following list as named by them:—

Anomia Flemingia.
Inoceramus Cedarensis.
Leda Hindi.
Natica obliquata.
Avillana concina.
Ammonites (sp. undet.)

Of those from my collection has been determined the *Leda Hindi*, and in addition *Ostrea lugubris*, scales of ctenoid fishes, with annelid tubes and plant remains. Traces of these beds were observed to the south of the Qu'appelle River, and also on the left bank of the North Saskatchewan, for a considerable distance above the Eagle Hills. Mr. Hind also observed them to form part of the high escarpment of the Duck and Riding Mountains which overhangs the lakes, having an altitude of 1,000 feet, and it was at 500 feet from the summit that he detected these strata. This group has not been distinguished from the next in colouring the map which accompanies this report; but from the more resisting texture of these shales, it is probable that they occupy a larger area than any other group of strata of the lower plains that have been subjected to such great denudation.

Group C.

At Fort Ellice the banks of the Assineboine are 240 feet high, and in general their structure is obscured by vegetation; but at one point a recent slide displayed a partial section of the bank. The upper part consisted of the comminuted fragments of the last-described shale, along with beds of pure sand, and also the more common yellow drift. Close to the water's edge masses of strata of tenacious calcareous clay were exposed, of a dark purple colour, but the weathered surface decomposing into a ferruginous earth. Along with these strata were two beds of soft clay ironstone about four feet apart, the lower one a half foot thick, and rather compact; the upper one concretionary, forming thick nodulated masses, the surfaces of which show the *cone-in-cone* structure. At this place only a few fragments of the nacreous shell of Baculites were found, but sufficient, along with the mineral resemblance, to identify these beds with *Group C*, in the vertical section. 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 ironstone, with veins of cavities filled with calc-spar. These septaria are in great numbers, and when broken are found to include fragments of the following fossils:—

Baculites compressus.
Inoceramus (Cripin of Roemer and Conrad) sp.?
Pholodomyn occidentalis, Morton.
Cardium.
Exogyra.
Astarte Texana.
Cytheria.

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 such shales on the bank of the river, the oldest, though now close to the water level, still 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 their development. Above the elbow of the South Saskatchewan these strata are very dark, and contain a large quantity of selenite in radiating crystals. Portions of these soft strata have been formed at the place, by the action of the weather and of the river on their base, into lofty conical mounds, which present a most extraordinary appearance. As no grass has time to grow on them, from the constant attrition of their surface, they are perfectly black, and their outline is broken into terraces by the successive lines of ironstone concretions, which from their hardness retain the soft strata underneath them.

At the base of the Cypress Mountains, where they commence to rise from the plains that lie between them and the South Saskatchewan, the sides of the coulées are formed of the same septaria clays, with fragments of inverraini, and presenting the usual ragged features. This locality would be very favourable for the study of the whole cretaceous group, and the overlying tertiaries which form the summit of the high lands of the Missouri Côteau, were it not so dangerous on account of the different hostile Indians that move about in strong parties through it. The Expedition only spent a very few days at this interesting place, as it was here that we broke up into parties to explore the Rocky Mountains in 1859. From the few observations I was able to make, however, I have been induced to carry the line of these strata from the elbow of the south branch along the côteau to the Cypress Mountains, besides their outcrop to the north-west, along the line of the Eagle Hills to Fort Pitt.

In the prairies, this and the other group of the cretaceous system preserve an unaltered condition, and rarely present other than a most gentle dip; but close to the Rocky Mountains, and also within the plication of the older rocks forming that chain, altered shales, highly charged with iron, and overlying sandstone, were observed, which, at the time, I was inclined to consider to be these septaria clays, as the concretions had a very great resemblance to those of this group.

These beds, with their characteristic fossils, were also observed at Nanaimo, on Vancouver Island; but I shall describe the whole strata at that place together, and for the present confine myself to the development of the cretaceous system in the eastern prairies.

Group D.

A very large proportion of the higher plains to the west of the Eagle Hill côteau is occupied by this great group of the cretaceous strata. It is met with forming the banks of the lower part of Red Deer River, near where the Expedition crossed it during the last summer's explorations. From that part it rises to the westward, till, at the Hand Hills, the sandstone which forms its upper member has preserved it as outliers, having abrupt escarpments to the west. By its marked lithological character it was also recognized on Bow River to the south, for a considerable distance above the mouth of Belly River, and also yet further to the south-west, forming the high broken grounds over which I passed on my journey from the Cypress Mountains to the Rocky Mountains in August 1859. It was also met with at the elbow of Battle River, and above Fort Pitt on the North Saskatchewan, where it seems to form the banks of that river for a considerable distance, but is wanting above the Snake Portage, till it reappears again at the Pyramids, about 100 miles above Fort Edmonton. Between these points it probably forms the high grounds back from the river, such as the Beaver Hills, Bear's Hill, and the hills round St. Ann's, to the west and north of Edmonton. I, however, offer this sketch of its distribution more as a surmise, founded on the physical features of the country, than from actual observations of its relations at these various points.

Excepting very obscurely below the Snake Portage, on the North Saskatchewan, I cannot say that I anywhere observed the relation of this group to the baculite clays of the preceding division. I descended that river on the ice, travelling with dogs, in March, 1858; and as the late season compelled me to travel a great deal in the night, I missed many points of interest. Its relations to the strata beneath it were apparently quite clearly shown on Red Deer River. At this place the group is found to form the broken country round the base of the escarpment, which probably in its full altitude includes several of the members of the cretaceous system, and therefore merits a more minute description. These hills form a high mass of table-land, a few miles back from Red Deer River, presenting an abrupt escarpment to every quarter but the east, in which direction they slope off gently with the dip of the strata. Our encampment on June 25th, 1859, was in one of the deep ravines on its western face, 375 feet above the plains below, and 160 feet below the level of the plateau above.

In the upper part of the escarpment facing the south-west, grey coarse sandstones were exposed, which had a considerable dip to the north-east. The bedding of these was hard and distinct, and they were seen to rest upon soft incoherent sandstone, underlaid by light sandy clays and blue clay shale. (See Section No. 7.) In the clays are enclosed angular masses of black iron-shot sandstone, and also pebbles of quartz and granite. No evidence of the exact position of these strata was obtained, but, although they were somewhat disturbed, I saw no reason to doubt that they are a superior number of the cretaceous series, overlying the beds next to be mentioned, which are of the group D. Section No. 6 gives a sketch of the strata of the hills from the valley of Red Deer River northwards, and it will be seen that there is an interval of several hundred feet between the sandstones and clays and the banded clays of Group D, the nature of which were not ascertained. These banded clays, which occupy a narrow tract of country round the Hand Hills, give rise to large white mud swamps, which we found, at this season of our visit, to be nearly dry, and presenting a very rough surface from the floundering of the large bands of buffalos in the tough plastic clay bottom, as they have eagerly striven for the last trace of water. These clay beds, which contain a large proportion of calcareous matter, and are often banded by these seams of ironstone, have a white chalky aspect, and are so easily acted on by the weather, that what were originally gullies soon expand into wide flats, bounded by conical hills, their bright surfaces being marked regularly at every few inches by the parallel streaks of ironstone, which are often only half an inch thick. From these swampy flats, that serve as reservoirs for the water which descends from the hills in spring, the streams have worn deep ravines, which join the valley of Red Deer River. At the commencement of one of these, or near the base of the group D, Section No. 8 was observed. Here the "banded clays" are seen to rest on red iron clay shales in their beds, underneath which is the bed of rotten limestone, of a buff colour, which again rests on a bed of

shell conglomerate, principally composed of fragments of *Ostrea cortex*, and aggregated into a solid bed with many complete specimens of the same shell. Mr. Etheridge has identified this shell, which is a species described by Conrad, in the Mexican Boundary Commision Reports (p. 157). Along with *Ostrea multilorata* it was found at Dry Creek, Mexico, and in describing them Conrad says that he knows no species like them in the cretaceous system, and that probably they belong to strata of still earlier date. However, at another locality near the Hand Hills, I again found *Ostrea cortex*, and along with it *Ostrea vellicata* and *Cytherea Texana*, and these are undoubted cretaceous shells of Mexico. From between El Passo and Fontera, which are places within a few miles of each other, the following list of fossils is quoted in the Mexican Boundary Report, *Ostrea vellicata*, *Cytherea Texana*, *Exogyra* (2 sp.), *Nodosarea*, *Trigonia Emori* and *Area*, which includes both fossils found in the neighbourhood of the lignite on Red Deer River, and also some that were found along with that of Vancouver Island.

On Battle River, in latitude 52° 17′, the banded clays were also observed with the same features, and, as far as I can judge, with the same fossils. These, however, along with many from other localities, including the Rocky Mountains, have not come to hand, which causes an unfortunate break in the evidence I have to offer. From Battle River to Red Deer River they appear to form the surface of the country, as every shallow ravine shows sides of the white chalky beds, and the white mud swamps are very common.

In my next group, E, the lowest of the cretaceous system, I have with great hesitation classed the large deposits of lignite; they are sufficiently compact to be of value as fuel, but which have hitherto been generally classed as of tertiary age. However, in all the sections which have been given of the cretaceous system in the United States, it will be observed that the lowest beds are always described as sandstones, containing fragments of fossil wood. Further Dr. Hayden has pointed out that at the base of his lowest cretaceous group freshwater beds occur, in which the shells are more nearly allied to tertiary forms, and the vertebrate remains, of which only a few bones have been obtained, are considered by Dr. Lerdy to belong to an equivalent of the Wealden period in Europe. In the same horizon have also been found angiospermous leaves, such as *Quercus*, *Salix*, &c. Also he remarks that the shells from the Judith River beds, of the supposed Wealden age, cannot be distinguished in many instances from those of the great lignite basin, which he knows to be tertiary beyond doubt, mentioning as instances an *Ostrea* and a *Trionyx* that were considered common to the two formations. It may, therefore, be justly concluded that this question is one of great nicety and doubt, which will only be slowly cleared up as those vast territories become explored. Nevertheless we are by these observations prepared to consider as possible, at least, the existence of a lignite-bearing formation at the base of the cretaceous system, even though developed to an extent not hitherto recognized. In his description of the lignite formation on the McKenzie River, Sir John Richardson refers to strata of a similar nature as occurring at Edmonton, on the North Saskatchewan: and on first arriving at that place, in January 1858, I had no difficulty in identifying the beds there with those he describes. I got not only the same yew-like leaf (*Taxites*) that he figures as characterising the shales, but also the same general succession of strata, excluding only the beds of shingle and gravel which he describes in his section of the McKenzie River. Before leaving England Colonel Lefroy furnished me with the following extracts from his notes on Peace River, a post midway between the McKenzie and Fort Edmonton, which are sufficient to show that the strata are probably continuous throughout this area. He observes that "at the ramparts on "Peace River is a vertical cliff of sandstone, with broken stratification towards the top," and that at Dunvegan the river is depressed "600 feet below the general level, and great quantities of crystals of "sulphite of lime were collected in the upper strata, while actual coal occurs in the seams about ten "miles above the fort, in one of the small tributaries." The lignite formation has also been remarked on "Smoking River," a tributary of Peace River, and I have traced it on the Athabasca and McLeod Rivers, and on Pembina River, all to the north of Edmonton, thus proving the range of this formation over a slope rising from 500 to 2,300 feet above the sea, and yet preserving on the whole the same characters, and showing no evidence of recent local disturbance beyond the gentle uplift which has effected this inclination.

I shall now describe this formation as it was observed in different parts of the country explored, commenced with the North Saskatchewan. The lowest point on that river where the lignite was actually observed, was about two miles below Fort Edmonton, where a heavy bed of it was seen dipping gently out of sight below the water level to the N.E. I have reason to believe, however, that other beds of it occur further down the river, for a distance of 50 or 60 miles.

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 the white marly clays of the group D; but the country in this neighbourhood 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 arenaceous clays, sometimes passing into true sandstone with spherical concretions, but at others into clay shale. Many of these beds are highly charged with nodules of clay ironstone, 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. There are no workings of any sort into any of the seams, the manner of procuring the small supply which is required for use at the fort being for the blacksmith to go down to the river bank with a pick, and procure a few basketfuls, where he can most easily get access to the material.

* The sulphur of the coal combining with the metal.

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 at a little distance below, sections Nos. 11 and 12 occur, where there are several seams exposed, the principal of which, close to the water edge, is six feet in thickness, and another a little way, where it is four feet, with others less pure. In the middle of the six-feet seam there occurs a layer five to eight inches thick of magnesian steatitic clay, which works up into a lather like soap, and is used by the women at the fort for washing blankets. From this seam a specimen of the lignite has been analysed with the following results. (See Appendix.)

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 the nodules derived from the underlying strata, along with pebbles of quartz and other rocks that must have been derived from elsewhere. Also large fragments of silicified wood are found in the subsoil at Edmonton, the same as that found in the upper part of the lignite group on Red Deer River, as will be described.

At the bend of the river below the fort, and on the same side, the bank looks as if broken tiles had been strewn over it. This arises from the lignite having at one time been completely burnt out, only being represented now by a thin layer of ash, while from the baked clays above and below the bright tile-like material has been derived. Amongst these fragments I obtained impressions of the same yew-like leaf that Sir John Richardson found in the McKenzie River beds under similar circumstances, but along with dicotyledonous leaves, of which I, however, found no trace.

For 90 miles up to the North Saskatchewan above Fort Edmonton, the grey 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 of 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. Where 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. These marls have much the look of those of group D.

Fifteen miles below the mouth of Brazeau's River, which is a large tributary to 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 a 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. At the Rocky Mountain House, in lat. 52° 21′ N., longitude 115° 10′ W., where I had the best opportunity of examining this formation, I divided it into three groups, judging from the mineral composition alone, as they were found to pass from one to the other without superposition, just as we might expect to find in a shallow lagoon deposit.

1st. Coarse-grained sandstone composed of angular grains of quartz, cemented by calcareous matters present in small quantity. This sandstone forms bold perpendicular cliffs often 150 feet in height, and hemming in the river on both sides. It resembles the descriptions given of the sandstone of the "Ramparts" on McKenzie and Peace Rivers, and indeed on all the rivers this formation may be traced by this marked feature as far south as the Missouri at least, where a drawing of the falls on that river exactly resembles these sandstone cliffs. (Given in Pac. Rail. Rep.)

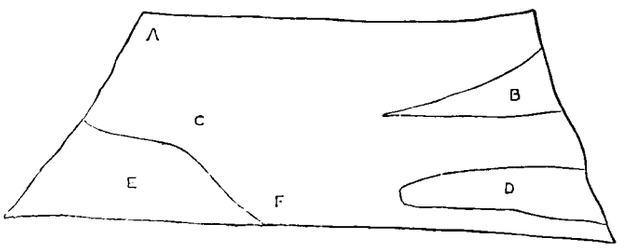
The 2nd group consists of beds of green argillaceous sandstone, which, as it weathers easily, always gives rise to sloping banks, from which protrude concretionary masses. These beds are generally horizontal, but sometimes present a rapid dip towards the edges of basins in the last group, in which they seem to have been deposited. They are, however, often overlaid by the hard bedded sandstone.

The 3rd group resembles more in its mineral characters than the other two the beds at Edmonton, consisting of alternations of clay shale and argillaceous sandstone in irregular beds, and including deposits of lignite. The shales, which are often very hard and compact, contain fragments of the yew-like frond, and also stems of plants like sedges.

Section No. 15 is an attempt to combine the different sections that were observed; and Nos. 13, 14, 16, and 17, show the arrangement of the strata at several localities. The irregularity in the mineral composition is well shown about five miles above the Mountain Fort, where, in a very short distance, beds of clay and soft green sandstone are suddenly replaced by cliffs of grey and yellow sandstone with heavy bedding. The features of the strata at the Mountain House are very similar to the description given of the lower cretaceous groups at Seargent's Bluff on the Missouri, by Meek and Hayden, where the following section is described:—

1.	Dark coloured clay, with sandstone seams	6 feet.
2.	Light yellow clay passing into grey sandstone	5 „
3.	Dark clay, with fragments of carbonized wood	1½ „
4.	Grey indurated clay or marl, with wood	4 „
5.	Dark seam like No. 3	8 inches.
6.	Clay like No. 4	3 feet.
7.	Grey sandstone (carbonized wood)	2 „
8.	Very dark grey clay, sometimes black, with organic matter in the lower part, and crystals of selenite	10 „
9.	Grey clay, carbonized wood, and hard concretions	30 „
10.	Grey sandstone, with wood	2 „
11.	Grey clay, with wedge-shaped masses of hard bituminous lignite or coal, and round lumps of sulphuret of iron, to the river level.	

It is mentioned that the beds thin out in many directions. Some beds increase to a great thickness in a few hundred yards, and sections like the following are not uncommon:—



A. Soft heavy bedded sandstone
B. Dark slaty clay and indurated clay.
C. Grey sandstone.
D. Hard reddish sandstone.
E. Dark shales.
F. Sandstone.

(Mexican Boundary Rep., vol. i. p. 136.)

As developed at the Mountain House, this formation, whatever is its exact age, may be described as consisting of sand and clay in varying proportions, great ridges of pure sandstone, including basins in which have been deposited clays and clay sandstones charged with lignite and ironstone in large quantities.

On the Athabasca River the valley from Fort Assineboine, in latitude 54° 50′, 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 those at the 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 Red Deer River the lignite formation was observed at various points, the lowest being at the Hand Hills, which have already been alluded to in speaking of the "banded clays." By again referring to section No. 6 it will be seen that a flat plain extends back from the summit of the river valley towards the base of the hills, where the white mud swamps are situated, but which is cut up by great ravines, gradually deepening as they approach the river. The river valley itself is half a mile wide and 270 feet deep.

At the commencement of one of the ravines, about three miles back from the river, was found the fossil before mentioned (*Ostrea carter*), and in another at only a quarter of a mile back from the river valley that fossil was again found in the highest part of the bank along with *Cytheria Texana*, showing that these beds must form the surface of the level plain. At the mouth of the same ravine (Shell Creek) the following sections (No. 9) were observed in the bank of the valley of Red Deer River, the beds being to all appearance horizontal:—

a. Buff unstratified earthy clay - - - - - 12 feet.
b. Ash-grey and cream-coloured sandy clays in bands, with their seams of clay ironstone and carbonaceous layers ("Banded Clays.")
Throughout this bed are angular pebbles of ironstone, which look like fragments of septaria - - - - - - - 30 feet.
c. Seam of pure lignite ("cuboidal lignite") - - - 3 „
d. "Banded clays," very sandy in some places; in other parts the coal has been burnt out and has converted the upper beds of this group into material like broken tiles, which lie scattered over the banks. Probably the ochre beds observed in some parts of the banks are the layers of ash which represent the lignite bed where consumed.
e. One foot of silicified wood, composed of stems, trunks, and roots of large trees. In the bed these are of a deep brown-black colour, but the fragments which lie scattered about weather to a light cream colour on the surface. One silicified root measured 18 inches in diameter.
f. Brown coal. This bed is about 18 inches thick, and in thin leaves, with a paper-like texture.
g. Sandy clays partially banded, varying from grey to light cream-colour; crystals of selenite very common, but no large masses were observed. This group has a very chalky look from a distance. It is probably 100 feet thick, but the base of the section was not observed.

Although these beds are very variable, passing horizontally into different varieties of shales, banded clays, and sandstones, still there seemed to be a definite inclination to the N.E., so that in ascending the river deeper beds were exposed.

A few miles above Shell Creek, the lower part of the banks are to a great extent composed of a bed highly charged with ironstone nodules, which have very irregular shapes, unlike the nodules in the other parts of the strata. The profusion of these strewn on the slopes of the valley reminded me of the heaps of roasted ironstone scattered in the neighbourhood of iron furnaces. A little way further on, where a creek joins the valley, thick beds of lignite appear at the base of the section, as in section No. 10. The lowest bed is four to five feet thick, and very compact and pure. It is included in the same gritty sandy clay that everywhere forms the matrix of the lignite.

The iron shales immediately overlie these beds, and these are again overlaid by the "banded clays," that form the base of the section lower down. By following up Coal Creek for a few hundred yards, to where the banks attained a height of 250 feet above the burnt lignite seam, I found in a hard, sandy limestone bed the following fossils:—

Ostrea anomiceformis.
Mytilus (2 sp.)
Cardium multistriatum, Schun.
Crassitella.
Venus.
Natica.
Rostellaria.

No break was observed in the beds, and the succession of the strata from the lignite upwards was such as might be expected in a gradual passage from freshwater to marine beds. I did not, however, remark the layer of silicified wood or brown coal that I expected to occur above the banded clays that overlie the lignite.

On Battle River similar beds were observed in latitude 52° 28′ N.; longitude, 111° 29′ W., having the same order. The high part of the banks was composed of the banded clays along with concretionary masses of sandy limestone, containing *Ostrea*, *Avicula*, and other shells, some of the specimens of which were unfortunately lost.* 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.

For 60 miles above the Hand Hills I had no opportunity of examining the banks of Red Deer River, but at the mouth of Bull Creek the strata were found to present much the same appearance as at that place, the higher banks consisting of the "banded clays," which along the river are exposed, the beds of lignite overlaid by the silicified wood. Beneath the lignite, and what must be the lowest beds of the section at this place, occurs a hard grey sandstone, with large concretions that contain a slight admixture of lime, and in these I obtained several leaves of deciduous dicotyledonous trees. The exact spot where these were obtained is just below the mouth of Deadman's Creek. A little above this place the lignite forms beds of great thickness, one group of seams measuring 20 feet in thickness, of which 12 feet consists of pure compact lignite, and the remainer of carbonaceous clays. At one point the seam was on fire, the bed exposed in a cliff of about 300 yards in length being at many places in a dull glow, the constant sliding of the bank continuing to supply a fresh surface to the atmosphere. For miles around the air is loaded by a heavy sulphureous and limey smell, and the Indians say that for as long as they can remember the fire at this place has never been extinguished summer or winter. For 10 miles above this place the lignite beds were traced in ascending Red Deer River, when they were succeeded by cliffs of sandstone apparently formed by beds overlying the lignite group, but the dip is very slight. The Nick Hills is where this sandstone forms a high ridge running to the N.W., and above which point the banks of the river are composed of finely laminated marly clays, often containing concretionary masses of limestone filled with what I thought at the time were freshwater shells, but they are also among the missing specimens.

These marly clays overlie the sandstone of the Nick Hills, and seem to occupy a great basin through which the river flows from above the forks of Mechimi River. Above that point there appear chocolate-coloured shales, with beds of sandstone, and in little Red Deer River section No. 21 was about, in which the sandstone beds become disturbed and harder, presenting beautiful flexures, and exposing at the base the same shales.

Relations of the Cretaceous Series on the West.

On Waipairous Creek, a tributary to Deadman's River, and within 15 miles of the old Bow Fort, thin disturbed beds are very distinctly exposed, as in section No. 22, and must include an enormous thickness of strata. Although in the absence of fossils I cannot speak positively, yet I believe that these sections include carboniferous strata, which are represented by the lower grits and shales, which contain coal in their streaks, with plant-impressions. This was also observed on the North Saskatchewan, but there, over the grits and clays of probably carboniferous age, there came clear beds of pink quartzose grit, with dark shales, on which rested a great thickness of black aluminous shale, containing a small oyster in great abundance. Also, on the west shore of *Lac à Brulé*, where the Athabasca River leaves the mountains, section No. 31 shows this same resting high upon the flanks of a mountain of carboniferous limestone.

At many other points in the mountains throughout the eastern ranges, patches of shales occur, which are highly ferruginous, and along with grits and heavy-bedded sandstones of various tints, and having apparently a superior position to the rocks of carboniferous age, of which the greater mass of that portion of the mountains is composed. In the sections of the various mountain ranges, the beds I consider to belong to the group I have named (3), and, as they are of great thickness, it is probable that they represent some of the strata that are found undisturbed in the prairies. At the extreme range of mountains on the North Saskatchewan masses of thick-bedded encrinite limestone rise 1,500 feet, with a heavy dip to the west, while the pink grits and aluminous shales dip away from them in every direction, just as if they had been masses of intrusive rock thrust up from below; thus showing the want of conformity between these limestones and the strata that I consider to intervene between them and the cretaceous strata of Vancouver Island and the Gulf of Georgia.

The map is a tracing from the Admiralty chart of the straits between the south end of Vancouver Island and the mainland, but extended northwards so as to include the position of the coal mines. On it I have sketched in the probable range of the different formations, but in a very imperfect manner, as my own observations were only the result of a trip made in a canoe with four Indians, for 70 miles up the coast to Nanaimo. At this place coal has been worked by the Hudson's Bay Company since 1854, and the total outport up to January 1860 has been about 12,000 tons. Through the kindness of Mr. Nichol, the gentleman in charge of the works, and of Mr. Pearce of the Land Office, I am able to show a plan of the workings, and also a map of the neighbourhood, in which I have inserted my own observations of the geology. At the time of my visit there were three pits in operation, giving employment to 30 miners and a number of labourers. The former are principally Scotch and Staffordshire men that have been brought out to the country at the Hudson's Bay Company's expense; but the greater number of the latter are Indians, small tribes of whom come and settle at the mines, and work for a short time, till they tire of the uncongenial life, when they leave to make room for another band. The irregular supply of labour from this cause adds greatly to the uncertainty and expense of the workings. When working in the best seams at Nanaimo, a miner can put out two and a half tons per day. The shipment from Nanaimo in the month of January 1860 was 2,000 tons, the trade having at that time

* The list of those examined by Mr. Etheridge, is as follows :—

Avicula Hebrascensis?	*Tellina.*	*Cardium.*	*Venus (Cytheria?)*	*Nucula.*
Nucula (Leola?)	*Ostrea Cortex.*	*Ostrea.*	*Baculites.*	*Wood.*

In one fragment occur *Cardium*, *Avicula*, *Nucula*, and *Baculites*. The *Ostrea Cortex* formed a bed by itself, along with another smaller species.

been suddenly extended by the demand consequent upon the establishment of gasworks at Portland, Oregon, and several other places. This extension of the market was supplied from a large stock that was lying on hand at the time, but from having been exposed to the action of the weather for many years was of very inferior quality. In spite of this, however, I understand that the demand has continued steady throughout last year, and that the coal has been much used in California for making gas, instead of that brought from the eastern states, as heretofore.

Coal from the same description of strata has been also worked to some extent on the opposite side of the Gulf of Georgia, at Billingham Bay, and also at Cooze Bay, in Washington territory. Although it has been found in many other localities along the coast, as I shall mention, after describing the formation, these are the only places where it has been worked to any extent. The whole formation associated with the lignite or coal beds is very extensively developed along the Pacific coast, and has generally been considered as of tertiary age, excepting from the first accounts sent home, which, as there were no fossils, induced geologists to consider them as carboniferous. Some fossils transmitted to the Jermyn Street Museum many years ago, were first rightly recognized by the late Professor E. Forbes as being cretaceous; but the localities were undescribed, and, in the absence of sections, it was impossible to deduce anything from them regarding the age of the coal beds.

The observations I have now to offer respecting these strata will, I believe, put their age beyond doubt as cretaceous: but rightly to understand the value to be attached to them requires me to give first a sketch of the physical features of the district.

The southern part of Vancouver Island, where the town of Victoria is built, is composed of metamorphic rocks, with occasional beds of crystalline limestone. This district, and also the central portion of the island, is, as may be expected from the formation, everywhere hilly, and even mountainous, with only limited patches of fertile soil in the valleys. However, the scanty soil on the rocky hills supports a fine growth of timber, so that they are almost invariably wooded to their summits. In the immediate neighbourhood of Victoria there is, nevertheless, a good deal of fine open land, dotted with small oak trees. On passing to the north, through the Canal de Nuro, the islands of the archipelago between Vancouver Island and the mainland are composed of strata of sandstone and conglomerate, which form lofty cliffs, overhanging intricate but beautiful inlets. The junction between these two formations was not observed, but I think it is south of St. Juan Island, and from thence crosses to Vancouver Island by Sandwich Point, and thence northwards a little way back from the coast, leaving a narrow slip of fine land.

These sandstone and conglomerate strata have a uniform strike of from N.N.W. and S.S.E., and in passing along the shore of Saluma Island they were observed to form several well-marked synclinal troughs, till on passing through the Plumper Pass they dip gently to the N.E. under the waters of the Gulf of Georgia. Section No. 1 (on the map) merely shows the plications of the strata as observed in passing along the shore once in a canoe, and again in a steamer; the nature of the beds not being ascertained beyond the general fact that they are thick-bedded sandstone and conglomerates, with sometimes strata of clay shale. The sandstones are much acted on by the weather, and at the water-line the sea has generally worn in them caves and hollows. The conglomerates form the highest beds of the series, and are of immense thickness.

After passing the Plumper Pass, in proceeding north through Trincomaler Channel, Galiano Island to the west presents cliffs about 800 feet high of the sandstone and conglomerate strata, with a gentle dip to the east: sometimes spits or low promontories of the strata run parallel with the coast, enclosing narrow bays. The west side of the channel, on Salt Spring Island, is a low shelving coast heavily timbered to the water's edge, and exposing outcrops of grey and blue clay shales, which dip to the east. The portion of this island which is occupied by these shales is the finest land for settlement I have seen on the coast; but the southern part is mountainous, rising to the height of 2,300 feet. It is on the north part of Salt Spring Island that the saline springs are situated from which it gets its name. They seem to escape from the shales, and occur in spots clear from timber, and covered with green moist vegetation abounding in saliferous plants. Round the orifices from which the brine escapes there have formed conical mounds of granular calcareous scinter stained with iron, but in summer there is said to be an abundant deposit of pure white salt.

North of Salt Spring Island the strata preserve the same strike and general appearance all the way to Nanaimo, the island forming long spits of sandstone and conglomerate, with precipitous shores to the west. Just below the "Rapids" the shales were again noticed resting on the sandstone, and both dipping to the west. At very low tide a thick seam of lignite is exposed at this point and on the island opposite, and to the east I found a thin seam in the sandstones. At Nanaimo the sandstone country occupies a broader belt along the shore of Vancouver Island than further to the south; but immediately to the north the strike changes to nearly east and west on Newcastle island, and on Fossil Point the lowest beds were seen to rest on igneous rocks, which continued to occupy the coast for the few miles I went further to the north. At the head of the Gulf of Georgia the sandstones are again said to form the islands that crowd the narrow channel that separates Vancouver Island from the main land, and also a great extent of both shores. From Comux and Valdez Inlet, which is situated in this locality, some of the fossils I have were procured by Mr. McKay of the Hudson's Bay Company. Also at the extreme north end of the island, at Fort Rupert, Mr. Lord, of the Boundary Commission, observed the sandstones and thick beds of lignite dipping out to sea.

At many points along the eastern shore of the Gulf of Georgia these strata have been detected with the associated lignite beds. North of Howse Sound the mountains closely hug the sea coast, but south of that they retire along the north shore of Burrard's Inlet to the S.E., so as to be 60 miles inland at where the boundary meets them, thus leaving a very heavily timbered tract, which forms the only level country in British Columbia east of the Cascade range. Most of this district is covered by shingle terraces and other superficial deposits, which obscure the underlying strata, but at Burrard's Inlet, eight miles north of the entrance to Fraser River, lignite and sandstones containing fossil leaves have been sent home by H.M. Ship "Plumper." Also on Fraser River, near Fort Langley, and on its tributary, Pitt River, the lignite has been observed; and again at Billingham Bay, south of the boundary line, so that it is probable that they underlie the greater part of this region.

Details of the Strata at Nanaimo.

In the section in the large map, I have represented the whole beds observed at Nanaimo in their probable order, but I did not see any one section giving the complete sequence expressed in it. In Section 1 (detached Sheet), starting from Fossil Point, north of Departure Bay, we have the high promontory formed of trap, resting on which are beds of greenstone conglomerate, consisting of spherical masses of greenstone cemented by a felspathic matrix. Over this is a tuffaceous bed with imperfectly formed crystals, five to six feet in thickness, partly fused and often buried by the trap from below. Then follows a very tough green sandstone quite filled with shells, for many of the specimens of which I have shown I am indebted to Mr. McKay. The following is the list as determined by Mr. Etheridge:—

Trigonia Emori.
Trigonia (sp.?).
Cytheria leonensis.
This is the most common shell.
Arca (3 species).
Psamslia sp. (?)
Exogyra (2 species).
Ostrea (2 species), one of which is of great size.
Rostellaria.
Pictea.

In speaking of the beds on Red Deer River, I referred to the fossils found at this place as showing the existence of forms which are in Mexico associated with those of the Saskatchewan, and in every case found in the proximity of the lignite beds. Thus, in particular, we have *Cytheria Texana*, common to the Saskatchewan and Mexico, and *Trigonia Emori* common to Mexico and the Pacific coast. This, in the very imperfect state of our knowledge and the limited collections, is probably a mere indication of the agreement that may yet be established.

The green sandstone beds, at the base of the series which contain the lignite, seem to have been deposited originally on the surface of the igneous rock, which was probably submarine, so that its chilled surface easily broke up into the masses that the conglomerate-like breccia, the cement of which has been from the tuffas that were deposited on its surface. On the shoal thus formed, the greensand beds had been found inclosing the molluscous remains. The whole has since been repeatedly disturbed, and some of the lower beds undergone partial fusion by more recent outbursts.

The sandstone is sometimes quite horizontal, but at others quite vertical for a little way, and is only found as patches all round the promontory and north side of Departure Bay. (See Sketch Map.)

Three hundred yards from the shore, in the channel that passes between Newcastle Island and the Fossil Point, is a row of islands composed of very fine conglomerate that might be termed "gravel stone," in beds that dip to the S.S.E. at 15°, these beds contain small fragments of carbonized wood.

A quarter of a mile further on in the direction of the dip, on the north end of Newcastle Island, there are high cliffs of sandstone which preserve the same direction. They seem to be rather more disturbed than the strata that form the islands in the channel, but this appearance is exaggerated by the great amount of false bedding. The strata of sandstone continue to preserve the same direction of dip all along the coast of Newcastle Island, but gradually becoming more horizontal towards the southern extremity. At "Exit Channel" occur the seams of coal, the lowest of which has been worked to a considerable extent, while the existence of the other has only been found by boring. The outcrop of these two seams has been ascertained on the east shore of the island, where they have the same characters and relative position, thus showing that they are continuous to that extent. The lowest bed of lignite is called the Newcastle seam, and is worked by levels driven into the outcrop as it rises with the high bank from the shore. The coal or lignite is six feet thick, with a floor of sandstone, and the roof of a very tough conglomerate of very small pebbles. The strata have a dip of 20 degrees, so that the method employed succeeds well for taking out small quantities.

This mine was not being worked when I visited it, but there were large heaps of the coal waiting for a market, that had been lying there for some years, so that I could judge the effect of the weather on it with great facility. The surface was turned to a rusty brown, and the masses showed a tendency to break up with a slaty fracture, otherwise the exposure had worked but little change.

Along the shore of the island to the south the strata of argillaceous sandstone are seen to dip steadily in the same direction, but with less and less inclination, till at the southern extremity they are almost horizontal. On Douglas Island there is said to be another seam of coal from the shale along with which the fossil leaves are generally procured. I had not an opportunity of visiting it, however, myself. On the coast of Nanaimo Harbour the strike of the strata is quite different, but yet they preserve the same character and sequence, "Exit Channel" seeming to mark a great fault. The little peninsula on which the Hudson's Bay Company's establishment stands, and where the coal was first discovered, is also another dislocated portion of the strata, as may be seen by reference to the map.

At Nanaimo, as on Newcastle Island, there are two seams, the "Newcastle" and the "Douglas," the first of which is everywhere about six feet in thickness, with sometimes a floor of fire-clay, but more generally of sandstone, and the roof consisting of the fine conglomerate bed, about 60 feet thick, on which rests the Douglas seam, with an average thickness of from three and a half to four feet. The roof of this seam is sometimes of iron clay shale, but more often of the same tough conglomerate that it rests upon. On Chase River, one and a quarter miles to the south, the outcrop of a seam has been discovered and worked to a small extent, which they consider to be the Newcastle seam, and as it occurs right in the line of strike, and they have ascertained the outcrop at several points, it is probable that the beds of coal are continuous thus far at least.

In the mines they have met several "stone faults," where the floor rises up and throws the coal seam out for several fathoms. It is generally represented, however, by a carbonaceous parting. These faults are a source of great expense in the working, as the conglomerate to be pierced is exceedingly tough and compact, so that the blast only brings it away in small pieces. The extent or character of the workings can be ascertained better from an inspection of map, however, than by any description.

It is probably from this place that the fossils were procured that Meek and Hayden refer to in a notice of the coal of the Pacific coast, contained in the Pacific Rail. Rep., where they say that, among the fossils from Vancouver Island, a number occur in a green sandstone matrix, which have a strong Jurassic aspect.

In proceeding along the coast towards the mouth of Nanaimo River, the strata consist of argillaceous sandstones, with a similar character to those of the southern part of Newcastle Island, and preserving a steady though gentle dip to the E. by S. A short way above the entrance to the river, in the sandstones there is a thin seam of coal, the position of which was pointed out to me by Mr. Nichol, as the river was too high to allow us to see it. Continuing to ascend the river, which is of small size, we found low exposures of the sandstone, still with the dip to the E., and at Fossil Bank, three or four miles from the mouth, they are overlaid conformably by dark purple clays, filled with septaria, which yield cretaceous fossils. The dip of the beds is 10° to the E. by N., and the clay strata were clearly seen to rest on the hard-bedded sandstones. I found *Inoceramus*, *Baculites*, and some other fragments of fossils, of which other specimens are also among those obtained by Mr. Bauerman at this place. I was told at Nanaimo that Ammonites have frequently been found there of large size, and from Mr. McKay I obtained a number of fossils, some of which he obtained at this locality, but others having the same appearance, and also contained in septaria, he procured from Comux and Valdez Inlet, at the head of the Gulf of Georgia; but these two sets of specimens had been unfortunately mixed together. For a couple of miles the Nanaimo River flows through these clay strata, and then turns again from the S.W., and in ascending the sandstone strata were again found to recur, as in the lower part of the river, but with a more rapid dip. At the "Cañon" these sandstones form precipices about 100 feet in height, forming a narrow gorge 600 yards long, through which the river flows. The beds dip at 15° to the E.N.E., and are very like those of Newcastle Island.

From under these sandstones, in ascending the river, hard beds of the gravel conglomerate cropped out with great regularity, separated by soft beds of red and greenish clay. These probably correspond to the group with the lignite at Nanaimo, but I failed in finding any trace of it beyond fragments of carbonized wood. The strata from the fossil bank up to the river, as far as I went, are shown in Section 3.

The total thickness of the beds from the lignite to the clays at Fossil Bank I estimated at 600 to 700 feet, but I had no opportunity of making any exact measurement. Between Nanaimo River on the coast there is a tract of very fine country, and it is probably occupied by the septaria clays, which, as I mentioned before, were seen a little south of the rapid.

The following is the list of fossils from the septaria clays, which includes those specimens obtained by Mr. McKay from Valdez Inlet:—*Inoceramus* (?), (this is the *I. Crepsii* of Conrad and Roemer), *I. Texanus*, *I. Nebracensis*, *I. undulato-plicatus*, *J. confertimannulatus*, *I. mytiloides*, *Baculites compressus* (and two other species), *Ammonites geniculatus* (and three other species).

It is thus evident that the group of strata, with the lignite seams towards their base, must be of cretaceous age, but as yet it would be premature to infer the exact position they hold with reference to the rest of that system. The great beds of conglomerate which form the long narrow islands along the west of the Gulf of Georgia must, I think, overlie all these strata.

From the sandy shales along with the lignite I forward fragments of the yew-like frond, just the same as those I got in the shales.

At the Rocky Mountain House and in the collection sent home by H.M.S. Plumper, all the specimens from Nanaimo are of this plant. Those from Burrard's Inlet are in a different sort of stone, and are reticulate leaves, and were found along with beds of lignite; but there seem to be no specimens of the yew frond from that locality.*

From Nanaimo Mr. Bauerman has also sent home a plant that looks much like a portion of a monocotyledonous leaf (*Musca?*)

At Billingham Bay the sections given on map were taken by Mr. Pemberton, and show that the lignite occurs in large quantity at that place. Lieut. Trowbridge, in describing the strata there, says they are 2,000 feet thick, and including in all 110 feet of the lignite coal. His sections are probably, however, all of the same group of strata, being at different points in the strike, which gives rise to this apparently enormous thickness.

The analysis of the coal from Billingham Bay, which is generally considered inferior to that of Nanaimo, is given in the Pac. Rail. Rep., as follows:—

Carbon - -	47·63
Bitumen† - -	50·22
Ash - - -	2·15

This coal has been sold in San Francisco market at $18 to $22 per ton (75*s.* to 91*s.* 6*d.* sterling.)

Lignite coal has also been worked for the same market from Coon Bay, which has the following composition:—

Carbon - - -	46·54
Gaseous matter - -	50·27
Ash - - -	3·19

Conrad states that shells from this locality are of Miocene age.

At Binicia, above San Francisco, coal also occurs, and was wrought for some time, but the dip was too steep.

In Newbury's report on the geology of this part of California I have not seen any notice of where this Binicia lignite occurs in his sections; but between Binicia and the sea he describes 3,000 feet of strata, the lowest beds being of sandstone and shales, resting on and penetrated by serpentine and trap (the same which are so highly charged with ores of copper and mercury further to the south). These are followed by green and brown shales, coarse soft sandstone, fine sandstone and shales, with *Pecten*, *Natica*, *Mactra*, and *Filaria*, and these conglomerates and tuffas, the whole lying at an angle of 30°. Towards Binicia are thin-bedded clays, with sharks' teeth. Up Feather River, a tributary of

* Dr. Hooker has specimens from Disco Island in the Arctic Regions, where the yew frond and reticulate leaves are associated in the same specimen.

† Also includes the water most probably.

the Sacramento River at Chico Creek, a calciferous sandstone is described containing *Nucula*, *Mactra*, and other tertiary forms, but from the same place are *Baculites*, *Inoceramus*, and *Ammonites*, which Meek considers as proving the existence of upper cretaceous strata at that place; so that it is probable that there are strata of both ages, but included in the same disturbances, and it is not unlikely that the section from Binicia to the sea may also include cretaceous strata.*

The existence of coal or lignite on the Pacific coast, of quality fit for the purposes of raising steam, is of great commercial importance, and that obtained from Nanaimo is as yet admitted to be the best in the market. If these beds are, therefore, discovered to be persistent, so that they can be worked to advantage on a large scale, there is little doubt that this coal, even though it be an imperfect substitute for the finer coal we are accustomed to in this country, will form a valuable source of wealth to the new British Colony. Already it is extensively used by the British Navy on that station, and it was found to require only a slight modification in the method of feeding the fires to make it highly effective as a steam generator.

As beds of coal of similar quality exist in the Islands of Japan and Formosa, we would thus have the supply of fuel at the extremity of the line of the great sea voyage, if the route from England by the Canadas, Saskatchewan, and British Columbia, to China and the east, were adopted, a natural fitness not to be overlooked in considering such a scheme.

Palæozoic Rocks of the Eastern Axis.

The general structural features of the country travelled over on the canoe route, so far as they can be learned from a single line of traverse, have already been well described by Mr. Keating, Sir John Richardson, Dr. Bigsby, and others; but from the complicated relations of the rocks of which it is composed, no detailed observation can be of any value until they are extended in every direction by means of a combined topographical and geological survey. 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.

From observations made in the course of our journey, it appears that there are two distinct directions of strata in the rocks which compose this axis, marking it into two districts, one from Lake Superior to Rainy Lake; the other from Lake of the Woods to Lake Winipeg. Not only the general strike of the altered and upheaved rocks in these two districts, but also the direction in which the watercourses affect the principal descents, and the manner in which the lakes in each of them are arranged, all indicate a different direction of the elevating and disturbing force, in other words, two different axes. These seem to converge towards the south, including an angle of about 25°, the eastern one being directed from the north-east to south-west, while the western one lies much more nearly north and south. In each of these there is a great central district, where nothing but rounded bosses of granite are seen occurring as ridges and islands, which rise little above the level of the flooded country in which they occur. On either side of these two granite districts metamorphic rocks are ranged with great seeming irregularity as regards their order and dip, but still, on the whole, preserving their direction very consistently with the bearing of either of the two axes to which they belong. There are besides many minor outbursts of granite as dykes and intrusions, but they do not seem to interfere with above-mentioned general bearings of the country. From this cause, in crossing the district between Lake Superior and Rainy Lake, the summit level is reached by an abrupt and rapid ascent in a direction at nearly right angles to the main eastern axis. Then follows a long traverse almost along the summit of that axis, and then an abrupt but comparatively short descent to Rainy Lake, again at right angles to the axis.

The first great step in the ascent from the east is made at the Kakabeca Falls, where, from a succession of faults which mark the commencement of the more highly metamorphosed rocks, a sudden elevation is effected, the summit level of which is 179 feet above Lake Superior at Fort William.

About one mile below the fall, a fine section is exposed in the form of a cliff 130 feet high, crossing the country from north-east to south-west, consisting of a dark argillaceous schist in thin fissile beds, from one to two inches in thickness, very much jointed, and having many small veins of quartz, and sometimes calc-spar, included both in the lines of bedding and in the joints. These beds are quite horizontal, and through their whole thickness the river has cut its way back to the present position of the fall, in a manner similar to that in which the river-bed below the Niagara Falls has been formed. They are supposed to belong to the Naronian series, a system which is largely developed on the shores of Lake Superior and Naron, resting unconformably upon the Laurentian series, and having, according to Logan, a thickness of 12,000 feet. This large system, which has not as yet yielded any fossils, and always underlies the Silurian, has been considered as representing Cambrian.

On the River Kaministoquoiah, 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 reappear 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. At the Dog Portage, another sudden rise takes place in the water level; for the rocky high grounds, which, for a long way below have been skirting the river at some distance, forming as it were the limits of a wide valley, here converge, and form a granite barrier across the river, the summit of which is about 719 feet

* On the "Colorado River," in Texas, lignite coal, in beds four feet thick, has been observed in strata beneath those with Eocene fossils, and on a tributary of the "Del Norte" beds 3 to 4 feet thick occur, of good working quality, in true cretaceous strata.—Pa. Rail. Rep.

above Lake Superior, and 440 feet above the river at the lower end of the portage, but only 140 feet above the lake level at the upper end; thus making a rise in the water level of 297 feet in the short distance, two and a half miles. As the portage road passes right over the top of this hill, and leads to a point in the lake far from the exit of the river, the nature of the falls which produce this sudden change in level could not be examined, but the mass of the hills seem to be granite. Although this is not the highest point of land over which we passed during the route, still it is probable that this hill is as high as any portion of the rocky axis of the country, as those along the lake are even inferior to it in elevation, while 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, as will be afterwards described.

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, and the route follows a chain of small lakes, which are in most cases detached from one another, being separated by rocky barriers, over which the canoes and cargoes are carried. 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. This chain of lakes may, in fact, be considered as occupying a line parallel with the summit of the watershed; and the country in which they lie is almost wholly composed of granite, occurring in broad rounded eminences, nowhere rising to 100 feet above the level of this half-drowned country. It is probable that this granitic belt is expanded considerably where the old portage route crosses it, and that the whole chain of lakes between Lake Rasiganagah and Sturgeon Lake lies within it. It is this belt which will form the great obstacle to the formation of any kind of road across this watershed.

From Sturgeon Lake in Bad River, there is a considerable descent to the south, which forms the only exception to the general north-westerly descent of the waters to Rainy Lake. From the Lake of the Cross to Lake Namucan the descent is rapid, and the river-channel crosses the strata of gneiss and bedded greenstones at right angles, following the direction of the dip.

Rainy Lake has its length agreeing with the strike of the strata, which is here more nearly east and west than before. Between Rainy Lake and the 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. The descent from the Lake of the Woods to Lake Winipeg is by successive groups of falls, between which the river forms lake-like expansions, which lie generally at right angles to its main course.

The first part of the River Winipeg flows across vertical strata, and then enters a granitic district, very similar to that passed through between the Lake of the Thousand Isles and Sturgeon Lake. The strike of the rocks in this region is generally a little to the east of north, and the nature of the strata is very similar to that of the country east of Rainy Lake, but less disturbed by dykes.

No trace was observed of the existence of the schistose rocks on the west flank of the axis, the gneissoid rocks continuing for the whole way to Lake Winipeg. The junction of the Silurian limestone, Silurian rocks, Mr. Hind, who had favourable opportunities from having coasted along the Lake Winipeg, and the other lakes that lie in this system, gives an interesting account of its development in his recent work (Hind's Canadian, Assineboine, and Sark, Ch. xxxviii.). His fossils having been submitted to Mr. Billings, of the Canadian , the following groups were identified as occurring in the Winipeg basin, all of which are lower Silurian:—

1. Chazy formation.
2. Bird's-eye.
3. Trenton.
4. Hudson River group.

Of these I only saw the latter at the same place that Dr. Owen examined and recognized the proper age of the beds in 1848, namely, at the Lower Fort Garry on Red River. Here there is a section of magnesian limestone exposed in the bed of the river when the water is low, and which is then quarried for building purposes. As the river was high when I was there, this section was not visible; but from fragments lying on the bank the following fossils were obtained:—

Cyathophyllum.
Columnaria alveolata, Hall.
Favertella (*Favosites basaltica* of Dr. Owen?)
Receptaculites occidentalis, Salter.
Osmoceras Lyonii, Stokes.
Strophomena plano-convexa.
Orthis, var. of Lynse.
Spirifer elegantula.
Machiria.
Rhynchonella incubiscens, Hall.

These fossils have been named for me by Mr. Paller, who has kindly examined the few Palæozoic fossils that have come to hand. The limestone is sub-crystalline, of a light buff colour with purple blotches, very hard, and with an angular fracture. At Stony Hill, about fifteen miles north-west from the upper fort, there is an isolated bluff of limestone, rising from the plain level to the height of 80 feet. The south and western exposures are abrupt and water-worn, it having evidently been at one time an island; and, indeed, during the great floods which have several times inundated the settlement, it has been one of the few spots upon which the inhabitants can take refuge, reaching it by means of boats. The beds of limestone are horizontal, or nearly so, and are slightly different from those at Fort Garry in their mineral aspect, having a more crystalline fracture, and the colour being of a reddish hue. No fossils can be discovered in newly fractured portions; but on the weathered surfaces a few obscure remains of fossils are to be seen, projecting, along with siliceous and gritty particles, from a dull floury surface.

The Silurian rocks have now been traced continuously from near Lake Superior, west of the sources of the Mississippi, and thence into the valley of Lake Winipeg, and on to the Arctic Ocean, skirting the more ancient axis. On the shore of Lake Winipeg, they have been observed much disturbed, and even vertical, by Dr. Owen (Report on Geol. of Minesota); but in general they rest nearly horizontal, or with only a very slight dip.

Resting on the Silurian strata, Mr. Hind has detected limestone with Devonian fossils, in a tract to the west of Lake Winipeg, where there are copious salt-springs, the brine from which is used for the

manufacture of salt. He considers the line marked by the occurrence of these salt-springs to indicate the outcrop of the Devonian strata. The route of the Expedition at once passed from Silurian and cretaceous rocks, without any indications of the intervening strata until reaching the Rocky Mountains.

Structure of the Rocky Mountains.

The plains at the eastern base of the Rocky Mountains are, as I have before stated, elevated above the sea 4,000 feet, and, as the average limit of vigorous vegetation at that latitude is attained at 5,000 to 6,000 feet, the greater mass of the mountains display, in consequence, naked and bald surfaces, which are generally very precipitous. Their structure is thus easily discerned to be of strata, the thickness of which, originally very great, has been much exaggerated by the complex flexures which cause the beds to recur again and again, sometimes even in the same mountain. This apparent confusion strikes the eye at once; and it is not till observations have been made over a considerable extent of the range that the extreme regularity with which the disturbing agencies have been exercised becomes evident. The flexures of the strata on the eastern part of the mountains have been so completely overturned that the prevailing dip is towards the centre of the mountains, that is, to the west and south. The strike of the plications varies, but in a regular manner. From Bow Fort southwards, it is only a few degrees E. of S., but north of that river, to the valley of the North Saskatchewan, its average direction is S.S.E., and between that valley and the Athabasca it is S.E. nearly, while to the north of that it is changed to within two points of east and west. These changes in the direction of the strata take place at the different great valleys by which these rivers leave the mountains, and which probably mark the lines of transverse fracture. The mountains are divided into groups by great longitudinal valleys, which are met with in every part of the chain I examined, running in the length of the range, and forming a part of each of the river systems. The course of these rivers is therefore in every case zigzag, alternately flowing through wide valleys either to the north or south, and then making short breaks to the east or west, through narrow and rugged defiles. Throughout these great valleys it seems to be the arrangement of the detrital deposits that has in many cases determined the direction in which the rivers flow. A curious feature is to be remarked in the position of the watershed between the waters of the Pacific and those of the Atlantic, arising, no doubt, from this cause. It is found gradually to occupy a position further to the west, and through the chain, so to speak, as the rivers rise more to the north. Thus the Missouri can hardly be said to rise within the Rocky Mountains at all; Belly River, on the boundary line, rises from the first ridge before reaching the first longitudinal valley; Kananiskis River rises in that valley, or from the second range; Bow River from the third range; the North Saskatchewan from the fourth range; the Athabasca from the fifth; and, although I have not seen Peace River, the one further to the north, still this feature is so well marked, that it has been spoken of as rising on the west side of the Rocky Mountains, and then cutting through that range to the east. This all tends to show that we must not look on the Rocky Mountains as a continuous range, stretching as a line of fracture through the length of the continent, but rather as a succession of centres of disturbance, a fact which has been amply proved within the American territory. Thus what are known as the Rocky Mountains at the head of the Missouri are rounded off to the north and south, losing their character of a lengthened range in that of a mass of mountain country. In like manner, the Rocky Mountains within the British territory must be looked upon as a mass with its longer axis lying N.N.W. and S.S.E., to which the main strike of the strata conforms.

There are three of these great longitudinal valleys that are more persistent than the others, each of which marks a change in the formations which compose the mountains. As far as the first of these the structure of the mountains may be obtained in sections Nos. 23, 33, 38, 39, and 40, where the strata are of thick-bedded limestones. These limestones are of dark and light blue colour, crystalline, compact or cherty, with fossils that are either of carboniferous or Devonian age, the principal of which are *Spirifer*, *Orthis*, *Chonetis*, *Conularia*, *Lonsdalia*, *Cyathophyllum*, *Lithostrotion*, &c. In the sections these limestones are numbered (1). Along with them are softer beds of gritty, sandy shale, generally of a dull red or purple colour (2), and the irregular disintegration of these two groups of strata produces the rugged appearance of this range, the mountains being in general formed by masses of synclinal folds, while the valleys mark anticlinal fractures. The valley between the first and second range marks a great trough in the strata, in which patches are preserved of chocolate-coloured ferruginous shales, with beds of grit and layers of ironstone, and which we see in section No. 24, resting on the flanks of the limestone mountains belonging to a more recent formation, being those to which I have previously alluded. In the second range we have the same limestones and shales repeated as in the first (see sections Nos. 26, 34, 31, 42), but at the base I observed traces of a magnesian limestone of a buff colour. Towards the west this range everywhere in the mountains presents a sheer wall of vertical limestone, the ragged edge of the beds forming the Sawback range. The change in the look of the mountains that now takes place may be well seen, as on Bow River in section 28, and on the North Saskatchewan in section 35, where the east side of this valley consists of vertical strata; while on the west side the mountains are formed of cubical masses of strata that are almost horizontal. These are of hard quartzite sandstone, passing into conglomerate, and capped by hard limestone, with the ferruginous shales resting obliquely on their sides at the line of fracture. The extraordinary block-like shape which is thus given to the mountains is shown in sections Nos. 29 and 30. Section 31, at the source of the Pipe Stone Creek, shows mountains of the second range, and from the beds marked (2) I procured some fossils that had been formed. They are, according to Mr. Salter, *Orthis*, *Lingula*, *Euomphalus*, and from the limestone (1) *Lithostrotion*. In a black carbonaceous shale, in another part of the second range, I found several calamites, and in the limestones along with them, *Productus*, *Spirifers*, *Encrinites*, and *Corals*, so there is little doubt that the beds are of a carboniferous age. On the Athabasca River gneissoid rocks, traversed with quartz veins, were observed to form the floor of the second longitudinal valley (Sect. 43) (6); and in descending the valley of Vermillion River, and also that of Blaeberry River, talcose shales were met with, also forming the floor of the valley. On Kicking-horse River, in the third range, we have the mountains again formed of blue limestone, along with a compact blue schist with red bands, giving a curious striped aspect to the rock. This schist or slate rock forms the highest points of the mountains in the above district.

The third longitudinal valley is that in which the Columbia and Kootanie Rivers flow in opposite directions, parallel with the range. Along the eastern shore of the Columbia Lakes we find the mountains again composed of the carboniferous limestones which form the eastern ranges, but resting on slates. At the source of the North Saskatchewan the mountains are very massive, and are principally composed of a deep blue compact limestone, that often contains nodules of iron pyrites. A few specimens of *Atrypa* (*reticularis?*), and *Athyris*, lead Mr. Salter to consider these limestones as Devonian. To the west of the great Columbian valley, the strata were only seen in descending the Kootanie River (as shown in Section No. 51). That river breaks through a succession of well-defined ranges, that never rise to any great altitude, and which are composed of dark schists traversed by quartz veins, the whole forming beautifully-developed flexures. Some miles east of Puddlers' Lake, the slates were again seen underlying these schists, and at that place commences a district of granite country, where mountain ridges rise in rounded masses to the height of 800 to 1,000 feet above the general level.*

Towards Fort Colville the Kullerpillem Mountains bound the Columbia to the east, and are formed of quartzite in thin beds, limestone partly altered, and serpentine. At the south end of the Kullerpillem Mountains the great trap flows of the Columbian Plain commence, and are then seen to overlie the granite and other rocks, filling up the hollows in their surface. The horizontal extent of these lava-flows is truly wonderful, as they occupy nearly the whole surface of the Great Columbian Desert, without any chain of mountains or peaks to which their origin can be referred.

This great plain is frequently cut by chasms, 500 to 600 feet deep, the sides of which expose stratum after stratum of thin lavas intercalated with softer tuffaceous beds, the whole being quite horizontal. The lava-flows have often a columnar structure, especially in the neighbourhood of depressions in the plain, such as Sil-katkwa Lake, which probably mark the position of ancient craters. At some points up Snake River, American explorers have procured tertiary fossils from the tuffaceous limestone that underlies these basalts.

The whole way to the Dalles the Columbia flows through an enormous chasm in these stratified lavas or tuffas, giving rise to most wonderful scenery. Often the whole of this mighty river is compressed between perpendicular walls of basalt, but with a channel of such depth that its treacherously swift current preserves a glassy surface. At where the Columbia breaks through the Cascade range, there is a great rapid rather than a fall, from which the mountains have derived their name, and connected with the formation of which there is an old Indian legend. The river from the Dalles to this point, a distance of 40 miles, is almost without current, and bounded by a perpendicular wall of mountains on either hand, and the story is that one time the river had a uniformly swift current the whole way, and, at where the cascades are, at that time passed under a gigantic natural arch that crossed from side to side of the chasm. During a great earthquake this arch fell down, and now remains as the chain of islands across the head of the cascades, while the river has gradually carried down the fragments so as to form the long rapid. The river was thus dammed back all the way to the Dalles, and submerged the forests along its banks, the stumps of which are still to be seen sticking out of the water at the distance of several hundred yards from the shore. The stumps of the submerged trees are of a kind of spruce that never grows near water, and as the other conditions of the story fit in remarkably well, I am inclined to think that there may be some truth in it. It was told me as we were passing the spot by a fellow passenger, who had been a long time among the natives as an American Indian agent, and I have since heard it repeated by gentlemen who have been 25 years in that country in the Hudson's Bay service.

In descending from the Cascades to Vancouver, stratified rocks are seen perched on the flanks of the mountains, among which is a group of strata of a bright vermilion colour. Along the valley of the river there are also strata of tuffaceous sandstone and clay, which are only slightly disturbed. At the Cascades the beds attain a considerable thickness, and contain large fragments of silicified wood. The scenery of the lower Columbia, before reaching the flat district around Vancouver, is exceedingly fine, the river passing successively by bold promontories, more than 1,000 feet in height, and sometimes under lines of cliff over which rivulets pour as cascades from a height of 600 feet. Between the Olympian or Coast range, which stretches to Cape Flattery, and the Cascade range, the great valley of Paget Sound is continued south as far as latitude 44°, first to the Columbia River by the Cowlity, and then by the Valley of the Willamette, thus forming a long stripe of valuable country, which forms the only good part of Oregon and Washington territories. The river Columbia crosses this stripe of country, only conforming to its direction for a short way from Vancouver to the Cowlity.

Of the Olympian range, I believe, nothing is known; but as viewed from Paget Sound the outline of this mountain reminded me in a striking manner of that of the exterior ranges of the Rocky Mountains, where they are composed of plications of stratified rocks. I have previously mentioned the metamorphic rocks, with beds of crystalline limestone, that form the base of Vancouver Island.

List of Fossil and Rock Specimens transmitted to England by Dr. Hector.

Fossils from lower Silurian magnesian limestone, from the bed of Red River, opposite to Lower Fort Garry. Col. 12th to 20th July 1857. (24 specimens.)

Fossils from upper cretaceous shales, exposed in the banks of *Long River*, and also at the *Forked Creeks*, in lat. 50° 2′ N., long. 101° 18′ W. Col. Aug. 1st to 14th, 1857. (15 specimens.)

Limestone from a bed at La Roche Percée, on the River Souri, in lat. 49° 7′ N., long. 104° W. The bed is two feet thick, and lies over the shale that includes the coal. On being exposed to the air it breaks into splintery fragments, and its blue colour changes to a light red.

Also specimens of the *coal*, *sandstone*, gypsum, and other beds, of upper cretaceous or tertiary age, from the same locality.

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* In the absence of data respecting their age, it is not advisable for me to dwell any longer on the strata which compose the Rocky Mountains, than I have in this my general sketch, or to give details that will be found in my journals elsewhere published.

Portions of ironstone septaria, from the clays of *upper cretaceous* age, which are exposed above the "Elbow" of the South Saskatchewan, Nos. 18 to 45. Col. Sept. 20th to 30th, 1857. Lat. 50° 48′ N., long. 108° W. These septaria are nodules of clay-ironstone, with a large proportion of lime, and generally traversed by cracks and veins filled with calc-spar. They also often contain fossil remains of Baculites, Ammonites, &c.

Similar specimens of septaria, with fossils, from the cretaceous clays at Fort Pitt, on the North Saskatchewan. Col. May 1858. Lat. 53° 35′ N.; long. 110° W. (25 specimens.)

Fossils from large boulders of magnesian limestone, found scattered over the plains near Fort Carlton. This is the same limestone as that at Fort Garry, and at the Grand Rapid on the Saskatchewan, above where it enters Lake Winipeg.

Specimen of coal from the lowest bed, exposed in the bank of the North Saskatchewan at Rocky Mountain Fort; lat. 52° 10′ N.; long. 115° 10′ W. This bed is about two feet thick, and is generally as pure as this specimen throughout. It can be traced for two miles along the river, close to the water's edge, and is easily worked for supplying the forge at the fort. No. 48.

Calcareous shale, with obscure plant-impressions, from below the thin coal seam in Sect. 14 at the mouth of Clear-water River. The impressions are like those of sedges or fibrous stems, along with *Taxites*, or a yew-like frond, but which is rare. No. 50.

Carbonaceous shale, into which the coal passes in the same section.

Ironstone nodule from the same shale. The ironstone is not very abundant in the deposits at the Rocky Mountain Fort. No. 53.

Calcareous shale, from above the coal in Sect. No. 14. No. 54.

Jet-like coal, from the two-foot seam at the Mountain Fort. No. 52.

Coal from the upper seam in Section 1. No. 61.

Calcareous shales and slates from same section. Nos. 56 to 60.

Coal from lowest bed in Sect. 13. No. 62. This bed abounds with iron pyrites. In this specimen the pyrites occurs in flat circular scales, very thin, and about one line in diameter. All the coal at the Rocky Mountain House is lustrous, with a sharp cubical fracture, and shows no tendency to crumble.

Specimens of the different sandstones associated with the coal and shales at the Rocky Mountain House. Nos. 63 to 70. There are two varieties among them. A, composed of large grains of pink or white quartz, cemented by a little calcareous matter, and containing a little green colouring matter disseminated in small specks. This stone is soft and friable, and often forms cliffs along the river, 100 to 200 feet in height. B, soft argillaceous sandstone, of a pale green colour. The clay varies in its proportion to the siliceous particles, so that the strata weather very irregularly, giving rise to ledges and concretionary masses, which protrude from sloping banks.

Portion of a silicified tree, ploughed up in a field at Fort Edmonton. The whole fragment was eight feet long, and one foot in diameter. Dark steel-grey colour. *Coniferous*. No. 71.

Specimens of the ash and slag from the forge at Edmonton, where the coal is used. Nos. 72 to 74.

Specimens of the shales, ironstone nodules, and limestone shales, that occur at Edmonton, along with the coal. They contain plant-impressions, of which only *Taxites* has a distinct form. Nos. 75 to 85.

Soap clay from the seam, six inches in thickness, that occurs in the middle of the six-foot coal seam at Edmonton in Section No. 12. This clay is of light green colour, very compact and unctuous, with a slightly harsh taste. It is used by the women at the fort for washing, and it works up into a lather like soap. Specimen No. 86.

Specimens of the coal from the seams at Edmonton; lat. 53° 32′ N.; long. 113° 20′ W. See Sects. Nos. 11 and 12. There are five or six beds, of good quality, but the coal varies much in character. The thickest seam is six feet in thickness. From this a block, one foot cube, was procured, which was compact and lustrous at first, but has since broken into large cubical fragments, the surfaces of which are dull and dusty. None of the coal has a proper wood-structure, like lignite, although portions of carbonized wood are not uncommon. Many of the seams abound in "*Mother of Coal*," or fibrous carbon, which fills small cavities in the coal, and might be mistaken for true charcoal.

Specimens of calcareous scinter and white pipe-clay from the superficial gravel, sand, and clay deposits in the neighbourhood of Edmonton.

Portions of the beds where the coal has been destroyed by spontaneous combustion, baking the adjoining clays into red brick-like material, and being itself represented by a stratum of ash.

Parcel of specimens collected on the route from York Factory to Lake Winipeg, by Lieutenant Blackiston, consisting of fragments of *Gneiss, Mica-schist*, quartz, slate, &c. No. 94.

Fragment of red sandstone picked up on the bank of the Saskatchewan, at Carlton, in which is a *fish vertebra*. No. 95.

Specimens of travertine, with dicotyledonous leaves, from the Saskatchewan valley at Birch Gully. In Section No. 3.

Fossils from the marl and sand beds of mixed tertiary and cretaceous age. Collected at Battle River; lat. 52° 17′ N.; long. 111° W. (18 specimens). These consist of shells, such as Cardium, Avicula, Ostrea, Baculites, &c., along with silicified wood, all overlying the coal beds. These strata were observed for 30 miles along Battle River above the point known as its elbow. They consist of sandstones, marlites with ironstone seams, gypsum, and compact clays. Col. July 1858.

Specimens of coal and associated strata from Red Deer River, in lat. 52° 5′ N.; long. 115° 30′ W. The coal seam exposed here reaches the thickness of 20 feet, of which 12 is pure carbonaceous matter. A little below the above point the coal is on fire, and has been burning slowly for ages. It is of good quality, but contains more iron pyrites than that obtained at Edmonton.

Dicotyledonous leaves, from nodules of grey sandstone that underlie the coal strata at the above locality. These leaves are of two kinds of trees, but the genera cannot be determined with certainty. Nos. 534, 535.

Fossil shells from masses of limestone in the marlites and freshwater strata at the crossing-place of Red Deer River; lat. 52° 5′ N.; long. 114° 30′ W. They consist of Paludina and some other forms, cemented into a hard concrete. The strata may be tertiary or of lower cretaceous age, like the coal strata. Nos. 531 to 533.

Specimens of a similar limestone which occurs on Windy Mount in the Rocky Mountains, also composed of an aggregation of freshwater shells. Collected by M. Bourgeau, at an altitude of 6,000 feet. Nos. 527 to 530.

Specimens of sandstones and shales, in the vicinity of the Rocky Mountains, at the Old Bow Fort, with obscure casts of Cardium, Ostrea, and plant stems. These strata are much disturbed and altered, and are probably of cretaceous age. Nos. 123 to 140.

Fossils from the blue crystalline limestone of the first range of the Rocky Mountains. Collected at Grotto Mountain, August 1858. Consist of *Spirifers, Strophomena, Cyathophyllum, Atrypa,* &c. Either Devonian or carboniferous in age. 19 *specimens.*

Fossils from the second range, which consist of limestones, with much the same character as the last mentioned. At their base limestone with *Atrypa reticularis*, which is Devonian. 10 *specimens.*

White chalky deposit composing the terraces in the mountain valleys, from the valley of Vermillion River. No. 192.

Recent conglomerate, with calcareous matrix, from the terraces along the North Saskatchewan, base of Rocky Mountains. No. 595. Overlying grits and shales with coal. *See* Section No. 1.

Fossils from micaceous shales of Big-horn Creek, south from where the North Saskatchewan leaves the Rocky Mountains. They consist almost entirely of a small *Ostrea*, imbedded in dark fissile beds of arenaceous shale. Cretaceous? 12 *specimens.*

Nodules of ironstone from septaria clays, occurring on Bow River, 10 miles below the Old Fort. They contain obscure cretaceous fossils.

Fossils of Devonian age, from the limestones at the great glacier which gives rise to the North Saskatchewan. These limestones are of a deep blue colour, with a compact or crystalline fracture, and contain large nodules of iron pyrites, feebly crystallized. 6 *specimens.* Also four of the same, from the Mountains at Jasper House.

Slate from the valley of Kicking-horse River.

Striped schist, from the top of Mount Hunter. This is a compact blue slate rock, with bands of red, which give it a striped look. This rock forms a great part of the mountains of the central range.

Earthy greenstone from a dyke in Beaverfoot valley, west side of Rocky Mountains. Nos. 182–3.

Various rocky specimens from the valley of Vermillion River.

Obsidian, found by the Indians on Red Deer River.

Tooth (reptilian?) found in the drift at Edmonton.

Corals from the limestone of 2nd range, height of land, Pipestone Pass. August 1859. 3 *specimens.*

Fossil shells from same locality. Consist of Lingula, Euomphalus, &c. 10 *specimens.* (B 17 to 27).

Devonian fossils from blue limestone in Glacier Valley, source of North Saskatchewan. 5 *specimens.*

Slate from the mouth of Blaeberry River. No. B. 5.

Coal, very impure, being a rolled fragment found on Kootanie River.

Tertiary shells *Ostrea, Unio,* &c., collected by Mr. Sullivan on a tributary to Belly River. Also, *Inoceramus* (cretaceous). Nos. 7 to 16.

From sections of cretaceous strata along Red Deer River, near the Hand Hills, in lat. 51°; long. 111°. These consist of freshwater shells, overlying the coal, with silicified wood, thin *Ostrea* and *Cytherea, Baculites* and *Inoceramus. Specimens,* Nos. B. 29 to 59.

Fossils from the coal-bearing strata of Vancouver Island, of cretaceous age. Partly obtained from the collection of Mr. McKay. 73 specimens. From under the coal, *Cytherea leonensis, Trigonia Emori, Exogyra, Ostrea,* and *Pecten,* &c.; with the coal, *Taxites* and other plants; over the coal, *Inoceramus, Baculites, Ammonites, Nautilus,* &c. Some of the specimens were from Valdez Inlet.

Specimens of plumbago, copper, and other ores said to be found by the Indians on Vancouver Island.

SECONDARY AND TERTIARY FOSSILS.—SASKATCHEWAN PLAINS AND VANCOUVER'S ISLAND.

Section.	Names, &c.	No.	Locality.
A 2. Incoherent sandstones, with concretions.	1. Modiola, ? sp. - - -	1	West flank of Cypress Mountains.
	2. Ostrea Veleniana - - -	5	
	3. ? sp. (Unio ?) - -	1	Lat. Long. Alt.
	4. Cardium, ? sp. - - -	1	
B 2. Indurated shale, traversed by band and fissures filled with clay ironstone.	5. Leda Hindi, Meek and Hayden -	1	Souri River, Long River, and Forked Creek.
	6. - - - - -	4	
	7. Annelid Tube - - -	1	Lat. Long. Alt.
	8. Ostrea Lugubris - - -	1	
	9. Plant remains - - -	2	
B 3. Dark purple and brown clay, with ironstone septaria and selenite crystals.	10. Baculites Compressus - -	23	Elbow of South Saskatchewan.
	11. Inoceramus, ? sp. - - -	1	
	Crepsii of Roemer and Conrad -		Lat. Long. Alt.
	12. Pholodomyn Occidentalis, Morton -	1	Also from bed of North Saskatchewan at Fort Pitt.
	13. Cardium, ? sp. - - -	1	
	14. Exogyra, ? sp. - - -	3	Lat. Long. Alt.
	15. Astarte Texana - - -	2	
	16. Cytherea, ? sp. - - -	1	
B 3.* As before; no selenite.	17. Inoceramus.—I. Cripsii of Conrad and Roemer.	2	Septaria clays on Nanaimo River at Fossil Bank,

* Of this group only specimens of Nos. 18, 22, 25, and 28 are, without doubt, from Nanaimo River beds, as in Sect. B 5, and of Nos. 17, 19, and 27, doubtfully so. The rest are from the sea coast at Comux, from beds the position of which is not known with reference to the section at Nanaimo.

In Bauerman's collection are Nautilus and Isocardium from Nanaimo River.

Section.	Names, &c.	No.	Locality.
	18. Inoceramus Texansis - -	2	Vancouver Island; also from Comux, Valdez Inlet, north of Nanaimo.
	19. „ Inbrascensis - -	1	
	20. „ Undulata Plicatus -	1	
	21. „ Confertim-Annulatus -	2	
	22. „ Mytilopsis - -	1	Lat. Long. Alt.
	23. Baculites, ? sp. - - -	3	The latter are collected by Mr. McKay.
	24. „ ? sp. - - -	2	
	25. „ Compressus - -	5	
	26. „ Ammonites, ? sp. - -	4	
	27. „ ? sp. - - -	1	
	28. „ Geniculatus - -	1	
	29. „ ? sp. - - -	1	
	Also Nautilus and Incardium.		
B 2 or 4. Sandy concretions in banded clays and siliceous marls, overlying the silicified wood and lignite group.	101. Auricula rubrascensis, ? - -	6	From Bath River, above the "Elbow." In ascending the river the beds dip to the east, and 15 miles above this point the lignite appears, the water bed and the Ostrea beds being high up in the banks.
	107. Tellina - - - -	4	
	118. Cardium - - - -	5	
	102. Venus (Cytherea ?) - - -	3	
	108. Nucula - - - -	2	
	113. Nucula (Leda ?) - - -	2	
	119. Ostrea Cortex - - -	2	
	121. Ostrea - - - -	1	
	112. Baculites - - - -	1	
	102. Wood - - - -	1	
B 4. Sandy clays, banded clays, ironstone, limestones, all above the great lignite group, in two beds: the highest having the Ostrea, the lower with the Natica? 90 to 120 feet above the lignite seams.	30. Ostrea Cortex - - -	6	Red Deer River, to the S.W. of Hand Hills.
	31. „ Vellicata. *Conrad* - -	2	Lat. Long. Alt.
	32. „ Anomæformis - -	1	
	33. Cytherea Texana - - -	4	
	34. Mytilus ? sp. - - -	3	
	35. Cardium Multistriatum. *Schum.* -	4	
	36. Crastilla, ? sp. - - -	1	
	37. Venus, ? sp. - - -	2	
	38. Natica, ? sp. - - -	15	
	39. Rostellaria, ? sp. - - -	3	
B 5. Great lignite group. Sandstones, grits, and silicified wood; beds of lignite 3 to 10 feet thick.	*Plants.* Taxites. Reticulate Dicotyledonous leaves.		Red Deer River, Saskatchewan, Athabesca, Bow River, Pembina River, &c., Nanaimo, Vancouver Island.
B 6. Green sand at base of lignite group at Nanaimo.	40. Trigonia Emori. *Conrad* - -	13	Departure Bay, Fossil Point, north of Nanaimo, Vancouver Island.
	41. ? sp. - - - -	1	
	42. Cytherea Conensis - - -	11	
	43. Area, ? sp. - - - -	1	
	44. „ ? sp. - - - -	1	
	45. ? sp. - - - -	1	
	46. Psamodobia, ? sp. - - -	3	
	47. Exogyra, ? sp. - - -	1	
	48. Ostrea Bella - - -	1	
	49. Rock specimen and shells - -		
	50. Exogyra, ? sp. - - -	1	
	51. Rostellaria, ? sp. - - -	1	
	52. Ostrea, ? sp. - - - -	1	
	53. Pecten, ? sp. - - - -	1	
	54. ? sp. - - - - -	1	
	55. ?		
	56. ?		
	57. ?		
	58. ?		
	59. ?		
	60. ?		

INCERTA SEDES.

Section.	Names, &c.	Locality.
Ostrea shales - -	Small "Ostrea" - - - -	Big-horn Creek.
Dark mica, sandy shales overlying.	„ - - - -	North Saskatchewan.

Section.	Names, &c.	Locality.
Rose-coloured quartzose sandstone and carbonaceous shales, all disturbed, and forming the outer range of the mountain beds of blue sandy limestone.	Small Cardium, Stems of Rushes, Inoceramus (overlying these beds, much disturbed, were the Septaria Clays, with Baculites ?). Sect. No.	Bow Fort, on Bow River, base of mountains.
Freshwater beds, sandy marls and clays, with calcareous concretions.	Paludina, Unio, Planorbis, Cyclus - -	Basin along Red Deer River, above the Nick Hills.

(527 to 530 also said to be from Windy Mountain in the 2nd range of the Rocky Mountains. Collected by G. M. Bourgeau. Doubtful.)

PALEOZOIC FOSSILS.—EASTERN AXIS AND ROCKY MOUNTAINS.

CARBONIFEROUS.

Section.	Names, &c.	No.	Locality.
Rocky Mountains. 1st range.	Spirifer ? - - - -	123	Like fig. 2, pl. V. A, "Dale Owen's Minesota," only has fine ribs on the [sic]
Grotto Mountain -	,, - - - -	149	,, ,,
Blue crystalline cherty limestones. *Spirifers.*	,, - - - -	150	,, ,,
Dark, compact, earthy limestone, with calcareous spar and pitchy streaks. *Corals.*	,, - - - -	180	
	Syringophora - - - -	598	
Cream-coloured nodular limestone. *Encrinite stems.*	Lonodalia - - - -	162	
Sandy ferruginous shales.			
Oolitic limestone -	,, - - - -	307	
See Sects. Nos.	Orthis ? - - - - -	308	Like Michilini.
	Lithostrotion - - - -	163	
	Lysthophyllum - - - -	301–2	
2nd range.	,, - - - -	305	
Same as first, but in addition a lower bed of limestone.	Spirifer (as No. 123) - - -	124	Somewhat like *Carpidalus* or *distans*.
	Conularia (Gigantea. MSS.)		
Cascade Mountain, &c.	Strophomena finestilla - - -	148	*See* Dale Owen, fig. 11, pl. V., (Orthis Umbraculum).
	,, ,, - - - -	152	
	Orthis - - - - - -	597	Like (308).
	Orthis ? - - - - -	8	
Pipe Stone Pass.	,, - - - - -	9	
Splintery sandy shale, light grey colour.	,, - - - - -	10	
	,, - - - - -	12	
	,, - - - - -	13	
	,, - - - - -	14	
	Lingula.		
	Euomphalus.		
	Lithostrotion. - - - -	- -	Curious, from the absence of the *Columella*.
	DEVONIAN.		
And from tough yellow crystalline limestone at base of Cascade Mountain.	Atrypa reticularis - - -	599	
3rd range.			
Quartzose limestone and conglomerate, deep blue compact limestone, with nodules of iron pyrites. Source of North Saskatchewan, and also on R. Myrtle at Jaspar House (1st range).	Spirifer - - - -	178	? Like Lineatus.
	,, - - - -	303	
	Clionest - - - -	303	
		178	
	Proctus - - - -	311	Dale Owen, fig. 5, pl. V. A, (Strophodonta Costata Carb.)
	Fenistella - - - -	333	
	Atrypa reticularis - - -	1 to 6	
	Athyris - - - - -		

SILURIAN OF WINIPEG BASIN.—EASTERN AXIS.

MAGNESIAN LIMESTONE, LOWER FORT GARRY

Cyathophyllum. Nos. 90, 92, 99, 47, 46.
Columnaria alveolata. (Hall, 93.)
Orinocerus Lyonii. Stokes.
Favistilla. (Favorites basaltica of Owen.)
Receptaculites occidentalis. Salter.
Strophomena plano-convexa.
Strophomena Englypha.
Orthis, var. Lynx.
Spirifer elegantata.
Macluria.
Rhynconella incubescens. Hall.

Mr. Salter has appended the following note to this list:—"So far as yet appears, the fossil data "confirm the idea that the Laurentine Chain (or rather *ridge*) was above water in the Lower Silurian "times. On the Arctic side no Lower Silurian fossils at all have been detected."

No. 11.

BOTANICAL COLLECTIONS.

On M. Bourgeau's Botanical Collections.

BOTANICAL REPORT.

The collections made by the botanist, M. Bourgeau, were forwarded to England from time to time, and were duly received by Sir William Hooker, at the royal gardens at Kew. They consisted—1st, of plant-specimens prepared for preservation in the herbarium; 2nd, seeds and roots of plants for culture; and 3rd, specimens of the vegetable products used in the country by the Indians, and which are preserved in the Museum of Economic Botany at Kew. M. Bourgeau also made collections of insects and shelled mollusca, all of which were forwarded to the British Museum.

Of the dried plants there were in general at least 12 specimens of each species sent home, and the duplicate sets of the collection which thus arose have been sent to the following places, each specimen having been labelled and named before its issue from Kew. The appended list of the plants obtained was prepared by Mr. Black, curator of the Kew Herbarium, under the eye of Dr. Hooker.

The collection consists of 819 species, belonging to 349 genera and 92 orders, which is more than two-fifths of the total flora of British North America. In the list there are 62 species returned as "undetermined," some of which will most likely prove to be new.

In the relative order of their importance from number of species, the principal orders stand thus:—

Compositæ form,	1-7th of the whole.		Ranunculaceæ form,	1-26th of the whole.	
Cyperaceæ ,,	1-12th	,,	Cruciferæ ,,	1-26th	,,
Gramineæ ,,	1-12th	,,	Salicaceæ ,,	1-28th	,,
Leguminosæ ,,	1-16th	,,	Scrophulariaceæ ,,	1-28th	,,
Rosaceæ ,,	1-16th	,,			

The analysis of the collection, which is given in the table prefixed to the list, will give a further idea of the nature of the flora of the country from which it was made.

Three great zones of vegetation have been described by Sir John Richardson as occurring in the northern part of the American continent. To the north we have the Polar and Arctic flora, characterized by a predominance of the orders saxifrageæ, cyperaceæ, cruciferæ, and gramineæ, and of which the great majority of the species are common to both hemispheres. To the south of this commences the circum-arctic woodland zone, in which, from side to side of the continent, the country is covered with a worthless forest of spruce, scrub pine, birch, willows, and poplar. The natural families of plants, which in the Arctic region were 67 in number, are only increased in this zone to about 85, and by far the richest in species is the order of cyperaceæ.

The next zone Richardson described, he divided into three areas,—an eastern woody district, the eastern prairies, and the western woody district of the Pacific coast. M. Bourgeau's collection embraces plants from the two first of these areas, and also for the alpine regions of the Rocky Mountains.

The plants which belong to the flora of the eastern woodland district were gathered in the canoe route from Lake Superior to Lake Winipeg, and also in the neighbourhood of the Red River settlement. As far as this point the forest growth includes some of the finer species of coniferæ, along with oaks, ash, elm, maple, and cedar. Those plants which were collected on this part of the journey have not been distinguished in making up the list, but from comparison with the excellent tables constructed by Richardson from Hooker's "Flora Boreali Americana" it is probable that 10 or 12 of the *orders* given in the list were found in this region only.

In proceeding due west from the Red River settlement, the great prairies are at once entered upon, being bounded to the north by the wooded country, the limit of which nearly follows the "isothermal mean" of 40° Fah. in a N.W. direction until it reaches the 109th meridian, 53°, when it sweeps again to the S.W. to intersect the Rocky Mountain chain in latitude 51°. The country to the north of the 49th parallel, and up to latitude 54°, which was the region examined, is thus boldly marked into two districts by the presence or absence of timber. A third district must, however, be also considered, forming a belt dividing the forests from the plains, and which at one time was itself forest land, but having been cleared by the successive devastations of prairie fires, it now combines the advantages of both, having the free expanse of pasturage like the prairies, but possessing the rich vegetable mould, with the nutritious grasses and leguminous plants of the forest.

The woodland district would seem to possess a flora which is only slightly different from that of the Sub-Arctic zone. The principal tree is the *Abies alba*, which only reaches any size in bas-fond valleys. On the dry rising grounds grows the "*Cypres*" of the *Voyageurs*, but under that name they include two different species of *Pinus*, the P. Banksiana, and a Pinus allied to the P. inops of the United States, or to the P. contorta of the Pacific coast. A few of these trees were seen near Fort Carlton, after

which they were not again met with till near the Rocky Mountains to the S.W. of Fort Edmonton. The most important, though not most plentiful tree of the wooded country, is the birch (Betula papyracea), as it is the only "hard wood" which the natives possess, and serves for making snow-shoes, dog-sleighs, and other necessary articles. These trees, with a few balsam firs and poplars, comprise the bulk of the forest that covers the country to the north of the Saskatchewan; but by the banks of the rivers, which have generally deeply depressed valleys, there is of course a much greater variety in the vegetation, owing to the sheltered position and richer soil.

The belt of partially cleared country, which lies to the north of the forest land, and stretches continuously from the Red River Settlement to the Rocky Mountains, averages 80 to 100 miles in width, but it expands very much towards the west, its northern margin continuing nearly due west, while its southern border trends to the S.W. In this district the woods are very scanty, and consist almost exclusively of the aspen poplar, which forms small groves and artificial-looking clumps that dot the rich pasture lands. Sometimes a small clump of the spruce fir has been left by the fires, but this is only in a few rare localities. From Fort Carlton to Fort Edmonton, a distance of nearly 400 miles, there are not more than five or six spots where any of the coniferæ have been left. The Saskatchewan and the other rivers of the prairies flow through valleys one to two miles in width, and excavated to the depth of 200 to 300 feet below the general level. The stream winds from side to side of this valley successively bounding rich alluvial flats, which sustain a rich and very different kind of vegetation than that formed on the plains immediately above. In such low situations the false sugar maple (Negundo fraxinifolium) may be found as far west as longitude 108° on the North Saskatchewan, and on an island a short way on the same river above Fort Carlton, the "*bastard elm*" was observed. On the river "points" as they are called, besides the *Populus balsamifera*, which is the largest tree in that part of the country, sometimes reaching three feet in diameter, the thicket is principally composed of *Salix longifolia*, *S. rostrata*, *Viburnum edule*, *Crataegus coccinea*, *Amelanchier canadensis*, the wood of which is used for making bows, and the luscious fruit for mixing with "pemican," and the *Cornus stolonifera*, or "red willow," the bark of which the Indians smoke along with their tobacco. *Shepherdia argentea* also forms often the greater mass of the thickets, and its red juicy berries are the favourite food of the grizzly bears.

On the prairies, besides the grove of the *Populus tremuloides* or aspen, there are dense willow thickets surrounding the swampy grounds. In such spots there is an immense variety of carices, and when, as is often the case, the water is saline, saliferous plants abound, and, as usual, generally of species having a very wide range. On the sides of rising grounds, the *Elæagnus argentea* forms a low silvery copse, affording food to large coveys of prairie grouse. If the ground is high, or has a very light sandy soil, it is then covered with a close matting of the *Kinnakin-ik*, or smoking weed, which is the *Arctostaphylos uva-ursi* of the Scotch Hills, or by the long flabelliform branches of the *Juniperus sabina* vel *prostrata*. Towards the mountains large expanses of plain are covered by a low birch or alder, six to eight inches high, which in winter much resembled the heather on a moorland. In some localities the prairies are covered with patches of brightly-coloured flowers of the genera *Astragalus*, *Hedysarum*, *Geranium*, *Lilium*, and others, or is covered with a low copse of rose-bushes. As the country towards the south merges more into open prairie, the clumps of copse and young poplars are found only nestling on northern exposures. The last outliers of the woods to the south generally consist of "islands," as they are called, which make a show from a distance, but when approached are found to consist of a small species of willow.

The true arid district, which occupies most of the country along the South Saskatchewan, and reaches as far north as lat. 52°, has even early in the season a dry parched look. In the northern district the accumulation of *humus*, and the distribution of the pleistocene deposits, have given rise to a great variety in the nature of the soil: but to the south the cretaceous and tertiary strata almost everywhere come to the surface, so that the stiff clay, highly impregnated with sulphates, bakes under the influence of the clear sun of early spring into a hard and cracked surface, that resists the germination of seeds. This must be the principal reason for the arid plains ranging to such a high latitude, as there is quite a sufficient quantity of moisture in the atmosphere during the summer months to support a more vigorous vegetation, as is shown as far south as lat. 49° 30′ N., when at the Cypress Hills, south sides of deep river valleys, and other expanses sheltered from the sun's rays until he acquires a considerable altitude, are found to be covered with pines, spruce firs, poplars, and abundant varieties of the vegetation that is found further to the north. In the arid plains, the plants which are most evidently different from those regions to the north are the small *Opuntias*, or prickly prairie apple, and which cause great annoyance to both horses and men; also the *absinthe*, or *sage* of the Americans, which name includes several species of fragrant *Artemisiæ*. In the ruts scratched by the buffalos, there also occurs a beautiful crimson mallow? (Sida coccinea, DeC.) The grass is very short on these plains, and forms no turf, merely consisting of little wiry tufts. Much of the arid country is occupied by tracts of loose sand, which is constantly on the move before the prevailing winds. This district, although there are fertile spots throughout its extent, can never be of much advantage to us as a possession. In June and July, the Expedition experienced great inconvenience in traversing it, from want of wood, water, and grass.

Along the base of the Rocky Mountains there is much fine land, with very rich pasture; but the sharp night frosts which occur throughout the summer, would render the raising of cereals in that district very precarious. Close to the mountains several trees, which are found in great numbers on the western slope of the continent, are met with for the first time. Of these the principal is that known to the voyageurs as the "*Perushe*," which is the name for the hemlock spruce (Abies Canadensis) of Canada. It appears, however, to have much larger cones than that species, and also several other characters that mark it as a distinct tree. Two species of pines were also found in this district, that are not observed further eastward, one of them being only slightly different from *P. Montreola*, Doug. The collections from the base of the mountains are not satisfactory, however, as it was past the flowering season, except for *alpinus*, at the time of M. Bourgeau's visit.

The valleys of the mountains are occupied by forests, excepting in a few localities, where there are level gravelly plains covered with "*bunch-grass*," (*Festuca*, sp. ?). These forests consist principally of

the *Prushe*, or hemlock, Abies Douglassii, Abies alba, and A. niger. This mixed forest extends to 5,000 feet, when it is succeeded by the Abies balsamea. The tree that is found highest on the mountains, however, is the Abies alba, and at an altitude of 7,000 feet is quite dwarfed in size, with recumbent branches that spread like thatch over the mountain sides.

The altitude of the alpine region in the Rocky Mountains is very variable, and ranges from 7,000 to 9,000 feet. It is characterized by many plants of identical species with those found in similar situations in Europe. Of 50 plants collected at 8,500 feet on the eastern slope of the mountains, 15 are common to the Scotch mountains. The plants which range highest are *Salix reticulata*, *Saxifraga Dahurica*, and *S. Nivalis*, which are also found in Europe.

As M. Bourgeau did not cross the Rocky Mountains, no collections are obtained from the western slope, or even from the axis of the chain, for a considerable distance on the east side of which there is an admixture of western forms. The most marked features of the physiognomy of the vegetation, and particularly of the forest growth on the Pacific slope, will be found alluded to in the journals.

Sir William Hooker has kindly furnished the following letters which he received from M. Bourgeau, and which contain much valuable matter respecting the flora of the country. The first two have already been printed in the Transactions of the Linnæan Society of London, 1859. His observations of the temperature of the interior of trees during the severe winter, taken by the readings of thermometers sunk obliquely into their trunks, are also appended; but they do not seem to point to any definite results. Various extracts are also furnished from his journal, giving the date of flowering of some early plants, and also remarks on the progress of the seasons.

Translations.

Letter I.—M. E. Bourgeau to Sir. W. Hooker.

(Journal of Linnæan Society, Vol. IV., No. 13, p. 1.)

Sir, Fort Garry, Saskatchewan, June 7th, 1858.

As you received the first letter sent from Fort Garry, I need not detain you with a description of the little collection I was enabled to make, while almost daily upon the rivers and lakes, hemmed in on all sides by dense forests, to the fort just mentioned.

I commenced my herborizations June 12th, upon the Ile Royale, situated on Lake Superior, where the vegetation had hardly commenced. The alders and willows were in flower on the banks of the island, and by their sides large banks of ice still existed under the rocks. This island is thoroughly wooded, and especially with two *Abies* (*alba* and *balsamifera*), *Betula papyracea*, and the *Thuya*. The same day we landed at the entrance of the Kaministoquoiah River, Fort William, but the shortness of the stay did not enable me to make excursions in that place. From that time it was only during the hours of rest and at the portages that I could gather a few specimens: the indifferent accommodation in our boat did not permit of a large collection being made, from the difficulty of preserving it from damp. I have been delighted to learn that you have received the plants in a good state of preservation, and I hope that this year also you will receive a pretty large quantity, and a good number of each species.

As you are geographically acquainted with the route of the Expedition, I need not speak concerning the localities through which we have passed; the specimens of plants (none neglected, but many repeated) will prove a better botanical journal of the Expedition than all the notes which I might send you from here; nevertheless, I have preserved some notes upon the particular places which are woody, if it is important to know them. There is one particular with which it is as well you should be acquainted; it is the geographical extent of the plants in the countries through which we have travelled; that is to say, the same species occupies a surface from 300 to 400 leagues. The prairies are well covered with plants, of the *Gramineæ* and *Cyperaceæ* in abundance, but of few species. Three distinct localities are to be met with in these prairies,—the ordinary plains, marshes and streamlets, and dry rising grounds. Each of these three localities has its peculiar vegetation, but let each locality occur where it will it presents the same plants throughout. The greater part of the plants at Fort Garry and Pembina are the same as those of Carlton, and it is my conviction that they extend close to the mountains. My collections of 1857, and a portion of those of 1858, you will receive this year, and I give you here the number of boxes which are addressed to you. Two from Fort Ellice, containing the collections from Pembina, and some parcels of seeds. The collection is superb, and contains the plants gathered at the most southerly part of our voyage, viz., from the great prairie of the Tortue Mountain, and in the neighbourhood of Riviere a Souris, to Fort Ellice, where I remained some time, and was consequently able to make a careful collection of the *Compositæ*, which are in perfection from August 15th till the close of the season.

From Fort Ellice our route lay direct to Saskatchewan, the greater part of which is what we in Europe would call pasturage. It is indeed pasture land, covered with buffaloes, and the grass being so constantly browsed does not attain any height. The country also seems very dry; there are some lakes, but few marshes. There are no forests, but, beside some streamlets, a few small copses of *Populus tremuloides*, which appear to have been spared from fires. The borders also of the Saskatchewan River at L'Elbow are wooded in some places with *Populus balsamifera*, *grandidentata*, *tremuloides*, *Fraxinus*, and *Betula pumila*. In the marshy localities, tufted willows, interspersed with other shrubs, constitute a covert for deer, and specially for the bear, whose principal food during the month of September is the fruit of such shrubs as the *Shepherdia argentea*, which I have seen in large quantities in his stomach.

We arrived at Carlton on the 8th of October, and there I finished putting in order my last collections, containing a quantity of seeds, besides the botanical specimens, and filling in all one case. There are 166 packets of different seeds, several shells, and some insects, which I beg you will keep until I return to make the catalogue. Of this spring's collection I send two cases; one containing the botanical packets, and the other some objects for your economical museum, and diseases of plants occasioned by the punctures of insects, for Dr. Hooker. In one of the boxes you will find some animals' skins and birds' eggs, which also I beg you will take care of till my return: each article is furnished with a ticket. As the news I looked for by the arrival of the Captain did not come, I shall be obliged to pass another

winter at Edmonton; and I trust, by the following spring, to be enabled to visit those parts of the Rocky Mountains lying nearest this locality, and thus I shall have all the spring plants, which, by arriving too late this season I run the chance of losing. It is well known that August is the most suitable month for traversing the mountains; and, besides, the *Compositæ*, and seeds of many plants, are not perfect till that season. The total number of cases which you will receive in 1858 is two from Fort Ellice, and three from Carlton, making five in all.

I am anxious to reach the mountains as soon as possible. It is now two seasons since I saw any mountains resembling the Alpine chains of my native country.

Dr. Hooker, to whom I desire my respectful remembrances, will receive at the same time all the observations which I have taken since I left Carlton. I have a journal, in which I have notes upon the temperature of the trees, upon the weather, and on various circumstances, and lastly, upon the vegetation, and specially upon a certain tree which puts forth its leaves a month later, which I should like to know the cause of. I desire to do my utmost in rendering the voyage as useful to science as possible.

Accept, Sir, every assurance of esteem from your humble servant,

E. Bourgeau.

I have given special attention to the collection of *Salices* made at Carlton; the species are not numerous, for which reason I have collected both male and female specimens of each plant, and have been careful to put corresponding numbers on each sex. There are a good many duplicates, therefore I trust you may have as many specimens as will enable you to study them satisfactorily. I regret not being able to send you the leaves of the *Salices*; they are not yet developed. During the third week of last month the catkins of *Populus balsamifera* have been frozen, and have fallen off; several other plants, also in flower, have been frozen, and thus for a week I have been deprived of my excursions.

Letter II. from M. E. Bourgeau to Sir W. J. Hooker.

(Journal of Linnean Society, Vol. IV., No. 13, p. 13.)

Sir, Fort Edmonton, Saskatchewan, October 9th, 1858.

I have much pleasure in laying before you the results of my botanical labours during the second season.

I suppose that you have received my account of the preceding season, in which I gave you full details up to Fort Carlton. I shall now, therefore, confine my narrative to the period between that locality and the Rocky Mountains.

The Expedition started on the 15th of June, crossing the prairie Saskatchewan, between the two arms of the river of the same name. Some days afterwards I found several places rich in leguminous plants, and particularly *Astragali*, which I had not found in the previous year. The numerous plants which I gathered led me to hope that I might find some fine things further on. My only difficulty was from the rains, which fall annually in June and July. I recorded 33 days of more or less continuous rain. I have succeeded in preserving all my collections without losing a single packet. I have not found so many different species as I had hoped to do. I have preserved many species already gathered the first season, on account of their forms, the dates, or their geographical distribution; probably half the collection is in duplicate.

On the 26th June we travelled over the open and treeless prairie, and on the 27th we encamped by a small forest of the two species of *Populus* (lat. 52° 39′ N., and long. 108° 52′ W.) On the 2nd July we reached more abundant forests, composed of the same trees, with thickets of rather large *Salix*, which provided us with excellent firewood. The spaces between the forests consist of more or less marshy prairies, with large plants of different species, nearly all inhabitants of the forests, such as *Lathyrus*, *Vicia*, *Orobus?* *Astragalus*, and *Carex*, in abundance. The prairies are rich in food for animals, the grass averaging in height from 18 inches to two feet. (Lat. 52° N.; long. 109° 3′ W.)

From the 3rd to the 7th July we crossed a wooded sandy slope. In many places the vegetation appeared to have suffered from the frosts and the hail. All the poplars looked as if they had been trimmed. The ends of the branches are cut by the frost nearly every year, and the number of checks which they thus receive gives them a peculiar appearance. Near this place we crossed two wide spaces where the hail has destroyed all the vegetation except the trees and the *Salix*.

It is worth describing to you the inconveniences of some seasons; for instance, the frosts which occurred this year on the 15th of May and the last week of July destroyed all the seeds of the trees, and the catkins of the *Populus* and *Salix* fell to the ground without ripening. The same thing occurred with the coniferous trees, and thus I have been unable this year to procure the seeds of any tree.

On the 10th of July we encamped on the shores of the Battle River, between the woods and rich prairies. The soil appears very fertile here, and I remarked some specimens of *Abies alba* and of *Pinus Banksiana*, which had escaped the fire, the first observed since leaving Carlton. This river is magnificent in summer. Towards the boundary of the woods it is in some places sunk between high banks. Lat. 52° 28′ N.; long. 111° 17′ W. from Greenwich.

From the 18th to the 20th July we encamped on the prairies, and amid thickets, near the Lake de Bœuf, which contains an abundance of a rather large fish of excellent quality. At this place we were about 50 miles from the superb river De la Biche, which is of sufficient size for the navigation of the ordinary boats of the country. Its shores are wooded for about 100 miles, particularly with *Abies alba*, and the two species of *Populus* useful as timber. Vegetation also is vigorous, and the soil appears to be very fertile. The varieties of herbaceous plants are not very numerous, but the quality of the species forms a good forage for horses. Fires appear to have been less frequent in this latitude, 52° 1′ N.

On the 24th, 25th, and 26th July we were in sight of the magnificent chain of the Rocky Mountains. I here observed a change in the vegetation. The first plants which attracted my attention were the *Geum rivale*, *Polygonum viviparum*, two species of geranium, &c. Although still 100 miles from the mountains, I am each day in hopes of finding new plants. Near a large "coulée" named the "Coulée of coloured stones," the prairie is magnificent, the *Astragali* especially forming a great ornament to it.

There are large patches of different colours, particularly red; a yellow and white *Astragalus;* a red, a white, and a violet *Geranium;* a *Hedysarum;* the three varieties, Rhinanthus, &c., forming an ensemble most attractive to a botanist.

At last, on the 7th of August, we arrived at the foot of the Rocky Mountains, at the place where stood the ancient fort, in lat. 51° 9′ N., long. 115° 4′ W., the shores of the River des Arcs being 4,100 feet above the level of the sea. In ascending this river, it is found to flow from a large valley in the interior of the mountains, which I have named the Valley des Arcs, as far as the second Lake, there being a first and second Lake des Arcs. The high peaks of this valley bear the following names:—Pic des Pigeons, Pic de la Grotte, Pic du Vent, the last being so named from the storms which begin upon its summit. I have explored this valley more than any, and especially the mountains on the northern side of the Pic du Vent, which I have found peculiarly rich in alpine plants. From the river to the limit of the snow, all the chain of peaks, as far as the eye can reach, are wooded, principally with three species of conifers, *Abies nigra?* and *alba*, and *Pinus*. The latter grows mostly on the southern slopes, and does not much exceed 30 feet high, the largest being about one mètre in circumference. The *Abies nigra?* is the largest and tallest of the forest trees which I have observed in the Valley des Arcs; one which I measured was 3 mètres 23 centimètres in circumference. There are also other forest trees in greater or less abundance, as *Populus balsamifera*, *P. tremuloides*, *Betula papyracea*, and *B. pumila*. The shrubs are mostly the same as in the plains, except some *Salices* of the alpine region.

There are considerable obstacles to travelling in the mountains. The forests suffer almost every year from fires; the trees fall in all directions on the ground, and thus form innumerable barricades to the progress of horses and even of men. To ascend to the summit of a mountain, a very hard day's work is needed to cross the forest region. This description holds good in all the localities which I have visited.

I am happy to inform you that I have made a good collection during this season. I hope that I have gathered the greater number of the plants inhabiting that portion of the mountains which I have visited, and which I have been able to explore in 17 days. For weighty reasons it was not possible for me to remain there longer. The month of August is the best period of the year, the plants being in perfect flower, and some few in fruit. I observed but few withered kinds.

List of some species gathered close to the perpetual snow:—

Silene acaulis.	Draba.
Silene ?	Androsace.
Arnica.	Vaccinium.
Menziesia.	Salix herbacea.
Pedicularis.	Poa alpina.
Gnaphalium.	Aspidium.
Erigeron.	Valeriana.
Artemisia.	Aquilegia.
Saussurea.	Dryas octopetala.
Luzula.	Epilobium.
Saxifraga.	&c. &c.

The nearest tree to the snow is *Abies alba*, which assumes the appearance of *Juniperus communis*, with which it grows; that is to say, it trails along the ground. The alpine region is from 6,500 to 8,600 feet in elevation. The vegetation is not rich in species; the mountains are barren, with few streams and little humidity, and no pastures like those of the Alps. In the Rocky Mountains, streams are scarce on the southern slopes; on the northern, water is more abundant, owing to the snow; but they are only little torrents sunk deep in the rocks. This is the character of all the ravines which I have visited. The plants in the forests are, for the most part, common in the woods of the Saskatchewan plains. The number of species is about in the same proportion on the mountains as in the other parts of the country. They are few in number, but each species is abundant, and each mountain, at the same elevation, bears the same species both on the north and on the south. All the collections made this season, and which are tolerably extensive, and in a good state of preservation, are here at the fort. Thanks to Captain Palliser, who has taken much interest in the success of my labours, and who has greatly assisted me in preserving the specimens from damp during the journey, I have about 22 packets of dried plants, and 110 of different sorts of seeds. The herbarium contains about 460 species, and about 60,000 specimens, I am now busy with the arrangement and packing of the collections to be ready against the spring, the period fixed for my return to Europe.

I am, &c.
E. Bourgeau.

Monsieur Bourgeau to Sir W. Hooker.

(No date.)

In the last letter which I had the honour to address to you, I described our journeys in passing through the parts of the countries we had not yet visited.

The object of the present letter is to transmit to you the principal botanical observations which I have made during a journey of nearly 600 leagues from Fort Edmonton, which I left on the 24th of May 1859, descending the north branch of the Saskatchewan to Lake Winipeg. On the banks of this magnificent river, and especially on the southern one, extend vast prairies covered with bisons, and fringed by woods, consisting chiefly of the *Populus tremuloides* and *balsamifera*. The herbaceous plants which I met in these prairies, consist chiefly of the same species which I collected the previous year in other portions of the Saskatchewan district, with a few exceptions found between Forts Pitt and Carlton. Generally speaking, the woods, consisting of conifers (*Pinus* and *Abies*), less frequently occur, excepting in the neighbourhood of Fort Carlton. Bourbon Lake is scattered over with numerous islands, of which some are covered exclusively with *Salix*, others, whose soil is more elevated, offer to the view forests composed of *Larix Americana*, *Pinus Banksiana*, *Abies alba*, *Betula papyracea*, and of the two poplars already named. Towards the Grand Rapid and at Lake Winipeg extend magnificent forests, composed of several trees, among which the *coniferæ* still predominate. The islands in Lake Winipeg present a

forest vegetation very similar to that on the islands in Lake Bourbon. The passage across the lake, of nearly 260 miles, occupied 22 days, owing to the contrary winds. I availed myself of the numerous delays we were compelled to submit to, in order to explore several islands, which afforded me excellent collections. I profit by the opportunity afforded me by the descent of the Company's boats to Hudson's Bay, to forward you the remainder of my collections, contained in four cases : a fifth case encloses a collection of eggs, animal remains, and various instruments and articles of Indian manufacture destined for the Economical Museum. Arrived at Red River, I was able to testify to the oak becoming sufficiently abundant. I have brought with me all the plants I collected between Red River and St. Pauls. From St. Pauls to New York I came by the most rapid conveyances, viz., steamboat and railways. I remained only two days in New York, and, after a passage of 13 days, arrived in London on the 20th of August. I enclose the list of meteorological observations made in the neighbourhood of Fort Edmonton, also information concerning the vegetable wealth or poverty in circumscribed spaces in different parts of my journey.

I am, &c.
(Signed) E. Bourgeau.

Letter IV. (Neither addressed nor dated.)

I submit the following remarks on the advantages for agricultural settlements in Rupert's Land and the Saskatchewan prairies of British North America, having been nominated by Sir William Hooker, in order to accompany the Expedition sent by the English Government into its North American possessions, and commanded by Captain Palliser, during the years 1857, 1858, and 1859.

I had especially to collect the plants which grew naturally in the country traversed by the Expedition, as well as their seeds. Independently of my botanical collections, Dr. Hooker had advised me to make thermometrical observations at the various stations, and above all things to take the temperature of the earth at certain depths, as well as that of the interior of forest trees; also to note the richness or poverty of the vegetation of the countries, and the maladies to which plants are exposed. In the several letters and notes addressed to Sir W. Hooker, which are also published, I have treated these questions with all the care that was permitted to me, by observations taken in the midst of the harassment and fatigue of a long journey; but it remains for me to call the attention of the English Government to the advantage there would be in establishing agricultural districts in the vast plains of Rupert's Land, and particularly in the Saskatchewan, in the neighbourhood of Fort Carlton. This district is much more adapted to the culture of staple crops of temperate climates, wheat, rye, barley, oats, &c., than one would have been inclined to believe from this high latitude. In effect, the few attempts at the culture of cereals, already made in the vicinity of the Hudson's Bay Company's posts, demonstrate by their success how easy it would be to obtain products sufficiently abundant largely to remunerate the efforts of the agriculturist. *There*, in order to put the land under cultivation, it would be necessary only to till the better portions of the soil. The prairies offer natural pasturage, as favourable for the maintenance of numerous herds as if they had been artificially created. The construction of houses for habitation and for pioneer development, would involve but little expense, because in many parts of the country, independent of wood, one would find fitting stones for building purposes, and in others it would be easy to find clay for bricks, and more particularly near Battle River. The other parts most favourable for cultivation would be in the neighbourhood of Fort Edmonton, and also along the south of the North Saskatchewan. In the latter district extend rich and vast prairies, interspersed with woods and forests, where thickwood plants furnish excellent pasturage for domestic animals. The vetches found here, of which the principal are Hedysarum, Lathyrus, Vicia, and Astragalus, are as fitting for the nourishment of cattle as the clover of European pasturage. The abundance of buffalos, and the facility with which the herds of horses and oxen increase, demonstrate that it would be enough to shelter animals in winter, and to feed them in the shelters with hay collected in advance, in order to avoid the mortality which would result from cold or the attacks of wild beasts, and to permit the acclimatization of other domestic farmyard animals, such as the sheep and pig. The harvest could, in general, be commenced by the end of August, or the first week in September, which is a season when the temperature continues sufficiently high, and rain is rare. In the gardens of the Hudson's Bay Company's posts, but more particularly in those of the different missions, feculent vegetables of the leguminous family, such as beans, peas, and French beans, have been successfully cultivated; also cabbages, turnips, carrots, rhubarb, and currants. No fruit tree has as yet been introduced; one might perhaps, notwithstanding, under favourable circumstances, try nut-trees: also apples that belong to varieties that ripen early (précoces). Different species of gooseberries, with edible fruits, as well as raspberries, grow wild here ; also different kinds of vaccinaceæ are equally indigenous, and have eatable fruits that will also serve for the preparation of preserves and confectionery. The Aronia oralis is very common in this country, and its fruit, commonly known by the name of "Poire," service berry, is eaten dried by the Indians, who collect it with care, and also serves for the purpose of excellent pudding, recalling the taste of dried currants. The only difficulty that would oppose agricultural settlements, is the immense distance to traverse over countries devoid of roads, and almost uninhabited; also the assistance of Government, or a company well organized, would be indispensable to the colonization of this country. It would be important that the settlements should be established in groups of at least 50 householders, for protection against the incursions of the Indians; who, notwithstanding, are far from being hostile to Europeans. It stands to reason that the colonists ought to be taken from the north of Europe, or from mountains; those brought up accustomed to the climatological condition and culture of the soil most resembling this interesting country, to the resources of which I call attention. The products of agricultural settlements thus established would yield subsistence to the Indians, whose resources for food, supplied only by hunting, tend to diminish every day. The presence of European settlers would form a useful model for this primitive people, who, notwithstanding their native apathy, still appreciate the benefits of civilization.

To Sir W. Hooker. (Signed) E. Bourgeau.

TABLE showing the TEMPERATURE of the INTERIOR of POPULUS BALSAMIFERA and ABIES ALBA, FORT CARLTON, 1857-8.

N.B. The thermometer readings in the Populus balsamifera were taken generally between the hours of 9 a.m. and 10 a.m. ; those of the Abies alba, between 3 p.m. and 4 p.m.

Month.	Day.	Populus.	Abies.	Month.	Day.	Populus.	Abies.	Month.	Day.	Populus.	Abies.
		°	°			°	°			°	°
1857, Dec.	2	17·0	—	1858, Jan.	26	−4·0	—	1858, Mar.	22	27·2	—
,,	3	9·0	—	,,	27	—	—	,,	23	31·2	—
,,	4	7·0	—	,,	28	—	—	,,	24	31·8	—
,,	5	11·0	—	,,	29	2·0	−10·0	,,	25	31·8	—
,,	6	12·0	—	,,	30	4·0	−5·5	,,	26	32·0	—
,,	7	−1·0	—	,,	31	16·0	8·0	,,	27	32·0	—
,,	8	7·0	—	February	1	—	15·0	,,	28	32·0	—
,,	9	5·0	—	,,	2	−7·0	−12·0	,,	29	32·5	—
,,	10	7·0	—	,,	3	−2·5	—	,,	30	33·0	—
,,	11	7·0	—	,,	4	—	7·0	,,	31	35·0	—
,,	12	8·0	—	,,	5	—	20·0	April	2	32·0	—
,,	13	12·0	—	,,	6	15·5	18·5	,,	3	32·5	—
,,	14	5·0	—	,,	7	—	−3·5	,,	4	32·0	—
,,	15	14·0	—	,,	8	−4·2	−15·0	,,	5	32·0	—
,,	16	15·2	—	,,	9	−13·0	—	,,	6	33·0	—
,,	17	6·5	—	,,	10	−20·0	—	,,	7	33·8	—
,,	18	10·0	—	,,	11	−24·0	—	,,	8	32·5	—
,,	19	16·5	—	,,	12	−25·0	—	,,	9	33·5	—
,,	20	16·0	—	,,	13	Scale not sufficiently graduated. Mercury in bulb.		,,	10	34·5	—
,,	21	11·0	—	,,	14			,,	11	33·0	—
,,	22	24·0	23·7	,,	15			,,	12	34·5	—
,,	23	16·0	—	,,	16			,,	13	34·0	—
,,	24	8·0	24·0	,,	17	−9·5	−14·0	,,	15	32·0	—
,,	25	3·5	4·0	,,	18	—	—	,,	16	32·0	—
,,	26	8·2	9·0	,,	19	—	—	,,	18	32·0	—
,,	27	6·0	14·0	,,	20	—	−2·0	,,	19	35·0	—
,,	28	5·0	14·0	,,	21	4·0	−5·0	,,	20	36·0	—
,,	29	12·4	8·0	,,	22	—	19·5	,,	22	34·5	—
,,	30	10·0	15·0	,,	23	—	16·5	,,	23	37·5	—
,,	31	5·0	11·0	,,	24	—	—	,,	25	34·5	—
1858, Jan.	1	—	5·5	,,	25	—	—	,,	28	47·8	—
,,	2	9·0	8·2	,,	26	—	—	,,	29	54·0	—
,,	3	28·0	28·0	,,	27	—	—	May	1	59·0	—
,,	4	—	22·5	,,	28	7·5	—	,,	3	59·0	—
,,	5	7·5	9·0	March	1	7·0	—	,,	5	49·0	—
,,	6	−9·9	−20·0	,,	2	12·5	6·3	,,	6	52·0	—
,,	7	−9·2	−20·0	,,	3	21.5	11·0	,,	7	54·2	—
,,	8	−7·5	−12·0	,,	4	28.6	26·0	,,	11	47·8	—
,,	9	−6·0	−15·0	,,	5	31·0	29·5	,,	13	38·5	—
,,	10	—	4·2	,,	6	—	—	,,	14	38·7	—
,,	11	2·5	—	,,	7	—	—	,,	17	40·7	—
,,	12	−8·6	—	,,	8	—	—	,,	18	40·8	—
,,	13	−13·2	—	,,	9	30.0	—	,,	19	46·5	—
,,	14	−22·0	—	,,	10	—	—	,,	20	46·2	—
,,	15	−13·0	−25·0?	,,	11	28·0	24·2	,,	21	49·7	—
,,	16	−8·0	—	,,	12	—	28·0	,,	22	49·8	—
,,	17	−7·0	−5·0	,,	13	29·5	26·0	,,	23†	54·0	—
,,	18	12·2	6·5	,,	14	28·0	—	,,	25	62·3	—
,,	19	—	0·2	,,	15	32·0	—	,,	27	50·5	—
,,	20	6·0	8·0	,,	16	—	—	June	1	52·5	—
,,	21	4·6	6·0	,,	17	32·0	—	,,	3	60·0	—
,,	22	14·0	9·5	,,	18	32·0	32·0	,,	4	58·2	—
,,	23	4·5	5·0	,,	19*	31·0	26·3	,,	5	54·0	—
,,	24	−2·0	−8·0	,,	20	30·8	—	,,	6	50·5	—
,,	25	—	—	,,	21	26·0	—				

* No observations were made on the Abies after the 19th March 1858.
† May 23rd, 1858. The sap of the Populus had quite filled the hole into which the thermometer had been inserted.

TABLE showing the MEANS of the above OBSERVATIONS.

Month.	Year.	Populus.	Abies.	REMARKS.
		°	°	
December - - -	1857	9·67	13·63	Abies, mean of nine readings.
January - - -	1858	0	−0·08	
February - - -	1858	−7·11	3·96	See note of this month.
March - - - -	1858	29·27	20·93	Abies, mean of 10 readings.
April - - - -	1858	35·54	—	
May - - - -	1858	49·33	—	
June - - - -	1858	55·04	—	Populus, mean of five readings.

(*Translation.*)

List of Plants which were earliest gathered at Fort Carlton in the spring of 1858.

April 12. Alnus Americana.
„ 13. Pulsatilla Nuttaliana.
„ 14. (Four inches of snow fell this day.)
„ 20. (River ice commenced to break up.)
May 3. Phlox Hoodii.
„ „ Populus tremuloides.
„ „ „ balsamifera.
„ „ Salix. (2 sp.?)
„ „ Corylus Americana.
„ „ Equisetum arvense.
„ „ (Aleguminous plant with yellow flowers.)
„ 6. More species of Salix.
„ „ Two species of Shepherdia (Canadensis? and argentea?).
„ „ Negundo acceroides (fraxinifolium).
„ 7. Androsacea.
„ „ Viola (Canadensis) canina?
„ „ Potentilla.
„ „ Astragalus.
„ „ Fragaria Americana.
May 7 Two species of Carex.
„ 11. Agrostis.
„ „ Salix (more species).
„ 12. (The temperature having fallen last night to 14·5° Fah., nearly all the plants in flower have been frozen, and the vegetation has been thrown back 8 days.
„ 20. Astragalus.
„ „ Salix, (two species.)
„ „ Viola Nuttalliana.
„ „ Amelanchier oralis. (Canadensis?)
„ „ Legustrum?
„ „ Ribes uva-crispa (?)
„ „ Betula papyracea.
„ 22. Astragalus.
„ „ Antennaria margaritacea.
„ 23. (First rain and thunder of this spring.)
„ 27. (Frost during the night.)
„ 28. Do. do.

Fort Edmonton, Spring 1859.

April 27. Corylus Americana.
„ 28. Salix (2 species).
„ 29. Alnus Americana.
„ „ Peltigna canina.
May 2. Populus tremuloides.
„ „ Salix.
„ 8. Salix.
„ „ Populus balsamifera.
„ „ Adenostylis (?)
„ 17. Fragaria Americana.
„ „ Ranunculus rhomboideus.
May 17. Equisetum arvense.
„ 18. Cerasus.
„ „ Antennaria margaritacea.
„ „ Viola canina (Canadense?)
„ „ „ palmata.
„ 19. Capsella bursa-pastoris.
„ 20. Ribes uva-crispa (?).
„ „ Ribes rubrum.
„ „ Viola blanda.
„ „ Androsace.

(Signed) E. Bourgeau.

Various irregular Observations of Temperature at Fort Carlton.

May 16.—Water of river at 9 a.m. 40·7° air 33°
Near a mass of ice under the south bank of the valley surrounded by poplar trees.
Under the ice towards the willows - 33°
Open side between the ice and the earth 34·8°
Under the ice at roots of the willows - 34·7°
Source of the buoy - - - - 37·6°
The willows had several catkins in flower; the observations were made at noon.

(This mass of ice was formed by the freezing of the water from a spring which continued to flow throughout the winter, its water having a temperature of 37°. J. H.)

May 17.—Another buoy situated beside the poplar in which the thermometer was inserted.
Water of buoy at 10 a.m. - 45° air 45·7°
May 18.—Water of river - 41·3° air 35·8°
June 6.—Certain thickets of poplars have got their leaves 12 days later than the others.
In thin ground at 3 ft. depth - 41·0° air 51·5°
„ 2 in. among the roots 50° „ do.

Measurements of some of the largest trees near Fort Carlton.

	Circumference.
Populus balsamifera -	- 98·6 inches.
„ tremuloides	- 44·8 „
Abies alba - -	- 87·7 „

Observed in the valley of Bow River within the Rocky Mountains.

Abies Niger? (A. Douglasii?) 145·7 inches.
Height, 160 feet. Most of the forest trees had no remarkable size, the too frequent burning of the woods preventing their development.

Observed by Lieut. Blackerton at Musquito Point, on the Lower Saskatchewan, lat. 53° 50′ N., long. 102° 53′ W.

Abies alba 100 inches.

Remarks on the richness and purity of the flora.

On the Saskatchewan, near Fort Carlton, got 29 species in a space of 10 yards, of which the principal were of the genera Oxytropis, Hedysarum, Astragalus, and Gramineæ. In the same extent of surface, and in soil of the same nature, and one mile from the first locality, six species only were to be found.

From 10 yards of space on the prairie at Pembina, collected 37 species, and sent them as a special collection to Kew.

From another spot on the same prairie, only five species were found in the same space.

A collection made in a little forest on the Saskatchewan shows the richness of the woodland flora.

(Signed) E. Bourgeau.

Analysis of the **Collection** of **Plants** made by M. **Bourgeau**, **Palliser's Exploring Expedition**, being an enumeration of the **Genera** and **Species**, with range of the **Orders**.

Note.—Those marked (a.) extend into the arctic province, (b.) into the circum-arctic zone, (c.) central district of the 3rd, or woodland zone, (d.) those orders which belong to either the Canadian or Pacific coast district, or to the central arid district.

Range.	Orders.	Genera.	Species.	of which undetermined.	In British N. America. Genera.*	In British N. America. Species.*	Range.	Orders.	Genera.	Species.	of which undetermined.	In British N. America. Genera.	In British N. America. Species.*
a.	Ranunculaceæ	11	32	—	18	72	b.	Pyrolaceæ	2	4	—	5	16
d.	Minispermaceæ	1	1	—	1	1	b.	Primulaceæ	7	10	—	8	23
c.	Berberideæ	1	1	—	3	5	d.	Oleaceæ	1	1	—	1	3
b.	Sarraceneæ	1	1	—	1	1	b.	Gentianaceæ	2	6	—	8	34
d.	Nymphaceæ	1	1	—	3	4	c.	Apocyneæ	1	2	—	1	4
a.	Papaveraceæ	1	1	—	3	3	c.	Asclepiadeæ	2	5	—	1	11
b.	Fumariaceæ	1	2	—	4	9	a.	Polemoniaceæ	3	5	—	3	13
a.	Cruciferæ	14	31	7	25	104	b.	Hydrophylleæ	1	1	—	2	5
d.	Capparideæ	2	2	—	2	2	c.	Convolvulaceæ	1	1	—	3	6
d.	Cistineæ	1	1	—	3	5	c.	Solaneæ	2	5	2	5	8
b.	Violaceæ	1	8	—	1	18	b.	Boraginaceæ	8	17	2	5	27
b.	Polygalaceæ	1	3	—	1	7	b.	Labiatæ	9	9	—	24	40
b.	Droseraceæ	1	1	—	2	9	b.	Verbenaceæ	1	1	—	2	7
b.	Lineæ	1	2	—	1	3	a.	Scrophulaineæ	7	24	2	20	74
a.	Caryophylleæ	6	17	3	12	66	b.	Lentibularieæ	2	2	—	2	8
d.	Paronychieæ	1	1	—	2	2	b.	Plantagineæ	1	2	—	1	5
c.	Malvaceæ	1	1	—	3	5	d.	Nyctagineæ	2	2	—	2	3
d.	Tiliaceæ	1	1	—	2	2	a.	Polygoneæ	4	14	—	5	34
d.	Hypericineæ	1	1	—	1	8	c.	Amaranthaceæ	1	1	—	1	6
c.	Acerineæ	2	3	—	2	8	b.	Chenopodeæ	8	17	1	8	20
c.	Oxalideæ	1	1	—	1	5	b.	Santalaceæ	1	2	—	1	2
c.	Geraniaceæ	1	4	—	2	6	b.	Elagneæ	2	3	—	2	3
b.	Balsamineæ	1	2	—	1	2	d.	Aristolochiæ	1	1	—	1	1
d.	Rhamneæ	2	2	—	2	6	c.	Euphorbiaceæ	1	1	—	2	8
d.	Anacardiaceæ	1	2	—	1	6	c.	Cupuliferæ	3	4	1	5	15
a.	Leguminosæ	13	50	7	26	98	a.	Salicaceæ	1	28	—	1	44
a.	Rosaceæ	16	48	7	24	124	b.	Salicineæ	1	3	—	1	4
b.	Haloragaceæ	3	4	—	4	10	d.	Cannabinaceæ	1	1	—	2	2
a.	Onagrariæ	3	13	2	6	28	b.	Urticaceæ	3	3	—	4	8
c.	Cucurbitaceæ	1	1	—	2	2	b.	Betulaceæ	2	4	—	2	11
d.	Cactaceæ	1	4	4	1	2	b.	Coniferæ	5	13	4?	7	20
d.	Loaseæ	1	1	—	1	3	b.	Typhaceæ	2	3	—	2	4
b.	Grossularieæ	1	7	—	1	15	b.	Aroideæ	3	3	—	6	9
a.	Saxifrageæ	4	15	—	8	56	b.	Naiades	2	4	—	4	14
b.	Crassulaceæ	1	2	—	2	3	c.	Alismaceæ	3	5	—	2	3
b.	Umbelliferæ	10	14	1	28	39	d.	Hydrocharideæ	1	1	—	2	2
b.	Araliaceæ	1	3	—	3	7	b.	Orchideæ	8	13	—	16	54
d.	Loranthaceæ	1	1	—	1	1	b.	Irideæ	2	2	—	2	8
b.	Corneæ	1	4	—	1	7	b.	Liliaceæ	11	20	—	16	45
b.	Caprifoliaceæ	6	13	—	7	24	b.	Melanthaceæ	4	4	1	5	5
c.	Rubiaceæ	2	5	—	5	15	a.	Juncaceæ	2	13	3	2	23
a.	Compositæ	40	112	8	70	321	d.	Commelynaceæ	1	1	—	0	0
b.	Valerianaceæ	1	1	—	2	6	a.	Cyperaceæ	5	68	4	8	218
a.	Campanulaceæ	1	2	—	1	8	a.	Gramineæ	33	62	—	49	153
d.	Lobeliaceæ	1	1	—	1	6	b.	Filices	13	17	—	17	47
b.	Vaccineæ	2	5	—	1	16	a.	Zycopodiaceæ	1	4	—	2	12
a.	Ericaceæ	7	9	—	10	40							

Summary of above in Monsieur Bourgeau's Collection.

819 species.
349 genera.
92 orders.

Of these orders

a. 19 range into the arctic province.
b. 40 „ into the subarctic zone.
c. 14 „ into central district of the woody zone.
d. 29 „ are restricted in their range to the central arid district, or to the eastern and western woody districts.

Of the same orders, there have been enumerated by Richardson in British and Russian North America,

471 genera.
2155 species.

The total flora he enumerates comprising—

118 orders.
509 genera.
1725 Dicotyledones.
554 Monocotyledones.

2279 species.

* These columns are from the Tables given in the "Arctic Searching Expedition, by Sir John Richardson, 1851," Vol. 2, p. 322. It is hardly necessary to remark that in this and the other works of this veteran explorer and philosopher will be found generalizations respecting the climate and vegetation of British North America, which the results of this Expedition have only served to establish respecting a small area of the region of which he treated.

List of Flowering Plants and Ferns gathered in Captain Palliser's Expedition by M. Bourgeau, the Botanical Collector.

Ranunculaceæ.	No. of sp. collected.
Atragene Americana, *Sims.* Kakabeka Falls and Rocky Mountains	5
Clematis ligusticifolia. *Torr and Gr.*	
Thalictrum Cornuti, *L.* Saskatchewan Plains	4
Thalictrum dioicum, *L.* Canoe route and Saskatchewan Plains	18
Anemone patens, *L.* Saskatchewan Plains	25
Anemone Pensylvanica, *L.* Canoe route and Saskatchewan	16
Anemone parviflora., *Michx.* Rocky Mountains	20
Anemone multifida, *L.* East Saskatchewan. Var. glabra. Rocky Mountains	40
Anemone Virginiana, *L.* Fort Garry	
Anemone nemorosa, *L.*	
Anemone cylindrica, *A. Gray.* Kakabeka Falls	
Ranunculus abortivus, *L.* Fort Carlton and Canoe route	15
Ranunculus sceleratus, *L.* West Saskatchewan	30
Ranunculus repens, *L.* East Saskatchewan	16
Ranunculus rhomboideus. *Gold.* East Saskatchewan. Rare	24
Ranunculus Purshii, *Prichard.* Saskatchewan	40
Ranunculus Purshii, *Var. 3.* South and East Saskatchewan. Rare.	25
Ranunculus reptans, *L.* Saskatchewan	30
Ranunculus Cymbalaria, *Pursh.* Red River to Saskatchewan	12
Ranunculus Elscholtzii, *Schl.* Alpine Rocky Mountains	8
Ranunculus cardiofolyllus, *Hook.* West Saskatchewan	40
Ranunculus repens, *L.* East Saskatchewan	
Ranunculus aquatilis, *L.* Var. Saskatchewan and Canoe route	16
Caltha palustris, *L*	
Coptis trifolia. *Salish.* Lake Superior, N. shore	
Aquilegia Canadensis, *L.* Canoe route and Rocky Mountains	20
Aquilegia brevistyla, *Hook.* Rocky Mountains	13
Actæa rubra, *Big.* Rocky Mountains	1
Actæa alba, *Big.* Rocky Mountains	
Delphinium scopulorum, *A. Gray.* Rocky Mountains	20
Delphinium azureum, *Var.* Lake Winipeg	7
Menispermaceæ.	
Menispermum Canadense, *L.* Lake Winnipeg	1
Berberideæ.	
Berberis aquifolia, *D.C.* West side of Rocky Mountains only	1
Saraceniaceæ.	
Saracenia purpurea, *L.* Prairie Portage, Canoe route. Rare	1
Nymphaceæ.	
Nymphæa advena, *Ait.* Canoe route, and west side of mountains	3
Papaveraceæ.	
Sanguinaria Canadensis, *L.* Winipeg River	
Fumariaceæ.	
Corydalis aurea, *Willd.* Saskatchewan	7
Corydalis glauca, *Pursh.* Perch Lake, Canoe route	7

Cruciferæ.	No. of sp. collected.
Nasturtium palustre, *D.C.* West Saskatchewan. Rare.	
Barbarea præcox, *R. Br.* Red River	2
Barbarea vulgaris, *R. Br.*	
Turritis patula *Grah.* Alpine Rocky Mountains, also Saskatchewan	35
Turritis glabra, *L.* West Saskatchewan	4
Turritis retrofracta, *Hook.* West Saskatchewan and Rocky Mountains	10
Arabis hirsuta, *Scop.* Saskatchewan and Rocky Mountains	29
Cardamine hirsuta, *L.* Saskatchewan	20
Vesicaria didymocarpa, *Hook.* South exposures of Rocky Mountains	40
Vesicaria arctica, *R. Br.* Saskatchewan	10
Vesicaria arctica, *Var. 3.* North Saskatchewan in Thick-woods	
Vesicaria Ludoviciana? Saskatchewan	10
Draba lutea. *Gilb.* Red River to Saskatchewan	15
Draba alpina. Alpine Rocky Mountains	8
Draba (sp. 1) (Arabascans, *Meek?*)	
Draba Arabascans, *Meek.* Alpine Rocky Mountains	1
Draba (sp. 2.) Alpine Rocky Mountains	1
Draba (sp. 3.) Alpine Rocky Mountains	3
Draba (sp. 4.) Alpine Rocky Mountains	1
Draba (sp. 5.) (incana *L.?*)	
Draba incana. Saskatchewan and Rocky Mountains	2
Thalspi arvense, *L.* Lake Winipeg	2
Smelowstria calegeina. *E. Mey.* Rocky Mountains	15
Sisymbrium canescens, *Nutt.* Saskatchewan to Rocky Mountains	7
Erysimum cheiranthoides, *L.* Winipeg River	6
Erysimum asperum, *D.C.* Saskatchewan	20
Erysimum (sp. 1.) Saskatchewan to Rocky Mountains	16
Erysimum (sp. 2.) Rocky Mountains	1
Camelina sativa, *Crantz.* Introduced at Red River	
Nesllia paniculata. Introduced at Red River	
Lepidium Virginicum, *L.* Saskatchewan	22
Lepidium savitum, *L.* Introduced at Red River	
Capparideæ.	
Cleome integrifolia, *Forrd Gr.*. West Saskatchewan	14
Polanisia trachysperma, *A. Gr.* Crow Wing, United States	1
Cistineæ.	
Helianthemum Canadense, *Mx.* Pembina to Crow Wing	
Violaceæ.	
Viola pubescens, *Ait.* Canoe route and Saskatchewan	20
Viola Canadensis, *L.* North Saskatchewan, in Thick-woods	
Viola Muhlenbergii. *Torr.* Saskatchewan to Oregon	20
Viola cucculata, *Ait.* Kakabeka Falls	10

	No. of sp. collected.
Viola blanda, *Willd.* North Saskatchewan, in Thick-woods	3
Viola Nuttaliana, *Pursh.* North Saskatchewan. Rare	10
Viola pedata, *L.* Saskatchewan	30
Polygalaceæ.	
Polygala paucifolia, *Willd.* Kakabeka Falls	
Polygala Senega, *L.* Canoe route and Saskatchewan	40
Polygala verticillata, *L.* Saskatchewan	
Droseraceæ.	
Drosera rotundifolia, *L.* Fort Francis. Canoe route	
Linaceæ.	
Linum perenne, *L.*	
Linum rigidum, *Pursh.* Saskatchewan	
Caryophyllaceæ.	
Moehringia lateriflora, *Teazl.* Canoe route	14
Cerastium arvense, *L.* Saskatchewan	5
Cerastium viscosum, *L.* introduced? Fort Edmonton	
Cerastium Alpinum, *L.* Alpine Rocky Mountains	8
Cerastium (sp.) West Saskatchewan	
Arenaria propinqua, *Rich.* Alpine Rocky Mountains	2
Arenaria Rossii, *R. Br.* Alpine Rocky Mountains	4
Arenaria (sp.) Alpine Rocky Mountains	4
Stellaria borealis, *Rig.* Alpine Rocky Mountains	1
Stellaria longifolia, *Muhl.* Saskatchewan	12
Stellaria longipes, *Goldi.* Winipeg to Rocky Mountains	76
Stellaria (sp.) Rocky Mountains	6
Lychnis apetala, *L.* Alpine Rocky Mountains	6
Silene Drummondi, *Herth.* Canoe route	3
Silene Antirrhina, *L.* Pembina	8
Silene acaulis, *L.* Alpine Rocky Mountains	3
Silene Scouleri, *Pursh.* Valleys of Rocky Mountains	12
Paronychiaceæ.	
Paronychia sessiliflora, *Nutt.* Rocky Mountains	20
Malvaceæ.	
Malvastrum coccineæ. Arid plains of Saskatchewan	40
Tiliaceæ.	
Tilia Americana, *L.* Red River	7
Hypericineæ.	
Hypericum pyramidatum. Crow Wing, United States	1
Aceraceæ.	
Negundo aceroides, *Moench.* Saskatchewan	4
Acer rubrum, *L.* Rat Portage, Canoe route	
Acer spicatum, *Lanell.* (montanum?) Rat Portage, Canoe route	
Oxalideæ.	
Oxalis corniculata, *L.*	
Geraniaceæ.	
Geranium Carolinianum, *L.* Lake Winipeg	1
Geranium Hookerianum, *Walph.* West Saskatchewan	18
Geranium albiflorum? Rocky Mountains	1
Geranium maculatum? West Saskatchewan	18
Balsamineæ.	
Impatiens fulva, *Nutt.* Red River	
Impatiens pallida? *Nutt.* Red River	
Phamnaceæ.	
Phamnus alnifolius, *L. Herit.*	
Cranolthus Americanus, *L.* Crow Wing, United States	4
Anacardiaceæ.	
Rhus glabra, *L.* Crow Wing, United States	2
Rhus Toxicodendron, *L.* Rainy Lake	
Leguminosæ.	
Thermopsis rhombifolia, *Nutt.* Elbow of South Saskatchewan to Carlton. Rare	24
Psoralea esculenta, *Pursh.* Red River to Rocky Mountains	26
Psoralea (brachiata, *Dougl.* esculenta). Pembina and Rocky Mountains	11
Psoralea argophylla, *Pursh.* Saskatchewan	
Amorpha nana, *Nutt.* Red River	7
Amorpha canescens, *Nutt.* St. Joseph's	17
Amorpha fruticosa, *Nutt.* Red River	7
Glycirrhiza lepidota, *Nutt.* Saskatchewan	3
Petalostemon villosum, *Nutt.* On the sand-hills of the Souri River	
Petalostemon candidum, *Michx.* Saskatchewan	
Petalostemon violaceum, *Michx.* Saskatchewan	
Petalostemon albidum, *D.C.* Var. candidum. Souri River	6
Astragalus pauciflorus, *Hook.* Alpine Rocky Mountains (occurs on the River Platte)	25
Astragalus Missouriensis, *Nutt.* Saskatchewan	20
Astragalus caryocarpus, *Pier.* (Buffalo apples.) Saskatchewan	12
Astragalus Drummondi, *Dougl.* Saskatchewan	25
Astragalus hypoglottis, *L.* (A. striatus, *Nutt.* var. adsurgens). Saskatchewan, also Alpine Rocky Mountains	30
Astragalus Canadensis, *L.* Saskatchewan. rare	5
Astralagus adsurgens, *Pall.* Fort Garry	
Phaca elongata, *Hook.* Saskatchewan to Rocky Mountains	40
Phaca bisulcata, *Hook.* Saskatchewan	40
Phaca frigida, *L.* Saskatchewan	25
Phaca astragalina, *D.C.* Rocky Mountains	3
Phaca cæspitosa, *D.C.* Fort Pitt. Rare	1
Phaca aboriginorum, *Hook.* Saskatchewan to Rocky Mountains	12
Phaca elegans, *Hook.* Saskatchewan. Rare	15
Phaca pectinata, *Hook.* Saskatchewan. Rare	25
Phaca (sp. 1.) Rocky Mountains	6
Phaca oroboides, *D.C.* Rocky Mountains	10
Phaca (sp. 3.) Rocky Mountains	15
Phaca (sp. 4.) (Astragulus nigrescens?) Saskatchewan	30
Phaca (sp. 5.) (elegans, *Hook?*) Saskatchewan	1
Oxytropis deflexa, *D.C.* Saskatchewan	22
Oxytropis arctica, *var.* Alpine Rocky Mountains	7

	No. of sp. collected.
Oxytropis campestris, *D.C.* Saskatchewan to Rocky Mountains	57
Oxytropis Lambertii, *Pursh.* Rocky Mountains	25
Oxytropis Lambertii, var. speciosa. Souri River	
Oxytropis splendens, *Dougl.* Saskatchewan	22
Lalthyrus ochroleucus, *Hook.* Lake Superior and Saskatchewan	20
Lalthyrus venosus, *Muehl.* Saskatchewan	25
Lalthyrus maritimus, *Big.* Fort Garry	16
Lalthyrus palustris, *L.* St. Joseph, U. S.	3
Vicia sativa, *L.* (cult.) Introduced at Red River	
Vicia Americana, *Muehl.* Saskatchewan	40
Vicia Americana. Var. 3. *Hook.* Carlton	12
Hedysarum Mackenzii, *Rich.* Saskatchewan and Rocky Mountains	60
Hedysarum boreale, *Nutt.* Saskatchewan	40
Hedysarum (sp. 1.) Rocky Mountains	25
Hedysarum (sp. 2.) Rocky Mountains	12
Desmodium Canadense, *D.C.* Carlton	4
Desmodium acuminatum, *D.C.* Pembina to St. Pauls, U. S.	6
Rosaceæ.	
Cerasus pumila, *Michx.* Winipeg	15
Cerasus Virginiana, *D.C.* Saskatchewan	20
Cerasus Pensylvanica, *Loisel.* Saskatchewan and Rocky Mountains	10
Prunus Americana, *Marsh.* Red River	
Spiræa salicifolia, *L.* Lake Winipeg	14
Spiræa betulifolia, *Pall.* Rocky Mountains	30
Chamærodos erecta, *Ege.* Saskatchewan	20
Sieversia triflora, *R. Br.*	
Geum strictum, *Ait.* Saskatchewan	16
Geum rivale, *L.* Rocky Mountains	8
Dryas Drummondi, *Hook.* Alpine Rocky Mountains	20
Dryas octopetala, *L.* Alpine Rocky Mountains	20
Agrimonia pilosa, *Led.* South Saskatchewan	3
Comarum palustre, *L.* Lake Winipeg	1
Fragaria Virginiana, *Mill.* Saskatchewan	12
Fragaria (sp.) Red River	16
Potentilla tridentata, *Ait.*	7
Potentilla fruticosa, *L.* Saskatchewan	30
Potentilla Norvegica, *L.* Saskatchewan	9
Potentilla Pensylvanica, *L.* with var. Saskatchewan	9
Potentilla argenta, *Pursh.*	
Potentilla Canadensis, *L.*	
Potentilla supina, *L.*	
Potentilla anserina, *L.* Saskatchewan	12
Potentilla concinna, *Prichard*	
Potentilla effusa, *Dougl.* Rocky Mountains	10
Potentilla flabelliformis, *Lehm.* Saskatchewan	20
Potentilla nivia, *L.* Rocky Mountains	2
Potentilla rubricaulis, *Lehm.* Rocky Mountains	1
Potentilla sericea, *L.?* Saskatchewan	12
Potentilla Drummondi? *Lehm.* Rocky Mountains	
Potentilla diversifolia, *Lehm.*	
Potentilla (sp. 1). Rocky Mountains and Saskatchewan	18
Potentilla (sp. 2). Saskatchewan	7
Potentilla (sp. 3). Rocky Mountains	18
Potentilla (sp. 4). Rocky Mountains	1
Potentilla (sp. 5). Saskatchewan	4
Rubris triflorus, *Prich.* Saskatchewan	8
Rubris arcticus, *L.* Lake Winipeg	15
Rubris strigosus, *Michx.* Saskatchewan	10
Rubris Mutkanus, *Nutt.* Rocky Mountains	1
Rubris pedatus. Rocky Mountains	1
Rosa blanda, *Ait.*	
Rosa (sp.) Many varieties. Saskatchewan	40
Cratægus tomentosa, *L.* Lake Winipeg	10
Cratægus coccinea. Saskatchewan	
Amelanchier Canadensis, *Torr.* and *Gr.* Saskatchewan and Rocky Mountains	12
Pyrus ancuparida, *D.C.* Winipeg River	2
Haloragieæ.	
Hippuris vulgaris. Saskatchewan	5
Myriophyllum verticillatum, *L.* Saskatchewan	10
Myriophyllum spicatum, *L.* Saskatchewan	2
Circæa alpina, *L.* var. Alpine Rocky Mountains	
Onagraceæ.	
Œnothera biennis, *L.*	
Œnothera punicla, *L.*	
Œnothera serratula. var. *Dougl.* Saskatchewan	3
Œnothera triloba, *Nutt.* Saskatchewan	7
Œnothera albicaulis. Saskatchewan	2
Gaura coccinea, *Spack.* Saskatchewan	30
Epilobium palustre, *L.* Saskatchewan	1
Epilobium angustifolium, *L.* Rocky Mountains and North Saskatchewan	4
Epilobium latifolium, *L.* Rocky Mountains	30
Epilobium tetragonum, *L.* Saskatchewan	5
Epilobium alpinum, *L.* Alpine Rocky Mountains	1
Epilobium origanifolium. Rocky Mountains	8
Epilobium (sp.)	
Cucurbitaceæ.	
Echinocystus lobatus. *Nix.*	1
Cactaceæ.	
Opuntia (sp. 1.) Missouriensis. Arid plains, Saskatchewan	
Opuntia (sp. 2.) Arid plains, Saskatchewan	
Opuntia (sp. 3.) Arid plains, Saskatchewan	
Opuntia (sp. 4.) Arid plains, Saskatchewan	
Loasaceæ.	
Mentzelia ornata, *Torr.* and *Gr.*	
Grossulariaceæ.	
Ribes floridum, *L.* Winipeg	7
Ribes oxycanthoides, *L.* Saskatchewan	6
Ribes rubrum, *L.* Saskatchewan	6
Ribes Hudsonianum, *Rich.* Winipeg	3
Ribes lacustre, *Bir.* Rocky Mountains	6
Ribes hirtellum. *Michx.*	
Ribes Anseum, *Pursh.*	
Saxifragaceæ.	
Heuchera Richardsonii, *Br.* Saskatchewan	14
Mitella nuda, *L.* Winipeg	20
Saxifraga controversa, *Stern.* Alpine Rocky Mountains	25
Saxifraga oppositifolia, *L.* Alpine Rocky Mountains	2
Saxifraga hyperborea, *Br.* Alpine Rocky Mountains	4
Saxifraga aizoides, *L.* Alpine Rocky Mountains	7

	No. of sp. collected.
Saxifraga Virginiana, *Michx.* Rocky Mountains	10
Saxifraga Dahurica, *Pall.* Alpine Rocky Mountains	30
Saxifraga tricuspidata, *Retz.* Winipeg	14
Saxifraga bronchialis, *L.* Alpine Rocky Mountains	30
Saxifraga cernua, *L.* Alpine Rocky Mountains	6
Saxifraga cæspitosa, *L.* Alpine Rocky Mountains	20
Parnassia Kobzibuci, *Cham.* Rocky Mountains	17
Parnassia palustris, *L.* Saskatchewan	19
Parnassia fimbrata, *Hook.*	
Crassulaceæ.	
Sedum Rhodiola, *D.C.* Rocky Mountains	12
Sedum stenopitatum, *Pursh.* Rocky Mountains	14
Umbelliferæ.	
Sanicula Marilemdica, *L.* Saskatchewan	5
Carum Carui, *L.*	
Thaspium cordatum, *Torr.* and *Gr.*	
Thaspium Barbinode? *Nutt.*	
Thaspium macrocarpum, *Nutt.* Saskatchewan	10
Tizia aurea, *Koch.*	
Cicuta virosa, *L.* Saskatchewan	2
Cryptolæmia Canadensis, *L.* Red River	1
Sium lineare, *Michx.* Saskatchewan	7
Peucedanum macrocarpum, *Nutt.* Saskatchewan	10
Peucedanum (sp. nov.?) Saskatchewan	15
Heracleum lanatum, *Michx.* Saskatchewan	5
Osmorrhiza longistylis, *D.C.* Winipeg	6
Osmorrhiza brevistylis, *D.C.* Rocky Mountains	4
Araliaceæ.	
Aralia nudicaulis, *L.* Saskatchewan	7
Aralia spinosa, *L.* Lake Winipeg	1
Aralia hispida, *Michx.*	
Loranthaceæ.	
Arcenthobium oxycedre	
Cornæ.	
Cornus Canadensis, *L.* Saskatchewan	3
Cornus stolonifera, *Michx.* Saskatchewan to Rocky Mountains	8
Cornus circinata, *L. Herit.*	
Cornus (sp.)	
Caprifoliaceæ.	
Sambucus racemosa, *L.*	
Sambucus Canadensis, *L.* Rocky Mountains	1
Symphoriocarpus racemosus, *Michx.* Saskatchewan to Rocky Mountains	17
Symphoriocarpus occidentalis, *B.* and *Br.* Saskatchewan	13
Linnæa borealis, *Gronor.* Saskatchewan	6
Dierbitta trifida, *Moench.*	
Lonicera involucrata, *Banks.* Rocky Mountains	14
Lonicera parviflora, *Lauck.* Saskatchewan	20
Lonicera oblongifolium	
Viburnum opulus, *L.* North Saskatchewan, Thick-woods	
Viburnum Lentago, *L.* Winipeg	6
Viburnum pubescens, *Pursh.* Winipeg	2
Viburnum pauciflorum, *Rylace.* Saskatchewan	15

	No. of sp. collected.
Rubiaceæ.	
Hediotis purpura, *Hook.*	
Hediotis angustifolia, *Hook.*	
Galium triflorum, *Mx.*	
Galium boreale, *L.*	
Galium trifidum, *L.*	
Compositæ.	
Liatris scariosa, *Willd.*	
Eupatorium purpureum, *L.*	
Nardosmia sagittata, *Hook.* Saskatchewan	9
Nardosmia corymbosa, *Hook.*	
Nardosmia palmata, *Hook.*	
Aster alpinus, *L.* Alpine Rocky Mountains	14
Aster lævis, *Torr* and *Gr.* Saskatchewan and Rocky Mountains	37
Aster Lindleyanus, *Torr* and *Gr.* Saskatchewan	20
Aster multiflorus, *Ait.* Saskatchewan	16
Aster conspicuus, *Lindl.* Rocky Mountains	28
Aster montanus, *Richards.* Alpine Rocky Mountains	30
Aster simplex, *Willd.*	
Aster pumiceus, *L.*	
Aster Novæ Angliæ, *L.*	
Aster ptarmicoides, *Torr* and *Gr.*	
Aster laxiflorus	
Aster augustus, *Torr* and *Gr.*	
Aster salsiginoides, *Richard.* Alpine Rocky Mountains	
Erigeron sonchfolyllum? *Rich.*	6
Erigeron canescens, *Torr* and *Gr.* Saskatchewan and Rocky Mountains	60
Erigeron cæspitosum, *Nutt.*	
Erigeron strigosum, *Muhl.* Winipeg	1
Erigeron glabellum, *Nutt.* Saskatchewan and Rocky Mountains	29
Erigeron Philadelphicum, *L.* Saskatchewan	8
Erigeron uniflorum, *L.* Alpine Rocky Mountains	20
Erigeron compositum, *Pursh.* Alpine Rocky Mountains	3
Erigeron acris, *L.* Rocky Mountains	2
Erigeron (nov.?) Alpine Rocky Mountains	6
Erigeron (yellow flowers). Alpine Rocky Mountains	6
Erigeron macranthum, *Nutt.* Rocky Mountains	1
Diphlopappus umbellatus? *Hook.* Rocky Mountains	10
Townsendria sericea, *Hook.* Rocky Mountains	10
Gutierretzia Eutliamiæ, *Torr* and *Gr.*	
Solidago Missouriensis, *A. Gr.* Saskatchewan	3
Solidago humilis, *Banks.* Rocky Mountains	10
Solidago virgaurea, *L.*, var. Rocky Mountains	12
Solidago rigida, *L.* Saskatchewan	8
Solidago lanceolata, *L.* Saskatchewan	14
Solidago Missouriensis, *A. Gr.* Saskatchewan	8
Solidago nemoralis. var. (sp. 2.) Rocky Mountains	2
Solidago incana, *Torr* and *Gr.* nemoralis. Saskatchewan	2
Solidago Canadensis. Saskatchewan	
Solidago procera. Saskatchewan	
Solidago gigantea. Saskatchewan	
Aplopappus lanceolatus, *Torr* and *Gr.*	
Aplopappus spinulosus, *D.C.*	
Aplopappus Nuttallia, *Torr* and *Gr.*; *Dumal.* Saskatchewan	3
Chrysopsis villosa, *Nutt.* Saskatchewan	10
Toa xanthifolia, *Nutt.*	
Toa axillaris, *Pursh.* Saskatchewan	25
Ambrosia artemisifolia, *L.*	

	No. of sp. collected.
Ambrosia trifolia. Winipeg	1
Franseria Hookeriana. *Nutt.*	
Xanthium strumarium	
Xanthium Canadense	
Heliopsis lævis *Pers.*	
Echinacea angustifolia, *D.C.*	
Rudbeckia hirta, *L.*	
Rudbeckia laciniata, *L.*	
Lepachys columnaris, *Torr* and *Gr.* Saskatchewan	6
Helianthus lenticularis, *Dougl.*	
Helianthus petiolaris, *Nutt.*	
Helianthus giganteus? *L.*	
Helianthus rigidus, *Desf.* Saskatchewan	6
Helianthus (sp. 1.) var. giganteus. Saskatchewan	7
Helianthus (sp. 2.) Maximiliani. Saskatchewan	1
Helianthus (sp. 3.) strumosus, var.	
Coreopsis delphinifolia, *Lam.* Winipeg	13
Coreopsis rigida, var. *B.*	
Bidens frondosa, *L.*	
Bidens comata, *Muhl.*	
Guillardia aristata, *Pursh*	
Actinella Richardsonii, *Nutt.* Saskatchewan	30
Helenium autumnale, *L.* Saskatchewan	1
Amida hirsuta, *Nutt.*	
Achillæa millefolium, *L.* Saskatchewan and Rocky Mountains	8
Achillæa multiflora, *Hook.* Saskatchewan	8
Artemisia frigida, *Torr* and *Gr.* Saskatchewan	20
Artemisia Canadensis, *Mx.* Saskatchewan and Rocky Mountains	28
Artemisia biennis, *Willd.* Saskatchewan	5
Artemisia discolor, *Dougl.* Rocky Mountains	30
Artemisia Ludoviciana. *Nutt.* Saskatchewan	12
Artemisia dracunculoides, *Pursh.* Saskatchewan	3
Artemisia cana, *Pursh.*	
Artemisia (sp. 1.)	
Antennasia Carpatica, *R. Br.* Saskatchewan	40
Antennasia alpina, *Gaert.* Alpine Rocky Mountains	12
Antennasia divisa, *Gaert.* Saskatchewan	70
Antennasia racemosa, *Hook.* Rocky Mountains	17
Senecio aureus, *L.* Saskatchewan and Rocky Mountains	30
Senecio lugens, *Richards.* Rocky Mountains	15
Senecio exaltatus? *Nutt.* Saskatchewan	30
Senecio palustris, *Hook.* Saskatchewan	6
Senecio canus, *Hook.* Saskatchewan and Rocky Mountains	38
Senecio triangularis, *Hook.*	
Arnica angustifolia, *Vahl.* Saskatchewan and Rocky Mountains	12
Arnica Chamissoni, *Less.* Rocky Mountains and Saskatchewan	37
Arnica latifolia, *Bong.*, var. Rocky Mountains	5
Arnica cordifolia, *Hook.* Rocky Mountains	10
Saupurea alpina, *D.C.*, var. *B.*	
Circium Hookerianum, *Nutt.* Saskatchewan	12
Circium discolor, *Spreng.* Rocky Mountains	9
Circium Drummondi, *Torr* and *Gr.* Saskatchewan	12
Circium foliosum, *D.C.* Rocky Mountains	2
Hieracium Canadense, *Michx.* Rocky Mountains	3
Nabulus albus, *Hook.*	
Nabulus racemosus, *Hook.* Saskatchewan	9
Lygodesmia juncea, *Don.*	
Crepis runcinata, var.? *Torr* and *Gr.* Rocky Mountains	30
Crepis nana, *Richard.*	
Crepis elegans, *Hook.*	
Troximon glaucum, *Nutt.* Saskatchewan	10
Troximon (sp. 1.) Rocky Mountains	10
Taraxacum Dens Leonis, *Derf.* Saskatchewan. Unique	1
Mulgedium palchellum, *Nutt.* Saskatchewan	1
Mulgedium Floridianum, *D.C.*	
Valerianaceæ.	
Valeriana sylvatica, *Richard*	
Campanulaceæ.	
Campanula rotundifolia, *L.* Saskatchewan	10
Campanula aparinoides, *A. D.C.* Winipeg	10
Lobeliaceæ.	
Lobelia Claytoniana, *L.* Saskatchewan	2
Vaccineæ.	
Vaccinium corymbosum	
Vaccinium Canadense, *Michx.* Winipeg	6
Vaccinium Vitis Idæa, *L.* Winipeg	8
Vaccinium Myrtillus, *L.* Rocky Mountains. Unique	1
Oxycoceus palustris. *Pers.* Winipeg. Unique	1
Ericaceæ.	
Arctostaphylus Uva Ursi, *L.* Saskatchewan (abundant everywhere).	2
Cassandra calyculata, *Don.* Winipeg	17
Andromeda polyfolia, *L.*	
Ledum palustre, *L.*	
Ledum latifolium, *L.* Winipeg	4
Kalmia glauca, *L.*	
Menziesia glandulifera, *Hook.* Rocky Mountains	20
Menziesia globularis, *Salisf.* Rocky Mountains	3
Cassiope tetragona, *Don.* Rocky Mountains	17
Pyrolaceæ.	
Moneses uniflora, *Salisf.* Rocky Mountains	12
Pyrola secunda, *L.* Rocky Mountains	12
Pyrola rotundifolia, *L.* Rocky Mountains	20
Pyrola chlorantha, *Sw.* Rocky Mountains	2
Primulaceæ.	
Maumbergia thyrsiflora, *Moench.*	
Trientalis Americana, *L.* Winipeg	7
Androsace septentrionalis, *L.* Saskatchewan	10
Androsace Chamagaome, *L.* Rocky Mountains	30
Glaux maritima, *L.* Saskatchewan	30
Dodycatheon media, *L.* Saskatchewan	30
Lysimachia ciliata, *L.* Saskatchewan	12
Lysimachia longifolia, *Pursh.* Winipeg	10
Primula Hornemanniana, *Hook.* Saskatchewan	8
Primula farinosa, *L.* Saskatchewan	30
Oleaceæ.	
Fraxinus viridis, *Michx.* Winipeg	4
Gentianaceæ.	
Gentiana propinqua, *Richard.* Rocky Mountains	14
Gentiana affinis, *Suo.* Saskatchewan	17
Gentiana detonsa. Var. Saskatchewan	25

	No. of sp. collected.
Gentiana acuta, *Michx.* Saskatchewan	20
Gentiana laponaria, *L.*	
Halenia deflexa, *L.*	
Apocyneæ.	
Apocynum hypericifolium, *L.* Winipeg	1
Apocynum androsomacfolium. *L.* Winipeg	9
Asclepiadeæ.	
Ascelepias ovalifolia, *Dem.* Winipeg	7
Ascelepias incarnata, *L.* Winipeg	7
Ascelepias cornuta, *L.* Winipeg	1
Ascelepias Douglasii, *Hook*	
Aceratas viridiflora, *Ell.* Winipeg	2
Polemoniaceæ.	
Phlox Hoodii, *Richard.* Saskatchewan	12
Phlox aristata, *Michx.* Winipeg	25
Collomia parviflora, *Nutt.*	
Collomia linearis, *Nutt.*	
Polemonium cœruleum, var. γ. Rocky Mountains	22
Hydrophylleæ.	
Ellisia nyctalea, *L.* Saskatchewan	21
Convolvulaceæ.	
Calystegia sepium, *Br.*	
Solaneæ.	
Solanum triflorum, *Hook.* Saskatchewan	4
Physalis grandiflora? *Hook*	
Physalis hirsuta? Winipeg	8
Physalis (sp. 1.) Winipeg	2
Physalis (sp. 2.) Winipeg	4
Boragineæ.	
Lithospermum canescens, *Lehm.* Saskatchewan	8
Lithospermum linearifolium, *Gold.* Winipeg	10
Lithospermum arvense, *L.* Winipeg. Unique	1
Lithospermum pilosum? *Nutt.* Rocky Mountains	8
Echinospermum Virginianum, *Lehm.*	
Echinospermum glomeratum? Saskatchewan	24
Echinospermum Redososkii, *Lehm.* Saskatchewan	30
Echinospermum floribundum, *Lehm.* Saskatchewan	12
Echinospermum Cappula, *Lehm.*	
Onosmodium hispidum, *Michx.* Winipeg	5
Eritrichium (sp. 1.) Saskatchewan	30
Eritrichium (sp. 2.) Saskatchewan	30
Pentalophus longiflorus, *A. D.C.* Saskatchewan	10
Pentalophus Mandanensis, *A. D.C.* Saskatchewan	8
Myosotis alpestris, *Schnuett.* Rocky Mountains	6
Mertensia paniculata, *Don.* Saskatchewan	15
Symphytum officinale? *L.*	
Labiatæ.	
Mentha Canadensis, *L.* Saskatchewan	12
Lycopus Virginicus, *L.* Saskatchewan. Unique	1
Monarda fistulosa, *L.* Saskatchewan	15
Lophanthus anisatus, *Benth.* Saskatchewan	9
Dracocephalum parviflorum, *Nutt.* Saskatchewan	4
Prunella vulgaris, *L.* Rocky Mountains	7
Physostegia Virginiana, *Benth.* Saskatchewan. Unique	1
Scutellaria galericulata, *L.* Saskatchewan	4
Stachys palustris, *L.* Saskatchewan	14

	No. of sp. collected.
Verbenaceæ.	
Verbena paniculata, *L.* Winipeg. Unique	1
Scrophulariaceæ.	
Pentstemon gracili, *Nutt.* Saskatchewan	30
Pentstemon confertus, *Dougl.*, var. Rocky Mountains	9
Pentstemon Menziensii? Rocky Mountains	10
Pentstemon procerus, *Dougl.* Saskatchewan	25
Pentstemon niltidus, *Dougl.* Saskatchewan and Rocky Mountains	26
Mimulus rigens, *L.* Saskatchewan	8
Veronica Virginiana, *Schw., L.* Winipeg	12
Veronica Americana, *Schw.* Saskatchewan	8
Veronica Anagallis, *L.* Winipeg	2
Veronica scutellata, *L.* Saskatchewan. Unique	1
Veronica peregrina, *L.* Saskatchewan	20
Veronica sessilifolia, *L.* Winipeg	2
Orthocarpus luteus, *Nutt.* Saskatchewan	15
Castelleja sessiliflora, *Pursh.* Winipeg	2
Castelleja coccinea, *Benth.*	
Castelleja septentrionalis? *Benth.* Saskatchewan and Rocky Mountains	61
Castelleja minuta, *Dougl.*	
Castelleja (sp. 1.) Saskatchewan	25
Castelleja (sp. 2.)	
Rhinanthus minor, *Ehrh.* Rocky Mountains	24
Pedicularis lanceolata	
Pedicularis surrecta? *Benth.* Saskatchewan	30
Pedicularis Canadensis, *Mx.* Winipeg. Unique	1
Pedicularis bracteosa, *Benth.* Rocky Mountains	12
Lentibulariaceæ.	
Utricularia vulgaris, *L.* Saskatchewan	6
Pinguicula grandiflora, *Prau.* Rocky Mountains	1
Plantagineæ.	
Plantago eriopoda, *Torr.* Saskatchewan	6
Plantago major, *L.* Saskatchewan	2
Nyctagineæ.	
Oxybaphus hirsutus, *Hook.* Saskatchewan	6
Cycloptera annua, *Nutt.*	
Polygonaceæ.	
Eriogonum androsaceum, *Benth.* Rocky Mountains	25
Eriogonum flavum *Nutt.* Saskatchewan	30
Eriogonum flavum, var. crassifolium. Rocky Mountains	20
Polygonum tenue, *Mx.* Saskatchewan	4
Polygonum amphibium, *L.* Var. β. Saskatchewan. Unique	1
Polygonum aviculare, *L.* Saskatchewan. Unique	1
Polygonum lapathifolium, var. lanatum. Saskatchewan	8
Polygonum viviparum, *L.* Rocky Mountains	5
Polygonum Convolvolus, *L.* Saskatchewan. Unique	1
Polygonum cilinode, *Michx.*	
Rumex domesticus, *Hartum.* Saskatchewan. Introduced	3
Rumex maritimus, *L.* Saskatchewan	3
Rumex salicifolius, *Ureum.* Saskatchewan	6
Oxyria reniformis, *Hook.* Rocky Mountains	1
Amaranthaceæ.	
Amaranthus retroflexus, *L.* Saskatchewan. Unique	1

	No. of sp. collected.
Chenipodiaceæ.	
Blitium maritimum, *Nutt* - - -	
Blitium capitatum, *L.* Rocky Mountains -	13
Blitium rubrum, var. *Mog.* - - -	
Monolepis Nuttaliana, *Mog.* Saskatchewan -	20
Chenopodium glaucum, *L.* - - -	
Chenopodium hybridum, *L.* - - -	
Chenopodium album, *L.* Saskatchewan -	4
Atriplex hastata, var. - - -	
Atriplex canescens, *Hook.* Saskatchewan -	8
Atriplex littoralis, *L.* - - -	
Eurotia ceratodes - - - -	
Eurotia, var. humifusa, *Mog.* Saskatchewan	15
Conospermum hyssopifolium - - -	
Chenopodina prostrata, *Mog.* - -	
Chenopodina (sp.) - - - -	
Salicornia herbacea - - - -	
Salicornia herbacea, var. prostrata - -	
Santalaceæ.	
Commandra umbellata, *Nutt.* Winipeg -	20
Commandra divida, *Richard* - - -	
Eleagneæ.	
Shepherdia argentea, *Nutt.* - - -	
S. Canadensis, *Nutt.* Saskatchewan. (Unique?) - - - - -	1
Eleagnus argentea, *Kursti.* Saskatchewan -	15
Aristolochiaceæ.	
Asarum Canadense, *L.* - - -	
Euphorbiaceæ.	
Euphorbia glyptosperma. Saskatchewan -	9
Cupuliferæ.	
Quercus rubra, *L.* Winipeg - -	4
Q. obtusiloba, *Michx.* Winipeg. - -	5
Corylus Americana, *Watt.* Winipeg. Saskatchewan - - - -	3
Carpinus (sp. ?). Winipeg. Unique - - - - -	13
Salicineæ.	
Populus balsamifera, *L.* Saskatchewan and Rocky Mountains - - -	12
P. grandidentata, *Michx.* Elbow of South Saskatchewan. Unique - - -	1
P. tremuloides, *Michx.* Saskatchewan and Rocky Mountains - - - -	9
Salicaceæ.	
Salix discolor, *Muhl.* S. and W. - -	
S. ericeptiala, *Muhl.* S. and W. - -	
S. cordata, *Muhl.* S. - - -	
S. cordata, var. vitellina, *And.* S. - -	
S. pyrolifolia, *Led.* W. - - -	
S. cordata padifolia, *And.* R. M. - -	
S. cordata pseudo mersmetes, *And.* R. M. -	
S. cordata rubhastata, *And.* S. - -	
S. petiolaris, *S. M.* W. and S. - -	
S. petiolaris, *S. M.* gracilis, *And.* W. and S.	
S. glauca, *L.* subjolylicifolia. *And.* R. M. -	
S. glauca, *L.* pallida deundata, *And.* R. M. -	
S. glauca, *L.* pallida glabrata, *And.* R. M. -	
S. glauca, *L.* (S. villosa, *Don* and *Hook*) R. M. - - - - -	
S. glauca, *L.* (desertorum, *Rich.*) S. -	
S. longifolia, *Muhl.* pediculata, *And.* S. -	
S. longifolia, *Muhl.* S. - - -	
S. candida, *W.* pellita, *And.* W. - -	
S. candida, *W.* S. and W. - - -	
S. reticulata, *L.* vestita ( ) grandifolia, *And.* R. M. - - - -	
S. arbuscula, *L.*? R. M. - - -	

	No. of sp. collected.
Salix arctica, *R. Br.* subalpeptris, *And.* (forte n. sp.) R. M. - - - -	
S. pentandra Americana, *And.* W. and S. -	
S. pentandra fragiliformis, *And.* W. -	
S. pentandra sublucida, *And.* W. - -	
S. pentandra forma? S. - - -	
S. pendandra forma? S. Carltoniana, *And.* (pro temp. apell.) - - -	
S. vagans (rostrata *Rich.*), *S. W.* - -	
Cannabinaceæ.	
Humulus Lupulus, *L.* - - -	
Urticaceæ.	
Urtica gracilis, *Ait.* Rocky Mountains -	20
Parietaria Pensylvanica, *Muhl.* - -	
Lapostea Canadensis, *Gand.* Winipeg. Unique - - - - - -	1
Betulaceæ.	
Betula glandulosa, *Mx.* Saskatchewan -	5
B. papyracea, *Ait.* Saskatchewan - -	13
B. pumila - - - - -	
Alnus viridis, *D.C.* Rocky Mountains, Winipeg, and Saskatchewan - -	11
Coniferæ.	
Juniperus communis, *L.* Saskatchewan and Rocky Mountains - - -	4
J. Virginiana, *L.*, vel Sabina prostrata. Saskatchewan and Rocky Mountains - -	6
Thuja occidentalis, *L.* Canoe route and Rocky Mountains - - - -	1
Larix microcarpa, *Lam.* North Saskatchewan and Canoe route - - -	1
Abies alba, *Michx.* Saskatchewan and Rocky Mountains - - - -	12
A. balsamea. Rocky Mountains - -	
A. Douglasii, *Lindl.* var. Old Bow Fort. Rocky Mountains - - - -	4
Pinus Banksiana, *Lamb.* Lake Winipeg and Canoe route - - - -	
P. (sp. 1) North Saskatchewan, Rocky Mountains - - -	
P. (sp. 2.) Saskatchewan and Rocky Mountains - - -	
P. (sp. 3.) - - -	
P. (sp. 4.) - - -	
Typhaceæ.	
Sparganium ramosum, *L.* - - -	
S. simplex, *L.* Saskatchewan - -	11
Typha latifolia, *L.* Winipeg - -	2
Aroideæ.	
Arisaema - - - - -	
Caltha palustris, *L.* - - - -	
Lemna piscula, *L.* - - - -	
Naiadeæ.	
Zanichella palustris, *L.* Saskatchewan -	10
Potamogeton pectinatum, *L.* - -	
P. perfoliatum, *L.* - - - -	
P. natans, *L.* - - - -	
Alsinaceæ.	
Triglochin maritima, *L.* Saskatchewan -	4
Sagittaria variabilis, *Engl.* Saskatchewan -	2
Sagittaria variabilis angustifolia. Saskatchewan - - - - -	7
Sagittaria variabilis hastata. Saskatchewan -	3
Alisina plantago - - - -	
Hydrocharideæ.	
Anacharis Canadensis, *Pursh.* Rocky Mountains - - - - -	2

	No. of sp. collected.
Orchidaceæ.	
Calypso borealis, *Salisb.* Winipeg	3
Aplectrum aphyllum, *Nutt.* Saskatchewan	7
Corallorhiza inuata, *Br.* Winipeg	1
Microstylis ophioglossoides, *Nutt.* Winipeg	2
Platanthera hyperborea, *Lindl.* Saskatchewan	17
Platanthera obtusata, *Lindl.* Rocky Mountains	8
Platanthera fimbriata, *Lindl.* Winipeg	1
Platanthera Hookerii, *Lindl.*	
Spiranthes cernua, *Lindl.* Rocky Mountains	12
Goodyera repens, *Brown.* Rocky Mountains	14
Cypripedium humile, *Salish.* Winipeg	8
Cypripedium parviflorum, *Salisb.* Saskatchewan	12
Cypripedium pubescens, *Willd.*	
Iridæ.	
Sisyrinchium mucronatum, *Mx.* Saskatchewan	30
Iris Caurina, *Herb.*	
Liliaceæ.	
Allium reticulatum, *Frey.* Saskatchewan	2
Allium Schœnoprasum, *L.* Rocky Mountains	4
Allium cernuum? Saskatchewan	11
Allium stellatum, *Frey.* Saskatchewan	
Allium (sp. 1) Saskatchewan	4
Lilium Canadense, *L.* Winipeg	2
Lilium Philadelphium, *L.* Saskatchewan	5
Uvularia sessilifolia, *L.*	
Uvularia grandiflora, *Sm.*	
Streptossus roseus, *Michx.*	
Streptossus amplexifolius	
Majanthenum bifolium, *Moench.* Winipeg	5
Smilacina racemosa, *Pursh.* Rocky Mountains	9
Smilacina stellata, *Desf.* Saskatchewan	25
Smilacina trifolia, *Desf.*	
Clintonia borealis, *Raf.*	
Prosartes Hookerii, *Torr* and *Gr.* Saskatchewan	6
Convallaria pubescens, *Willd.*	
Smilax lasioneuron, *Hook.* Winipeg	4
Trillium cernuum, *Pursh.*	
Melanthaceæ.	
Zygadenus chloranthus, *Mx.* Saskatchewan and Rocky Mountains	28
Amianthium Nuttalii, *Torr* and *Gr.* Saskatchewan	25
Stenanthium? Rocky Mountains	30
Tofieldia glutinosa, *Vild.* Saskatchewan and Rocky Mountains	37
Juncaceæ.	
Juncus acutiflorus, *Ehrh.*	
Juncus batticus, var. *β.* Saskatchewan	9
Juncus polycephalus, *Mx. γ.* Winipeg	5
Juncus polycephalus, var. *β.*	
Juncus castaneus, var. pallidiflora. Saskatchewan	5
Juncus arcticus	
Juncus affinis, *R. Br.* Saskatchewan	8
Juncus consifolius	
Juncus (sp. 1.) Rocky Mountains	1
Juncus (sp. 2.) Saskatchewan	2
Juncus (sp. 3.)	
Luzula parviflora, *D.C.* Rocky Mountains	12
Luzula spicata	
Commelinaceæ.	
Tradescantia Virginiana, *L.* Winipeg	14

	No. of sp. collected.
Cyperaceæ.	
Cyperus filiculmis, *Wahl.* Winipeg	2
Scirpus maritimus, *L.* Saskatchewan	8
Scirpus atrovirens, *Muhl.* Winipeg	1
Scirpus sylvaticus, *L.* Saskatchewan	5
Scirpus eriophorum, *Wahl.* Saskatchewan	5
Scirpus lacustris, *L.* Winipeg	3
Scirpus triqueter? *L.* var.	
Scirpus (sp. 1.) Rocky Mountains	8
Scirpus (sp. 2.)	
Eleocharis acicularis, *R. Br.* Saskatchewan	4
Eleocharis palustris, *R. Br.* Saskatchewan	20
Eriophorum vaginatum, *L.*	
Eriophorum (sp. 1). Winipeg	6
Eriophorum (sp. 2). Saskatchewan	8
Carex aristata, *Br.* Saskatchewan	8
Carex aurea, *Nutt.* Rocky Mountains	25
Carex adusta, *Boot.* Saskatchewan	12
Carex alpina, *Sw.* Rocky Mountains	7
Carex ampullacea, *Good.* Saskatchewan	13
Carex agnalitis, *Wahl.* Rocky Mountains	2
Carex Bachii, *Boot.* Saskatchewan	6
Carex Buxbaumii, *Wahl.* Winipeg	2
Carex Crawei, *Dewz.* Winipeg	8
Carex capillaris, *L.* Saskatchewan	10
Carex concinna, *R. Br.* Rocky Mountains and Saskatchewan	15
Carex disticha, *Huds.* Saskatchewan	10
Carex filifolia, *Nutt.* Saskatchewan	14
Carex festiva, *Dougl.* Rocky Mountains	13
Carex flava, *L.* Saskatchewan. Unique	1
Carex gracillima, *Schw.*	
Carex granularis, *Muhl.* Saskatchewan	4
Carex Hoodii, *Boot.* Rocky Mountains. Unique	1
Carex Houghtonii, *Torr.* Saskatchewan	24
Carex intumescens, *Rudge*	
Carex incurva, *Light.* Rocky Mountains	3
Carex longirostris, *Torr.* Saskatchewan	9
Carex lenticularis, *Michx.*	
Carex lanuginosa, *Mx.* Saskatchewan	17
Carex marcida, *Boot.* Winipeg	4
Carex Novæ Angliæ, *Schw.*	
Carex nitens, *Boot.* Rocky Mountains	7
Carex ovata, *Rudge.* Rocky Mountains	11
Carex obtusata, *Lilgeb.* Saskatchewan	14
Carex pseudo cyperus, *N.*	
Carex pallida, *Wegas.* Saskatchewan	
Carex panicea, *L.* Winipeg. Unique	1
Carex Pensylvanica, *Lam.* Saskatchewan	2
Carex retrorsa, *Lehm.* Saskatchewan	3
Carex rosea, *Schk.*	
Carex rupestris, *All.* Rocky Mountains. Unique	1
Carex Richardsonii, *Br.* Saskatchewan	14
Carex stricta, *Lamb.*	
Carex staminea, *Schk.* Winipeg	4
Carex siccata, *Dewz.*	
Carex stipata, *Muhl.*	
Carex scoparia, *Schk.*	
Carex stellulata, *Good.* Saskatchewan. Unique	1
Carex scirpoidea, *Mx.* Rocky Mountains	8
Carex stenophylla, *Wahl.* Saskatchewan	25
Carex fenella, *Schk.*	
Carex tenera, *Dewz.*	
Carex Torregi, *Tuck.* Saskatchewan. Unique	1
Carex Torregana, *Desf.* Saskatchewan	12
Carex utriculata, *Boot.* Saskatchewan. Unique	1
Carex vaginata, *Tausch.* Rocky Mountains	5
Carex vesicaria, *L.*	
Carex vitilis, *Fries.*	
Carex vulpinoidea, *Mx.* Saskatchewan	12

	No. of sp. collected.
Gramineæ.	
Beckmannia crucæformis, *Hochst.* Saskatchewan	8
Alopecurus geniculatus, *L.* Saskatchewan and Rocky Mountains	40
Phleum pratense, *L.*	
Phalaris arundinacea, *L.* Saskatchewan	9
Hierochloa borealis, *R. & S.* Winipeg	10
Panicum virgatum, *L.* Winipeg. Unique	
Panicum capillare, *Gronov*	
Panicum rectum, *R. & S.*	
Panicum nitidum, *Lamb.*	
Panicum xanthophysum, *Cyr.* Saskatchewan	16
Panicum Echinocloa colonum, *L.*	
Panicum Echinocloa Crus Galli, *L.*	
Setaria verticillata, *Beam.*	
Orygopsis asperifolia, *Rich.*	
Eriocoma cuspidata, *Nutt.* Saskatchewan	20
Stipa viridula, *Trin.* Saskatchewan	8
Stipa Richardsonii. Rocky Mountains	17
Stipa capillata, *Trin.* Saskatchewan	13
Stipa spartea, *Trin.* Saskatchewan	8
Muhlenbergia glomerata, *Trin.*	
Vilfa cuspidata, *Torr.* Saskatchewan	6
Sporobobus heterolepsis, *A. Gray.* Saskatchewan	4
Agrostis laxiflora, *Rich.* Saskatchewan	3
Agrostis æquivalvis, *Trin.*	
Calamagrostis purpurascens. *Br.*, var.	
Calamagrostis longifolia. *Hook.*	
Calamagrostis Canadensis, *Beam.* Saskatchewan	30
Calamagrostis struta, *P. de B.* Rocky Mountains	3
Calamagrostis sylvatica, *D.C.* Rocky Mountains	6
Calamagrostis coarctata. Saskatchewan	10
Spartina cynosuroides, *Willd?*	
Entryana oligostachia, *Kth.* Saskatchewan	10
Deschampsia cæspitosa, *Beam.* Saskatchewan and Rocky Mountains	36
Trisetnum subspicatum, *Beam.* Rocky Mountains	9
Avena versicolor, *Vill.* Saskatchewan	20
Danthonia sericea, *Nutt.* Saskatchewan	4
Brigopyrum spicatum, *Holt.* Saskatchewan	8
Poa alpina, *L.* Winipeg and Rocky Mountains	16
Poa serotina, *Ehrh.* Winipeg. Unique.	1
Poa pratensis, *L.*	
Poa flexuosa, *Wahl.*	
Poa brevifolia, *Muhl.*	
Atropis distans, *Grisel.*	
Atropis California, *Munro.* Saskatchewan	12
Glyceria Michauxii, *Kth.* Saskatchewan	30
Glyceria aquatica, *Wahl.* Saskatchewan	29
Reboulia gracilis, *Kth.*	
Catabrosa aquatica, *Br.* Saskatchewan	40
Koehleria cristata, *Pero.* Saskatchewan	30
Festuca ovina, *L.* Winipeg to Rocky Mountains	15
Festuca scabrella, *Trin.* and *Hook.*	
Festuca borealis, *Mert.* and *Koch.* Saskatchewan	12
Festuca rubra, *L.* Saskatchewan	10
Bromus purgans, *L.* Saskatchewan and Rocky Mountains	26
Bromus Kalmii, *Agr.*	
Bromus ciliatus	
Triticum repens, *L.* Saskatchewan	6
Triticum caninum, *L.* Saskatchewan and Rocky Mountains	40
Triticum substrictum	
Elymus Canadensis, *L.* Saskatchewan	12
Elymus mollis, *Br.* Saskatchewan	17
Hordeum tubatum, *L.* Saskatchewan	7
Filices.	
Woodsia ilvensis, *Br.* Rocky Mountains	
Cystopteris fragilis, *Bernh.* Rocky Mountains	
Cheilanthus vestita, *Willd.* Rocky Mountains	
Lastrea spinulosa, *Prest.* Saskatchewan	
Lastrea cristata, *Prest.* Winipeg	
Polysticum Lonchitis, *L.* Rocky Mountains	
Onvelea sensibilis, *L.* Winipeg	
Struthiopteris Germanica, *L.* Saskatchewan	
Pteris aquilina *L.* Rocky Mountains	
Allosonus acrostichoides, *Br.* Rocky Mountains	
Allosonus atropurpureus, *Aur.*	
Asplenium viride, *L.* Rocky Mountains	
Polypodium dryopteris, *L.* West Rocky Mountains	
Polypodium vulgare, *L.* West Rocky Mountains	
Botrychium Virginicum, *L.* Rocky Mountains	
Botrychium Lunaria, *L.* Winipeg	
Osmunda interrupta, *Mx.* West Rocky Mountains	
Lycopodiaceæ.	
Lycopodium dendriodeum. *Mx.*	
Lycopodium clavatum, *L.*	
Lycopodium complanatum, *L.*	
Lycopodium lucidulum, *Mx.*	

Alpine Plants collected by Dr. Hector at altitudes determined by the temperature of boiling water.

Silene acallis, *L.*
Pipe Stone Pass, Rocky Mountains, 8,800 feet. August 27th.

Arenaria.
Pipe Stone Pass, 8,700 feet. August 26th.

Cerastium alpinum, *L.*
Pipe Stone Pass, 8,800 feet. August 27th.

C. arvense, *L.*
Pipe River, 8,800 feet. August 26th.

Stellaria longipes, *Gold.*
Rocky Mountains, 7,500 feet. August 26th.

Fragaria Virginiana, *Ehrh.*
Pipe Stone Pass. August 26th.

Potentilla fruticosa, *L.*
Pipe Stone Pass, 8,000 feet. August 26th.

P. diversifolia? *Lehm.*
Pipe Stone Pass, 8,000 feet. August 26th.

Epilobium alpinum, *L.*
Rocky Mountains, highest point of vegetation, 9,500 feet to 10,000 feet, Pipe Stone River.

Saxifraga bronchialis, *L.*
Pipe River, 8,800 feet. August 26th.

S. controversa, *Sternb.*
Pipe Stone Pass, August 26th, 9,100 feet, and Kootanie River. October.

S. Dahurica, *Call.*
Pipe Stone Pass, 9,000 feet. August 24th.

Parnassia fimbriata, *Hook.*
Pipe Stone Pass, 7,500 feet. August 24th.

Sedum stenopetalum, *Pursh.*
Pipe River, 8,800 feet. August 20th.

Youngea pygmaia, *Led.*
Pipe Stone Pass, 9,100 feet. August 26th.

Senecio triangularis, *Hook.*
Pipe Stone Pass, 9,000 feet, August 26th, and West side Rocky Mountains.

Erigeron (sp.)
Pipe Stone Pass, 8,800 feet. August 27th.

E. compositum, *Pursh.*
Pipe Stone Pass, 8,800 feet. August 27th.

Valeriana capitata?
Pipe Stone Pass, 7,500 feet. August 26th.

Menziesia glanduliflora, *Hook.*
Pipe Stone Pass, 8,800 feet. August 26th.

Cassiope tetragona.
Pipe Stone Pass, 8,800 feet. August 26th.

Gentiana propinqua, *Rich.*
Pipe Stone Pass, 7,500 feet. August 26th.

Castillega mincata, *Doug.*
Pipe Stone Pass, 8,000 feet. August 26th.

Polygonum viviparum, *L.*
Pipe River, 8,800 feet. August 27th.

Oxyria reniformis, *Hook.*
Pipe River, 9,500 feet to 10,000 feet.

Salix reticulata, *L.*, var. nana, *Andr.*
Pipe River, 8,000 feet. August 27th.

Salix reticulata. var.
Pipe River, 8,000—9,000 feet, near the [*sic*]

S. arctica? *R. Br.*
Pipe Stone Pass, 8,000 feet. August 27th.

Allium Schœnoprasum, *L.*
Pipe River, 7,500 feet. August 28th. Only seen once, and those very abundant.

Ligadenus chloranthus, *Rich.*
Pipe Stone Pass, 7,500 feet. August 26th.

Juncus ensifolius, *Wick.*
Pipe Stone Pass, 7,500 feet. August 27th.

J. arcticus, *Willd.*
Pipe Stone Pass, 7,500 feet. August 26th.

J. castaneus, *Sm.*
Pipe Stone Pass, 8,000 feet. August 26th.

Luzula parviflora, *Desv.*
Pipe Stone Pass, 8,800 feet. August 26th.

L. spicata, *L.*
Pipe Stone Pass, 8,800 feet. August 26th.

Poa alpina, *L.*
Pipe Stone Pass, 8,800 feet. August 26th.

Phleum pratense, *L.*
Pipe Stone Pass, 8,800 feet. August 26th.

Poa pratensis, *L.*
Pipe Stone Pass, 8,800 feet. August 26th.

Bromus ciliatus, *L.*
Pipe Stone Pass, 8,800 feet. August 26th.

Trisetum subspicatum, *P. de B.*
Pipe Stone Pass, 8,800 feet. August 26th.

Festuca ovina, *L.*
Pipe Stone Pass, 8,800 feet. August 26th.

Calamagrostis (Degenia) caratata, *Torr.*
Pipe Stone Pass, 8,800 feet. August 26th.

Notes on the foregoing Plants by Dr. Asa Gray, U.S.

Ranunculus Pennsylvanicus. Saskatchewan. 1857-8=R. repens, *L.*

Delpinium exaltatum. *Nutt.*=D. scrophulorum, *A Gr.*; not the D. exaltatum of the Alleghanies, &c.

Turrites retrofracta=T. patula.

Vesicaria Astria has long style, &c., of=V. Ludoviciana.

Lepidium corymbosum=L. Virginiana.

Sphæralacea, Sp.=Malvastrum coccineum *Gr.*; or cristani, *Pursh.*

Phaca No. 2.=P. oroboides, *D.C.* (*Astragalus*)

Phaca Robinsii *Oakes*, No. 5.=P. elegans, *Hook.*

Astragalus hypoglottis var.?=A. strictus, *Nutt.*, var. adsurgens.

Phaca, No. 4.=Astragalus nigrescens, *Hook.*

Phaca, No. 3.=Astragalus homolobus decumbens, *Nutt.*

Phaca, No. 1.=Astragalus homolobus?

Pyrus Americana, Winipeg, just =P. aucuparida. Elliptical oblong leaves, not accuminate.

Œnothera Nuttalliana.=E. triloba, *Nutt.*

Opuntia Saskatchewanensis.=O. Missouriensis.

Cicuta maculata. Why not=C. virosa.

Peucedanum ? Rocky Mountains, = Musenium tenuifolium, *Nutt.*

Aster ptarmicoides; a wrong [*sic*] got in with a specimen of A simplex.

Erigeron (lanatum), globellum var., Rocky Mountains,=E. lilifolium.?

Erigeron sp. Rocky Mountains.=E. macranthum, *Nutt.*.

Erigeron. ? Rocky Mountains,=E. grandiflorum, *Hort.*, capit. minor.

Solidago sp. Saskatchewan.=S. nemoralis.

Solidago, No. 1.=dwarf S. Missouriensis.

Solidago, „ 2.=S. nemoralis, var.

Solidago, sp., Saskatchewan=S. incane. β., *Tor. Gr.*, inter S. nemoralis et Canadense.

Solidago, No. 3.=S. Canadense.

Solidago sp.=S. procera.

Solidago sp., Saskatchewan,=S. gigantea.

Grindelda. ? ? Saskatchewan.=Aplopappsus Nuttallii. *Tor. & Gr.* (Eriocarpum, *Nutt.*)

Coreopsis delphinifolia, var. rigida.=C. palmata, *Nutt.*

Helianthus, No. 1.=H. giganteus.

Helianthus, sp. Saskatchewan.=H. Maximiliani.

Helianthus, sp., Saskatchewan,=H. strumosus, var.

Bidens cornuta.=Cronna, *Tor. & Gr.*,=Chrysanthemoides.

Gentiana saponaria=G. Condrasii.

Pentstemon Mengasii, Rocky Mountains,=P. Lenisii. *Bath.*

P. Anitichus, the sp. in front Rocky Mountains, =certainly P. Floodlii, *Gray.*=P. cymothus, *Hook.* Bot. Mag. x. 4464; P. nitidus distinct ?

Asclepias purpurascens=A. cornuti.

Fraxinus viridis=F. tomentosa.

Bitula, Saskatchewan,=B. papyracea, var.

Quercus obtusiloba, Saskatchewan,=Q. macrocarpa.

Q. rubra, Winipeg Valley,=Q. palustris.

Platanthera, Pembina, 21 July, fl. alba.=P. leucra, cophæa, *Nutt.*

Aphetium aphyllum, Saskatchewan,=Corallorhiza Macraei, *Gr.*; in Agassiz C. superior.

Sparangum ramosum. Fort Garry.=S. enrycephalum, *Eng.*

Smilacina pubescens. R. Winipeg.=Polygonetum giganteum.

Scirpus, sp., Saskatchewan,=S. atrovirens.

Stenanthium? Rocky Mountains, est n. sp. ! ! !

(Signed) A. Gray.

No. 12.

Meteorological Report.

Report on Meteorological Observations.

The meteorological observations were made with instruments supplied by Government, and furnished for the most part through the observatory at Kew, where the corrections were obtained previous to their issue.

Barometers. Several of Adie's mercurial barometers were supplied, but these were all damaged before they reached the Red River settlement, as their construction was too heavy to bear the rough carriage. The few observations that were made with them have therefore only been applied to the verification of the aneroids.

Three aneroid barometers were used by the Expedition for ascertaining the barometric variations, their readings being checked at intervals by comparison with the temperature of boiling water. For this purpose two sets of the necessary apparatus, with four thermometers, were supplied, but only one reached Fort Carlton in safety. The means remaining at the disposal of the Expedition for ascertaining the barometric readings during the second and third seasons were thus very imperfect; but while individual observations must therefore be looked upon as only approximate, reliance may still be placed on averages derived from continued observations at one place.

The behaviour of the aneroids at different altitudes, from their comparison with the boiling point of water is shown in a table appended to this report, and is interesting from its proving that where minute accuracy is not attempted, useful results can be obtained with a carefully-selected instrument over a much greater range than has generally been admitted. From the table mean corrections have been obtained for the aneroids, which are applied to the average readings elsewhere tabulated in the abstract. The errors were found to be so irregular, but always small in amount, that one uniform mean correction has been applied except in a few special cases.

The sympiesometers were used on some occasions, but leakage rendered the indications very irregular.

Thermometers. The thermometers which were furnished to the Expedition consisted of a Kew standard, with plain, maximum, and minimum thermometers. Most of these were made by Messrs. Negretti and Zambra, and had the requisite corrections supplied with them. After having been in use for some time at very low temperature, their relative readings varied from these corrections, but as the range of those selected for use had all the same error within a degree, their corrections were practically disregarded. For very low temperature, however, no corrections were supplied, and then they varied among themselves to a considerable degree. Metallic tubes, each three feet long, were supplied at the suggestion of Dr. Hooker, for the purpose of obtaining the temperature of the soil. The results obtained by the use of these are very interesting; and where observations with them were continued at one station for a length of time, they may prove to have a relation to the mean fluctuations of the temperature of the air at the place, which will be a practical value.

The meteorological data accumulated by the Expedition are as follows:—

1st.—Desultory observations during the summer of 1857, which are to be found scattered throughout the journal for that period, as they were made principally for the purpose of measuring differences of level.

2nd.—The regular meteorological register kept at Fort Carlton from October 10th, 1857, to June 1st, 1858. This valuable register was amassed under the superintendence of Captain Blackiston, in connexion with the hourly observations of magnetic variation, which were continued for the greater part of that period.*

3rd.—A register kept at Fort Edmonton from January 1st to April 30th, 1858, under the direction of Dr. Hector, but the greater bulk of the observations having been taken by chief factor Swanston, the gentleman in charge of the Saskatchewan district at that time.

4th.—Besides these registers, regular observations were made at least twice a day, including the minimum temperature for the 24 hours, by Dr. Hector, while engaged on the various journeys he made during the winter of 1857–8. At Fort Carlton, in addition to the ordinary observations, the temperature of the soil at two feet and three feet below the surface was observed daily by M. Bourgeau throughout the winter, also the readings of thermometers inserted in the trunks of different trees. The temperature of the river before and after winter, and the progress of the seasons, were carefully noted by Mr. Sullivan at the same place. At Edmonton, an extract of the journal kept under Mr. Swanston's care was obtained, giving facts relative to the advance of spring. At the same place the depth of the frozen soil was examined in the month of March by Dr. Hector.

5th.—On leaving Fort Carlton, in June 1858, regular observations were made morning and evening, and in some cases more frequently, while on the march to the westward. As the stations at which these observations were made embrace every variety of camping-ground, their tabulation only serves to display approximately the meteorological phenomena during the summer months. However, under the instructions of Captain Blackiston, partial observations were continued throughout the summer at Fort Carlton by Mr. Hardesty, the gentleman in charge of that post.†

In the latter part of the summer, while the members of the Expedition were engaged in exploring the mountains, the observations were made under very exceptional circumstances, and more properly find place in the journals, especially the aneroid readings, as the changes of level are generally greater than the possible barometric variations.

6th.—On returning to Fort Edmonton for the winter, such instruments as remained in order were devoted to the amassing of a register during the winter months under the direction of Dr. Hector, the

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* The register was forwarded to England by Captain Blackiston, and has not been yet recovered. An extract from it by M. Bourgeau, of the daily maxima and minima temperatures, and of a portion of the register for January and February 1858, have been used, however, in this report.

† Neither of these have been received.

observations being taken three times a day, generally by M. Bourgeau, who was the most constant resident in the fort of the different members of the Expedition. This register extends from October 12th, 1858, to May 15th, 1859, and was conducted much on the same plan as that at Fort Carlton during the previous winter.

7th.—A register was obtained for the months of February, March, and April at Jasper House, which is situated within the Rocky Mountains at their eastern base, and is nearly the same latitude as Edmonton. These observations were commenced by Dr. Hector, and continued by Mr. Moberly, the Company's resident at that place.

8th.—The observations were taken with great regularity during the two winter journeys made by Dr. Hector from Fort Edmonton to the Rocky Mountains, and have been tabulated as affording some interesting variations from the standard observations at the former place.

9th.—Shortly after starting for the work of the summer of 1859, one of the two remaining aneroids became irregular in its indications, and the only sound one, along with the few thermometers that remained, was reserved for use in the mountains. The observations made during that summer were therefore very irregular, and have not been tabulated separately. When in the mountains observations were made by Dr. Hector, as in the previous summer.

In all these observations the instruments were used with every precaution against influences which might interfere with their results. When observations were taken at a station for a considerable time, the conditions under which the instruments were exposed have been prefixed to the register in each case, but where taken *en route* one method has been followed as nearly as possible, which was to suspend the thermometer to a tree or otherwise, at the height of four feet above the ground, exposed to the north, and well away from the influence of the camp fire. In winter the thermometer was always suspended immediately on choosing the camping-place, so that by complete sunset a reliable reading was generally obtained. The instrument used in winter travelling was always a spirit thermometer for registering the minimum temperature, and which also served to indicate the temperature of the air at the time of observation. If a halt was made in the middle of the day the thermometer was generally again suspended, and under special circumstances observations were taken. In every case simplicity of means and freedom from incumbrance were aimed at when travelling, even at the expense of minute accuracy in the results.

From the digest of these materials, a fair estimate has been obtained of the nature of the winters at least of 1857–8 and 1858–9 throughout the valley of the Saskatchewan, from the Rocky Mountains to Fort Carlton.

Fort Carlton.

The abstract of the few observations available for this report of the large series taken at this place is as follows:—

I. Fort Carlton.*—From Daily Maxima and Minima.

		Maxima.	Minima.	Range.	Mean.	
		° ′	° ′	°	° ′	
1857.	November -	25 5	9 1	41	17 3	12th to 30th.
„	December -	16 2	1 6	57	8 9	„
1858.	January - -	10 3	−10 2	79	0 0	„
„	February -	5 5	−20 4	98	−7 4	„
„	March - -	35 0	17 6	67	26 3	„
„	April - -	48 6	23 1	66	35 8	„
„	May - -	58 1	32 9	62	45 0	„
„	June - -	67 8	42 0	46	54 9	1st to 6th.

Extract from the Expedition Register, the original being in the hands of Captain Blackiston.

1858.	January.	Mean of Observations at 9 a.m. and 4 p.m.	- 1 2
„	February.	Ditto ditto	- −1 6
„	January.	Mean of Minima - - -	- −10 0
„	February.	Ditto - - - -	- −14 2†

Notwithstanding the extreme low temperature indicated by these averages for this winter yet, by persons resident in the country it was considered a mild open season; and the reason for this can be understood when we consider the great range of the thermometer during the depth of winter, the variations of which were accomplished by rapidly succeeding recessions, giving rise to almost spring days even in the months of January and February. Early in November the mean daily temperature fell below the freezing point, and, with three exceptions, never again reached it until March. These were on the 22nd of December, when it reached 32°, the 3rd of January, when a great storm that was felt all over the country, raised it to 37°, and, again, on 5th of February, when it was 33°. From the 9th of March to the 17th of April the temperature remained about the same, oscillating above and below the freezing point. From that date, however, the mean temperature never again fell below 32°, excepting on the 11th, 13th, and 14th of May. To this untoward recession must be attributed the total sterility of all the coniferæ, and many other trees and shrubs throughout the district for that year. During the night the temperature frequently fell below the freezing point as late as the end of May, and on the 18th of that month it is recorded at 19°.

From the small materials at command no connection can be established between the degree of cold and the direction of the wind, further than in most cases the very extreme cold is from the N.W., but on the 14th February, the day before the greatest cold recorded, the wind blew from the S.W.

* These are from observations recorded by Mons. Bourgeau.

† This difference from the above mean arises from some of the lowest temperatures not having been corrected in the register at the time the extract was made. Thus on the 15th, 46° 7′ with M. Bourgeau reads 54°.

The S.W. and N.W. winds were usually clear and dry, while a fall of snow was in general preceded by a N.E. wind, which towards spring always brought with it a cold raw fog, and a temperature only slightly above 32°, but during the fall of snow the wind was generally due east.

Fort Edmonton.

As we have observations at this place for part of the winter of 1857-8, and besides for the whole of the winter 1858-9, we are enabled to compare the difference between these two seasons, besides also having the means of judging of its climate relative to that at Carlton.

The Abstract of the Observations taken three times a day, excluding the Maximum and Minimum Observations, is as follows :—

		Highest.	Lowest.	Range.	Mean.	No. of Observations.
		° ′	° ′	° ′	° ′	°
1858.	January - -	45	−19 5	64 5	11 2	62
„	February -	55 5	−41 5	97 0	9 3	61
„	March - -	56	5	51 0	34 9	93
„	April - -	76	24	52 0	45 1	90
„	May - -	74	21	53 0	49 6	54
„	October - -	53	16	37 0	38 5	49
„	November -	47 5	−19	66 5	27 1	85
„	December -	29 8	−27 5	68 0	−2 9	93
1859.	January - -	42	−26	68 0	12 0	93
„	February -	42 0	−37 0	79 0	5 1	84
„	March - -	44 5	−2 5	47 0	24 9	91
„	April - -	65 0	11 0	54	32 5	90
„	May - -	64	37	27	50 8	92

We have therefore—

Mean for January, February, March, and April, 1858 - - 25° 12′
Mean for January, February, March, and April, 1859 - - 18° 62′

Showing the latter winter to be much more severe than that of 1858.

The following is the Abstract of the Maxima and Minima Temperatures at the same place, and as there was no maxima thermometer used the first winter, the comparison of the average Minimum Temperature for the first four months of the year can only be shown.

		Maxima.		Minima.		Mean Temperature.
		Highest.	Mean.	Lowest.	Mean.	
		° ′	° ′	° ′	° ′	° ′
1858.	January - -	—	—	−22 5	3 3	—
„	February -	—	—	−41 10	3 2	—
„	March - -	—	—	1 5	22	—
„	April - -	—	—	11 5	27 9	—
„	October - -	—	—	18 5	26 2	—
„	November -	52	34 0	−2 0	18 9	26 45
„	December -	37 5	6 4	−25 0	−14 0	−7 6
1859.	January - -	45 0	20 1	−35 7	−1 0	9 55
„	February -	43 5	13 6	−38 0	−11 1	1 25
„	March - -	44 5	34 7	−6 0	11 4	23 05
„	April - -	67 0	41 8	0 0	20 4	31 1
„	May - -	67 0	58 6	31 0	37 2	47 9

Mean of Minima for January, February, March, and April, 1858 - 21° 7′.
Mean of Minima for January, February, March, and April, 1859 - 9° 8′.

For Fort Carlton the mean minimum temperature for the same four months in the first of these years is 13·7°, showing a difference of 8° in favour of Edmonton in this item.

During the winter of 1857-8 the influence of the different winds upon the climate of Edmonton was very well marked, and although in the following season the phenomena were the same, they were not so decided and easily discerned.

The winds may be divided into three groups at this place; first, the clear winds that in winter bring the intense extreme of cold, and which are from the N.W. In spring and summer this direction is exactly reversed, when it becomes a clear, hot, and dry wind. This may be considered as the proper Continental current, and is the wind of fine steady weather. It often only affects the lower stratum of the atmosphere, the clouds passing right across it in the upper air. This wind must not be too rigidly defined by its direction, as it often blows from anomalous quarters, while its character remains the same, being quite subordinate in force to either of the other two groups, which are both stormy winds. The second group includes all the winds that generally blow from between N. and E., and which in winter bring the snow; while the third group are S. and S.W. winds, that blowing from the Pacific over and through the Rocky Mountains, always bring cloud, warmth, and sometimes even rain during the winter. The succession of phenomena in the winter of 1857-8 in the Upper Saskatchewan district, excepting close along the mountain, was as follows:—A few days of fine steady, though, perhaps, intensely cold weather, with the north-westerly wind, would be followed by a slight rise in the

temperature, caused by the N.E. wind having piled a canopy of cloud over the lower stratum of wind, and so preventing the radiation. This is done gradually every morning, the sky being more and more overcast, and clearing away later in the day, till after a few days the clouds last till evening, when a cutting north-east wind commences, that soon increases to a storm followed by snow. This often lasts for two or three days, the snow at length falling more softly, and the temperature rising rapidly, till the clouds break and show the upper stratum of air moving rapidly from the south-west, carrying generally light fleecy clouds against a clear sky. Generally, the following night the wind, now from the S.W., increases in violence, sometimes ranging rapidly through many points of the compass, showing it to take the form of a cyclone, often bringing high temperature and dense cloud discharging rain. One of these storms passed over both Edmonton and Carlton on the 3rd January 1858, and at the former place the minimum temperature registered for that day and night was 36°, and the next day the maximum for the twenty-four hours was only 10°. Another, on the 24th of the same month, was still more striking, when the temperature fell from 37° at four p.m. to 13·5° before midnight, or a difference of 50·5° in eight hours. After the storm from the S.W. the light norwester generally sets in irregularly, and the temperature falls in a few days to an extreme, during which there is generally a calm, followed by the haze and fog from the N.E. as before.

By the register we can follow the proportion of these winds to each of the first four months in 1858 with great facility.

Thus in January there were of clear cold winds from the N.W. - 4 days.
Snow winds from the N.E. - - - - - - 17 days.
With 10 overcast and 4 days of snow.
Mild moist wind from S.W. - - - - - - 6 days.
With 4 cloudy and 1 day of rain.

January is thus seen to have been a stormy month, with long intervals of calm amounting to 11 days, and the majority of which would rank under the period of the clear cold weather.

In February of the clear cold wind there were - 10 days.
Of the snow winds - - - - - 7 days.
With 7 overcast and 4 days of snow.
Of the warm winds - - - - - 11 days.
With 7 of cloud and 3 days of rain.

These last-mentioned warm days did not occur throughout the month as in January, but just before and after one long period of steady cold, that occupied from the 5th to the 22nd, so that this was the month during which the climate was most nearly what we should expect to find in the central district of a great continent.

March was a very strong month, during which the proper continental weather was almost wanting, and a continual struggle was kept up between the N.E. snow winds and the warm winds from the S.W. Thus,

Of clear cold N.W. wind there was only - - 1 day.
Of N.E. snow or raw cold wind there were - 15 days.
With 9 overcast and 7 days of snow.
Of S.W. warm winds - - - - 13 days.
With 9 of cloud and 3 days of rain.

This continual struggle kept the temperature always close to the freezing point, the extreme range for the month being 50°, while that for February was 97°, but the average range, excluding a few occasional extremes, may be considered only as 25°.

In the month of April the warm winds begun to predominate, and, excepting the two first days, there was no snow, the N.E. winds bringing cold raw fog instead. Thus,

Of clear cold days - - - - None.
Of N.E. winds, cold and raw - - - 10 days.
With 8 overcast and 2 of snow.
Of S.W. warm winds - - - - 15 days.
With 10 cloud and 4 days of rain.

Irregular spring weather commenced in March, but it was not till the beginning of April that the mean daily temperature was habitually above the freezing point. In many houses the same recession took place as at Carlton from the 11th to the 14th, during which the average temperature fell to 27°, and the minimum to 21°, attended with snow. I have described this portion of the winter of 1858 somewhat minutely, as I believe it displays, better than any other series of observations we have, the succession of the winter phenomena in the northern part of the prairie country at a medium distance from the influence of the Rocky Mountains and that of the eastern lake country.

The same period of the following winter and spring was different in many respects, probably representing the opposite extreme of the usual climatic conditions. The temperature never reached such extremes, and the changes in the weather were effected more gradually. The mean daily temperature remained below the freezing point till April, when on the 3rd it reached 35°, and then receded till the 15th, when spring weather commencing, the average never again fell below 32°.

The register of the observations at Jasper House shows the nature of the climate at the eastern base of the Rocky Mountains just within the limits of the range. The following is the abstract of that register—

From Observations excluding Maximum and Minimum.

——	Highest.	Lowest.	Range.	Mean.	No. of Observations.
	°			°	
1859, February - -	42	—20	62	14·7	78
„ March - - -	43	7	36	25·3	92
„ April - - -	53	5	48	25·8	42

From Daily Minimum—

	Lowest.	Mean.
	°	°
1859, February -	26·0	−3·0
„ March - -	2·0	12·3
„ April - -	1·0	12·7

The little trading port of Jasper House where these observations were made, is in the valley of the Athabasca River within the first range of the mountains. The valley is almost straight, and lies north and south the whole way through the mountains; accordingly the winds are north or south, blowing uniformly either up or down the valley. All the cold weather comes from the N. and all the warm weather from the S. These blow alternately, and the warm soft wind with clear sky and spring weather is often after a few days seen quite distinctly to be banked up outside the mountains, forming a heavy black cloud that overhangs the plain country to the N.E. This at last forces its way into the valley, bringing a slighter fall of snow than might be expected, and then a "spell" of very cold weather sets in, generally, accompanied by a raw fog; this in a few days changes to a dazzling haze, from the wind having set in from the S.W. again in the upper stratum of air, where it is all sunshine and fine weather, as was proved by ascending a mountain where it was found to be actually warmer on the top of a peak than in the valley below; the S.W. wind at last occupies the valley again, upon which a "spell" of open weather ensues. The result of such changes occurring frequently during the winter prevents the accumulation of snow and also the freezing over of the rivers where they are rapid. In consequence ducks are frequently found remaining the whole winter in the mountains, while from the plains, in latitudes much to the south, they are necessarily absent from October till May.

The following are the means of similar observations for the same period at Jasper House and at Fort Edmonton, places nearly in the same latitude, and they show that although the temperature for February is rather higher in the mountains than in the plain district, yet during the advance of spring it is nearly the same:—

		°		°
February.	Jasper House - - -	5·8	April, 1st to 15th:—	
„	Edmonton - - -	−3·8	„ Jaspar House - -	19·2
March.	Jasper House - - -	18·0	„ Edmonton - -	18·7
„	Edmonton - - -	18·2		

Along the eastern base of the Rocky Mountains there is a narrow tract of country in which there is never more than a few inches of snow on the ground. About 40 miles to the eastward, however, there the fall begins to be much greater, but during the winter rarely exceeds two feet. On the prairies the snow evaporates rapidly, and except in hollows where it is drifted never accumulates, but in the woods it is protected, and in spring is often three to four feet deep. Both in 1858 and 1859 the snow was much deeper, and lay longer at Fort Pitt than either at Edmonton or at Carlton, and yet it is midway between these places, and in much the same latitude and position in respect to the line of wooded country.

The following abstracts of the temperatures recorded when travelling during the winter months shows the nature of the weather experienced in moving from place to place:—

I. Between Fort Carlton and Edmonton.

		°
1857, December 14th to 30th	Means of daily observations - - -	15·0
	Means of minima - - - -	4·7
	Means of temperature - - -	9·8

No. of Observations 28.

During the journey there were two storms with high wind and snow, but never so severe as to prevent travelling. The snow averaged six to eight inches in depth, and only for two days, when between Fort Pitt and Edmonton, required snow shoes to be used.

II. Edmonton to the Rocky Mountain House and back.

	°
1858, January 9th to 30th.—Mean of daily observations - - -	10·0

No. of Observations 45.

The want of snow on the ground made this journey hard for the dogs, as they had often to drag the sleighs over bare ground for miles. Only once we had to camp a little earlier than usual on account of a storm. At the Mountain House the weather was often quite open, and there seemed to have been less of the cold N.E. wind there than for the same period at Edmonton, which is distant 100 miles to the N.W.

III. Edmonton to Lake St. Ann's.

On this trip from the 12th to the 15th of February, 1859, the mercury was twice frozen, exclusive of which the mean of the recorded temperature is −17·9°.

No. of Observations 10.

This was a trip during the coldest weather experienced in the country. If proper precautions are taken there is nothing merely in extreme cold to stop travelling in the wooded country, but the danger of freezing from exposure upon the open plain is so great that they cannot be ventured on with safety during any part of the winter.

IV. Edmonton to Bow Fort and Back.

		°
1858, Nov. 26th to Dec. 26th.	Mean of daily observations - - -	4·9
	Mean of minima - - - -	−4·2
	Mean temperature - - - -	0·3

No. of Observations 63.

During this trip we had to halt for half a day, as the snow became so wet on the 27th November from a temporary thaw, that the dogs could not drag the sleighs. These short thaws when followed by extreme cold, as is generally the case, are very dangerous to the traveller, all the serious injuries from frost-bite occurring under such circumstances.

V. Edmonton to Jasper House, Athabasca River.

		°
1859, 13th to 31st January.	Mean daily temperature - - -	6·5
	Mean of minima - - - -	−3·7
	Mean temperature - - - -	1·4

No. of Observations 40.

This journey through the northern thick wood country was severe from the depth of the snow which fell on 11 days out of the 19, requiring the constant use of snow shoes until within 40 miles of the mountains, when there was only a sprinkling on the ground.

VI.—Jasper House into the Mountains.

		°
1859, February 10th to 16th.	Mean daily temperature - - -	5·7
	Mean minima - - - -	−5·0
	Mean temperature - - - -	0·3

No. of Observations 13.

Mean temperature at Jasper House for same period - - - - 13·9

No. of Observations 19.

This trip was made up the valley of the Athabasca towards the heart of the mountains. It was not till far up the river, when the valley became contracted, that the snow was so deep as to require the use of snow shoes. It will be noticed that the cold was more intense than for the same period at Jasper House, which is in the same valley, but only a few miles within the range. In the month of March in both years it was only possible to travel at night, as during the day the snow is so wet that the dog sleighs slide very heavily. At this season, therefore, the time for travelling is from 6 or 7 p.m. until the sun acquires power next morning, generally between 8 and 9 a.m. The snow is then crisp, and has a hard crust, which bears up the dogs, or a man upon snow shoes. After this comes the worst season of the year for travelling, as the rivers and swamp begin to break up, and are quite impassable till clear of the ice. The country is then soft and wet, and camping is miserable work.

The Indians travel throughout the winter with horses, and the Hudson's Bay Company also drag most of the buffalo meat with horse sleighs, but it is very slow work, and wears out the animals very quickly, In 1858, travelling with dogs was not possible after the 25th of March in the Upper Saskatchewan, but in 1859 it was continued till the 20th of April, at Fort Pitt.

Spring and Summer.—The advance of spring in the Saskatchewan district is very rapid, but much more so in the north-western part of the country than in the eastern, where the ice on the lakes renders the season much later. A few days after warm weather sets in the alders and willows are in flower, and the little prairie anemone covers the dry southern exposures. At this season (early in April) the ash-leaf maple (*Negundo fraxinifolium*) is tapped for sugar at Fort Carlton and several other localities; but sharp frost at night, followed by hot clear sunshine during the day, is essential to the flow of the sap.

During the summer months, when the Expedition was for the most part traversing the more arid plains, or skirting the edge of the wooded country, rain with cloudy weather was much more frequent than might have been expected. On the low prairies to the west of the Red River Settlement, as far as Turtle Mount, thunderstorms with heavy rain were almost of daily occurrence during the months of July and August. The temperature in that district was often very high, the thermometer several times reaching 90° to 95° in the shade.

On the higher plains, which were traversed in 1858, from Fort Carlton to the Rocky Mountains, and ranging in altitude from 2,000 to 3,500 feet, thunderstorms were more rare, but yet a good deal of rain fell. Thus during the latter part of June, in the district of the Eagle Hills, there were nine days of rain and cloudy weather, to six of fine clear sky. The winds were nearly equally divided between those from the north and east, which are raw and cold, and those from the south and west. The mean temperature for the same period, from observations made three times a day, was 58·8°; the highest recorded being 72°, and the lowest 46°. The minimum for each night was not observed however, and several times it must have approached very near to the freezing point. The mean degree of moisture in the atmosphere was 0·64: saturation being 100.

During the month of July, between the Grand Coulée and the base of the mountains, there was a greater proportion of fine weather, with light, unsteady winds, nearly all of which were from the south and west. However, on twelve days of the month there were rain clouds. The mean temperature was 59·5°, the highest record being 70°, and the lowest 40°, with the degree of humidity 0·59, or rather less than in June.

During the first half of August, when the Expedition was near the base of the Rocky Mountains, east from the Old Bow Fort, the mean temperature was 54·9°; the highest record 79° and the lowest 40·5°. The degree of moisture was 0·65, showing an increase upon that of the preceding month. This is an exceptional fact when we consider the proximity of the mountains, and remember the influence they apparently exercise in reducing the snow fall during the winter in the snow district. During the two months just treated of, the Expedition was travelling through the fertile belt that bounds the arid plains lying to the south, and which is a region that possesses much the same botanical features throughout, and the mean temperature for it, from June 16th to August 12th, for 1858 was 57·09°, and

the mean degree of humidity ·626. Notwithstanding that the whole amount of rain that falls in this district is but small, yet, from the frequent showers, the vegetation is enabled to make vigorous and rapid advance. In the beginning of July all the prairie streams are dried up, but those rivers that rise in the Rocky Mountains continue in flood till the end of that month, and never fall to extreme low water until the end of September or October. There are, however, sometimes remarkable exceptions to this rule, as for instance, in the summer of 1858 the Saskatchewan, and other large rivers, seem never to have been in flood during the whole season; and their navigation, which generally might be effected by steamers of light draught from the middle of May till August, would have been totally suspended for that year.

The radiation, as might be expected, is very great during the summer nights in the northern prairie region, so that when the sky is not cloudy, the quantity of dew that falls is great in proportion to the degree of moisture in the atmosphere. It is owing to this, combined with the sharp frosts that occur early in September, that the rich pasture along the north Saskatchewan plains is preserved green and juicy until the snow falls, when the hard steady frost keeps it as fresh and nutritious as artificial hay until the return of spring.

In the summer of 1859 the Expedition traversed the most arid plains that lie within the British territory, without however encountering any of the great expanses of true desert country which exist further to the south, within the United States. Neither was there any marked difference between the frequency of rain-clouds and the deposit of dew; and that a considerable amount of moisture passes over the plains is proved by the marked increase in the vigour of the vegetation on the high patches of table land, such as the Hand Hills. Other parts of the prairie are covered with a short sparse growth of wiry grass, which is very nutritious, but in very small quantities, along with sage (*Artemisia*) and cacti (*opuntiæ*). There is no doubt that the prevalence of a hard clay soil derived from the cretaceous strata, which bakes under the heat of the sun, has a great deal to do with the aridity of these plains, but it is probably due more to the want of moisture in early spring. The little snow which falls on the open plain is at once swept off by the winds, and evaporated during the winter, so that in spring the clear powerful sun at once bakes the soil and prevents the germination of seeds. We have an indication of this cause from the way in which patches of the northern flora nestle on steeps that are sheltered from the south, so that the snow drifts have been preserved to afford moisture till late in the season. This is most evident from comparing the opposite sides of rivers and valleys that lie N.W. and S.E., such as that of Battle River, where it traverses the low arid plains above its "elbow." This valley is a trough cut into the plains to the depth of 200 feet, and on its northern slope we find the arid vegetation characterised by the cacti and sage, while, on the opposite side, where sheltered from the sun, we have clumps of poplars and spruce firs.

The weather experienced in the Rocky Mountains was very irregular, with a great daily range of the thermometer. Thus in the end of August the temperature was as low as 14°, and almost every night fell below the freezing point, although during the day it reached to 70° and 80°. In the valleys of the eastern slope, the amount of rain-fall is very small compared to that on the first part of the descent to the west, where fine clear days form the exception. This only applies, however, to the mountain north of the 51st parallel of latitude; south of which, for some reason, the rain-fall on the western slope in the valley of the Kootanie River must be much less, both judging from the experience of two years, and from the nature of the vegetation, which is of the arid type.

On the eastern slope, throughout the whole summer, there are occasional slight falls of snow above an altitude of 5,000 feet, but snow never lies deeply at any season. It is only on the various heights of land which have an altitude of 6,000 feet, and for a few miles of the western descent, that snow appears to accumulate in quantities in the valleys, reaching sometimes in drifts to the depth of 16 to 20 feet. There is no season at which nearly the whole of the eastern slope of the mountains could not be ascended with horses, as far as snow is concerned, but in the months of May, June, and July, the flooded state of the torrents would present great difficulties. In the valleys of the western slope the quantity of snow that falls, although greater, must still be insignificant, as the Indians with bands of horses encamp on them during the whole winter.

Between the Rocky Mountains and the Cascade range the climate, from what was learned indirectly, seems to be a good deal similar to that of the eastern plains as regards duration of the seasons, but the winter is much less severe, and the snow-fall greater. The northern limit of the arid country on this slope of the continent is further south by several degrees than in the Saskatchewan district, but, owing to the broken and mountainous nature of the country, its boundary line has not the same simplicity of character.

The Cascade range of mountains, although not the geographical dividing ridge of the continent, yet acts more truly as such, as far as climate is concerned, than does the Rocky Mountain chain; the quantity of snow that falls on the Cascade range, especially in the western valleys, is from this cause much greater than on the central chains. The winter is mild and open to a high latitude upon the Pacific coast compared to that in the interior of the country, and still more to that on the Atlantic coast; but an idea of the difference of the various climates is best conveyed by diagrams of the ranges of temperature at a few typical localities given in Diagrams Nos. III. and IV.

Diagram Tables have also been prepared to show at a glance the nature of the climate at a few localities, so far as may be judged from the curves formed by the daily temperatures observed. Besides the observations made by the Expedition, there is also appended a series of readings of the thermometer taken by Mr. M'Aulay, clerk in the Hudson Bay Company's service, at York Factory, on Hudson's Bay, in the winter of 1856–7, the averages of which, for each month, were as following:—

VIII.—1856,	November	7·9
„	December	−13·5
1857,	January	−19·8
„	February	−26·6
„	March	−5·6
„	April	4·9

The following observations of the temperature of the soil at depths less than [*sic*] feet were principally made by M. Bourgeau, excepting those of the prairies, which were taken by Mr. Sullivan. The curves formed by the two sets taken at Fort Carlton, where the thermometer was buried at two and three feet, have an extraordinary relation to each other. The more shallow thermometer kept about two degrees in advance of the deeper one, as the latter descended during the excess of radiation from the earth's surface until February; but during the greatest cold the difference between them is increased to 10 degrees. By comparing the two columns, however, it will be seen that two feet is not sufficient to remove the thermometer from the influence of temporary fluctuations, but that at three feet the indication has great steadiness.

From the point of greatest depression the two thermometers continue to rise together, preserving the same relative position, but that at two feet soon gains on the deeper one, so that by the middle of March the readings coincide, and continue together during the rise from 23° to 31°, which temperature is reached in the beginning of May. However, in June, while the temperature at three feet is still only slightly above the freezing point, that at two feet has nearly reached 40°.

The observations made at Fort Edmonton in 1858–9, were only with one thermometer, buried to the depth of two feet, and therefore no good comparison can be made between the series of two successive years; but still the average for the month agrees very fairly, showing a slightly higher temperature at Carlton in 1857–8. The following extracts from the Journal give the only observations which were made with a view to determine the depth of the frozen soil, and it will be observed that in 1857–8 the frost had penetrated the ground at Fort Edmonton to a greater depth than during the following winter, owing, no doubt, to the smaller quantity of snow that fell in that season.

FORT EDMONTON, March 1858.

OBSERVATION on the TEMPERATURE of the SOIL and Depth of the FROZEN GROUND.

Thermometer at 2 feet below the Surface.					Thermometer at 5 feet.				
Date.	Hour.	Therm. Air.	Therm. Soil.	Remarks.	Date.	Hour.	Therm. Air.	Therm. Soil.	Remarks.
		°	°				°	°	
March 3	8 A.M.	20	18·5		March 5	8 A.M.	20	30	
„	Noon	24	18·5						
„	4 P.M.	24	18·5		Thermometer at 8 feet.				
Thermometer at 3 feet.					March 6	8 A.M.	38	33	
March 4	8 A.M.	23	21·5		„		49	33	
„	Noon	30	21·5						

N.B.—A hole was dug 6 × 4 in order to ascertain the depth to which the soil is frozen. It passed through
(a.) dark loam 9 inches.
(b.) Reddish yellow sandy earth, with fragments of rock 2 feet.
(c.) White clay with shingle, 2 feet.
(d.) Red sand.

On the 5th the unfrozen soil was reached at the depth of 7 feet in the red (d.) As the sand was soft and incoherant below this point the line was easily observed.

1859, March 16th.—Got a hole dug close to that of last year (referred to above), and reached the limit of the frozen soil at 6 feet. At 2 feet from the surface the thermometer read 28° 5′ the thermometer sunk in the tube to that depth for daily use, reading 28° 0′ at the same time.

TABLE SHOWING the TEMPERATURE of the SOIL at FORT CARLTON.—Winter, 1857–8.
Thermometer sunk to depth of 2 and 3 feet respectively.

Year and Day.	Air.	Ther. at 2 feet.	Ther. at 3 feet.	Year and Day.	Air.	Ther. at 2 feet.	Ther. at 3 feet.	Year and Day.	Air.	Ther. at 2 feet.	Ther. at 3 feet.
1857.	°	°	°	1857.	°	°	°	1857.	°	°	°
Nov. 1	37·5	39·0	41·0	Nov. 23	28·5	33·7	36·0	Dec. 15	29·0	30·5	33·0
„ 2	27·0	39·5	41·5	„ 24	13·0	34·0	36·0	„ 16	19·0	30·5	33·0
„ 3	—	39·0	40·5	„ 25	12·5	33·5	35·5	„ 17	−5·0	30·5	33·3
„ 4	—	39·0	40·5	„ 26	21·0	33·0	36·0	„ 18	10·0	30·0	33·0
„ 5	—	38·5	39·5	„ 27	25·4	33·0	35·0	„ 19	20·3	30·0	33·0
„ 6	—	38·5	39·7	„ 28	18·5	33·0	35·0	„ 20	19·8	30·0	32·9
„ 7	—	37·7	39·6	„ 29	14·5	33·0	35·0	„ 21	14·0	29·2	32·6
„ 8	17·5	37·0	39·0	„ 30	14·0	33·0	35·0	„ 22	36·0	29·2	32·6
„ 9	—	37·0	39·0	Dec. 1	17·0	33·0	35·0	„ 23	10·0	30·0	32·6
„ 10	13·5	37·0	39·0	„ 2	14·0	32·5	35·0	„ 24	0	29·9	32·0
„ 11	—	37·0	39·0	„ 3	1·0	32·0	34·0	„ 25	11	29·2	32·0
„ 12	23·0	36·5	38·2	„ 4	12·2	32·0	34·0	„ 26	26·5	29·0	32·0
„ 13	25·0	36·0	38·0	„ 5	13·5	32·0	34·0	„ 27	5·9	29·0	32·0
„ 14	28·5	36·0	38·0	„ 6	14·5	32·5	34·0	„ 28	10·0	28·5	32·0
„ 15	—	36·0	38·0	„ 7	−14·6	32·0	34·0	„ 29	15·0	28·5	32·0
„ 16	30·8	35·5	37·5	„ 8	4·0	31·5	34·0	„ 30	15·0	28·0	32·0
„ 17	25·5	35·0	37·0	„ 9	0·2	31·0	34·0	„ 31	−7·0	28·0	32·0
„ 18	2·5	35·0	37·0	„ 10	−7·0	31·0	34·0	1858.			
„ 19	6·5	35·0	37·0	„ 11	6·5	31·0	34·0	Jan. 1	2·0	28·0	32·0
„ 20	28·0	34·7	36·7	„ 12	15·0	31·0	34·0	„ 2	31·7	28·0	31·7
„ 21	2·5	34·5	36·5	„ 13	13·0	30·5	33·0	„ 3	43·3	28·0	31·7
„ 22	3·5	34·0	36·0	„ 14	−1·0	30·5	33·0	„ 4	3·0	28·0	31·8

Year and Day	Air.	Ther. at 2 feet.	Ther. at 3 feet.
1858.	°	°	°
Jan. 5	2·9	28·0	31·8
„ 6	−23	28·0	31·8
„ 7	−12·2	26·5	31·5
„ 8	−3·0	25·2	31·5
„ 9	10·0	24·6	31·0
„ 10	−0·2	24·6	31·0
„ 11	1·0	24·2	30·5
„ 12	−23·0	24·2	30·5
„ 13	31	24·2	30·5
„ 14	−17·2	24·2	30·5
„ 15	−17·0	22·5	29·2
„ 16	−31·5	22·0	29·2
„ 17	−4·3	22·0	29·2
„ 18	20·5	22·0	28·1
„ 19	15·9	23·0	28·1
„ 20	14·5	23·0	28·0
„ 21	4·5	23·0	28·0
„ 22	7·0	23·2	28·0
„ 23	−2·3	23·5	28·0
„ 24	−7·7	23·2	28·0
„ 25	−5·2	22·5	27·6
„ 26	−9·3	22·2	27·4
„ 27	0·8	22·0	27·2
„ 28	−13·0	21·8	27·0
„ 29	−11·2	21·5	26·2
„ 30	−3·0	21·1	26·0
„ 31	8·0	21·0	26·0
Feb. 1	2·0	21·8	26·0
„ 2	−9·9	21·8	26·0
„ 3	0	21·0	25·8
„ 4	25·8	21·0	25·6
„ 5	26	21·0	25·3
„ 6	11·3	21·0	25·0
„ 7	−14·3	22·0	25·8
„ 8	−11·2	21·0	25·2
„ 9	−25·0	20·7	25·0
„ 10	−22·0	19·4	24·5
„ 11	23·7	18·2	24·0
„ 12	1·1	16·9	24·0
„ 13	−29·3	15·0	24·0
„ 14	−36·0	14·2	23·1
„ 15	−32·3	13·5	21·5
„ 16	−15·3	11·7	21·0
„ 17	−8·7	11·5	20·4

N.B.—The thermometers having been covered with ice, the observations from 17th February to the end of this month have been consequently irregular.

Year and Day.	Air.	Ther. at 2 feet.	Ther. at 3 feet.
1858.	°	°	°
March 1	1·0	19·8	23·0
„ 2	−1·0	18·8	23·0
„ 3	17·2	18·0	22·6
„ 4	22·0	18·8	22·0
„ 5	26·2	19·0	22·2
„ 6	33·2	19·8	22·2
„ 8	32·5	20·7	22·2
„ 9	31·5	23·0	23·5
„ 10	16·0	24·0	24·5
„ 11	28·2	24·8	24·8
„ 12	38·7	25·0	25·2
„ 13	30·0	25·8	25·8
„ 14	31·6	26·0	26·0
„ 15	38·5	26·5	26·5
„ 16	—	26·8	26·8
„ 17	28·0	27·0	27·0
„ 18	21·0	27·7	27·2
„ 19	40·3	27·8	27·8
„ 20	32·8	28·0	28·0
„ 21	21·2	28·0	28·0
„ 22	31·9	28·0	28·0
„ 23	35·7	28·0	28·3
„ 24	42·0	28·6	28·6
„ 25	37·8	28·9	28·9
„ 26	32·2	29·0	29·0
„ 27	38·2	29·0	29·0
„ 28	44·7	29·0	29·0
„ 29	28·1	29·4	29·0
„ 30	40·3	29·5	29·0
„ 31	39·0	29·8	29·6
April 1	0	29·8	29·6
„ 2	32·8	29·8	29·7
„ 3	26·9	29·8	29·7
„ 4	28·6	29·8	29·7
„ 5	28·3	30·0	29·8
„ 6	40·0	30·0	29·8
„ 7	39·4	30·0	30·0
„ 8	36·1	30·0	30·0
„ 9	40·0	30·0	30·0
„ 10	42·9	30·0	30·0
„ 11	49·8	30·0	30·0
„ 12	48·4	30·2	30·0
„ 13	—	30·2	30·0
„ 14	26·2	30·2	30·0
„ 15	16·0	30·2	30·0
„ 16	25·4	30·3	30·2
„ 17	28·3	30·3	30·2
„ 18	43·0	30·5	30·5
„ 19	42·0	30·6	30·5

Year and Day.	Air.	Ther. at 2 feet.	Ther. at 3 feet.
1858.	°	°	°
April 20	44·0	30·7	30·6
„ 21	43·0	30·7	30·6
„ 22	36·0	30·8	30·7
„ 23	32·0	30·8	30·7
„ 24	42·0	30·8	30·7
„ 25	45·0	30·9	30·8
„ 26	44·0	31·0	30·8
„ 27	54·0	31·0	30·8
„ 28	41·0	31·0	30·8
„ 29	53·9	31·2	30·9
„ 30	—	31·2	30·9
May 1	68·5	31·3	30·9
„ 2	48·0	31·6	30·8
„ 3	61·0	32·0	31·0
„ 4	56·5	32·2	31·0
„ 5	42·0	32·3	31·0
„ 6	52·0	32·4	31·0
„ 7	54·0	32·5	31·0
„ 8	50·0	32·7	31·0
„ 9	51·0	33·0	31·0
„ 10	37·0	33·2	31·2
„ 11	37·0	33·5	31·4
„ 12	42·0	33·5	31·4
„ 13	37·0	33·5	31·4
„ 14	29·0	33·0	31·5
„ 15	37·0	33·0	31·7
„ 16	39·0	33·0	31·7
„ 17	36·2	33·0	31·7
„ 18	38·3	33·0	31·7
„ 19	49·5	33·3	31·8
„ 20	54·5	33·7	31·9
„ 21	49·0	34·0	31·9
„ 22	52·0	35·0	31·9
„ 23	51·0	35·5	32·0
„ 24	62·0	36·0	32·0
„ 25	58·0	36·2	32·2
„ 26	43·0	36·7	32·2
„ 27	47·0	36·9	32·3
„ 28	50·0	36·9	32·3
„ 29	44·0	36·9	32·6
„ 31	44·0	36·2	32·8
June 1	52·5	36·4	33·0
„ 2	62·0	36·7	33·0
„ 3	62·0	37·5	33·2
„ 4	66·0	38·6	33·8
„ 5	57·0	39·7	33·9
„ 6	50·5	40·0	34·2
„ 7	57·0	40·0	34·9
„ 8	58·0	40·0	34·9

TABLE SHOWING the MEANS of the above OBSERVATIONS.

Months.	Year.	Mean Air.*	Mean at 2 feet.	Mean at 3 feet.	Remarks.	Mean Temperature for each Month.
		°	°	°		
November - - -	1857	19·03	35·88	36·66	- - - -	17·3
December - - -	1857	10·25	30·40	32·83	- - - -	8·9
January - - -	1858	−0·22	23·40	29·39	- - - -	0·0
February - - -	1858	−9·5	18·33	24·35	First 17 days - -	−7·4
March - - -	1858	28·94	24·66	25·37	- - - -	26·3
April - - - -	1858	36·75	30·39	30·26	- - - -	35·8
May - - - -	1858	47·31	33·86	31·60	- - - -	45·0
June - - - -	1858	58·12	38·61	33·86	First 8 days - -	54·9

* At time of Observation.

OBSERVATION on TEMPERATURE of SOIL at FORT EDMONTON at 9 a.m.—Thermometer 2 feet depth.

Date.	Soil.	Atmosphere.	Date	Soil.	Atmosphere.	Date.	Soil.	Atmosphere.
	°	°		°	°		°	°
1858, Nov. 9	37·5	44	1859, Jan. 2	13·5	−1	March 7	23·0	19
„ 10	37·5	34	„ 4	15·0	4	„ 11	24·0	13
„ 11	37·5	31	„ 6	20·0	−26	„ 14	25·0	19
„ 14	36·8	32	„ 8	24·0	32	„ 18	26·0	27
„ 18	35·8	20	„ 11	24·8	29	„ 21	26·7	−2
„ 21	35·0	19	„ 13	22·0	15	„ 24	27·5	22
„ 24	34·5	17	„ 17	22·0	17	„ 28	28·5	26
„ 27	33·7	25	„ 21	23·0	−11	„ 30	29·2	10
„ 30	33·0	0	„ 24	22·5	30	April 3	29·5	29
December 2	32·0	−14	„ 28	21·7	−8	„ 5	29·5	34
„ 4	31·8	−1	February 1	17·0	−6	„ 8	30·0	17
„ 6	30·0	−23	„ 4	17·5	24	„ 12	30·0	11
„ 8	28·5	10	„ 8	18·0	−21	„ 18	30·5	28
„ 10	26·0	−7	„ 12	18·0	−16	„ 22	30·5	35
„ 12	23·0	−16	„ 15	18·0	0	„ 26	30·5	52
„ 13	21·0	−10	„ 19	19·0	−9	„ 28	31·0	39
„ 18	21·0	−10	„ 21	17·0	11	„ 29	31·5	50
„ 20	18·5	−9	„ 24	17·0	4	May 2	31·7	43
„ 24	17·0	−18	„ 28	17·5	−9	„ 6	32·0	58
„ 28	16·5	−15	March 2	20·0	20	„ 8	32·6	50
„ 30	15·7	2	„ 5	22·5	14			

MEANS OF ABOVE OBSERVATIONS.

Months.	Year.	Mean Air.	Mean at 2 ft.	Remarks.	Mean Temp. for each Month.
		°	°		°
November - -	1858	25	35·7	From 9th to 30th	26·45
December - -	„	−9	23·4	„	−7·6
January - -	1859	8	20·8	„	9·55
February - -	„	−2	17·6	„	1·25
March - -	„	16	25·2	„	23·0
April - - -	„	33	30·3	„	31·1
May - - -	„	50	32·1	From 1st to 8th	47·9

TEMPERATURE of SOIL at depths less than three feet in the SASKATCHEWAN PRAIRIES.

Latitude.	Longitude.	Date.	Therm. in Air.	Therm. in Soil.	Nature of Soil.	Remarks.
° ′	° ′	1858.	°	°		
52 32 N.	109 6W.	July 3	—	44·9	2½ ft. V.M.—F.S.	Superior soil to any in the neighbourhood.
52 35	109 22	„ 4	—	54·2	1½ ft. V.M.—F.S.	Near poplar clump.
52 35	109 40	„ 6	50°	49·9	S.	On a sand-hill near to a growth of small poplars.
52 36	110 23	„ 7	56°	53·9	S.	
52 36	110 50	„ 8	65°	50·2	S.	Valley of Battle River.
52 33	111 20	„ 9	58·7	49·1	½ ft. V.M.—S.	Near poplar patches.
52 28	111 30	„ 10	66·6	54·2	— —	Valley of Battle River.
52 28	111 30	„ 11	62·0	54·5	— —	do.
52 27	112 0	„ 13	—	53·9	1 ft. V.M.—S.	Fine pasture here.
52 24	112 19	„ 15	55·5	51·9	do.	Poplars and fine pasture.
52 24	112 19	„ 16	65·0	52·2	do.	Same place.
52 24	112 19	„ 17	70·0	52·2	do.	do.
52 23	112 40	„ 18	—	52·1	do.	Fair growth of poplars.
52 23	112 40	„ 19	65°	51·9	do.	
52 19	113 3	„ 20	84°	53·4	S.	Dead Man's Creek.
52 19	113 3	„ 21	57°	53·4	— —	do.
52 18	113 10	„ 22	58°	52·0	3 ft. V.M.	Valley Red Deer River.
52 13	113 40	„ 23	47°	52·5	do.	Nick Hills.
51 56	114 10	„ 24	50·5	50·5	2 ft. V.M.—S.	Edge of the woods.
51 56	114 10	„ 25	65·7	49·0	do.	do.
51 56	114 10	„ 26	72°	50·0	do.	do.
51 56	114 10	„ 27	69·5	50·1	do.	do.
51 56	114 10	„ 28	65°	49·5	do.	do.
51 56	114 10	„ 29	57°	49·5	do.	do.
51 36	114 0	„ 30	63°	51·9	½ ft. V.M.—S.	In a creek valley.
51 26	114 0	„ 31	46°	54·4	S.	do.
51 20	113 55	Aug. 1	75·2	54·9	S.	Prairie.
51 20	113 55	„ 3	76°	55·1	S.	do.
51 9	115 6	„ 9	60°	47·2	Shingle.	Bow River.

V.M. signifies Vegetable Mould. —F.S. signifies followed by Fine Sand. S. signifies Sand.

The corrected barometric readings have been grouped, so as to afford data by which to arrive at a rough estimate of the various districts of the prairies. Their altitudes are given, along with a few others, that may be useful for reference. (Table, p. 276, gives a selection of the observations of the temperature of boiling water taken at various places for the correction of the aneroid barometer.)

In calculating the altitudes, Toronto was taken as the point of comparison with Fort Carlton for the winter of 1857–8, and all the localities have been obtained by reference to the latter place.

ABSTRACT OF CORRECTED BAROMETRIC MEANS.

Date.	Highest.	Lowest.	Range.	Mean.	Number of Observations.
I.—FORT EDMONTON.					
1858.—January -	27·80	27·12	·68	27·54	21
„ February -	27·54	27·28	1·26	27·77	40
„ March -	28·00	27·36	·64	27·39	36
„ October -	28·02	27·14	·88	27·59	50
„ November -	28·33	27·10	1·23	27·78	85
„ December -	28·41	27·09	1·32	27·63	93
1859.—January -	28·31	27·18	1·13	27·78	93
„ February -	28·21	27·21	1·00	27·31	84
„ March -	28·06	27·21	·85	27·60	93
„ April - -	28·41	27·41	·90	27·86	90
„ May - -	28·01	27·32	·69	27·74	22
				Mean 27·626	of 707 obs.
MEANS OF HOURLY OBSERVATIONS.					
1858.—February 21 -	- - -	- - -	- - -	27·00	25
„ „ 22 -	- - -	- - -	- - -	27·35	24
1859.—January 20 -	- - -	- - -	- - -	28·12	25
„ February 1 -	- - -	- - -	- - -	28·04	24
„ „ 21 -	- - -	- - -	- - -	27·46	24
„ March 1 -	- - -	- - -	- - -	27·52	24
				Mean 27·691	of 853 obs.
Mean for January, February, and March, 1858 -				- 27·566	
„ „ „ 1859 -				- 27·563	
II.—JASPER HOUSE.					
1859.—February -	26·77	26·02	·75	26·35	58
„ March - -	26·88	25·97	·91	26·34	93
„ April - -	27·24	26·40	·84	26·65	42
				Mean 26·443	of 193 obs.
MEAN OF HOURLY OBSERVATIONS.					
1859.—February 1 -	- - -	- - -	- - -	26·13	24
				Mean 26·285	of 217 obs.
III.—ROCKY MOUNTAIN HOUSE.					
1859.—January - -	26·69	26·02	·67	26·515	of 23 obs.
IV.—BASE OF MOUNTAINS, IN LAT. 51.					
This group includes a series of observations at the Old Bow Fort, with selected observations made in the neighbourhood.					
1858.—August - -	25·93	25·52	·41	25·701	13
„ December -	26·17	24·88	1·29	25·560	17
1859.—August - -	26·20	25·33	·87	26·070	8
				Mean 25·770	of 38 obs.
V.—RED DEER RIVER.					
Observations taken on the Ice for 94 miles of its course above the Nick Hills, for which mean lat. 52° 2′, long. .					
1858.—December -	27·35	26·21	1·14	26·729	of 27 obs.
Estimated mean fall of river per mile, 5·3 feet.					
VI.—NORTH SASKATCHEWAN.					
Observations taken on the Ice for 211 miles of its course from Mountain House to Edmonton, for which mean lat. 52° 57′, long. 114° 5′.					
1857.—January -	27·83	26·72	1·11	27·332	of 10 obs.
Estimated mean fall of river per mile, 4·2 feet.					

Date.	Highest.	Lowest.	Range.	Mean.	Number of Observations.

VII.—Athabasca River.

Observations taken on the Ice for 259 miles of its course, from Fort Assineboine to Jasper House, for which mean lat. 53° 56′, long. 116°.

1859.—January -	27·80	26·20	1.60	27·274	of 34 obs.

Estimated mean fall of river per mile, 4·9 feet, Fort Assineboine being considered as 200 feet below Edmonton.

VIII.—General Plain Level.

Level along Saskatchewan River Valley between Carlton and Edmonton.

1857.—December -	28·62	27·14	1·48	28·120	of 55 obs.

IX.—General Level,

Along track from Edmonton to Mountain House.

1857.—Jan. & Dec. -	27·28	26·24	1·04	26·929	of 30 obs.

X.—Plains to East of Eagle Hill.

South of North Saskatchewan.

1858.—June - -	28·50	27·92	·58	28·209	of 8 obs.

XI.—Eagle Hill Plateau.

1858.—June - -	27·68	27·24	·44	27·465	of 13 obs.

XII.—Grand Coulée and Valley of Battle River.

1858.—July - -	28·08	27·40	·68	27·834	of 47 obs.

XIII.—Plains between Battle River and Red Deer River.

South of Bull Lake Hills.

1858.—July - -	27·47	27·24	·23	27·387	of 22 obs.

XIV.—Plateau South of Red Deer River.

(Caché Camp.)

1858.—July - -	27·22	26·69	·53	26·841	of 33 obs.

Table of Altitudes, deduced from Barometric Means, to which all Local Measurements of Altitudes have been referred.

Toronto, 29·62 ; 342 feet above sea level.
Carlton, above the sea 1,321 feet.

Place.	Refer.	Bar.	Therm.	Above Edmonton.	Above Carlton.	Above Sea.
			°			
Fort Carlton - - - - - -	—	28·555	1·1	—	—	—
Fort Edmonton - - - - - -	I.	27·691	24·	—	767	2,088
Jasper House - - - - - -	II.	26·285	22·9	1,284	2,051	3,372
Rocky Mountain House - - - - -	III.	26·515	10·	1,107	1,874	3,195
Bow Fort Level - - - - - -	IV.	25·770	29·	1,875	2,642	3,963
Mean Level of Red Deer River for 94 miles above Nick Hills.	V.	26·729	4·	901	1,668	3,089
Mean Level of Saskatchewan between Mountain House and Edmonton.	VI.	27·332	10·	344	1,111	2,432
Mean Level of Athabasca River between Jasper House and Fort Assineboine.	VII.	27·274	6·	320	1,087	2,408
Mean Level of Track from Carlton to Edmonton - -	VIII.	28·20	18·	−375	392	1,713
Mean Level of Trail from Edmonton to Mountain House -	IX.	26·929	10·	734	1,501	2,822
Level of Prairie at Elbow of North Saskatchewan -	X.	28·209	56·	−468	299	1,620
High Plateau of Eagle Hills - - - -	XI.	27·465	57·	240	1,007	2,328
Grand Coulée and Battle River - - - -	XII.	27·834	59·	−101	622	1,943
Plains to the South of Bull Lake - - - -	XIII.	27·387	56·	289	1,056	2,377
Plains to South of Caché Camp - - - -	XIV.	26·841	56·	817	1,584	2,905
Base of Hand Hills - - - - -	XV.	26·769	60·	850	1,517	2,838
Base of Cypress Mountains and of Watershed of Missouri -	XVI.	26·439	60·	1,173	1,940	3,261

ADDITIONAL ALTITUDES from various sources.

	Above the Sea.
Lake Superior	641 feet.
Dog Portage, upper end	1,420 „
Height of Land, Prairie Portage	1,500 „
Lake of the Woods	950 „
Rainy Lake	1,000 „
Lake Winipeg	620 „
Riding Mountain	1,600 „
Top of Hand Hills	3,400 „
Top of Cypress Hills	3,800 „
Height of Land, South Kootanie Pass (*Blackiston*)	6,030 „
Height of Land, British Kootanie Pass	6,300 „
Height of Land, Kananaskis Pass	5,700 feet.
„ „ Vermillion Pass	4,903 „
„ „ Kicking-horse Pass	5,210 „
„ „ Howe's Pass	4,500 „
Source of South Saskatchewan or Bow River	6,347 „
Source of Pipe-stone River	7,200 „
Lakes at Source of Columbia	3,090 „
Kootanie Trading Post	2,300 „
Fort Colvile	1,050 „
Height of Land, Manson's Trail, Cascade Range ?	4,000 „

TABLE of OBSERVATIONS of the Temperature of the Boiling Point of Water for the Correction of the Aneroid Barometers.

Date.	Place.	Obs. Temp.	Corr.	Converted.	Aneroid, 18,257.	Corr.	Aneroid, 17,871.	Corr.	Therm. Air.
1858.		°							°
June 10	Carlton	209·43	+·100	28·460	28·35	+·11	28·36	+·16	Th. 60
Aug. 8	Bow Fort	205·57	+·095	25·795	25·75	+·04	25·66 (17,867)	+·13	„ 70
Nov. 1	Edmonton	208·55	+·150	27·989	27·84	+·14	27·76	+·22	„ 58
„ 8	„	207·86	+·147	27·601	27·41	+·19	27·35	+·25	„ 57
„ 19	„	207·20	+·170	27·249	27·10	+·14	27·02	+·22	„ 63
Dec. 26	„	207·85	+·147	27·642	27·47	+·17	27·41	+·23	„ 53
1859.									
Jan. 5	„	209·22	+·120	28·351	28·11	+·24	28·07	+·28	„ 60
Feb. 1	Jasper House	206·22	+·125	26·686	26·53	+·15	—	—	„ 60
„ 6	„	205·10	+·130	26·091	25·94	+·15	—	—	„ 61
May 10	Edmonton	207·30	+·160	27·291	27·18	+·11	27·11	+·18	„ 63
„ 20	„	208·03	+·150	27·702	27·61	+·09	27·58	+·12	„ 69
June 1	„	207·69	+·147	27·516	27·39	+·12	27·32	+·19	„ 70
„ 10	„	207·97	+·140	27·656	27·58	+·07	27·42	+·23	„ 77
„ 24	Hand Hills	205·49	+·110	26·288	26·26	+·02	25·97	+·21	„ 60
July 4	Lake Camp	207·21	+·165	27·252	27·06	+·19	26·98	+·27	„ 64
„ 26	Base of Cypress Mountains	207·28	+·158	27·293	27·18	+·11	26·98	+·31	„ 59
„ 31	Cypress Mountain Camp	205·95	+·150	26·511	26·34	+·17	26·13	+·38	„ 51
Aug. 2	„ „ „	205·65	+·100	26·368	26·28	+·08	25·96	+·40	„ 80
„ 17	Bow Fort	205·25	+·071	26·139	26·08	+·05	—	—	„ 50
„ 23	On Bow River	203·55	+·090	25·261	25·21	+·05	—	—	„ 51
„ 27	Pipe-stone Falls	200·60	+·070	23·762	23·69	+·07	—	—	„ 41
„ „	Height of Land	197·85	+·080	22·447	23·18	−·74*	—	—	„ 37
„ 31	North Saskatchewan	204·33	+·110	25·680	25·62	+·06	—	—	„ 41
Sept. 3	„ „	204·33	+·110	25·679	25·62	+·05	—	—	„ 39
„ 7	Source of Blueberry River	203·89	+·110	25·461	25·40	+·06	—	—	„ 40
„ 17	Mouth of ditto	207·83	+·147	27·606	27·41	+·19	—	—	„ 47
Oct. 2	Source of Columbia	207·15	+·170	27·219	26·96	+·25	—	—	„ 43
„ 8	Kootanie Post	208·10	+·165	27·742	27·48	+·26	—	—	„ 50
„ 19	Clark's Fork	209·250	+·120	28·360	28·20	+·16	—	—	„ 35
„ 28	Fort Colvile	210·20	+·100	28·902	28·82	+·08	28·61	+·29	„ 50

Mean Correction for Aneroid	No. 18,257	+0·122
„ „ „	No. 17,871	+0·142
„ „ „	No. 17,867	+0·252
Or for Observations while at rest at Edmonton		+0·213

* This reading is obviously beyond the range of the instrument.

TABLES USED FOR CALCULATING BOILING POINT OBSERVATIONS.

I.—REGNAULT'S VALUES for the Elastic Force of Aqueous Vapour in inches of Mercury at 32° at the Sea Level in Lat. 53°, as given by Dixon on Heat, vol. I., p. 270.

Temp.	Inches.	Diff.	Temp.	Inches.	Diff.	Temp.	Inches.	Diff.
195°	21·110	·449	201°	23·924	·498	207°	27·048	·552
196	21·559	·457	202	24·422	·507	208	27·597	·561
197	22·016	·464	203	24·929	·516	209	28·158	·570
198	22·480	·473	204	25·445	·524	210	28·728	·580
199	22·953	·482	205	25·969	·533	211	29·308	·598
200	23·435	·489	206	26·502	·543	212	29·898	

II.—Instrumental Corrections for the Themometer used, supplied from Kew Observatory.

Temp.	Corr.	Temp.	Corr.	Temp.	Corr.
182°	+·180	203°	+·090	208°	+·147
187	+·110	204	+·110	209	+·124
192	+·070	205	+·130	210	+·100
197	+·080	206	+·150	211	+·090
202	+·070	207	+·170	212	+·080

The magnetical observations of the Expedition have been admirably described and discussed by Major-General Sabine, in the great work published under his superintendence entitled "Observations made at the Magnetical and Meteorological Observatory at St. Helena, with discussion of the Observation at St. Helena, the Cape of Good Hope, Falkland Islands, Carlton Fort in North America, and Pekin. Vol. II. London. 1860." page 105.

What relates to the Expedition in this work has been extracted as follows.—

Carlton Fort.

In the spring of 1857, Her Majesty's Government, designing to send an expedition to examine and survey the yet unsettled country on the north of the boundary line of the British territories, and comprised between Canada on the east, and the Rocky Mountains on the west, notified their intention to the Royal Society, and invited suggestions regarding any objects of physical research for which the Royal Society might deem this to be a fitting occasion.

Amongst the objects to which attention was called in reply, the expediency of repeating and extending the magnetic survey of British North America,—which, at the instigation of the Royal Society, was made in 1843 and 1844, and of which the results are contained in the Philosophical Transactions for 1846, Art. XVII.,—was not forgotten, and Lieutenant (now Captain) Blakiston, of the Royal Artillery, was in consequence appointed to accompany the Expedition, having special charge of the magnetic observations, and with directions to assist generally in geographical determinations. The magnetic instruments were provided under the superintendence of the director of the observatory of the British Association at Kew, where, also, Captain Blakiston received instruction in their use, and acquired practical experience in their manipulation.

The hourly observation of the declination, which had been made by Captain Rochfort Maguire and the officers of H.M.S. "Plover" at Point Barrow in 1852, 1853, and 1854 (Phil. Trans. 1857, Art. XXIV.), having manifested the importance of observations of this nature, and the desirability of obtaining them at other stations on the North American continent not far removed from Point Barrow, the attention of Captain Blakiston was specially drawn to the subject by a memorandum supplied to him by the Royal Society through the Colonial Office.

In the winter and spring of 1857–58, Captain Blakiston availed himself of an opportunity, afforded by the sojourn of the Expedition at Fort Carlton during the part of the year not favourable to field operations, to carry into execution this part of his instructions by conducting a series of hourly observations with the unifilar magnetometer at that station, in latitude 52° 52′ N. and longitude 106° 30′ W., commencing November 12, 1857, and terminating April 15, 1858. Captain Blakiston was enabled to accomplish this laborious work by the assistance voluntarily rendered to him by Dr. Hector, Mr. Sullivan, and M. Bourgeau, which last gentleman had accompanied the Expedition as botanist, and actuated by a disinterested and most praiseworthy zeal for the advancement of science (though in a branch foreign from his own department) divided with Captain Blakiston the labour of maintaining the hourly observations unintermittingly during two of the five months. The records of the observations, transmitted through the Colonial Office, have been received at Woolwich, and submitted to the same process as those from Point Barrow; the original records of both will be ultimately deposited in the archives of the Royal Society.

On reviewing the Carlton Fort observations, 6 scale divisions, corresponding to 6′·0 of arc, appeared a suitable amount to be taken as characterizing one of the larger disturbances. The whole number of observations was 3,716, of which 776 differed from their respective normals of the same month and hour by an amount equalling or exceeding 6′·0, being about 1 in 4·8, or nearly one-fifth of the whole number, a proportion very nearly the same as at Point Barrow, where a difference from the normals of 22′·87 was adopted as constituting a large disturbance.

The aggregate amount of disturbance, computed from the respective normals, was 12,095 minutes of arc in the five months, of which 7676′·9 was easterly and 4418′·1 was westerly disturbance, the easterly preponderating in the proportion of 1·74 to 1·0. The aggregate values in different months were as follows:—

Table XCV.

November 1857	19 days	1958′·0 minutes of arc
December „	31 „	2320′·7 „
January 1858	31 „	1047′·6 „
February „	28 „	1534′·4 „
March „	31 „	2909′·6 „
April „	15 „	2324′·7 „
	155 „	12095′·0 „

Table XCV. exhibits the aggregate values of the disturbances distributed into the different *hours* of their occurrence, and the ratios which the values at the different hours bear to the mean of all the hours.

TABLE XCVI.

Local Astronomical Hours.	Disturbances.	Ratios.	Local Civil Hours.	Local Astronomical Hours.	Disturbances.	Ratios.	Local Civil Hours.
H.	′		H.	H.	′		
18	603·2	1·20	6 a.m.	6	231·7	0·46	6 p.m.
19	470·7	0·93	7 a.m.	7	374·4	0·74	7 p.m.
20	373·0	0·74	8 a.m.	8	389·8	0·77	8 p.m.
21	317·8	0·63	9 a.m.	9	536·9	1·07	9 p.m.
22	613·0	1·22	10 a.m.	10	578·5	1·15	10 p.m.
23	410·8	0·82	11 a.m.	11	561·7	1·11	11 p.m.
0	262·7	0·52	Noon.	12	735·6	1·46	Midnight.
1	316·8	0·63	1 p.m.	13	809·6	1·61	1 a.m.
2	189·7	0·38	2 p.m.	14	1011·0	2·01	2 a.m.
3	333·2	0·66	3 p.m.	15	852·7	1·69	3 a.m.
4	282·5	0·56	4 p.m.	16	898·4	1·78	4 a.m.
5	286·3	0·57	5 p.m.	17	655·0	1·30	5 a.m.
				Total	12,095·0		
				Mean hourly value	$\frac{12,095·0}{24}=504·0=1·00$		

We perceive in this table, as everywhere else, unmistakeable evidence of the existence of laws regulating the occurrence and the mean effects of the disturbances according to the hours of solar time. We perceive, also, that this regularity is so systematic, that at Fort Carlton even the short period of five months of hourly observation is sufficient to yield an approximate representation of the ratio of disturbance at different hours.

In Table XCVII. the aggregate values of the disturbances are separated into their respective easterly and westerly constituents.

TABLE XCVII.

Local Astronomical Hours.	Disturbances.		Ratios.		Local Civil Hours.	Local Astronomical Hours.	Disturbances.		Ratios.		Local Civil Hours.
	Easterly.	Westerly.	Easterly.	Westerly.			Easterly.	Westerly.	Easterly.	Westerly.	
H.	′	′			H.	H.	′	′			H.
18	439·3	163·9	1·37	0·89	6 a.m.	6	95·6	136·1	0·30	0·74	6 p.m.
19	262·5	208·2	0·82	1·13	7 a.m.	7	239·0	135·4	0·75	0·74	7 p.m.
20	193·0	180·0	0·60	0·98	8 a.m.	8	282·1	107·7	0·89	0·58	8 p.m.
21	196·4	121·4	0·61	0·66	9 a.m.	9	464·9	72·0	1·45	0·39	9 p.m.
22	352·9	260·1	1·10	1·41	10 a.m.	10	364·7	213·8	1·14	1·16	10 p.m.
23	171·6	239·2	0·54	1·30	11 a.m.	11	349·3	212·4	1·09	1·15	11 p.m.
0	128·8	133·9	0·40	0·73	Noon.	12	465·2	270·4	1·45	1·47	Midnight.
1	98·2	218·6	0·31	1·19	1 p.m.	13	450·4	359·2	1·44	1·95	1 a.m.
2	59·8	129·9	0·19	0·71	2 p.m.	14	774·1	236·9	2·42	1·29	2 a.m.
3	164·4	168·8	0·51	0·92	3 p.m.	15	749·5	103·2	2·34	0·56	3 a.m.
4	84·7	197·8	0·26	1·07	4 p.m.	16	836·0	62·4	2·61	0·34	4 a.m.
5	123·2	163·1	0·39	0·88	5 p.m.	17	331·3	323·7	1·04	1·76	5 a.m.
						Total	7676·9	4418·1			

In reviewing Table XCVII. we perceive, as we might indeed expect, that as the easterly disturbances preponderate at Carlton Fort in the proportion of nearly one and three-quarters to one, so the easterly ratios bear a more decidedly systematic appearance than those of the westerly disturbances; both are, indeed, remarkable examples of the degree of regularity which may be manifested by the results of even so short a period of observation as five months, when conducted with the requisite care and fidelity; but a longer period would be desirable, particularly for the westerly deflections. The easterly and westerly disturbances have obviously distinct laws in respect to their times of occurrence; the easterly have their principal development from 2 to 4 a.m., and their ratios are above unity from 9 p.m. to 6 a.m., whilst, with a single exception, viz., at 10 a.m., which is probably accidental, the ratios are below unity from 7 a.m. to 8 p.m. In comparing the easterly ratios at Carlton with the easterly at the arctic station of Point Barrow (the latter being taken from the Phil. Trans., 1857, Art. XXIV. p. 504), a comparison to which we may be led by the circumstance that the easterly disturbances predominate at both stations (at Point Barrow in the proportion of 1·63 to 1, and at Carlton of 1·74 to 1), we find, as seen in Table XCVIII. (with a general resemblance in other respects) this remarkable difference, that the ratios are above unity about five hours earlier at Carlton than at Point Barrow; that they also descend below unity about five hours earlier, and that there is the same amount of difference of five hours between the respective epochs of principal development, viz., 2 to 4 a.m. at Carlton, and 7 to 9 a.m. at Point Barrow. It is obvious, however, that the data regarding the laws of the disturbances are yet insufficient for an attempt to generalize beyond the mere pointing out of certain decided resemblances and differences.

Table XCVIII. exhibits the comparison of the ratios of the disturbances which produce easterly deflections at Carlton Fort and Point Barrow.

TABLE XCVIII.

Local Astronomical Hours.	Easterly Disturbances.		Local Civil Hours.	Local Astronomical Hours.	Easterly Disturbances.		Local Civil Hours.
	Carlton Fort Ratios.	Point Barrow Ratios.			Carlton Fort Ratios.	Point Barrow Ratios.	
H.			H.	H.			H.
18	1·37	1·65	6 a.m.	6	0·30	0·09	6 p.m.
19	0·82	2·82	7 a.m.	7	0·75	0·13	7 p.m.
20	0·60	3·22	8 a.m.	8	0·59	0·15	8 p.m.
21	0·61	3·88	9 a.m.	9	1·45	0·48	9 p.m.
22	1·10	1·93	10 a.m.	10	1·14	0·57	10 p.m.
23	0·54	1·03	11 a.m.	11	1·09	0·81	11 p.m.
0	0·40	0·40	Noon.	12	1·45	0·96	Midnight.
1	0·31	0·34	1 p.m.	13	1·44	0·96	1 a.m.
2	0·19	0·27	2 p.m.	14	2·42	1·07	2 a.m.
3	0·51	0·15	3 p.m.	15	2·34	0·93	3 a.m.
4	0·26	0·14	4 p.m.	16	2·61	1·22	4 a.m.
5	0·39	0·08	5 p.m.	17	1·04	1·69	5 a.m.

Aurora.—When each hourly observation was recorded at Carlton Fort, an examination was made whether Aurora was visible or not, and if visible the hourly observation was marked by an asterisk. There are 460 observations so marked out of the whole number of 3,716, or Aurora was seen at about one-eighth part of the whole number of hourly observations in the five months. When the 460 observations of the Aurora are distributed into the different *hours* of their occurrence we find them to have been as follows:—

TABLE XCIX.

Showing the number of times that the Aurora is recorded to have been seen at the several observation hours in the months of November and December 1857; January, February, March, and April, 1858.

Hours of local Civil Time.	Number of Auroras observed.	Hours of local Civil Time.	Number of Auroras observed.	Hours of local Civil Time.	Number of Auroras observed.	Hours of local Civil Time.	Number of Auroras observed.
6 a.m.	10	Noon.	0	6 p.m.	5	Midnight.	59
7 a.m.	1	1 p.m.	0	7 p.m.	13	1 a.m.	56
8 a.m.	0	2 p.m.	0	8 p.m.	26	2 a.m.	46
9 a.m.	0	3 p.m.	0	9 p.m.	35	3 a.m.	46
10 a.m.	0	4 p.m.	0	10 p.m.	41	4 a.m.	40
11 a.m.	0	5 p.m.	3	11 p.m.	53	5 a.m.	26

We perceive by this table that the most frequent appearance of Aurora was between midnight and 1 a.m., and that the progression of frequency decreases without interruption from that hour to 7 a.m. on the one side, and to 5 p.m. on the other; whilst between 8 a.m. and 4 p.m. (both hours included) not a single appearance of Aurora is recorded. In all this the phenomena bear a marked resemblance to those at Point Barrow, as may be seen by the following tabular comparison:—

TABLE C.

Showing the number of times that the Aurora is recorded to have been seen at the several observation hours at Point Barrow in the months of December, January, and February 1852, 1853, and in the same months in the following years.

Local Civil Hours.	Number of Auroras.	Local Civil Hours.	Number of Auroras.	Local Civil Hours.	Number of Auroras.	Local Civil Hours.	Number of Auroras.
6 a.m.	66	Noon.	0	6 p.m.	30	Midnight.	85
7 a.m.	54	1 p.m.	0	7 p.m.	56	1 a.m.	103
8 a.m.	28	2 p.m.	0	8 p.m.	56	2 a.m.	96
9 a.m.	10	3 p.m.	0	9 p.m.	60	3 a.m.	95
10 a.m.	2	4 p.m.	5	10 p.m.	77	4 a.m.	80
11 a.m.	0	5 p.m.	15	11 p.m.	78	5 a.m.	71

The principal difference at the two stations consists in there being more manifestation of Aurora at the early hours of the morning, viz., from 6 to 10 a.m. at Point Barrow than was the case at Carlton Fort.

Solar-diurnal Variation.—The solar-diurnal variation shown by the five months of hourly observation at Carlton Fort, after the omission of the larger disturbances, or those which equalled or exceeded a difference of 6·0 from the respective normals, is exhibited in Table CI.

TABLE CI.

ASTRONOMICAL HOURS.

0h.	1h.	2h.	3h.	4h.	5h.	6h.	7h.	8h.	9h.	10h.	11h.
2′·31W.	3′·50W.	4′·75W.	4′·20W.	3′·69W.	3′·14W.	2′·03W.	1′·16W.	0′·17W.	0′·23W.	0′·46W.	0′·06 E.

continued.

12h.	13h.	14h.	15h.	16h.	17h.	18h.	19h.	20h.	21h.	22h.	23h.
0′·84 E.	0′·90 E.	1′·64 E.	0′·74 E.	0′·88 E.	1′·16 E.	1′·96 E.	3′·72 E.	5′·08 E.	4′·63 E.	3′·47 E.	0′·58 E.

The declination magnet reaches its extreme easterly deflection a little before 8 a.m., and its extreme westerly a little after 2 p.m.

The progression from the extreme easterly to the extreme westerly, and from the extreme westerly to the extreme easterly is continuous, with the exception of a slight interruption at 8 and 9 p.m., when the easterly disturbance variation is most considerable, and from 15h. to 18h., when the westerly deflection caused by the semi-annual inequality (October to March) interferes.

The range of the solar-diurnal variation at Carlton Fort is only a very little greater than the range in the same months at Toronto; whilst, on the other hand, the magnitude and frequency of the disturbances are much greater than at Toronto. The latitude of Carlton Fort is about a degree north of the latitude of London; but in comparing the relative frequency of Aurora in the southern parts of Britain and at Carlton Fort, we become fully sensible of the fact that auroral frequency is not simply a function of the geographical latitude, but that both Carlton and Point Barrow are in a part of the globe where magnetic disturbances, and their concomitant phenomena of auroral displays, prevail to a much greater extent than in the corresponding latitudes of Europe.

NOTES RELATIVE TO PROGRESS OF SEASONS.

EXTRACT from the JOURNAL of the Rev. THOS. WOOLSEY, Wesleyan Missionary, EDMONTON HOUSE, SASKATCHEWAN.

1855, November 1st.—A little snow has fallen for the first time.
November 12th.—Swamps frozen over so as to allow of haymaking.
November 13th.—Saskatchewan frozen over. A little more snow has fallen.
November 17th.—River crossed to-day for the first time.
December 2nd.—The past week has been remarkably mild.
December 9th.—More snow.

1856, January 8th to 11th.—More like spring than winter.
January 13th.—Still fine open weather.
January 17th.—Somewhat colder.
February 14th.—Weather open.
February 16th.—The snow is disappearing rapidly.
February 20th.—The winter packet "Express" arrived to-day.
February 23rd.—Mr. J. Simpson returned to Fort Pitt with six sleighs drawn by 24 dogs.
February 28th.—Rev. H. B. Sternham arrived with dog sleighs.
March 11th.—More snow.
March 17th.—They are firing the pasture ground to-day.
March 18th.—Thunderstorm.
March 21st.—Ducks and geese are returning.
March 30th.—A considerable fall of snow has taken place, but it is again rapidly disappearing.
March 31st.—Snow quite gone.
April 7th.—Ploughing commenced. River crossed to-day for the last time.
April 19th.—A hurricane of wind.
April 28th.—First wheat sown.
April 30th.—Rain.
May 1st.—Still rain all day.
May 5th.—The boats arrive from the Rocky Mountain House. Navigation open.
July 13th.—A terrific storm of wind, hail, rain, and thunder.
September 25th.—Very cold weather.
September 26th.—Heavy rain.
September 27th.—A little snow fell to-day.
November 4th, 5th.—Considerable fall of snow.
December 16th.—Influenza has prevailed in the fort for some days back, nearly everyone is affected.

1857, January 4th.—Weather very cold.
January 8th.—Weather somewhat less intensely cold.
February 11th.—Snow covers the ground to the depth of three feet. Winter very severe.
February 14th.—More snow still falling.
February 19th, 20th.—Partial thaw.
February 21st.—Mild.
February 27th.—Snow scarcely diminished in quantity yet. The "Express" is behind time, probably in consequence of it.

March 2nd.—Winter packet "Express" arrived to-day, having taken 13 days from Fort Pitt, and being 10 days behind last year.

March 3rd.—Snow disappearing.

March 17th.—Considerable fall of snow yesterday.

March 27th.—Three inches of fresh snow has fallen.

April 1st.—Snow storm still continuing.

April 6th.—Considerable fall of rain.

April 7th.—Thawing rapidly.

April 14th.—The river again crossed by a number of horses after having been broken up for some days. The cold has been severe for the last few days.

April 16th.—More snow has fallen.

April 17th.—The priest nearly drowned in crossing a lake on his way to Lake St. Ann's, in consequence of the rotten texture of the ice from the repeated thaws.

April 19th.—Again another fall of snow.

October 30th.—M. Bourgeau sank two thermometers at the depth of two and three feet respectively (according to Dr. Hooker's instructions), in order to record the temperature of the soil throughout the coming winter (*see* record of these observations; also two thermometers were inserted, one 15 inches into a *Populus balsamifera*, the other at 18 inches into an *Abies alba* (*see* record of these observations).

November 1st.—Sensible change in the weather, the thermometer indicating 2° below zero. The wolves killed one of our horses; this is by no means a rare occurrence during the winter months.

November 3rd.—Occasional snow.

November 4th.—Snow rests on the ground, and the river is full of drifting ice.

November 5th.—Very mild, thermometer as high as 33°.

November 6th.—Cold. Increase of snow. Second horse killed by the wolves. Buffalo reported far off.

November 7th.—Increase of snow. Dogs tackled in sledges for the first time this season. Very little provision in the fort.

November 9th.—Increase of snow. River entirely frozen over, and horses and carts have been driven over its surface.

November 10th.—Piercingly cold.

November 30th.—Nothing important to record since 10th. Mr. Vidler arrived at the fort, accompanied by an Indian, and obtained supplies from Expedition stores.

December 14th.—Dr. Hector started for Fort Edmonton to engage men for the ensuing spring. He goes *viâ* Fort Pitt.

January 12th.—Throughout the day and during last night it has been intensely cold. The mercurial thermometer had to be replaced by the spirit thermometer. The aneroid barometer proved valueless also, and we find that its indications are not to be relied on when the mercury is far below the "freezing point."

January 26th.—We have received bad news within the last few days—there are no buffalo, the fort hunters are reduced to great straits for provisions, and the Indians have been forced to kill their horses and dogs for food.

January 27th.—Letters from Fort Garry, none of later date than the first week of last June. Newspapers full of frightful accounts of the state of our Indian empire.

February 3rd.—Men returned from the hunter's camp without meat. Mr. Hardesty, the gentleman in charge of the fort, has been forced to kill a domestic cow, as there is not an ounce of provision in the establishment. He has served out ammunition also, and despatched all the resident families but three, to live in the woods. Two of our men start with them and the third remains for our horseguard.

February 19th.—Three inches of snow has fallen since last night, and has continued more or less throughout the day.

February 22nd.—An additional two inches of snow has fallen to-day.

April 6th.—The men whom Capt. Palliser engaged at Red River settlement for the ensuing spring have arrived.

April 8th.—Red River brigade sent off with guns and ammunition under charge of Hallet (second guide) to support themselves by hunting.

April 10th.—Everything is commencing to wear a spring aspect; the women of the fort are scattered along the banks of the river, busy gleaning their annual harvest of maple sugar. The tree from which they obtain sugar is not the true maple. It is the *Negundo fraxinifolium*. M. Bourgeau has a small portable garden, in which he has already brought several of the early plants to perfect flower. Ducks and geese have been seen more or less plentiful since March 25th, on which day they were seen for the first time this season at Jackfish Lake, Fort Pitt, and at this place. The river ice is entirely free at the margins, and only awaits a slight flood to be quite broken up. However, occasionally, winter struggles with the advancing spring, as after intervals of a few genial days, a storm occurs bringing sleet and snow and cold winds from N.E.

April 11th.—After a severe storm yesterday the weather to-day is delightfully open and warm, and, for the first time this season, frogs have been heard to croak in the swamps. A small gull has been seen to-day flying up the river. A blue Anemone was observed in flower on the plains, and the alders also, on the river banks.

April 12th.—The river water swarms with myriads of small blackbeetles: we have made a collection. Yesterday the ice in the river took a start, and at several places there are now clear open spaces of water extending from bank to bank. A lichen, *Peltigera canina*, in flower.

April 18th.—The temperature in 24 hours has not been below the "freezing point." Snow has almost entirely disappeared from the ground; some secluded localities, where the sun's rays cannot penetrate, still keep their winter coat. The buds of the flowers and leaves of the *Salix*, *Alnus*, *Betula*, *Acer*, *Elæagnus*, and *Populus tremuloides*, have greatly increased during the last few days, and await

only for the frosts to cease, in order to develop. An Astragalus on the plains is already sporting its new leaves.

Now that the snow has disappeared we are able to remark the excellent preservation in which the hay of last year has been kept during the long winter. The cold is so great during the inclement season that the snow which falls is perfectly dry, and the hay of the previous autumn therefore remains as well preserved beneath it as if it had been stacked.

April 21st.—River increased in volume, and drift timber is carried down by the current. Collections of insects made. *Alnus* on the border of the river in flower.

April 23rd.—The first swallows were seen to-day. Extensive prairie fire in the environs of the fort, and all hands engaged in extinguishing it.

Every night adds more voices to the chorus of frogs in the swamps and marshes. Ducks, geese, and swans plentiful, and these form our whole support. No buffalo have appeared, and the Plain Indians have eaten wolves, foxes, &c., which animals they use as food only when extreme want compels them. Since 11th numerous species of insects have appeared; small butterflies abound, and a great many specimens have been collected. The Anemones, which were remarked to have flowered on 11th, were frozen during the night of 15th.

April 24th.—Fire raging on N. side of river, and during the afternoon we have had three sudden whirlwind storms. These are undoubtedly local, and caused by the influence of the fires; they were seen carrying along columns of smoke with great rapidity. To the fires also may be attributed the almost entire disappearance of the annual plants. There is no doubt but that in former years forests of coniferous trees existed in the neighbourhood of Carlton, as frequently the remnants of numerous *Abies alba* are met with in the small poplar clumps which characterise the country here. To-day a pair of grouse (*Tetrao Canadensis*) which are rare in this part of the country, were shot.

April 28th.—Lieut. Blakiston started to run buffalo. M. Bourgeau has gone off also on a botanical tour. There are said to be two kinds of water hen in this part of the country, the rarer of the two was killed to-day, and Lieut. Blakiston has preserved it among his collection of birds. Land shells are very scarce here; we have only collected four species—*Helix*, *Succinia*, *Vitrina*, the two former by far the most plentiful. *Lymnia* are abundant.

April 29th.—First eggs obtained (three goose eggs). A young owl was taken from its nest, and appears to be three or four days old.

May 1st.—The catkins of the large grey willow commenced to show.

Some free traders arrived here from Fort Pitt: they had left that place on 21st April, and the ice there had only then commenced to thaw. It is curious that such a difference exists between the temperature at that place and that of Fort Carlton. Even when short periods of mild weather have taken place at the latter, the cold has been intense at Fort Pitt, and it is said to be the coldest spot on the river.

M. Bourgeau returned to-night; his botanical collection has not been great, but he has obtained the parasitical plant in flower which clings to the branches of the *Pinus banksiana*. This plant causes the leaves of the pine to be of a diminutive size, only about one inch in length. We observed it at the Kakabeca Falls in June 1857, but it was then in an unfit state for preservation.

The country which M. Bourgeau has visited is about 1° to the north of this place, and he describes it as being at least one month behind Carlton; the swamps and lakes in that locality are still frozen over. The dense forests, which commence about two miles to the N. of Shell River, are composed of the following, in the dry elevated parts, *Pinus banksiana*, and in the low marshy lands, *Abies alba*. The most northerly part he visited is densely clothed in the two ordinary kinds of poplar, the *Laryx Canadensis* and *Betula papyraceæ*. The latter are so closely packed that they attain a great altitude (sometimes 40 ft.) before any branches commence to protrude. Their extreme height seems to be 100 ft., but the *Laryx* grows to a greater height, and the average diameter does not measure more than 15 or 18 inches. In the environs of Carlton the new grass is sprouting on the old burnt ground, thus giving the country the appearance of young corn fields.

May 2nd.—The hazel nut, *Corylus Americana*, has flowered, and specimens have been obtained.

May 3rd.—Swallows appear plentifully. The Bearberry (*Hypophae*) has flowered, also two other species of the same family. The *Phox Hoodii*, remarked by Sir J. Richardson to have flowered on 4th May 1827, has flowered to-day. Some specimens, three in all, of the *Salix*, and the *Populus balsamifera* and *tremuloides* are in flower.

May 4th.—An avocet, the bird with the curiously turned-up bill, has been shot near the fort. It differs slightly in colour from those we killed last September, at the Qu'appelle Lakes. At this place the neck of the avocet is of a fawn colour.

A squaw, while angling in the river, caught a fine sturgeon, and a fish called by the Canadians the Marry (Burbot). Also a fish with small clear scales and a round body, that we could not identify with any described by Richardson. (Sent home, but did not arrive well preserved.) Sturgeon is seldom fished for at Carlton, there being none of those eddies in the vicinity which facilitate the operation; but at the mouth of Battle River, a tributary of the Saskatchewan, sturgeon are plentiful, and at Fort à la Corne great numbers are caught.

May 5th.—Morning broke clouded, no sun visible, and during last night rain fell. The Cabri, or Prairie Antelope, has made his appearance for the first time this season. It is about this time every year that they return to the north in order to seek an asylum for their young against the attacks of wolves. A *Lathyrus* (?) has flowered.

May 6th.—The *Ranunculus rhomboideus*, *Negundo fraxinifolium*, and *Betula papyracea*, have flowered.

May 7th.—The *Viola androsaceæ* flowered to-day.

May 8th.—The *Potentilla* in flower, also *Astragalus Fragaria*, and two *Carex*.

May 12th.—At 8 a.m. one half inch of ice on the surface of the water. An *Aira* in flower.

May 14th.—A half inch of ice on the surface of the water.

May 15th.—The frosts of last week have been sufficient to freeze all the flowers which have appeared since the 12th February. *Alnus*, *Corylus*, *Salix*, *Œleagnus*, &c., will not produce good seed this season

in the neighbourhood of Carlton, and others, as *Pulsatilla Nuttaliana*, &c., are killed on this account. The leaves of the poplars even have suffered, but the leguminous and cruciferous plants have suffered most.

May 16th.—Snow has fallen to-day, and a high wind prevails from S. First magpies seen. Gooseberry bushes in flower. Goatsuckers appear.

May 21st.—Numerous birds' nests with eggs appear. Sharp-tailed grouse lay in the long prairie grass, and as many as 12 eggs have been taken from a nest. Two falcons' nests, with two and three eggs respectively. Mosquitoes numerous.

May 23rd.—Day broke fine, but towards evening a storm broke out, accompanied by thunder and lightning. New grass four inches high at this date, and the young poplars and others have a lively green appearance.

May 25th.—Mr. Sullivan killed a new species of squirrel? It resembles the *Arctomys Hoodii*, but is much smaller, and is located in the woods. The animal is striped as the *Arctomys Hoodii*, but the grey patches on the dark stripe are wanting.

June 4th.—The people of the fort go off to the small lakes and swamps in search of eggs.

June 7th.—In the secluded valleys, and in the neighbourhood of marshy tracts of land, the trembling poplars are still leafless, but in exposed positions all the forest trees are in an advanced state.

TABLE showing the TEMPERATURE of the RIVER WATER previous to the Setting of the Ice in November 1857; also the Temperature after the Breaking-up of the Ice in April 1858. FORT CARLTON.

Date.	Hour.	Air.	Water.	Remarks.	Date.	Hour.	Air.	Water.	Remarks.
1857.		°	°		1858.		°	°	
Oct. 16	10 a.m.	39·2	38·2		May 12	2.30 p.m.	52·0	49·1	
„ 17	—	36·0	38·0		„ 13	9.30 a.m.	33·0	45·8	
„ 18	—	27·7	37·2		„ 14	2.30 p.m.	37·0	43·0	
„ 19	—	30·5	35·5		„ 15	2.30 p.m.	62·0	43·1	
„ 21	—	40	38·0		„ 16	2.30 p.m.	44·0	43·5	
Nov. 2	—	24	33·0		„ 18	3 p.m.	50·0	45·1	
„ 12	—	—	—	River frozen over.	„ 19	3 p.m.	62·3	48·4	
1858.					„ 20	2.30 p.m.	74·3	51·2	River risen 4 in.
April 24	9.30 a.m.	51·0	45·5		„ 21	2.30 p.m.	65·2	54·3	River sunk 6 in.
„ 29	9 a.m.	52·0	48·6	River risen 10 in.	„ 22	3 p.m.	65·6	57·8	
„ 30	10 a.m.	65·0	49·0		„ 24	7.30 p.m.	62·0	59·7	
May 1	10 a.m.	69·3	49·4	River risen 3 in.	„ 25	Noon.	64·8	59·2	
„ 2	10 a.m.	70	49·9		„ 25	7 p.m.	57·0	59·8	
„ 3	9 a.m.	64·5	50·3	River sunk 12 in.	„ 26	2.30 p.m.	54·8	56·2	River sunk 3 in.
„ 4	9.30 a.m.	62·0	52·8	Ditto 4 „	„ 28	9.30 a.m.	55·0	51·5	
„ 5	9 a.m.	44·2	51·6	Ditto 4 „	„ 30	7.30 p.m.	60·5	50·5	
„ 6	9 a.m.	59·9	48·8		„ 31	7.30 p.m.	59·1	54·2	River rapidly increasing in volume.
„ 6	7 p.m.	58·9	50·2						
„ 7	9 a.m.	58·0	50·1		June 1	7.30 p.m.	65·3	56·8	
„ 8	10 a.m.	59·0	52·0		„ 2	8 p.m.	61·5	58·2	Increase of 5 in. since yesterday.
„ 9	9.30 a.m.	61·0	52·1						
„ 10	9.30 a.m.	59·2	52·7		„ 3	7.30 p.m.	64·3	60·0	
„ 10	7 p.m.	48·0	51·2		„ 4	6.30 p.m.	71·5	61·9	Still increasing.
„ 11	9.30 a.m.	41·0	48·5						

The river has risen very slightly indeed during the past spring months. Sometimes it has been known to rise upwards of ten feet. At these times large quantities of sand are brought down by the stream, and even at this date (June 1st, 1858) we are obliged to allow the water to stand some time before drinking. There has been very little rain this spring. The following will show the extent of rainy weather since the breaking-up of winter:—

April 24th.—Smart shower for 10 minutes.
May 4th.—Very little rain fell at night.
May 23rd.—Rain this evening for 30 minutes.
May 26th.—Drizzling rain from 7 a.m. to 9 a.m.
May 27th.—A little rain.
May 28th.—Ditto.
May 29th.—Rain for half the day.
June 5th.—Thunder weather, with passing rain clouds.

EXTRACT from a DAILY JOURNAL kept at EDMONTON HOUSE, 1858.

March 1st to 7th.—Fine mild weather; very clear and calm.

March 8th.—A party sent off with horses and pack-saddles to meet the meathaulers and assist them in bringing home the meat, there being little or no snow on the track; it is unfit for sleighs.

March 9th, 10th, 11th, 12th.—Weather very mild and calm.

March 13th.—Blowing a strong breeze from the south. A party of four men arrived from the plains with sleighs; they had great difficulty in bringing them here, there being no snow whatever on the track; the snow is all melted away from all bare places, but a little is to be seen yet in thick woods.

March 14th.—Wind south; blowing fresh.

March 15th.—A dark cloudy day; blowing fresh. Dr. Hector, his man, and two Company's men from Fort Pitt started for Fort Pitt, with dogs, on the ice of the River Saskatchewan.

March 16th.—The weather still continues cloudy and blowing fresh.

March 17th.—Cloudy, and calm in the morning. A great deal of snow fell during the day, but it all melted before night.

March 18th.—A fine mild day; sky very clear.

March 19th.—Weather same as yesterday.

March 20th.—A dark, dull day. Rev. Mr. Steinham arrived by the river from Snake Hills; he informed us that the river was open in some places, and was so free of snow and slippery that it was difficult to travel on it. He met Dr. Hector and party at Snake Hills on his way to Fort Pitt.

March 21st.—A fine clear day; very mild.

March 22nd.—A dark cloudy day; very calm.

March 23rd.—A dark cloudy day; blowing fresh; a great deal of snow fell last night.

March 24th.—A fine clear day; blowing fresh.

March 25th.—Snowing all day.

March 26th, 27th.—Fine clear weather; very mild.

March 28th.—A dark cloudy day, but very mild. Stock ducks were seen to-day for the first time this season.

March 29th.—A fine clear day. The first goose this season seen to-day from the fort, but geese have been seen a few days ago at Sturgeon lake, 10 miles to the west.

March 30th, 31st.—Weather very mild and calm.

April 1st.—Sky overcast; snowing the most of the day, but the ground being so wet, and the weather so mild it soon melted away.

April 2nd.—Weather same as yesterday.

April 3rd.—Snowing all night and in the morning, but before evening it all disappeared.

April 4th.—A cold windy day; sky overcast.

April 5th.—A fine clear day and calm.

April 6th to 10th.—Weather, same as yesterday; engaged driving manure.

April 11th.—Weather still very mild.

April 12th.—Weather still very mild. The river open in different places, but yet in a fit state to cross over it. Salois killed two geese, being the first killed at this place this season. Three men commenced ploughing the tower fields to-day.

April 13th.—A cold, windy day; snowing all last night and the most of to-day.

April 14th.—Fine and clear in the morning; commenced to snow about noon, and cleared up again in the evening.

April 15th.—A fine clear day; thawing a little.

April 16th.—Fine and clear in the morning; after part of the day cloudy.

April 17th.—A fine clear day. Ducks and geese are very numerous about Long Lake.

April 19th.—A dark cloudy day. A party of men sent with horses to Fort Assinneboine Portage for the Lesser Slave Lake returns.

April 21st.—Weather same as yesterday; the river ice made a move this evening, but set fast again.

April 22nd.—A fine clear day; very mild.

April 23rd.—The river is clear of ice above the fort, but is still fast opposite it.

April 24th.—Fine clear weather. Men finished putting potatoes in cellars; 309 rigs were put into cellars, 91 rigs destroyed by frost.

April 25th.—A fine warm day; the ice has made a move at last; a great deal of ice drifting down the river; snakes and mosquitos were seen at the fort for the first time this season.

April 26th.—Fine warm weather.

April 27th.—Fine warm weather. Five old and nine new boats launched to-day. Light boat taken off the stocks.

April 29th.—A fine clear day. Three men sowing wheat; 10 bo. put in the ground to-day.

May 2nd.—Fine and clear in the fore part of the day; in the evening a sudden gale came on accompanied with thunder and lightning. Three men arrived from the R. M. House with the horses belonging to that place.

May 3rd.—A fine clear day; blowing fresh.

May 4th.—A dark cloudy day, rather cold. Three men sowing barley. Two men sent off with ten horses to meet Mr. Fraser and assist him in bringing the Lesser Slave Lake returns here.

May 5th.—A fine clear day. Mr. Brazeau and family arrived from the R. M. House in the morning with one boat, and the rest of his men and boats arrived in the evening.

May 6th.—Fine clear weather; blowing fresh.

May 7th.—Dark and cloudy in the morning, but cleared about noon. Nine boats started from here loaded with the returns of the R. M. House.

May 8th.—Weather same as yesterday.

May 9th.—Very cold and blowing fresh; raining most part of the day. Ten men arrived from Fort Pitt to assist in taking down the boats.

May 10th.—Weather same as yesterday. Seven men engaged in ploughing.

May 15th.—Remainder of the brigade left to-day.

Notes on the Month.—June, 1858.

June 16th.—Barometer at river level at 7½ p.m., 28″·05; thermometer 60°. Wind veered from S. to N. during the afternoon, with violent gusts and heavy passing showers.

June 17th.—Morning cloudy. At 9.30 a.m. thick mist from N. It passed off after one hour's duration and became overcast.

June 18th.—Morning, thick rain. Noon, rains heavily.

June 19th.—Dull the whole morning; cleared up in the afternoon; evening still cloudy.

June 20th.—Rain and thick mist nearly the whole day.

June 21st—Morning broke fine. Towards noon clouds passed to the W. During night a little rain fell.

June 22nd.—At 6.30 p.m. a dense thunder cloud to S. Rain fell; thunder cloud veered to W.; lightning.

June 23rd.—Wind cold and high from W. and S.W. till sunset when it moderated. Aurora to-night.

June 24th.—Wind veered through N. during night. In the afternoon high gale from N. with very heavy rain. At 9 p.m. the wind suddenly chopped to S.E. and it has commenced to clear. Rain ceased; a high gale.

June 26th.—Readings of both aneroids identical, so that the extraordinary fall is no error in the instruments.

June 27th.—By 10 a.m. the sky overcast, although the morning was clear.

June 28th.—Very heavy rain during the night, dense thunder clouds passing to S.W. Distant thunder; heavy rain during the night, but no thunder, although there was vivid lightning.

June 29th.—It has been dull and overcast throughout the day with fresh wind from E. and S.E.

June 30th.—Wind increased to very fresh at noon, and at 8 increased to a gale. Rain.

Notes on the Month.—July 1858.

July 3rd.—Wind from S. till sunrise; fine till noon, when it became overcast. During the afternoon clouds gathered from S., and a thunder cloud of great breadth formed. At 5.30 p.m. it broke over us. Smart hail shower. Storm half hour in diameter. Thunder cloud very high, lightning very vivid. It passed to N.E. Rain incessant for one hour after the storm had passed.

July 4th.—At 11.45 a.m. sky overcast, distant thunder to N.E. At noon it commenced to clear, and the remainder of the day was bright up to 7 p.m., when dark clouds again pervaded the sky.

July 5th.—At noon a great storm burst on us; thunder with most violent rain.

July 11th.—At sunset a dense thunder cloud to N. of us. Heavy rain during the night.

July 12th.—Very hot all day. At night slight fog.

July 13th.—Very hot all day. Afternoon, wind fresh from N.E. At 4 p.m. heavy clouds from S.W. against the wind, and a thunder-storm with rain passed to N.E. Rain during the whole of night.

July 15th.—From 13th to this date cloudy and rain. Rain very local, at our next camp we could scarcely get water, the swamps all dry.

July 17th.—Very warm, although fresh breeze from W. The sky has now been cloudless for 48 hours.

July 18th.—In the afternoon heavy clouds gathered from W., and a violent thunderstorm, in a circular manner passed over us, moving from W. to N.E. The clouds high and diffused, but the lightning vivid and thunder peals continuous. It had passed by at 8.30 p.m.

July 19th.—Clear and hot all day. At 8 a heavy cloud to N.N.W., with much sheet lightning.

July 21st.—Afternoon overcast and rain. Sheet lightning to N.W.

July 23rd.—All afternoon heavy cloud with thunder skirting the mountains to S.

July 29th.—Thunder clouds passing to S.W. during the day, but not reaching us. Cloudy but fine.

July 30th.—Morning clear. Overcast 8 a.m. Threatening thunder clouds, with much lightning in E. Cloudy during the whole day. Much rain falling towards our east.

Fort Edmonton, 1858.

March 12th.—Most extraordinary aurora commenced at 8 p.m., as a faint arch, but by 10 p.m. the whole sky was covered with vivid streamers, and wreaths of coloured light, moving with great rapidity. The colours were orange, crimson, and green. The only part of the sky free from this display was that portion included by the primary auroral arch, which extended from N.W. to E. The appearance was that of a vortex, the centre of which was a little to the S.W. of the zenith, and around it the streamers waved and curdled with great rapidity. It lasted for 20 minutes, and then gradually disappeared.

October 27th.—9 p.m. a faint aurora of a reddish colour appeared at N., and soon very bright streamers followed, commencing at the zenith and extending to all points of the horizon. No auroral arch was visible. A great deal of dew also fell to-night.

November 1st.—Swamps and streams have been frozen for some time: the ground is also frozen to the depth of two inches, and the sun's heat only softens the upper surface of the layer. Last blackbirds seen in flocks on the 26th of October. Ducks and geese still to be found along the river. Snow birds have been here for some weeks. The grey plover is the only bird found on the plains. There has been great failure this year in the wild fruit, owing to the unfavourable spring.

November 4th.—The river is lower than it has ever been known to be before. Carts now cross at the ford; it is full of floating ice, and fringe ice is now found along the margins.

November 5th.—Ice collecting in the bends of the river.

November 11th.—The ice in the river gradually increasing. Snow fell.

November 12th.—Snow again to-day. During the last 20 hours, at various intervals, about 2½ inches have fallen. An east wind caused it to melt very rapidly.

November 14th.—During the past week, the ice disappeared again from the river, and the frozen margin partially gave way. All summer birds have now left. The surface of the ground is now frozen to the depth of four inches.

N.B.—The maximum thermometer for several days back is erroneous. The indications of the wet bulbs for yesterday, and perhaps several days previous, are not trustworthy, the bulb of the thermometer having been allowed to dry, owing to the frost.

November 15th.—The wind has been from S.W. throughout the greater part of the day. At evening, high wind, accompanied by rain, which changed to sleet as the wind veered to N. At night, hard frost with drift snow.

November 16th.—River filling rapidly with ice. The water rising fast. The bays frozen across. Very cold.

November 17th.—River crossed to-day for the first time at a bend. The rapid still open, so that they crossed the meat carts with the boat.

November 18th.—This morning there are only a few open places in the river. Fall packet arrived last night. (The river was so full of ice at Fort Pitt on the 9th that they could not cross.)

November 19th.—Wind changed to S. yesterday, followed by thaw. The ice on the river going slightly.

November 22nd.—River set fast, and a horse crossed it to-day on the ice. Above the rapid at the ford, there is still much open water.

N.B.—Minimum thermometer taken for travelling with, replaced by Negretti and Zambra, 993.

November 23rd.—Remarkable weather, continues dull, and the thermometer has hardly altered for 24 hours. A little snow this evening. The wind continues light and variable, changing several times each day. The mass of cloud which has overhung us so long does not seem to have moved much. This is quite the same kind of weather as on the 22nd October. Then the overhanging clouds passed to N.E. Slight shower of fine sleet at 6 p.m. This occurs nearly every night.

November 28th.—The snow which fell last night in the environs of the fort, had almost entirely thawed by daylight of this date; at 9 a.m. to-day rain fell; at 10 p.m. the wind veered round to due N., and it froze hard. At 8 p.m. a very loud gust of wind, and since then a thaw has commenced.

December 24th.—Yesterday it was mild until sunset, when a keen north wind arose and blew fresh during the night. At 3 a.m. it calmed, and a bright aurora appeared which lasted until sunrise. It was very bright and was visible after clear daylight. It consisted of bright flame-like streamers, most of which were deep red mixed with green. A band of red, also, extended across the zenith.

1859, January 5th.—8 p.m. The weather has been very steady with N.E. wind until 2nd. Since then a little snow has fallen every day up to this date. This afternoon with the great rise of the barometer the sky cleared, and the wind is now from the N.W.

February 20th.—A very high wind prevailed from S.W. during the morning of this date, and had increased at noon to half a gale. A powerful sun throughout the day has caused a great thaw.

March 1st.—During the hours 2, 3, and 4 a.m., an auroral glow was visible in N.E., but no definite arch was apparent.

March 16th.—Got a hole dug close by the one of last year in order to ascertain the depth of the frozen soil. At two feet thermometer read 28°·5; the one buried in tube 28°·80. The limit of frozen soil reached at 6 feet.

March 18th.—The standard thermometer broken to-day.

N.B.—After this date the temperature of the air is obtained by readings of minimum thermometer, 993.

March 25th.—An auroral glow visible in the north, no arch defined. The sky soon became overcast afterwards.

March 26th.—This morning at a very early hour snow had fallen, but disappeared with the rising sun. The river banks and exposed localities are becoming clear of snow, but on the plains the snow is still deep.

In the evening of this date a very bright aurora extended from N. to N.E., consisting of streamers and an ill-defined arch of about the altitude of 5°. One streamer, especially, in N.E., was particularly bright. The snow is one foot deep on the plains.

March 29th.—9 p.m. A magnificent auroral arch was observed at an altitude of 15°, extending from N. to E. Streamers were prevalent from the zenith to all points between N.E. and E., increasing in brilliancy towards the vertex of the arch.

March 30th.—Yesterday a high cold wind from N. by W. prevailed throughout the day, and died away towards sunset. To-day the wind has blown a half gale, and in like manner has become calmer towards the same hour.

March 31st.—The high wind from N. has blown throughout the day and, as yesterday, ceased at sunset; the evening remarkably calm till 8.30, when a stiff breeze sprung up. Sky overcast. No aurora visible.

April 1st.—Still an overcast sky with a high wind throughout the day, but modifying towards evening. Wind N. During the afternoon a little very light snow fell for about an hour after 2 p.m. Ducks seen for the first time this spring at Lac St. Ann's.

April 2nd.—A bright aurora to N. by E., no defined arch but two ill-defined streamers were visible, increasing in brightness towards the body of the glow, which was at an altitude of 5°. To-day the sun has made his first appearance since March 29th.

April 3rd.—Day broke fine with a high wind from N.W. Towards 2 p.m. it became overcast, and the sky changed to partially clear shortly afterwards. At 7 p.m. snow fell.

April 4th.—By this morning 2 inches of snow had fallen. Day broke and continued fine.

April 5th.—Day broke overcast, with gusts of wind at intervals from N.W. Ducks were seen for the first time this spring at Fort Edmonton.

April 6th.—During last night 4 inches of snow has fallen; sky remained overcast till 3 p.m., when a clear sky, with bright sun succeeded. The evening of this date was extremely fine, with a magnificent aurora, consisting of bright streamers from the zenith to all parts of the horizon; no arch visible.

April 8th.—A few auroral streamers appear to-night, but no arch.

April 13th.—Since 10th up to present date, snow has been almost incessant, and this morning three inches lay on the ground.

April 14th.—During last night 3 inches of snow fell. At 9 a.m. this morning the wind chopped round to E., and a partially clear sky prevailed.

April 16th.—Since 14th the thaw has been continual, and towards evening a mass of clouds from S. has for the last three nights hidden the moon and stars. Ducks appear to have returned again to the south, as none have been seen since those on the 1st at Lac St. Ann's, and on the 5th at this place. At 6 p.m. a shower of rain, the first smart shower for the season, commenced, and continued till 7.30 p.m., the thermometer indicating at the time 39°.

April 18th.—At 4 p.m. it became overcast, and the wind veered to E., blowing cold. To-day again a duck was seen on the river.

April 19th.—At midnight of last night the wind came on in gusts, and this morning a high wind has prevailed and snow has fallen; cold and cheerless. A goose was seen yesterday, and a duck was killed on the river. At 3 p.m. a bright sun succeeded to the overcast sky, and Cirri 3 appeared.

April 20th.—This morning snow fell for one hour and a half, and was succeeded by a partially clear sky and a bright sun. Thermometer last night as low as 20°.

April 21st.—Day broke and continued fine, with a stiff breeze from due S. Geese were again seen to-day. The *Corylus Americana* is in an advanced state, and will flower in a day or two. At 9 p.m. an auroral streamer in N.E.

April 22nd.—It has been fine throughout the day; the river in many parts is quite clear of snow, and a few holes in the ice appear. Ducks commence to come in flocks, and a loon passed near the fort this morning. Auroral streamers to E.

April 23rd.—Beautiful day, with light breeze from S., but towards evening the sky became overcast, and a high wind followed from S.S.E. Plovers, for the first time this season, have been seen. The birds which remain in the neighbourhood during the winter months have, during the last two or three days, changed their note, especially the small bird resembling a linnet, that remains among the small poplars and willows. Auroral glow, though ill defined, in E. At 9 p.m. a beautiful auroral arch, the vertex of which was at an altitude of 13°, became developed in the sky, and extended from N. to E. At E. the light was excessively brilliant, being the lower extremity of a bright streamer which extended half way to the zenith. At 11 p.m. the arch was very brilliant, and extended right round to S. There the auroral light appeared as sparkling festoons to the very edge of the horizon. From the zenith to S.E. part of the horizon streamers were perfect, and the sky was patched by auroral light everywhere in the southern part of the horizon. Swans were seen for the first time to-day.

April 24th.—Day very fine. Near sunset two sun-dogs were visible, each at the distance of 20° from the true sun, and bearing in a line N. by E. and S. by W. The river thaws very gradually, there being no rush of water to break up the ice. It is usually the latter end of June before the snow melts sufficiently in the Rocky Mountains to cause an increase to the river volume.

April 25th.—Measured the extent to which the thaw had penetrated the soil, found it 1 ft. 6 in.

By Dr. Hector when travelling.

1858. November 26th.—All day the air filled with crystals of ice forming splendid sun-dogs. This month is known to the Indians as the Rhimy Moon, on account of the prevalence of this frozen fog. These crystals continue falling gently to a considerable depth.

November 27th.—Snowing all morning and at noon sets in thaw. Towards evening rain with S.W. wind.

November 28th.—In the afternoon frost set in again. During the night a very high gale.

November 29th—Clear sharp day. Snow during the night.

November 30th.—Snows all day till 4 p.m., then clear.

December 1st.—Very clear and sharp; gets colder as the day advances; towards evening the cold gets very intense with a light east wind. The stars are exceedingly brilliant; fancy we see one of Jupiter's satellites with the naked eye. Fine aurora.

December 2nd.—Still very cold, but towards evening the temperature rises and it begins to snow. At 9 p.m. the thermometer reads +21, making a change of 61° in less than 24 hours.

December 3rd.—The high temperature continues accompanied with violent snow storms from the N. and N.E.

December 5th.—Every night clouds gather from the N.E., with snow.

December 7th.—Very keen sharp weather. Bright aurora every night.

December 15th.—Weather has been steady with occasional snow storms. Rivers along the Rocky Mountains quite open. Temperature of water in Dead Man River 33°. The snow averages from 6 to 10 inches, but out on the prairies still more.

December 17th.—A circular storm passed over to the N.E., attended by a great rise in the temperature for a few hours.

December 23rd.—For the last few days the air has been filled with rime again, with snow storms almost every day. The snow is now about 18 inches deep. This afternoon there was a very sudden change from mild weather to most intense cold with a high breeze from the N.E. During the night the wind fell.

1859. January 13th.—Variable weather with occasional snow storms.

January 18th.—This afternoon a great storm of wind from the S.W. with a very decided thaw for a few hours and a heavy shower of rain. The whole storm passed in about eight hours.

January 22nd.—The storm of the 18th has been followed by extremely cold weather, the mean temperature for the last four days being −7°0. A great deal of snow has also fallen, so that in the open river ice there is from 2 to 3 feet.

January 27th.—The last five days have been milder again, with occasional thaws.

January 31st.—Since the 27th the temperature has been exceedingly low. The Athabasca, when it leaves the Rocky Mountains, is not frozen across, although there is a broad margin of very strong ice on either side. The reason is that during the winter here the wind either blows due N. or due S., and when the latter, it always thaws more or less, so that the rapid current clears away the new-formed ice; the snow does not lie along the eastern flank of the mountains from the same reason; in the valleys at Jaspar House the winds are extremely local; often a very cold and a warm wind blowing in different parts at the same time.

March 7th.—During the last month there have been several violent changes from extreme cold to thaw. An unusual amount of snow has fallen this spring; there being from 2 to 3 feet in the woods to the west of Edmonton. At Edmonton there is not more than 8 inches.

Notes on the Spring of 1859 at Fort Pitt.

March 28th.—The season is much later here than at Fort Edmonton. The snow is 18 inches deep in average localities.

March 29th.—Cold north wind with snow.

April 1st.—Mild wind from S.W.

April 2nd.—Thawing rapidly.

April 6th.—Stormy weather for the last four days. Wind from N. with much snow.

April 7th.—Men arrive from Fort Edmonton, and say that four days ago the ground there was nearly free from snow. Wind S.W. Mild.

April 10th.—Wind W.N.W. and N., with cold weather and snow.

April 12th.—Until this evening very intense cold, with heavy snow from the N.; but the wind at 4 p.m. changed to the S.E., and it is now raining slightly.

April 14th.—Dull raw weather, with snow from the S.W. Thaw for a few hours each day.

April 15th.—Men return from the plains to the south, near Battle River, where they say the snow is 3 to 4 feet deep.

April 17th.—This is the first night that there has been a thaw after sunset.

April 18th.—Great thaw to-day. Two geese passed the fort up the river. Ring-necked plover has arrived. Banks are beginning to show bare spots.

April 21st.—Frost every night, but thaw during the day. Snow 2 to 3 feet deep, except in the knolls, which are now bare.

April 22nd.—Bright cloudless day; very hot. Ice on river breaking into holes; much water overflowing it.

April 25th.—Yesterday and to-day the bulk of the snow has disappeared. River ice very rotten. Creeks running. Ducks and geese in numbers. Farming operations commenced.

April 26th.—Ice breaks up, and the river becomes open very suddenly towards evening with a flood to the height of 9 feet.

April 28th.—Cold at night; raw during the day.

April 29th.—Very hot, with rain.

May 3rd.—Dull rain, with much lightning, for the last few nights.

No. 13.

Meteorological Observations.

Fort Carlton, Saskatchewan River, 1857.

Maxima and Minima Temperatures observed, 9 A.M.

Date.	Max.	Min.
1857.		
Nov. 12	30	4
„ 13	27	9
„ 14	33	12
„ 15	35	18
„ 16	34	20
„ 17	31	11
„ 18	15	4
„ 19	14	0
„ 20	41	10
„ 21	6	0
„ 22	11	2
„ 23	34	11
„ 24	25	10
„ 25	28	10
„ 26	30	10
„ 27	26	23
„ 28	22	15
„ 29	17	13
„ 30	17	12
Mean	25·5	9·1
	Av. Temp. - 17·3	
Dec. 1	18	14
„ 2	17	5
„ 3	18	— 4
„ 4	17	— 5
„ 5	16	5
„ 6	23	1
„ 7	13	5
„ 8	8	2
„ 9	6	0
„ 10	9	—16
„ 11	16	4
„ 12	33	5
„ 13	27	8
„ 14	12	— 1
„ 15	35	4
„ 16	24	— 1
„ 17	8	—10
„ 18	19	0
„ 19	26	13
„ 20	21	12
„ 21	24	3
„ 22	41	24
„ 23	23	6
„ 24	5	—14
„ 25	15	— 2
„ 26	32	5
„ 27	14	— 7
„ 28	14	— 6
„ 29	32	— 2
„ 30	18	8
„ 31	19	— 7
Mean	16·2	1·6
	Av. Temp. - 8·9	
1858.		
Jan. 1	21·9	— 3·5
„ 2	44	5·1
„ 3	45	29
„ 4	28	— 1
„ 5	7	—14
„ 6	—13	—25
„ 7	—22·9	—31
„ 8	2·1	—13
„ 9	18·9	—10

Date.	Max.	Min.
1858.		
Jan. 10	14	— 2·1
„ 11	18	—15·0
„ 12	—15	—34
„ 13	—15·7	—40
„ 14	26	—14
„ 15	— 1·3	—29·2
„ 16	— 1·3	—11·4
„ 17	15·3	— 6·2
„ 18	26·1	5·2
„ 19	15·3	6·2
„ 20	24·5	2·6
„ 21	16·7	— 2·2
„ 22	22·5	5
„ 23	4·5	—11·6
„ 24	22·0	—14
„ 25	13·3	— 8·9
„ 26	1·0	—13·8
„ 27	5·0	—12·3
„ 28	5	—14·7
„ 29	6	—11·2
„ 30	1·4	—12·4
„ 31	3·2	— 8
Mean	10·3	—10·2
	Av. Temp. - 0·0	
Feb. 1	—21	—24·5
„ 2	— 9·9	—30·4
„ 3	0	—25·2
„ 4	32	9·7
„ 5	32	14
„ 6	12	— 9·1
„ 7	— 6·8	—23
„ 8	3·0	—24·7
„ 9	—10·0	—28·3
„ 10	— 4·7	—33·3
„ 11	— 7·8	—27
„ 12	—19·7	—36
„ 13	—24	—37
„ 14	—23·6	—12·1
„ 15	—24·2	—54
„ 16	— 9·7	—32·3
„ 17	— 1·6	—13·2
„ 18	1·2	—21·5
„ 19	3·8	—24·4
„ 20	2·9	—26
„ 21	8	—31
„ 22	14	—15
„ 23	39·2	3·6
„ 24	32·8	7·2
„ 25	44·6	18·4
„ 26	39	19
„ 27	18·8	— 5
„ 28	16	10·0
Mean	5·5	—20·4
	Av. Temp. — 7·4	
March 1	2·4	—18
„ 2	1·0	—23
„ 3	17·3	3
„ 4	20·7	6·0
„ 5	24·2	3·0
„ 6	39	15·5
„ 7	35·8	12·6
„ 8	38·8	23·7
„ 9	46·7	22·9
„ 10	30·5	13·7

Date.	Max.	Min.
1858.		
March 11	37·7	15·6
„ 12	39·2	21·2
„ 13	43·8	11·7
„ 14	44·0	12·0
„ 15	39·0	31·0
„ 16	35·8	31·3
„ 17	31·5	25·8
„ 18	33·0	15·5
„ 19	41·2	12·0
„ 20	33·6	14·4
„ 21	27·5	4·1
„ 22	40·0	23·7
„ 23	40·0	31·0
„ 24	41·5	25·5
„ 25	39·8	21·6
„ 26	35·4	22·5
„ 27	41·2	21·0
„ 28	49·5	15·8
„ 29	45·0	32·4
„ 30	43·8	30·0
„ 31	45·9	29·6
Mean	35·0	17·6
	Av. Temp. - 26·3	
April 1	49·0	25·6
„ 2	34·6	25·3
„ 3	26·9	18·0
„ 4	37·0	16·0
„ 5	32·7	13·0
„ 6	47·0	22·0
„ 7	48·8	22·0
„ 8	37·2	22·0
„ 9	48·7	18·6
„ 10	43·8	28·4
„ 11	53·7	26·7
„ 12	67·8	27·0
„ 13	53·0	24·5
„ 14	28·0	14·7
„ 15	28·4	9
„ 16	48·0	9
„ 17	22·0	19
„ 18	61·0	34·2
„ 19	63·0	29·0
„ 20	52·5	23·6
„ 21	48·3	18
„ 22	44·2	20
„ 23	45·5	20·2
„ 24	55·0	26·5
„ 25	52·7	28·0
„ 26	70·0	36·1
„ 27	75·0	35·2
„ 28	54·0	25·0
„ 29	64·5	27·2
„ 30	65·0	31·0
Mean	48·6	23·1
	Av. Temp. - 35·8	
May 1	69·0	42·2
„ 2	75·5	45·0
„ 3	71·0	37·2
„ 4	73·2	40·1
„ 5	52·7	30·0
„ 6	60·0	33·5
„ 7	61·7	38·8
„ 8	63·3	31·0
„ 9	60·8	33·0

Date.	Max.	Min.
1858.		
May 10	59·8	33·0
„ 11	43·8	14·5
„ 12	45·5	24·2
„ 13	32·0	20·0
„ 14	42·0	13·8
„ 15	58·7	27·0
„ 16	44·5	26·5
„ 17	48·0	28·6
„ 18	49·0	19·0
„ 19	61·3	30·5
„ 20	70·3	41·2
„ 21	72·2	34·0
„ 22	67·2	39·0

Date.	Max.	Min.
1858.		
May 23	68·4	40·0
„ 24	70·0	50·0
„ 25	69·0	35·3
„ 26	49·4	38·0
„ 27	54·7	45·0
„ 28	54·0	38·9
„ 29	48·8	33·7
„ 30	51·0	31·9
„ 31	56·2	27·6
Mean	58·1	32·9
	Av. Temp. - 45·0	

Date.	Max.	Min.
1858.		
June 1	67	36·6
„ 2	72·0	44·0
„ 3	70·0	49·5
„ 4	77·6	46·3
„ 5	63·3	44·0
„ 6	56·0	31·9
Mean	67·8	42·0
	Av. Temp. - 54·9	

EXTRACT from the METEOROLOGICAL REGISTER kept at FORT CARLTON, Winter 1857–8. Jan. and Feb. 1858.

Date.	Hour.	Bar.	Therm.	Min.	Wind.
Jan. 1	9 a.m.	28·10	4	— 8·0	N.
„ „	4 p.m.	28·12	— 3·4	—	Calm.
„ 2	9 a.m.	27·94	24·9	— 3·3	SW.
„ „	4 p.m.	27·90	40	—	W.
„ 3	9 a.m.	27·60	33·8	23·7	W.
„ „	4 p.m.	27·58	39	—	NW.
„ 4	9 a.m.	28·07	— 1·0	— 0·7	Calm.
„ „	4 p.m.	28·03	5·2	—	„
„ 5	9 a.m.	28·61	— 2·2	— 1	„
„ „	4 p.m.	28·10	1·2	—	NNE.
„ 6	9 a.m.	28·14	—24·8	—23·7	Calm.
„ „	4 p.m.	28·12	—13	—	SE.
„ 7	9 a.m.	28·12	—19·6	—22·2	NE.
„ „	4 p.m.	28·00	— 3·8	—	Calm.
„ 8	9 a.m.	27·91	—11·1	—17	SW.
„ „	4 p.m.	28·00	3	—	„
„ 9	9 a.m.	27·84	5·2	—11·4	SSW.
„ „	4 p.m.	27·58	16·9	—	Calm.
„ 10	9 a.m.	27·70	— 0·2	— 0·5	„
„ „	4 p.m.	27·95	10	—	„
„ 11	9 a.m.	27·82	1·7	— 2·7	NE.
„ „	4 p.m.	27·59	5	—	„
„ 12	9 a.m.	27·07	—23	—22·5	WNW.
„ „	4 p.m.	27·65	—20·3	—	W.
„ 13	9 a.m.	28·32	—33	—36·2	Calm.
„ „	4 p.m.	28·24	—16·3	—	NE.
„ 14	9 a.m.	28·46	—18·5	—32·6	Calm.
„ „	4 p.m.	28·50	—15	—	„
„ 15	9 a.m.	28·22	—21·2	—29·9	E.
„ „	4 p.m.	27·91	— 2·7	—	SE.
„ 16	9 a.m.	28·26	— 6·7	—19·6	NW.
„ „	4 p.m.	28·43	— 6	—	Calm.
„ 17	9 a.m.	28·30	— 4·3	—11·4	„
„ „	4 p.m.	28·36	13	—	SSW.
„ 18	9 a.m.	28·14	8·2	— 3·5	SW.
„ „	4 p.m.	28·10	23	—	„
„ 19	9 a.m.	28·17	9·8	8	WSW.
„ „	4 p.m.	28·12	23·3	—	Calm.
„ 20	9 a.m.	28·16	5	4	NW.
„ „	4 p.m.	28·21	21	—	Calm.
„ 21	9 a.m.	28·20	— 1·9	— 2·5	NE.
„ „	4 p.m.	28·23	14·9	—	E.
„ 22	9 a.m.	27·88	7	— 0·0	Calm.
„ „	4 p.m.	27·86	20	—	„
„ 23	9 a.m.	28·19	— 1·2	— 7·5	NE.
„ „	4 p.m.	28·24	— 3	—	N.
„ 24	9 a.m.	28·39	—10·8	—13·8	Calm.
„ „	4 p.m.	28·20	4·9	—	S.
„ 25	9 a.m.	28·38	— 4	— 9	NNE.
„ „	4 p.m.	28·39	— 1·5	—	NE.
„ 26	9 a.m.	28·29	—10·7	—12·6	„
„ „	4 p.m.	28·14	— 4·2	—	„
„ 27	9 a.m.	28·21	0·8	— 9·2	W.
„ „	4 p.m.	28·46	2·9	—	NE.
„ 28	9 a.m.	28·70	—13	—13·9	„
„ „	4 p.m.	28·66	— 5·3	—	E.
„ 29	9 a.m.	28·44	— 9·5	—12·1	„
„ „	4 p.m.	28·45	8·9	—	ENE.
„ 30	9 a.m.	28·53	—10	—12	Calm.
„ 30	4 p.m.	28·39	13·5	—	Calm.
„ 31	9 a.m.	28·31	8	— 9·2	„
„ „	4 p.m.	28·28	27·3	—	SW.
Feb. 1	9 a.m.	28·40	2·8	2·7	ENE.
„ „	4 p.m.	28·62	1·8	—	NE.
„ 2	9 a.m.	28·77	30·3	—28·6	Calm.
„ „	4 p.m.	28·66	—12	—	S.
„ 3	9 a.m.	28·60	— 7·1	—26·2	Calm.
„ „	4 p.m.	28·55	5	—	SSW.
„ 4	9 a.m.	28·13	18	— 6·3	WSW.
„ „	4 p.m.	28·01	31·8	—	SW.
„ 5	9 a.m.	28·31	24·9	17·4	N.
„ „	4 p.m.	28·41	30	—	NNW.
„ 6	9 a.m.	28·53	12	— 6·2	N.
„ „	4 p.m.	28·58	7·3	—	„
„ 7	9 a.m.	28·94	—16·5	—16·3	NNE.
„ „	4 p.m.	28·93	— 7	—	Calm.
„ 8	9 a.m.	28·51	—16·2	—22·9	W.
„ „	4 p.m.	28·28	2	—	SW.
„ 9	9 a.m.	28·68	—25	—24·4	N.
„ „	4 p.m.	28·64	—16	—	WNW.
„ 10	9 a.m.	28·37	—30·9	—29	W.
„ „	4 p.m.	28·40	— 6	—	Calm.
„ 11	9 a.m.	28·41	—30·4	—29	N.
„ „	4 p.m.	28·30	—11·1	—	W.
„ 12	9 a.m.	28·48	—29	—32·4	NNE.
„ „	4 p.m.	28·53	—21·3	—	Calm.
„ 13	9 a.m.	28·66	—34·2	—33·6	NE.
„ „	4 p.m.	28·64	—24	—	N.
„ 14	9 a.m.	28·75	—39·6	—42·2	SW.
„ „	4 p.m.	28·79	—24	—	„
„ 15	9 a.m.	28·89	—41·4	—46·7	Calm.
„ „	4 p.m.	28·87	—24·2	—	„
„ 16	9 a.m.	28·75	—19·8	—40·6	E.
„ „	4 p.m.	28·74	— 9·7	—	„
„ 17	9 a.m.	28·75	—11·7	—17·2	NNE.
„ „	4 p.m.	28·74	— 4·1	—	NE.
„ 18	9 a.m.	28·60	— 8	— 9·8	ENE.
„ „	4 p.m.	28·61	— 0·4	—	Calm.
„ 19	9 a.m.	28·22	—10·4	—22·7	E.
„ „	4 p.m.	28·4	1·9	—	NE.
„ 20	9 a.m.	28·50	— 4·7	— 9·4	N.
„ „	4 p.m.	28·53	4	—	NW.
„ 21	9 a.m.	28·58	—15·5	—	WSW.
„ „	4 p.m.	28·52	7·1	—	SW.
„ 22	9 a.m.	28·14	— 7·5	—14·2	NNW.
„ „	4 p.m.	28·01	12·8	—	Calm.
„ 23	9 a.m.	28·03	12·8	— 6·1	SE.
„ „	4 p.m.	28·22	35·5	—	WNW.
„ 24	9 a.m.	28·30	11·6	6·7	Calm.
„ „	4 p.m.	28·22	31·7	—	SW.
„ 25	9 a.m.	28·11	22·5	11	„
„ „	4 p.m.	27·91	42·2	—	„
„ 26	9 a.m.	28·03	28·1	21	WNW.
„ „	4 p.m.	28·02	29	—	NW.
„ 27	9 a.m.	28·52	5·6	5	N.
„ „	4 p.m.	28·70	6·5	—	NNW.
„ 28	9 a.m.	28·90	— 9·5	15	Calm.
„ „	4 p.m.	28·79	8·9	—	SW.

II.—1858.—Fort Edmonton.

Date.	Hour.	Bar.	Therm. in Air.	Min. Therm.	Wind. Direcn.	Wind. Force.	Remarks.
		°	°	°			
Jan. 1	9 a.m.	27·44	16	16·0	N.	light	Clear, snow during the day.
,, ,,	4 p.m.	27·40	35·5	—	—	calm	Overcast.
,, 2	9 a.m.	27·34	41	15	SW.	fresh	Very fine. Clear.
,, ,,	4 p.m.	27·27	45	—	,,	,,	Cloudy.
,, 3	9 a.m.	26·98	44·5	36·0	,,	high	Rain. Great storm. Hot wind.
,, ,,	4 p.m.	27·20	32	—	NW.	very high	Fine. Clear.
,, 4	9 a.m.	27·28	9	8·5	—	calm	Clear.
,, ,,	4 p.m.	27·15	15	—	N.	light	Fine.
,, 5	9 a.m.	27·51	7	0·5	NW.	,,	,,
,, ,,	4 p.m.	27·59	5	—	E.	fresh	,,
,, 6	9 a.m.	27·58	−11	−14·0	—	calm	Clear.
,, ,,	4 p.m.	27·45	0	—	NW.	light	Fine.
,, 7	9 a.m.	27·44	− 9	−11·0	,,	fresh	,,
,, ,,	4 p.m.	27·42	2	—	N.	light	Overcast.
,, 8	9 a.m.	27·42	−14·5	−15·5	NW.	,,	Clear.
,, ,,	4 p.m.	27·22	17·5	—	NW.	,,	Overcast.
,, 9	9 a.m.		30	−14·5	SE.	,,	Partially overcast.
,, ,,	4 p.m.		32	—	N.	,,	Overcast.
,, 10	9 a.m.		16	0	NE.	,,	Clear.
,, ,,	4 p.m.		20·5	—	ENE.	,,	Overcast.
,, 11	9 a.m.		− 9	−10·5	N.	,,	Clear.
,, ,,	4 p.m.		−14	—	,,	,,	,, } Dull, haze in the mornings.
,, 12	9 a.m.		−16	−22·0	,,	,,	,, } Dull, haze in the mornings.
,, ,,	4 p.m.		−16·5	—	,,	,,	,, } Dull, haze in the mornings.
,, 13	9 a.m.		−19·5	−22·5	NE.	,,	Overcast.
,, ,,	4 p.m.		−13·5	—	,,	,,	,,
,, 14	9 a.m.		−17·5	−21·0	,,	fresh	Clear.
,, ,,	4 p.m.		− 9	—	,,	,,	Overcast.
,, 15	9 a.m.		− 8·5	−17·0	ENE.	light	,, Snow } 4 inches.
,, ,,	4 p.m.		− 2·5	—	,,	,,	,, ,, } 4 inches.
,, 16	9 a.m.		2	− 7·5	SW.	,,	Clear.
,, ,,	4 p.m.		22·5	—	SE.	,,	,,
,, 17	9 a.m.		20	− 2·5	SW.	,,	Cloudy.
,, ,,	4 p.m.		30	—	S.	,,	Overcast.
,, 18	9 a.m.		33	20	,,	,,	Clear.
,, ,,	4 p.m.		33·5	—	SW.	,,	Cloudy.
,, 19	9 a.m.		35	—	,,	fresh	Clear.
,, ,,	4 p.m.		17	—	W.	light	,,
,, 20	9 a.m.		22	11·5	,,	fresh	,,
,, ,,	4 p.m.		35·5	—	NE.	light	,, Cloud in E.
,, 21	9 a.m.		15	12	,,	,,	Cloudy.
,, ,,	4 p.m.		23	—	,,	,,	Clear.
,, 22	9 a.m.		− 1	−11	N.	,,	Cloudy.
,, ,,	4 p.m.		− 4	—	,,	,,	,,
,, 23	9 a.m.		−13·5	−14	,,	,,	,,
,, ,,	4 p.m.		−11	—	,,	,,	,,
,, 24	9 a.m.		17	−17·5	,,	,,	,,
,, ,,	4 p.m.		37	—	,,	,,	,,
,, 25	9 a.m.		−11	−13·5	NE.	light	Overcast. Snow } 3 inches.
,, ,,	4 p.m.		− 2	—	ENE.	,,	,, ,, } 3 inches.
,, 26	9 a.m.		− 1·5	−11·5	NE.	,,	,,
,, ,,	4 p.m.		17	—	,,	,,	,,
,, 27	9 a.m.		2·5	− 1·0	ENE.	,,	,,
,, ,,	4 p.m.		6·5	—	NE.	,,	Clear.
,, 28	9 a.m.		2	− 1·5	,,	,,	,,
,, ,,	4 p.m.		16	—	,,	,,	,,
,, 29	9 a.m.		4	− 3	,,	fresh	Cloudy.
,, ,,	4 p.m.		17·5	—	E.	light	Clear. During night fog with brilliant Lunar Perihilia.
,, 30	9 a.m.	27·59	12	2	NE.	fresh	Cloudy.
,, ,,	4 p.m.	27·61	35	—	SW.	,,	,,
,, 31	9 a.m.	27·64	33	12	S.	high	Clear.
,, ,,	4 p.m.	27·66	30	—	SW.	light	,,
Feb. 1	9 a.m.	27·69	21·5	7·0	S.	,,	Clear.
,, ,,	4 p.m.	27·70	23	—	W.	fresh	Overcast.
,, 2	9 a.m.	27·64	17	15	,,	light	Cloudy.
,, ,,	4 p.m.	27·60	31·5	—	SW.	,,	,,
,, 3	9 a.m.	27·72	28·0	17	W.	light	Clear.
,, ,,	4 p.m.	27·63	38·5	—	,,	fresh	,,
,, 4	9 a.m.	27·42	44	28	,,	,,	Overcast.
,, ,,	4 p.m.	27·48	39·5	—	,,	,,	Clear. Heavy rain during night.
,, 5	9 a.m.	27·78	35·5	27·5	,,	light	Cloudy.
,, ,,	4 p.m.	27·77	33	—	NW.	fresh	Clear. Gale from N.W. last night.

Barometer absent on trip to Rocky Mountain House.

Date.	Hour.	Bar.	Therm. in Air.	Min. Therm.	Wind.		Remarks.
					Direcⁿ.	Force.	
		°	°	°			
Feb. 6	9 a.m.	27·70	12·5	10·5	E.	fresh	Overcast. Drifting snow.
,, ,,	4 p.m.	27·81	5·5	—	N.	,,	,, ,,
,, 7	9 a.m.	27·93	− 9	−13	NW.	,,	Clear.
,, ,,	4 p.m.	28·40	4	—	W.	,,	,,
,, 8	9 a.m.	27·78	− 5·5	−12	SW.	,,	,,
,, ,,	4 p.m.	27·60	14	—	NW.	,,	,,
,, 9	9 a.m.	27·67	− 5	−18·5	E.	light	,,
,, ,,	4 p.m.	27·79	0·5	—	SW.	,,	,,
,, 10	9 a.m.	27·76	− 8	−20·0	NE.	fresh	,, Clouds in NE.
,, ,,	4 p.m.	27·63	2·5	—	NNE.	light	Cloudy.
,, 11	9 a.m.	—	− 5	−14·5	SE.	,,	Clear. Haze.
,, ,,	4 p.m.	—	− 2	—	NE.	,,	Cloudy.
,, 12	9 a.m.	—	−25·5	−26·5	N.	,,	Clear.
,, ,,	4 p.m.	—	−21	—	,,	,,	Cloudy.
,, 13	9 a.m.	—	−33	−39·5	—	calm	Haze. Very cold.
,, ,,	4 p.m.	—	−22·5	—	N.	light	Overcast.
, 14	9 a.m.	—	−41·5	−41·5	NW.	,,	Clear, with little haze.
,, ,,	4 p.m.	—	−13	—	W.	,,	Clear.
,, 15	9 a.m.	—	28	−38·0	,,	,,	,,
,, ,,	4 p.m.	—	−10	—	N.	,,	,,
,, 16	9 a.m.	—	−19	−27·5	E.	,,	,,
,, ,,	4 p.m.	—	−14	—	W.	,,	,,
,, 17	9 a.m.	—	−15·5	−25·5	E.	fresh	Overcast. Raw.
,, ,,	4 p.m.	—	−11	—	,,	,,	,, Snow } 2 inches.
,, 18	9 a.m.	—	− 7·0	−15·5	W.	light	,, ,, }
,, ,,	4 p.m.	—	− 3·0	—	,,	,,	Clear.
,, 19	9 a.m.	27·33	1	− 9	E.	,,	Overcast.
,, ,,	4 p.m.	27·41	7	—	,,	,,	Clear.
,, 20	9 a.m.	27·78	16	− 4	NE.	,,	Fine. Clear.
,, ,,	4 p.m.	27·69	14	—	NW.	,,	Clear. Cold.
,, 21	9 a.m.	27·72	16	6·5	SW	,,	Fine. Clear.
,, ,,	4 p.m.	27·69	26·5	—	W.	,,	Fleecy clouds.
,, 22	9 a.m.	27·21	18·5	9·5	,,	,,	Overcast.
,, ,,	4 p.m.	27·14	41·5	—	,,	,,	Cloudy. Dull.
,, 23	9 a.m.	27·56	41	18·0	NW.	moderate	Clear. Mild.
,, ,,	4 p.m.	27·58	38	—	NE.	light	Overcast.
,, 24	9 a.m.	27·44	36	25	SW.	,,	,, Rain.
,, ,,	4 p.m.	27·47	55·5	—	NW.	very light	,, Close. Hot.
,, 25	9 a.m.	27·30	53·5	36	NNW.	very high	Forenoon, cloudy at 2 p.m. Thermometer, 65°. Rain at 2.30 p.m.
,, ,,	4 p.m.	27·20	52	—	N.	—	
,, 26	9 a.m.	27·57	30	24·5	NW.	very light	Fine. Cloudy to SE.
,, ,,	4 p.m.	27·24	25	—	,,	high	Gusty. Stormy. Overcast.
,, 27	9 a.m.	27·92	2	0·5	NNW.	fresh	Clear. Cold.
,, ,,	4 p.m.	28·05	7	—	NW.	light	Overcast. Cold.
,, 28	9 a.m.	27·60	15	−12·0	SW.	,,	Clear. Cold.
,, ,,	4 p.m.	27·84	24	—	NW.	,,	Passing clouds,
Mar. 1	9 a.m.	27·84	9·0	1·5	E.	,,	Overcast.
,, ,,	2 p.m.	27·85	8·0	—	,,	,,	Clouds in patches. Raw.
,, ,,	9 p.m.	27·86	5·0	—	NE.	moderate	Hazy. Overcast.
,, 2	9 a.m.	27·66	11	2	E.	light	Overcast. Chilly.
,, ,,	2 p.m.	27·51	24·5	—	NE.	very light	Clear. Cloudy in E.
,, ,,	9 p.m.	27·48	19	—	SW.	light	Overcast.
,, 3	9 a.m.	27·56	20	11	E.	,,	Cloud from NE to SW. Chilly.
,, ,,	2 p.m.	27·56	24·5	—	,,	moderate	Cloudy. Haze in E.
,, ,,	9 p.m.	27·50	16	—	,,	fresh	Dense cloud.
,, 4	9 a.m.	27·42	20	14	,,	light	Overcast. Chilly.
,, ,,	2 p.m.	27·52	35·5	—	,,	,,	Clear. Cloud to S. Mild.
,, ,,	9 p.m.	27·68	26	—	SE.	,,	,, Starlight.
,, 5	9 a.m.	27·66	24·5	12.5	,,	,,	,, Snow during night.
,, ,,	2 p.m.	27·62	46	—	SW.	light	Overcast. Mild.
,, ,,	9 p.m.	27·56	37	—	—	calm	Clear. Very mild.
,, 6	9 a.m.	27·63	37	24·5	W.	light	Cloudy. Mild.
,, ,,	2 p.m.	27·70	43	—	NE.	moderate	Clear. Mild.
,, ,,	9 p.m.	27·74	35	—	—	calm	Stars dull, but clearing.
,, 7	9 a.m.	27·62	35	25	W.	very light	Hazy. Very mild.
,, ,,	2 p.m.	27·54	52	—	SSW.	light	Mild. Cloudy.
,, ,,	9 p.m.	27·42	41	—	—	calm	Overcast. A few dim stars.
,, 8	9 a.m.	27·47	37	29	—	,,	Dull. Mild.
,, ,,	2 p.m.	27·46	49·5	—	E.	light	Cloudy. Very mild.
,, ,,	9 p.m.	27·30	37·5	—	—	calm	Clear. Mild.
,, 9	9 a.m.	27·44	48·5	26·5	W.	light	,, Warm.
,, ,,	2 p.m.	27·36	39	—	E.	moderate	Cloudy. Mild.
,, ,,	9 p.m.	27·40	30	—	ESE.	light	Clear. Chilly.
,, 10	9 a.m.	27·46	31	19·5	W.	,,	Cloudy.
,, ,,	2 p.m.	27·40	42	—	SW.	fresh	Clear.

Date.	Hour.	Bar.	Therm. in Air.	Min. Therm.	Wind.		Remarks.
					Direcn.	Force.	
		°	°	°			
Mar. 10	9 p.m.	27·48	31	—	NE.	light	Bright star light.
„ 11	9 a.m.	27·62	40	21	—	calm	Clear. Fine.
„ „	2 p.m.	27·54	43	—	SE.	moderate	Cloudy at 3 p.m. Wind W.
„ „	9 p.m.	27·42	34	—	„	light	Dull.
„ 12	9 a.m.	27·34	31·5	22	—	calm	Partially overcast.
„ „	2 p.m.	27·29	51	—	SW.	light	Cloudy. Mild.
„ „	9 p.m.	27·22	40	—	„	„	Clear. Warm.
„ 13	9 a.m.		46	26	„	„	„ „
„ „	2 p.m.		48	—	—	calm	Cloudy. Mild.
„ „	9 p.m.		35·5	—	SW.	moderate	Cloudy and chilly.
„ 14	9 a.m.		32	23	„	light	Overcast.
„ „	2 p.m.		39·5	—	E.	„	Cloudy and mild.
„ „	9 p.m.		29	—	„	„	Overcast. Chilly.
„ 15	9 a.m.		42	27	W.	fresh	Clear. Mild.
„ „	2 p.m.		42	—	NE.	„	Clear. Chilly.
„ „	9 p.m.		29	—	SW.	light	„ „
„ 16	9 a.m.		29	23	W.	very light	Overcast. „
„ „	2 p.m.		41	—	—	calm	Densely overcast.
„ „	9 p.m.		35	—	NE.	very light	„
„ 17	9 a.m.		32	29	W.	light	Overcast. A little snow.
„ „	2 p.m.		34	—	E.	very light	Snowing.
„ „	9 p.m.		29	—	SE.	light	Still snow.
„ 18	9 a.m.		31·5	27	E.	„	Overcast.
„ „	2 p.m.		38	—	E.	„	Cloudy. Snow disappearing.
„ „	9 p.m.		29	—	NE.	„	Very clear Aurora.
„ 19	9 a.m.		33	24·5	„	„	Cloudy. Mild.
„ „	2 p.m.		52	—	W.	light	Clear. Mild.
„ „	9 p.m.		38	—	—	calm	Fine. Clear.
„ 20	9 a.m.		35·5	32·5	W.	very light	Overcast.
„ „	2 p.m.		45	—	ENE.	light	Cloudy. Mild.
„ „	9 p.m.		34	—	E.	moderate	Overcast. Chilly.
„ 21	9 a.m.		29	27	NE.	light	„ Raw.
„ „	2 p.m.		37	—	W.	„	Overcast at 6 p.m. Rain and hail. Wind SE.
„ „	9 p.m.		33	—	—	calm	Clear stars. Bright.
„ 22	9 a.m.		32·5	29	W.	light	Overcast. Chilly.
„ „	9 p.m.		46	—	E.	very light	„ Mild.
„ „	2 p.m.		36	—	—	calm	„ Moon dim. During night 2 inches snow, followed by rain.
„ 23	9 a.m.		32	27·5	W.	moderate	Cloudy.
„ „	2 p.m.		38·5	—	NE.	„	Clear. Mild.
„ „	9 p.m.		32	—	—	calm	„ Chilly.
„ 24	9 a.m.		45	16	S.	light	„ Warm.
„ „	2 p.m.		43	—	E.	moderate	„ Chilly.
„ „	9 p.m.		32	—	NE.	light	Cloudy. Cold. Raw.
„ 25	9 a.m.		27·5	27·5	„	„	Chilly. Overcast. Snow.
„ „	2 p.m.		31	—	E.	„	Still snowing.
„ „	9 p.m.		25	—	NE.	„	Overcast. 6 inches of snow.
„ 26	9 a.m.		34	23	W.	„	Cloudy and mild.
„ „	2 p.m.		38	—	—	calm	Mild. Clear. Snow melting.
„ „	9 p.m.		26	—	E.	light	Clear. Cold.
„ 27	9 a.m.		37	8·5	—	calm	Cloudy. Mild.
„ „	2 p.m.		41	—	E.	fresh	Clear. Chilly. Snow off.
„ „	9 p.m.		30	—	NE.	moderate	Clear and cold.
„ 28	9 a.m.		34	24·5	E.	„	Cloudy. Chilly.
„ „	2 p.m.		38·5	—	W.	„	Overcast. Rain from 2.30 to 2.48.
„ „	9 p.m.		36	—	NE.	light	„ Chilly.
„ 29	9 a.m.		48	24·5	E.	„	Clear. Warm.
„ „	2 p.m.		56	—	SW.	„	Clear and mild.
„ „	9 p.m.		38	—	NE.	„	Densely overcast. Raw at 8 p.m.
„ 30	9 a.m.		37·5	34·5	NW.	moderate	Cloudy.
„ „	2 p.m.		41	—	N.	fresh	„ Chilly.
„ „	9 p.m.		30	—	E.	very light	Clear. Cold.
„ 31	9 a.m.		49	22	SW.	light	„ Warm.
„ „	2 p.m.		49	—	S.	very light	„
„ „	9 p.m.		35	—	E.	moderate	Overcast and close.

Barometer returned to Fort Carlton.

Date.	Hour.	Therm. in Air.	Min. Therm.	Wind. Direcn.	Wind. Force.	Remarks.
		°	°			
April 1	9 a.m.	31·0	27·0	N.	very light	Overcast. Snowing.
„ „	2 p.m.	38	—	NE.	moderate	„ Snow till 1 p.m.
„ „	9 p.m.	32	—	„	„	„ Snow now.
„ 2	9 a.m.	30	30	ENE.	„	„ Snowing a little.
„ „	2 p.m.	29	—	NE.	light	„ „
„ „	9 p.m.	25	—	—	calm	„ Snow ceased at 7 p.m.
„ 3	9 a.m.	33·5	24	SE.	light	Cloudy.
„ „	2 p.m.	38	—	NE.	„	„
„ „	9 p.m.	27	—	—	„	„
„ 4	9 a.m.	35·5	16·5	N.	„	Clear. Cold.
„ „	2 p.m.	34	—	SE.	fresh	„ „
„ „	9 p.m.	25	—	W.	„	Overcast. Cold.
„ 5	9 a.m.	38·5	23·5	„	light	Clear and mild.
„ „	2 p.m.	46	—	S.	„	Dark cloud to N.
„ „	9 p.m.	33	—	E.	„	Clear and mild.
„ 6	9 a.m.	41	27	S.	very light	Cloudy and mild.
„ „	2 p.m.	50	—	NW.	moderate	Mild. Cloudy to W.
„ „	9 p.m.	38	—	W.	very light	Clear.
„ 7	9 a.m.	39	24	SW.	mild	Cloudy from E. to S.
„ „	2 p.m.	50	—	E.	light	Cloudy and mild.
„ „	9 p.m.	36	—	„	„	Clear and mild.
„ 8	9 a.m.	52	24	S.	„	Clear and warm.
„ „	2 p.m.	53·5	—	E.	moderate	Cloudy and mild.
„ „	9 p.m.	38	—	SE.	light	Rather hazy and mild.
„ 9	9 a.m.	44	28·5	ENE.	„	Clear and mild. Sprinkling rain.
„ „	2 p.m.	45	—	W.	„	Overcast and mild. Small rain.
„ „	9 p.m.	34·5	—	SW.	„	Clear. Few clouds to E.
„ 10	9 a.m.	55	29	S.	„	Clear and warm.
„ „	2 p.m.	52	—	W.	„	Cloudy. At 11·30 a little hail.
„ „	9 p.m.	38	—	„	moderate	Cloudy and chilly. A little hail.
„ 11	9 a.m.	58	31	„	very light	Clear and warm.
„ „	2 p.m.	54·5	—	„	light	Rather cloudy. Mild.
„ „	9 p.m.	40	—	NW.	„	Clear.
„ 12	9 a.m.	60	30	S.	„	Clear and warm.
„ „	2 p.m.	61	—	—	calm	Partially cloudy. Mild.
„ „	9 p.m.	37	—	ENE.	fresh	Fresh. Overcast.
„ 13	9 a.m.	30·5	30·5	N.	„	„ „
„ „	2 p.m.	30	—	„	„	„ „ and cold.
„ „	9 p.m.	25	—	„	light	Overcast and cold.
„ 14	9 a.m.	41	15·5	SW.	„	Clear and warm.
„ „	2 p.m.	31·5	—	W.	„	Clear and mild. 10·20 snow.
„ „	9 p.m.	24	—	„	very light	Chilly. Clouds in W.
„ 15	9 a.m.	44	—	W.	„	Clear and mild.
„ „	2 p.m.	40	11·5	„	moderate	Light fleecy clouds. Chilly.
„ „	9 p.m.	33	—	„	light	Cloudy and cold.
„ 16	9 a.m.	59	22	S.	very light	Clear and warm.
„ „	2 p.m.	50	—	E.	light	Overcast. Chilly.
„ „	9 p.m.	36	—	„	very light	Chilly.
„ 17	9 a.m.	37	30	NE.	very fresh	Cloudy and chilly.
„ „	2 p.m.	38	—	„	„	Overcast.
„ „	9 p.m.	42	—	E.	moderate	„
„ 18	9 a.m.	62	31	SW.	light	Clear and warm.
„ „	2 p.m.	61	—	„	„	Very bright. Clear and warm.
„ „	9 p.m.	48	—	E.	„	Bright. Rather chilly.
„ 19	9 a.m.	48	34	NW.	moderate	Cloudy and chilly.
„ „	2 p.m.	53	—	„	—	Clear and mild.
„ „	9 p.m.	38	—	„	very light	Clear and cloudy.
„ 20	9 a.m.	52	29	SW.	light	Clear and warm.
„ „	2 p.m.	49	—	NE.	fresh	Very hazy and mild.
„ „	9 p.m.	33	—	W.	„	Very bright, clear and dry.
„ 21	9 a.m.	55	26	SW.	light	„ „ „
„ „	2 p.m.	52·5	—	E.	„	Partially clouded. Mild.
„ „	9 p.m.	38	—	—	calm	Overcast. Rather chilly.
„ 22	9 a.m.	46	28	ESE.	moderate	Clear and warm.
„ „	2 p.m.	48·5	—	W.	very light	Fleecy clouds, and mild.
„ „	9 p m.	35	—	NE.	light	Clear and chilly.
„ 23	9 a.m.	47	32·5	SW.	moderate	Overcast. Rather chilly.
„ „	2 p.m.	55	—	E.	light	„ „
„ „	9 p.m.	45	—	W.	moderate	Densely overcast and mild.
„ 24	9 a.m.	54	37	„	„	Cloudy and mild.
„ „	2 p.m.	53	—	N.	„	Cloudy and cold.
„ „	9 p.m.	38	—	—	calm	Clear and chilly.
„ 25	9 a.m.	61	28·5	SW.	very light	Clear and warm.
„ „	2 p.m.	59	—	—	calm	Clear and mild.
„ „	9 p.m.	47	—	SW.	moderate	Hazy and mild.

Date.	Hour.	Therm. in Air.	Min. Therm.	Wind.		Remarks.
				Direcn.	Force.	
		°	°			
April 26	9 a.m.	61·5	39	SW.	light	Clear and warm.
„ „	2 p.m.	76	—	NE.	fresh	„
„ „	9 p.m.	56	—	SW.	very light	Beautifully clear. Chilly.
„ 27	9 a.m.	57·5	34	W.	moderate	Overcast. Mild.
„ „	2 p.m.	58·0	—	NW.	strong	Cloudy. Mild.
„ „	9 p.m.	41·5	—	NE.	light	Clear and mild.
„ 28	9 a.m.	42·0	36·5	E.	„	Overcast. Mild with rain.
„ „	2 p.m.	52	—	NW.	„	Overcast and chilly.
„ „	9 p.m.	44	—	E.	very light	Clear and mild.
„ 29	9 a.m.	66	31·0	S.	„	Clear and warm.
„ „	2 p.m.	65	—	W.	„	„
„ „	9 p.m.	49	—	W.	„	„
„ 30	9 a.m.	64	36·0	SSE.	light	Hazy and warm.
„ „	2 p.m.	66	—	S.	„	„
„ „	9 p.m.	54	—	SW.	moderate	Fine, clear, and chilly.

Meteorological Register, No. . Fort Edmonton, 1858-9. Lat. 53° 32′ N.

Date.	Hour.	Aneroid.	Thermometers.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
Oct. 11	Sunr.	27·56	16	—	—	light	ESE.	Cloudy. Sunrise. Clear.
„ „	2 p.m.	27·54	46	—	—	„	SW.	Overcast.
„ 12	Sunr.	27·54	38	—	—	fresh	NW.	Clear. Cloudless. Cold.
„ „	2 p.m.	27·62	49	—	—	„	WNW.	„ „ Wind in gusts.
„ 13	7 a.m.	27·59	33·5	—	—	light	NW.	Hail. Heavy cloud in NW.
„ „	2 p.m.	27·48	49	—	—	„	SE.	„ Overcast.
„ 14	7 a.m.	27·40	31	—	—	„	E.	Rain. Threats of Snow.
„ „	2 p.m.	27·42	39	—	—	„	„	Rain and snow.
„ 15	7 a.m.	27·38	33	—	33·0	„	„	„ Cold.
„ „	2 p.m.	27·42	39	—	—	„	NE.	Snowing.
„ 16	7 a.m.	27·68	24	—	24·5	„	E.	„
„ „	2 p.m.	27·72	27	—	—	„	„	„
„ 17	7 a.m.	27·65	26	—	23·0	„	N.	Fine Cirri ·2.
„ „	2 p.m.	27·68	41	—	—	„	W.	„
„ 18	7 a.m.	27·60	29	—	20	„	NW.	„ Cirri ·3.
„ „	2 p.m.	27·58	42	—	—	„	W.	„ Cirri ·1.
„ 19	7 a.m.	27·55	40	—	28	„	SW.	Soft. Overcast.
„ „	2 p.m.	27·45	42	—	—	„	„	Cloudy. Wind veering to N.
„ 20	9 a.m.	27·38	45	—	33	„	„	Very fine.
„ „	2 p.m.	27·40	53	—	—	„	„	„
„ 21	9 a.m.	27·49	35	—	32	„	NE.	Overcast. Little rain.
„ „	2 p.m.	27·45	47	—	—	fresh	E.	Clear.
„ 22	10 a.m.	27·32	34	—	33	light	„	Dull. Raw. Threatening rain.
„ „	2 p.m.	27·27	44	—	—	„	„	„ „ „
„ „	9 p.m.	27·23	—	—	—	very light	„	„ Thick rain.
„ 23	9 a.m.	27·17	39·5	—	34·5	„	NNE.	„
„ „	5 p.m.	27·08	43·5	—	—	„	E.	„ Mist.
„ „	9 p.m.	27·02	42	—	—	„	„	„ „
„ 24	9 a.m.	27·09	32·5	—	28	„	NE.	„
„ „	2 p.m.	27·12	42·5	—	—	light	„	Overcast.
„ „	7 p.m.	27·25	38·5	—	—	very light	„	„
„ 25	9 a.m.	27·50	42	—	31·5	light	„	Clear. Cirri ·3.
„ „	2 p.m.	27·55	51	—	—	„	N b E.	„ Cirri ·4.
„ „	7 p.m.	27·64	37·5	—	—	very light	„	„ No cloud.
„ 26	9 a.m.	27·59	39·5	—	18·5	light	„	Cloud ·2 to the S.
„ „	2 p.m.	27·55	47	—	—	fresh	SE.	Clear.
„ „	7 p.m.	27·60	41·5	—	—	very fresh	SSE.	Overcast.
„ 27	9 a.m.	27·59	35·5	—	33	light	S.	„ Little rain.
„ „	2 p.m.	27·62	39	—	—	„	„	Partially clear.
„ „	7 p.m.	27·63	37	—	—	very light	S b E.	Clear.
„ 28	9 a.m.	27·64	39·5	—	20	light	NE.	Partially clear.
„ „	7 p.m.	27·42	37	—	—	„	„	Clear.
„ 29	9 a.m.	27·26	30·5	—	21	very light	N.	Cir-cum ·4.
„ „	2 p.m.	27·27	39	—	—	„	E b N.	Overcast.
„ „	7 p.m.	27·32	35·5	—	—	„	NE.	Partially clear.
„ 30	9 a.m.	27·58	37·5	—	33	very light	N b E.	Overcast. Moist.
„ „	2 p.m.	27·59	43·5	—	—	fresh	N.	Partially clear.
„ „	7 p.m.	27·67	34·0	—	—	light	„	Clear. Starlight.
„ 31	9 a.m.	27·90	34	—	20	„	NE.	Fine. Clear.
„ „	2 p.m.	27·85	47	—	—	„	„	„ „

Date.	Hour.	Aneroid.	Thermometers.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
Nov. 1	9 a.m.	27·80	34	—	30	light	E.	Dull.
„ „	2 p.m.	27·90	41	—	—	„	„	„ Overcast.
„ 2	9 a.m.	28·11	32	—	28	„	„	Cir-cirri ·5.
„ „	2 p.m.	28·12	41·5	—	—	„	„	Clear. Fine.
„ 3	9 a.m.	27·94	40·5	—	25·5	„	NE.	„ „
„ „	2 p.m.	27·90	42	—	—	„	„	Very fine.
„ 4	9 a.m.	27·70	37	52	15	„	E.	Fine. Clear.
„ „	2 p.m.	27·65	42	—	—	„	SW.	Fine open. Soft.
„ 5	9 a.m.	27·72	32	—	25	very light	„	Very bright sun. Cloudless.
„ „	2 p.m.	27·66	39	—	—	„	NW.	Sharp. Clear. Cloudless.
„ „	9 p.m.	27·68	28	—	—	„	NE.	Cloudless. Sharp. Bright starlight.
„ 6	9 a.m.	27·85	29	41	26·4	fresh	N.	Overcast. Raw. Storm threatens.
„ „	2 p.m.	27·86	31	—	—	light	„	Very fine. Cloudless.
„ „	9 p.m.	27·87	27	—	—	very light	NE.	Clear. Cirri ·2 in West.
„ 7	9 a.m.	27·85	31	33	25·2	„	SE.	Very fine. Bright.
„ „	2 p.m.	27·84	39	—	—	light	„	Clear. Cloudless.
„ „	9 p.m.	27·80	32	—	—	„	„	„ „
„ 8	9 a.m.	27·36	35·5	40	28·3	„	„	Dull. Overcast.
„ „	2 p.m.	27·30	41·0	—	—	„	„	Overcast.
„ „	9 p.m.	27·40	47·5	—	—	very fresh	—	Partially clear.
„ 9	9 a.m.	27·60	44	50	29	light	NW.	Clear. Cirri ·2.
„ „	2 p.m.	27·65	43·7	—	—	fresh	„	Cirri ·4.
„ „	9 p.m.	27·68	34·5	—	—	light	„	Partially clear.
„ 10	9 a.m.	27·61	34·0	47	29	„	SE.	Very clear.
„ „	2 p.m.	27·58	45·2	—	—	calm	„	Slightly overcast.
„ „	9 p.m.	27·56	38·0	—	—	„	„	Partially clear.
„ 11	9 a.m.	27·72	31·5	45·8	32·0	„	NE.	Slightly overcast.
„ „	2 p.m.	27·67	32·5	—	—	light	„	„
„ „	9 p.m.	27·68	31·5	—	—	calm	„	Clear.
„ 12	9 a.m.	27·57	25	32	21·5	„	„	„
„ „	2 p.m.	27·45	33·5	—	—	light	„	Partially clear.
„ „	9 p.m.	27·42	30	—	—	fresh	—	Overcast.
„ 13	9 a.m.	27·50	26·2	34	24	—	—	Snowy.
„ „	2 p.m.	27·57	31·6	—	—	calm	NE.	Overcast.
„ „	9 p.m.	27·60	29	—	—	„	N.	„
„ 14	9 a.m.	27·59	32·6	34	28·3	fresh	—	Partially clear.
„ „	2 p.m.	27·48	38·0	—	—	light	SE.	Clear. Cirri. 2.
„ „	9 p.m.	27·30	33·7	—	—	very light	„	„
„ 15	9 a.m.	27·68	30·8	39	28	light	„	Overcast.
„ „	2 p.m.	27·02	36	—	—	„	„	„
„ „	9 p.m.	27·37	15	—	—	very fresh	NW.	„
„ 16	9 a.m.	27·84	4·6	38	1·0	fresh	„	Clear.
„ „	2 p.m.	27·81	15	—	—	„	„	„ Cirri ·1 to W.
„ „	9 p.m.	27·84	10·5	—	—	light	„	„ Starlight.
„ 17	9 a.m.	27·85	9·7	13	6·5	calm	„	Partially overcast.
„ „	2 p.m.	27·80	30	—	—	„	NNW.	Clear.
„ „	9 p.m.	27·80	21·7	—	—	„	NW.	„
„ 18	9 a.m.	27·70	20·0	31·7	9·2	„	SE.	Cirri ·3.
„ „	2 p.m.	27·50	38·2	—	—	light	„	Cirri ·4.
„ „	9 p.m.	27·29	34·7	—	—	calm	„	Slightly overcast.
„ 19	9 a.m.	27·10	33·5	40·0	19·5	light	NE.	„
„ „	2 p.m.	26·94	42	—	—	„	„	Cirri ·2.
„ „	9 p.m.	26·89	29·8	—	—	calm	N.	Slightly overcast.
„ 20	9 a.m.	27·05	29·5	44·8	27·2	light	NE.	Snow.
„ „	2 p.m.	27·14	30	—	—	„	„	„
„ „	9 p.m.	27·34	24·5	—	—	—	—	Slightly overcast. α Lyræ brilliant.
„ 21	9 a.m.	27·50	19	27·5	17·5	light	NE.	Overcast.
„ „	9 p.m.	27·58	18	—	—	—	N.	„ Dull.
„ 22	9 a.m.	27·65	19	22·5	10·5	light	NW.	Dull haze.
„ „	2 p.m.	27·60	35·6	—	—	very light	„	Overcast.
„ „	9 p.m.	27·52	22	—	—	light	„	„
„ 23	9 a.m.	27·35	22·7	28	16·2	calm	NE.	„
„ „	2 p.m.	27·36	22·5	—	—	light	N.	„
„ „	9 p.m.	27·47	22	—	—	—	„	„
„ 24	9 a.m.	27·68	17	25·5	16	—	NE.	Partially clouded.
„ „	2 p.m.	27·67	21·2	—	—	very light	„	Slightly overcast.
„ „	9 p.m.	27·77	20	—	—	—	—	Overcast. Sign of clearing.
„ 25	9 a.m.	27·78	11	25·5	10	light	NE.	Cir-cum ·6.
„ „	2 p.m.	27·74	13·2	—	—	—	„	Slightly overcast.
„ „	9 p.m.	27·70	11	—	—	—	—	Overcast.
„ 26	9 a.m.	27·77	9·6	17	5	calm	NE.	Partially clear.
„ „	2 p.m.	27·68	12·5	—	—	—	—	Slightly overcast.
„ „	9 p.m.	27·58	10	—	—	light	N b E.	Overcast.
„ 27	9 a.m.	27·25	25	31·5	9·5	fresh	NNE.	„
„ „	2 p.m.	27·18	36·8	—	—	—	—	„

Date.	Hour.	Aneroid.	Thermometer.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
Nov. 27	9 p.m.	27·13	37	—	—	—	—	Overcast.
„ 28	9 a.m.	27·26	37·2	39·8	27	fresh	NE.	„
„ „	2 p.m.	27·40	28	—	—	„	NW.	Partially clear.
„ „	9 p.m.	27·54	26·7	—	—	light	„	Snow.
„ 29	9 a.m.	27·60	13·5	35·0	8·6	„	NE.	Partially clear. Cirri ·3.
„ „	2 p.m.	27·55	17	—	—	very light	NNE.	Clear. Cirri ·1.
„ „	9 p.m.	27·42	5·2	—	—	light	ENE.	„
„ 30	9 a.m.	27·78	0	18·5	−2	calm	E.	Partially clear.
„ „	2 p.m.	27·80	−2	—	—	„	NE.	Clear.
„ „	9 p.m.	28·00	−19	—	—	very light	„	Clear at 10 p.m.
Dec. 1	9 a.m.	28·15	−22·3	4·7	−23	calm	„	Clear.
„ „	2 p.m.	28·20	−9	—	—	„	„	„
„ „	9 p.m.	28·20	−19·5	—	—	„	„	„
„ 2	9 a.m.	27·70	−14	−3·7	−20	„	„	„
„ „	2 p.m.	27·64	11·2	—	—	—	NW.	Slightly overcast.
„ „	9 p.m.	27·32	22	—	—	—	NNW.	Overcast.
„ 3	9 a.m.	27·10	29·8	37·5	−13	calm	NW.	Slightly overcast.
„ „	2 p.m.	27·25	24·2	—	—	light	NNW.	Overcast. Snow.
„ „	9 p.m.	27·50	15	—	—	—	NW.	Snow.
„ 4	9 a.m.	27·71	−1	32	−2	light	„	Partially clear.
„ „	2 p.m.	27·70	−1·5	—	—	very light	NNW.	Slightly overcast. Snow.
„ „	9 p.m.	27·67	−2·6	—	—	light	NW.	Partially overcast.
„ 5	9 a.m.	27·78	−10	4·2	−11	„	„	Partially clear.
„ „	2 p.m.	27·77	−10	—	—	calm	„	Sky nearly clear of clouds.
„ „	9 p.m.	27·88	−13·5	—	—	light	—	Clear.
„ 6	9 a.m.	27·88	−23	−7	−24	very light	NNW.	„
„ „	2 p.m.	27·82	−6	—	—	light	„	„
„ „	9 p.m.	27·70	−12·2	—	—	fresh	„	„
„ 7	9 a.m.	27·50	−11·9	−5·7	−23	calm	NW	Overcast. Snow.
„ „	2 p.m.	27·43	9·5	—	—	—	—	Snow.
„ „	9 p.m.	27·42	25	—	—	—	—	Overcast.
„ 8	9 a.m.	27·68	10	26·2	9·0	—	NW.	Cloudy.
„ „	2 p.m.	27·70	21	—	—	—	WNW.	Overcast.
„ „	9 p.m.	27·70	4·5	—	—	light	NNW.	Clear at 10¼ p.m.
„ 9	9 a.m.	27·77	−2·5	24	−9	—	NW.	Clear.
„ „	2 p.m.	27·75	−3·2	—	—	—	NNW.	„
„ „	9 p.m.	27·60	−13·2	—	—	—	NW.	„
„ 10	9 a.m.	27·60	−7·5	0·5	−15·2	light	NNW.	Slightly overcast.
„ „	2 p.m.	27·57	−1·0	—	—	fresh	NE.	Overcast.
„ „	9 p.m.	27·70	−5·0	—	—	light	NNE.	Partially clear.
„ 11	9 a.m.	27·71	−10·0	0·5	−11·0	calm	NE.	Overcast.
„ „	2 p.m.	27·65	−10·5	—	—	„	„	„ Snow.
„ „	9 p.m.	27·58	−8·5	—	—	„	„	„
„ 12	9 a.m.	27·47	−16·0	−7·5	24	very calm	NNE.	Slightly overcast.
„ „	2 p.m.	27·41	−10	—	—	calm	„	Partially clear.
„ „	9 p.m.	27·38	−10·5	—	—	„	„	Clear.
„ 13	9 a.m.	27·24	−10·5	−7·7	−21	„	NE.	„
„ „	2 p.m.	27·20	1·0	—	—	light	„	Light clouds to S.
„ „	9 p.m.	27·20	−10·0	—	—	very light	NNE.	Clear.
„ 14	9 a.m.	27·29	−10·0	−7·2	−21	calm	NE.	Partially clear.
„ „	2 p.m.	27·30	−6·0	—	—	light	SE.	„
„ „	9 p.m.	27·32	−12	—	—	„	SSE.	„
„ 15	9 a.m.	27·38	−6·0	−5·0	−14·5	very light	SE.	„
„ „	2 p.m.	27·44	−4·0	—	—	light	„	Cirri ·2 to SE.
„ „	9 p.m.	27·35	−5·2	—	—	fresh	SSE.	Cloudy. Cir-cum ·8.
„ 16	9 a.m.	27·20	−1·0	0·5	−8·0	„	SE.	Cirri ·3.
„ „	2 p.m.	27·16	4·5	—	—	light	„	„
„ „	9 p.m.	27·25	3·0	—	—	„	SE b S.	Partially clear.
„ 17	9 a.m.	27·18	14·0	16·5	−0·5	fresh	ENE.	Slightly overcast.
„ „	2 p.m.	27·00	27·2	—	—	—	—	Overcast.
„ „	9 p.m.	26·88	19·0	—	—	—	—	Partially clear.
„ 18	9 a.m.	27·44	−10·5	29·0	−11·0	light	NE.	Clear.
„ „	2 p.m.	27·37	−5·0	—	—	—	—	Partially clear.
„ „	9 p.m.	27·27	−10·5	—	—	—	—	„
„ 19	9 a.m.	26·88	−4·0	−1·0	−14·0	fresh	NW.	Overcast.
„ „	2 p.m.	27·02	5·2	—	—	„	„	Slightly overcast.
„ „	9 p.m.	27·20	−4·5	—	—	—	—	Partially clear.
„ 20	9 a.m.	27·45	−9·0	7·5	−10·0	light	NE.	Clear. Cirri ·2.
„ „	2 p.m.	27·51	−5·0	—	—	—	—	Partially clear.
„ „	9 p.m.	27·45	−6·5	—	—	—	—	Slightly overcast.
„ 21	9 a.m.	27·08	−3·0	−2·0	−8·0	calm	ENE.	„
„ „	2 p.m.	27·07	−5·0	—	—	—	—	Snow.
„ „	9 p.m.	27·21	−6·5	—	—	—	—	Overcast.
„ 22	9 a.m.	27·35	−10·0	−1·0	−13	calm	NE.	Partially clear.
„ „	2 p.m.	27·30	20	—	—	—	NNE.	Overcast.

Date.	Hour.	Aneroid.	Thermometer.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
Dec. 22	9 p.m.	27·24	25	—	—	—	SSE.	Overcast.
,, 23	9 a.m.	26·97	29·7	30·2	−5·5	fresh	SE.	,,
,, ,,	2 p.m.	97·00	24·3	—	—	—	E.	,,
,, ,,	9 p.m.	27·21	−5·0	—	—	—	,,	,,
,, 24	9 a.m.	27·39	−18·0	31·5	−19·5	fresh	N b W.	Clear.
,, ,,	2 p.m.	27·38	−9·0	—	—	—	N.	Slightly overcast.
,, ,,	9 p.m.	27·28	−13·2	—	—	—	NNW.	Overcast.
,, 25	9 a.m.	27·06	−18·0	−7·5	−20	calm	N.	Clear. Cirri ·2.
,, ,,	2 p.m.	27·12	−6·3	—	—	—	NNE.	,,
,, ,,	9 p.m.	27·23	−12	—	—	—	NE.	Slightly overcast.
,, 26	9 a.m.	27·49	−20	−3·7	−21·7	calm	,,	Clear. Cirri ·3.
,, ,,	2 p.m.	27·43	−11·4	—	—	,,	,,	Partially clear.
,, ,,	9 p.m.	27·58	−20	—	—	,,	,,	Clear.
,, 27	9 a.m.	27·51	−27·5	—	—	,,	,,	,,
,, ,,	2 p.m.	27·53	−9	—	—	,,	,,	,,
,, ,,	9 p.m.	27·54	−15	—	—	,,	,,	,,
,, 28	9 a.m.	27·39	−15·2	−7·7	−25	,,	,,	,,
,, ,,	2 p.m.	27·42	−3	—	—	,,	NNE.	,,
,, ,,	9 p.m.	27·40	−15	—	—	,,	,,	,,
,, 29	9 a.m.	27·11	−20	−1·5	−20·5	—	NE.	A large difference. Slightly overcast.
,, ,,	2 p.m.	27·12	1·0	—	—	—	—	Overcast.
,, ,,	9 p.m.	27·20	1·5	—	—	—	—	,,
,, 30	9 a.m.	27·24	1·7	6·5	−18·0	—	NE.	,,
,, ,,	2 p.m.	27·22	11·0	—	—	—	—	Partially overcast.
,, ,,	9 p.m.	27·25	8·0	—	—	—	—	Partially clear.
,, 31	9 a.m.	27·42	−1·0	11·8	−30	light	NE.	,,
,, ,,	2 p.m.	27·48	2·0	—	—	—	—	—
,, ,,	9 p.m.	27·55	−10	—	—	—	NE.	Clear.
Jan. 1	9 a.m.	27·17	−6	6	11	light	,,	Overcast.
,, ,,	2 p.m.	27·19	8	—	—	—	—	—
,, ,,	9 p.m.	27·25	−5	—	—	—	—	—
,, 2	9 a.m.	27·48	−1	10·5	8	,,	,,	Cloudy.
,, ,,	2 p.m.	27·62	6·5	—	—	—	—	—
,, ,,	9 p.m.	27·71	2·5	—	—	—	—	—
,, 3	9 a.m.	27·27	18·5	20	−7·5	—	NNE.	Clear. Cirri ·2.
,, ,,	2 p.m.	27·18	17	—	—	—	—	Cir-cum ·6.
,, ,,	9 p.m.	27·26	11	—	—	calm	NE.	Slightly overcast.
,, 4	9 a.m.	27·51	4·5	20·2	1·7	,,	,,	Partially clear.
,, ,,	2 p.m.	27·59	11	—	—	—	—	Slightly overcast.
,, ,,	9 p.m.	27·79	0	—	—	—	—	Partially clear.
,, 5	9 a.m.	27·94	−9	12	−9·5	—	NW.	,,
,, ,,	2 p.m.	28·01	−10	—	—	light	,,	Clear.
,, ,,	9 p.m.	28·10	−26	—	—	calm	N	,,
,, 6	9 a.m.	27·88	−26	−9·7	−35·7	,,	SE.	,,
,, ,,	2 p.m.	27·70	1	—	—	light	,,	Slightly overcast.
,, ,,	9 p.m.	27·59	4 6	—	—	very light	SSE.	Partially clear.
,, 7	9 a.m.	27·68	31	35·5	−26·2	light	SSW.	,,
,, ,,	2 p.m.	27·64	35·5	—	—	,,	,,	Slightly overcast.
,, ,,	9 p.m.	27·69	25	—	—	fresh	S.	Partially clear.
,, 8	9 a.m.	27·68	32·5	36·5	16·5	,,	SSE.	Cirri ·4.
,, ,,	2 p.m.	27·65	42	—	—	—	—	Clear. Cirri ·2.
,, ,,	9 p.m.	27·62	34	—	—	—	—	Clear. Cir-cum to W.
,, 9	9 a.m.	27·47	24	43·5	17·2	light	,,	Clear.
,, ,,	2 p.m.	27·48	32	—	—	—	—	Slightly clouded.
,, ,,	9 p.m.	27·48	21·2	—	—	—	—	Partially clear.
,, 10	9 a.m.	27·44	16·5	41·5	12·7	,,	SSW.	Clear. Sun dogs.
,, ,,	2 p.m.	27·27	32·7	—	—	—	—	,,
,, ,,	9 p.m.	27·21	28	—	—	—	—	,,
,, 11	9 a.m.	27·28	29	34·5	26·7	,,	SW.	,,
,, ,,	2 p.m.	27·30	37	—	—	—	—	—
,, ,,	9 p.m.	27·34	28	—	—	,,	NW.	Clear. Sun dogs.
,, 12	9 a.m.	27·36	21	38	18	—	—	,,
,, ,,	2 p.m.	27·39	34·5	—	—	—	—	,,
,, ,,	9 p.m.	27·40	18	—	—	—	—	,,
,, 13	9 a.m.	27·54	15	35·7	9	fresh	NE b E.	,, Cir-cum ·2.
,, ,,	2 p.m.	27·61	28	—	—	—	—	,, ,,
,, ,,	9 p.m.	27·62	14·7	—	—	—	—	Clear.
,, 14	9 a.m.	27·66	16	23	5	,,	NE.	Partially clear.
,, ,,	2 p.m.	27·55	25	—	—	light.	,,	Overcast.
,, ,,	9 p.m.	27·07	25·2	—	—	fresh	,,	,, Snow.
,, 15	9 a.m.	27·33	17	22	14·2	very fresh	NNW.	Snow.
,, ,,	2 p.m.	27·54	14	—	—	—	,,	Partially clear. Indications of snow.
,, ,,	9 p.m.	27·70	−1	—	—	very light.	N.	Clear. Sun dogs visible.
,, 16	9 a.m.	27·65	−7	19	9	light.	NE b E.	Partially clear.
,, ,,	2 p.m.	27·65	16·2	—	—	—	NE.	Overcast.

Date.	Hour.	Aneroid.	Thermometer.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
Jan. 16	9 p.m.	27·50	14	—	—	—	„	Partially clear.
„ 17	9 a.m.	27·38	17·0	20·0	−5·7	light	NE.	Clear. Cir-cum. ·2.
„ „	2 p.m.	27·34	28·0	—	—	„	„	Partially clear.
„ „	9 p.m.	27·26	18·3	—	—	„	„	„
„ 18	9 a.m.	29·02	19·5	30	14·5	„	„	„
„ „	2 p.m.	26·97	39·0	—	—	—	—	Light clouds pervading.
„ „	9 p.m.	27·04	35·7	—	—	light	NE.	Slightly overcast.
„ 19	9 a.m.	27·48	7·5	40·5	4·0	fresh	NNW.	Clear. Cirri ·3.
„ „	2 p.m.	27·74	1·0	—	—	„	„	Slightly overcast.
„ „	9 p.m.	27·90	−2·5	—	—	„	„	„ Snow.
„ 20	9 a.m.	27·91	−8·0	7·8	−10	very fresh	N	Overcast. Snow.
„ „	2 p.m.	27·81	−5·5	—	—	light	„	Snow.
„ „	9 p.m.	27·90	−10·0	—	—	—	—	Overcast.
„ 21	9 a.m.	28·04	−11·0	−4·5	−11·3	calm	NE.	Slightly overcast.
„ „	2 p.m.	28·00	−2·0	—	—	„	„	„
„ „	9 p.m.	27·85	5·0	—	—	light	NNW.	Overcast.
„ 22	9 a.m.	27·65	14·0	17·0	−9·8	„	„	Partially clear.
„ „	2 p.m.	27·55	40·5	—	—	—	—	„
„ „	9 p.m.	27·34	29·0	—	—	—	—	„
„ 23	9 a.m.	27·41	33·0	45·0	15·0	very light	WNW.	„
„ „	2 p.m.	27·60	34·0	—	—	„	„	Clear. Cirri ·2.
„ „	9 p.m.	27·68	26·7	—	—	—	—	„
„ 24	9 a.m.	27·68	30·0	35·7	21·0	very light	W b N.	Snow.
„ „	2 p.m.	27·78	34·0	—	—	—	—	Overcast.
„ „	9 p.m.	27·90	21·5	—	—	—	—	Partially clear.
„ 25	9 a.m.	27·50	24·0	34·0	9·0	fresh	SE.	Slightly overcast.
„ „	2 p.m.	27·34	35·0	—	—	„	„	„
„ „	9 p.m.	27·47	30·0	—	—	„	„	„
„ 26	9 a.m.	27·59	26·0	38·0	19·0	„	NNE.	Overcast. Snow.
„ „	2 p.m.	27·60	16·0	—	—	—	—	Partially clear.
„ „	9 p.m.	27·65	21·3	—	—	—	—	„
„ 27	9 a.m.	27·77	6·8	23·0	4·5	light	NNW.	„
„ „	2 p.m.	27·77	19·0	—	—	—	—	„
„ „	9 p.m.	27·78	4·5	—	—	—	—	Slightly overcast.
„ 28	9 a.m.	27·79	−8·5	11·5	−10·0	„	„	„
„ „	2 p.m.	27·80	−5·5	—	—	„	NE	„
„ „	9 p.m.	27·79	−17·5	—	—	„	—	Partially clear.
„ 29	9 a.m.	27·78	−25	−4	−26	calm	„	Clear. Cirri ·1.
„ „	2 p.m.	27·85	−9·2	—	—	—	—	„
„ „	9 p.m.	27·87	−15·9	—	—	—	—	„
„ 30	9 a.m.	27·77	−15·0	−14·0	−24	calm	ENE.	Slightly overcast.
„ „	2 p.m.	27·70	−5·0	—	—	„	„	„
„ „	9 p.m.	27·67	−12·5	—	—	„	ESE.	Clear. Cirri ·2.
„ 31	9 a.m.	27·47	−10·0	−5·0	−12·0	fresh	NE.	Slightly overcast.
„ „	2 p.m.	27·49	−4·2	—	—	—	—	„
„ „	9 p.m.	27·54	−8·0	—	—	—	—	„ Snow.
Feb. 1	9 a.m.	27·76	−6·0	−5·8	−10·8	light	NNE.	„
„ „	2 p.m.	27·85	−5·5	—	—	—	„	Partially clear.
„ „	9 p.m.	28·00	−18·0	—	—	—	„	Clear.
„ 2	9 a.m.	27·75	−29·5	−5·2	−30	calm	SE.	„
„ „	2 p.m.	27·75	−1·0	—	—	—	„	„
„ „	9 p.m.	27·69	−9·0	—	—	—	„	„
„ 3	9 a.m.	27·54	−4·0	8·0	−30·0	„	NNE.	Slightly clouded.
„ „	2 p.m.	27·41	25·0	—	—	—	—	„
„ „	9 p.m.	27·44	27·5	—	—	—	—	Snow.
„ 4	9 a.m.	27·51	24·0	23·4	−27	„	NE.	Slightly overcast.
„ „	2 p.m.	27·58	33·5	—	—	fresh	NW.	„
„ „	9 p.m.	27·58	31·0	—	—	light	NE.	Overcast.
„ 5	9 a.m.	27·35	39·5	—	—	„	—	Clear.
„ „	2 p.m.	27·30	40·0	—	—	very light	—	„
„ „	9 p.m.	27·20	32	—	—	light	—	Partially overcast.
„ 6	9 a.m.	27·00	14·5	40·0	11·0	fresh	NE.	Slightly cloudy.
„ „	2 p.m.	27·08	28·0	—	—	—	—	„
„ „	9 p.m.	27·37	18·0	—	—	—	—	Snow.
„ 7	9 a.m.	27·67	1·0	28·5	0·5	light	NW.	Slightly cloudy.
„ „	2 p.m.	27·74	0·5	—	—	„	„	„
„ „	9 p.m.	27·83	−10·5	—	—	calm	N.	Clear.
„ 8	9 a.m.	27·97	−21·0	4·0	−21·2	„	NNE.	„
„ „	2 p.m.	27·97	−12·0	—	—	„	„	„
„ „	9 p.m.	27·96	−22	—	—	„	„	„
„ 9	9 a.m.	27·84	−34	−11·5	−33·0	„	„	„
„ „	2 p.m.	27·84	−10·0	—	—	„	„	„
„ „	9 p.m.	27·88	−21·0	—	—	„	„	„
„ 10	9 a.m.	27·71	−37·0	−10·6	−38·0	„	ENE.	„ Mercury frozen in bulb.
„ „	2 p.m.	27·72	−9·5	—	—	light	SE.	„

Date.	Hour.	Aneroid.	Thermometer.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcⁿ.	
			°	°	°			
Feb. 10	9 p.m.	27·64	−17·5	—	—	light	SE.	Clear.
„ 11	9 a.m.	27·50	−21·0	− 8·5	−34·0	„	S.	„
„ „	2 p.m.	27·55	−1·0	—	—	„	„	„
„ „	9 p.m.	27·56	−12·0	—	—	„	„	„
„ 12	9 a.m.	27·40	−16·5	—	—	„	NE.	„
„ „	2 p.m.	27·44	24·0	—	—	—	—	„
„ „	9 p.m.	27·49	12·0	—	—	—	—	„
„ 13	9 a.m.	27·38	−4·5	26·0	−14·0	„	„	„
„ „	2 p.m.	27·30	26·0	—	—	—	ENE.	„
„ „	9 p.m.	27·27	19·0	—	—	„	„	Slightly overcast.
„ 14	9 a.m.	27·19	6·0	29·0	6·0	—	NE.	„
„ „	2 p.m.	27·15	29·0	—	—	calm	„	Snow.
„ „	9 p.m.	27·17	13·7	—	—	„	„	Clear.
„ 15	9 a.m.	27·16	−0·5	29·5	−0·4	„	„	Slightly overcast.
„ „	2 p.m.	27·11	23·0	—	—	„	„	„
„ „	9 p.m.	27·09	14·5	—	—	„	„	Overcast.
„ 16	9 a.m.	27·04	9·5	29·5	0·5	light	„	Partially clear.
„ „	2 p.m.	27·05	12·5	—	—	„	„	„
„ „	9 p.m.	27·04	−2·0	—	—	„	„	Clear. Cirri ·1.
„ 17	9 a.m.	27·09	1·5	16·0	−10·0	„	„	Slightly overcast.
„ „	2 p.m.	27·19	13	—	—	„	„	„
„ „	9 p.m.	27·38	8·0	—	—	„	„	Slightly clouded.
„ 18	9 a.m.	27·40	7·0	12·0	0·5	„	„	„
„ „	2 p.m.	27·38	14·0	—	—	„	SE.	Clear, with cirri ·1 to N.
„ „	9 p.m.	27·39	0	—	—	„	„	Clear.
„ 19	9 a.m.	27·44	−9·0	15·0	−10·0	„	„	Partially clear.
„ „	2 p.m.	27·54	13·6	—	—	„	„	Clear. Cir-cum ·1.
„ „	9 p.m.	27·50	2·0	—	—	calm	„	Partially clear.
„ 20	9 a.m.	27·16	4·0	18·0	−10·0	fresh	SE.	Clear.
„ „	2 p.m.	27·13	42·0	—	—	very fresh	SW.	Partially clear.
„ „	9 p.m.	27·13	28·5	—	—	calm	„	Clear.
„ 21	9 a.m.	27·28	11·0	43·5	5·0	light	NE.	Partially clear.
„ „	2 p.m.	27·14	14·0	—	—	„	„	„
„ „	9 p.m.	27·40	1·8	—	—	„	„	„
„ 22	9 a.m.	27·54	−1·0	14·0	−1·7	fresh	ENE.	Slightly overcast.
„ „	2 p.m.	27·58	10·0	—	—	„	„	Overcast.
„ „	9 p.m.	27·62	0	—	—	light	NE.	Partially overcast.
„ 23	9 a.m.	27·50	1·0	10·0	−3·3	very light	SE.	Partially clear.
„ „	2 p.m.	27·40	9·0	—	—	—	—	„
„ „	9 p.m.	27·35	5·0	—	—	—	—	Overcast.
„ 24	9 a.m.	27·35	4·0	10·0	1·0	light	N.	Slightly overcast.
„ „	2 p.m.	27·38	7·0	—	—	„	„	„
„ „	9 p.m.	27·37	4·0	—	—	fresh	„	Snow
„ 25	9 a.m.	27·30	−8·8	10·0	−9·5	light	NE.	Clear.
„ „	2 p.m.	27·27	15·0	—	—	„	ENE.	„
„ „	9 p.m.	27·32	6·0	—	—	very light	NE.	„
„ 26	9 a.m.	27·52	−16·0	−17·5	−16·0	calm	„	„
„ „	2 p.m.	27·51	17·0	—	—	„	„	„
„ „	9 p.m.	27·48	8·5	—	—	fresh	„	„
„ 27	9 a.m.	27·40	1·5	23·0	−10·0	light	„	Partially clear.
„ „	2 p.m.	27·44	22·0	—	—	„	„	Clear.
„ „	9 p.m.	27·44	4·0	—	—	calm	ENE.	„
„ 28	9 a.m.	27·36	−9·0	24·0	−15·0	„	NE.	„
„ „	2 p.m.	27·38	23·0	—	—	fresh	„	„
„ „	9 p.m.	27·31	9·0	—	—	calm	„	Partially clouded.
March 1	9 a.m.	27·32	2·1	25	−5·1	light	W.	Clear. Bright.
„ „	2 p.m.	27·29	27·4	—	—	„	NE.	Clear. Cirri ·1.
„ „	9 p.m.	28·0	18·0	—	—	—	—	Partially clear.
„ 2	9 a.m.	27·22	20·0	20·0	2	calm	ENE.	Sky very bright to W.
„ „	2 p.m.	27·14	42·0	—	—	„	E.	Clear with no clouds.
„ „	9 p.m.	27·34	35·0	—	—	—	—	Cloudy.
„ 3	9 a.m.	27·40	25·5	44	24	fresh	E b S.	Fine. Bright.
„ „	2 p.m.	27·38	38·0	—	—	light	ESE.	„ „
„ „	9 p.m.	27·10	28·5	—	—	very light	SE.	Overcast.
„ 4	9 a.m.	26·88	35·0	44·5	21·0	—	NE b E.	Fine. Bright.
„ „	2 p.m.	27.00	—	—	—	—	—	—
„ „	9 p.m.	27·24	—	—	—	—	—	—
„ 5	9 a.m.	27·37	14·0	42·0	8·0	light	NE.	Clear.
„ „	2 p.m.	27·37	35·0	—	—	„	SSE.	Very fine. Clear.
„ „	9 p.m.	27·31	27·5	—	—	„	SE.	Clear.
„ 6	9 a.m.	27·06	26·5	36·0	9·0	„	„	Overcast.
„ „	2 p.m.	27·05	44·5	—	—	fresh	SW.	Clear. Cirri ·2.
„ „	9 p.m.	27·25	26·0	—	—	„	„	Partially clear.
„ 7	9 a.m.	27·39	19·0	42·7	15·0	light	NE.	Slightly overcast.
„ „	2 p.m.	27·38	34·0	—	—	very light	ENE.	„

Date.	Hour.	Aneroid.	Thermometer.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
March 7	9 p.m.	27·35	27·0	—	—	fresh	ENE.	Slightly overcast.
„ 8	9 a.m.	27·37	24·5	38·5	17·0	„	NE.	Partially clear.
„ „	2 p.m.	27·38	28·0	—	—	„	„	„
„ „	9 p.m.	27·37	18·2	—	—	light	N.	Clear.
„ 9	9 a.m.	27·38	2·0	29·5	−6·0	calm	NE.	Slightly overcast.
„ „	2 p.m.	27·39	26·0	—	—	„	„	Partially clear.
„ „	9 p.m.	27·47	14·5	—	—	„	„	„
„ 10	9 a.m.	27·55	10·0	25·5	−5·5	light	E b N.	Clear.
„ „	2 p m.	27·44	34·0	—	—	„	„	„
„ „	9 p.m.	27·30	21·7	—	—	„	„	„
„ 11	9 a.m.	27·31	13·5	34·7	6·0	„	NE.	„
„ „	2 p.m.	27·35	34·5	—	—	very light	„	„
„ „	9 p.m.	27·49	23·0	—	—	„	„	„
„ 12	9 a.m.	27·60	24·0	36·0	9·5	fresh	ENE.	Partially clear.
„ „	2 p.m.	27·62	39·0	—	—	„	E.	Clear.
„ „	9 p.m.	27·60	27·4	—	—	„	E b N.	„
„ 13	9 a.m.	27·44	32·0	39·5	20	light	NW.	„
„ „	2 p.m.	27·50	39·0	—	—	„	NNW.	Cir-cum ·3.
„ „	9 p.m.	27·58	28·5	—	—	„	„	Cir-cum ·2.
„ 14	9 a.m.	27·48	19·5	41·0	12·0	very fresh	NE.	Clear.
„ „	2 p.m.	27·30	38·7	—	—	—	—	Partially clear.
„ „	9 p.m.	27·07	30·0	—	—	—	—	„
„ 15	9 a.m.	27·00	30·6	38·0	16·5	light	E.	Raw. Dull. Partially clear.
„ „	2 p.m.	27·20	35·0	—	—	„	E b N.	Partially clear.
„ „	9 p.m.	27·32	25·0	—	—	fresh	W.	„
„ 16	9 a.m.	27·51	23·7	37·0	16·0	„	NW.	„
„ „	2 p.m.	27·56	32·5	—	—	light	„	„
„ „	9 p.m.	27·65	21·0	—	—	very light	NE.	Clear.
„ 17	9 a.m.	27·58	21·0	32	7·0	„	„	„
„ „	2 p.m.	27·54	37·0	—	—	„	„	Partially clear.
„ „	9 p.m.	27·48	26·2	—	—	light	„	„
„ 18	9 a.m.	27·28	27·5	36·0	18·5	„	ENE.	Slightly overcast.
„ „	2 p.m.	27·28	38·0	—	—	„	NE.	Partially clear.
„ „	9 p.m.	27·18	25·5	—	—	very light	ENE.	„ Cirri ·2.
„ 19	9 a.m.	27·18	24·0	40·0	18·0	light	NE.	Snow.
„ „	2 p.m.	27·30	30·0	—	—	—	N.	„
„ „	9 p.m.	28·36	20·5	—	—	—	„	Snow (fine).
„ 20	9 a.m.	27·34	20·0	29·7	17·0	fresh	NW.	Overcast.
„ „	2 p.m.	27·30	25·0	—	—	—	WNW.	„
„ „	9 p.m.	27·25	13·2	—	—	—	„	Partially clear.
„ 21	9 a.m.	27·18	− 2·5	22·0	−3·7	light	NE.	Clear.
„ „	2 p.m.	27·13	27·0	—	—	—	SE.	Partially clear. Cir-cum ·2.
„ „	9 p.m.	27·12	14·2	—	—	fresh	„	„
„ 22	9 a.m.	27·14	11·2	30·0	2	light	NE.	Overcast.
„ „	2 p.m.	27·16	26·0	—	—	—	„	Partially clear.
„ „	9 p.m.	27·25	12·2	—	—	—	„	Clear.
„ 23	9 a.m.	27·47	13·5	29·0	1·0	light	NE.	Slightly overcast.
„ „	2 p.m.	27·52	29·5	—	—	„	„	Partially clear.
„ „	9 p.m.	27·60	25·0	—	—	„	„	„
„ 24	9 a.m.	27·57	22·0	36·0	9·5	„	ENE.	Clear.
„ „	2 p.m.	27·42	35·2	—	—	fresh	SE.	Partially clear.
„ „	9 p.m.	27·29	29·0	—	—	light	S.	Slightly overcast.
„ 25	9 a.m.	27·27	28·5	38·0	19·0	„	NE.	„
„ „	2 p.m.	27·30	31·5	—	—	„	„	„
„ „	9 p.m.	27·35	29·0	—	—	„	„	Partially clear.
„ 26	9 a.m.	27·37	29·5	38·0	25·5	fresh	ENE.	Overcast.
„ „	2 p.m.	27·31	38·0	—	—	light	E.	Partially clear. Cirri ·2.
„ „	9 p.m.	27·34	33·0	—	—	„	—	„
„ 27	9 a.m.	27·32	29·0	42·4	19·0	fresh	NE.	„
„ „	2 p.m.	27·36	38·5	—	—	„	NE.	„
„ „	9 p.m.	27·42	28·0	—	—	„	—	Partially clear.
„ 28	9 a.m.	27·58	26·5	41·0	25·0	very fresh	W.	Slightly clouded.
„ „	2 p.m.	27·60	29·2	—	—	fresh	NW.	Partially overcast.
„ „	9 p.m.	27·65	20·0	—	—	light	„	Clear.
„ 29	9 a.m.	27·69	20·5	33·5	11·0	„	N.	„
„ „	2 p.m.	27·70	22·0	—	—	fresh	„	Partially clear.
„ „	9 p.m.	27·70	14·0	—	—	„	„	Clear. Fine Aurora.
„ 30	9 a.m.	27·68	10·0	25·5	10·0	very fresh	N b W.	Partially clear.
„ „	2 p.m.	27·64	17·0	—	—	„	„	Slightly overcast.
„ „	9 p.m.	27·70	13·5	—	—	calm	„	Clear.
„ 31	9 a.m.	27·81	9·5	20·0	8·0	very fresh	N.	Slightly overcast.
„ „	2 p.m.	27·81	19·0	—	—	„	„	„
„ „	9 p.m.	27·85	16·2	—	—	calm	„	„
April 1	9 a.m.	27·85	15·2	22·0	9·0	very fresh	„	Overcast.
„ „	2 p.m.	27·85	24·5	—	—	„	„	Slightly overcast.

Date.	Hour.	Aneroid.	Thermometer.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
April 1	9 p.m.	27·86	24·2	—	—	calm	N.	Slightly overcast.
„ 2	9 a.m.	27·76	28·0	30·5	15·0	light	NE.	Partially clear.
„ „	2 p.m.	27·70	39·0	—	—	„	„	„
„ „	9 p.m.	27·76	29·0	—	—	„	„	Clear.
„ 3	9 a.m.	27·70	29·5	41·0	16·5	„	NW.	„
„ „	2 p.m.	27·78	41·0	—	—	„	„	„
„ „	9 p.m.	27·88	31·5	—	—	„	„	Partially clear.
„ 4	9 a.m.	28·20	27·0	44·0	25·0	„	„	„
„ „	2 p.m.	28·19	31·5	—	—	very light	NNW.	Clear.
„ „	9 p.m.	28·08	26·0	—	—	—	„	„
„ 5	9 a.m.	27·69	34·0	36·7	20·5	—	„	Slightly overcast.
„ „	2 p.m.	28·71	38·0	—	—	—	—	Partially clear.
„ „	9 p.m.	27·72	29·5	—	—	—	—	Overcast. Snow.
„ 6	9 a.m.	27·73	21·0	41·5	19·8	light	ENE.	Three inches of snow fell.
„ „	2 p.m.	27·90	31·2	—	—	„	N.	Overcast.
„ „	9 p.m.	28·00	13·0	—	—	calm	„	Clear.
„ 7	9 a.m.	27·84	11·5	30·5	0	light	NE.	„
„ „	2 p.m.	27·77	25·5	—	—	„	„	„
„ „	9 p.m.	27·59	16·5	—	—	„	„	„
„ 8	9 a.m.	27·51	17·7	31·0	10·0	„	„	Partially clear.
„ „	2 p.m.	27·50	23·0	—	—	—	„	Clear.
„ „	9 p.m.	27·55	14·0	—	—	„	—	„
„ 9	9 a.m.	27·65	16·3	25·7	10·5	„	—	Slightly overcast.
„ „	2 p.m.	27·69	23·0	—	—	„	—	Clear.
„ „	9 p.m.	27·71	14·0	—	—	„	—	Slightly overcast.
„ 10	9 a.m.	27·60	14·5	26·2	6·0	fresh	N.	Overcast.
„ „	2 p.m.	27·56	18·0	—	—	„	SE.	Slightly overcast.
„ „	9 p.m.	27·61	11·5	—	—	„	„	Snow (fine).
„ 11	9 a.m.	27·62	12·0	22·0	7·0	light	—	Partially clear.
„ „	2 p.m.	27·59	18·0	—	—	„	NE.	Clear.
„ „	9 p.m.	27·54	11·0	—	—	„	„	„
„ 12	9 a.m.	27·60	11·6	22·0	7·0	„	N.	Overcast. Very fine. Snow.
„ „	2 p.m.	27·56	21·2	—	—	„	„	Slightly overcast.
„ „	9 p.m.	27·53	11·5	—	—	„	„	Snow.
„ 13	9 a.m.	27·66	13·5	24·5	8·0	„	E.	Slightly overcast.
„ „	2 p.m.	27·70	26·0	—	—	„	„	Very fine snow.
„ „	9 p.m.	27·69	15·2	—	—	„	„	„
„ 14	9 a.m.	27·49	21·5	30·0	12·5	„	NE.	Overcast.
„ „	2 p.m.	27·70	34·0	—	—	„	„	Partially clear.
„ „	9 p.m.	27·89	23·5	—	—	„	„	Slightly overcast.
„ 15	9 a.m.	27·90	24·0	38·8	19·0	„	E.	„
„ „	2 p.m.	27·96	41·0	—	—	—	—	Partially clear.
„ „	9 p.m.	27·85	31·5	—	—	—	—	„
„ 16	9 a.m.	27·60	39·0	42·0	24·5	Light	E.	Overcast.
„ „	2 p.m.	27·44	43·0	—	—	„	„	„
„ „	9 p.m.	27·42	34·0	—	—	„	„	Partially clear. Rain at 6 p.m.
„ 17	9 a.m.	27·54	41·0	47·2	27·0	„	NE.	„
„ „	2 p.m.	27·52	48·5	—	—	„	E.	„
„ „	9 p.m.	27·59	33·0	—	—	„	„	„
„ 18	9 a.m.	27·54	28·0	52·0	27·2	„	NE.	„
„ „	2 p.m.	27·46	35·0	—	—	„	„	„
„ „	9 p.m.	27·50	25·0	—	—	„	„	„
„ 19	9 a.m.	27·70	28·0	50·0	27·0	„	„	Overcast. Very fine snow.
„ „	2 p.m.	27·87	35·0	—	—	„	„	Slightly overcast.
„ „	9 p.m.	27·98	25·0	—	—	„	„	Clear at 11 30 p.m.
„ 20	9 a.m.	28·02	28·0	40	20	very light	NE.	Snow.
„ „	2 p.m.	28·00	37·0	—	—	„	ENE.	Partially clear.
„ „	9 p.m.	27·98	27·0	—	—	fresh	E b S.	Clear.
„ 21	9 a.m.	27·78	39·0	44·5	20	„	SSE.	„
„ „	2 p.m.	27·70	49·0	—	—	light	„	„
„ „	9 a.m.	27·62	39·0	—	—	„	„	„
„ 22	9 a.m.	27·66	35·0	54	25	„	NE.	„
„ „	2 p.m.	27·67	52·0	—	—	—	—	„
„ „	9 p.m.	27·70	39·0	—	—	light	NE.	„
„ 23	9 a.m.	27·64	47·5	56·5	30·0	„	S.	„
„ „	2 p.m.	27·54	54·0	—	—	„	„	„
„ „	9 p.m.	27·50	40·0	—	—	„	„	Clear. Starlight.
„ 24	9 a.m.	27·41	49·0	57·5	29·5	„	SSE.	„
„ „	2 p.m.	27·38	55·5	—	—	„	„	„
„ „	9 p.m.	27·36	44·0	—	—	„	„	Clear. Starlight.
„ 25	9 a.m.	27·35	49·0	57	29·5	very light	S b W.	„ Very fine
„ „	2 p.m.	27·33	65·0	—	—	light	SSW.	„
„ „	9 p.m.	27·30	50·0	—	—	„	„	„
„ 26	9 a.m.	27·40	52	67·0	32·0	„	S.	Slightly overcast.
„ „	2 p.m.	27·35	60	—	—	„	„	Partially clear.

Date.	Hour.	Aneroid.	Thermometer.			Wind.		Remarks.
			Air.	Max.	Min.	Force.	Direcn.	
			°	°	°			
April 26	9 p.m.	27·40	49·0	—	—	light	S.	Partially clear.
„ 27	9 a.m.	27·60	39·0	63·0	37·0	fresh	NW.	„
„ „	2 p.m.	27·59	48·0	—	—	light	W.	„
„ „	9 p.m.	27·59	39·0	—	—	„	„	Slightly overcast.
„ 28	9 a.m.	27·57	39·0	51·0	34	„	NE.	„
„ „	2 p.m.	27·48	47·5	—	—	„	E.	„
„ „	9 p.m.	27·48	42·0	—	—	„	NW.	Partially clear.
„ 29	9 a.m.	27·50	50·5	52	34·0	„	S.	„
„ „	2 p.m.	27·38	40·0	—	—	„	„	„
„ „	9 p.m.	27·49	40·0	—	—	„	„	Slightly overcast.
„ 30	9 a.m.	27·49	41·5	54	32	fresh	NW.	Overcast.
„ „	2 p.m.	27·40	54·0	—	—	—	E.	Partially clear.
„ „	9 p.m.	27·47	45·0	—	—	—	—	„
May 1	9 a.m.	27·38	45·5	58·5	34	light	NE.	„ Cirri ·2.
„ „	2 p.m.	27·57	56·6	—	—	„	„	„ Cirri ·3.
„ „	9 p.m.	27·59	47·0	—	—	„	„	„
„ 2	9 a.m.	27·49	43·0	60	38·0	„	„	Slightly overcast.
„ „	2 p.m.	27·54	45·5	—	—	„	NW.	„
„ „	9 p.m.	27·52	40·5	—	—	„	„	Rain.
„ 3	9 a.m.	27·53	42·0	50·0	37·0	„	N	Overcast.
„ „	2 p.m.	27·47	53·0	—	—	„	„	Partially clear.
„ „	9 p.m.	27·46	46·5	—	—	„	„	„
„ 4	9 a.m.	27·54	50·5	56·0	40·0	„	„	„
„ „	2 p.m.	27·57	59·5	—	—	„	„	„
„ „	9 p.m.	27·64	49·0	—	—	„	„	„ Cirri ·2.
„ 5	9 a.m.	27·80	53·6	63·6	34	fresh	NE.	Clear.
„ „	2 p.m.	27·78	60·0	—	—	„	S.	„
„ „	9 p.m.	27·75	57·0	—	—	„	„	„
„ 6	9 a.m.	27·74	58·0	62·0	34	light	SE.	„
„ „	2 p.m.	27·61	64·0	—	—	„	„	„
„ „	9 p.m.	27·60	60·0	—	—	„	„	„
„ 7	9 a.m.	27·46	57·0	66	40·0	fresh	„	„
„ 8	9 a.m.	27·18	50·0	58	46·0	„	„	Overcast.
„ 9	9 a.m.	27·31	40·5	67·0	38	light	N.	Rain.
„ 10	9 a.m.	27·11	37·0	45·0	31·0	„	„	„

III.—Meteorological Observations. Jaspar House, 1859.

Date.	Hour.	Barom.	Therm.	Min.	Wind.	Force.	Sky.
			°	°			
Feb. 2	9 a.m.	26·55	+13·0	−18·5	N.	light	Tops of mountains to W. covered.
„ „	7 p.m.	26·54	+29	—	S.	fresh	Cloudy and soft. High wind during night.
„ 3	9 a.m.	26·46	+31	+23·5	„	light	„ High gale from S.
„ „	2 p.m.	26·35	37	—	„	„	„ High wind.
„ „	9 p.m.	26·34	37	—	„	„	Passing clouds. Wind in gusts.
„ 4	9 a.m.	26·44	35	33·5	„	„	Cloudy. Soft wind. Mountains capped.
„ „	2 p.m.	—	42	—	„	„	Clear. Mountains to W. capped.
„ „	9 p.m.	26·44	34	—	„	„	Clear. Gale from S.
„ 5	9 a.m.	26·30	37	34	„	fresh	Fine passing clouds.
„ „	2 p.m.	26·18	35	—	SW.	„	Overcast. Dense black snow clouds to NE.
„ „	9 p.m.	26·08	30·5	—	„	gale	Clear.
„ 6	9 a.m.	25·90	26	23	„	light	Dull. Mountains capped.
„ „	2 p.m.	25·94	31	—	N.	„	Thick clouds filling the valleys.
„ „	9 p.m.	26·18	15	—	„	fresh	Snowing.
„ 7	9 a.m.	26·44	4	3·5	„	„	Mist. Snow.
„ „	2 p.m.	26·49	8	—	„	light	Clearing.
„ „	9 p.m.	26·60	−1	—	„	„	Clear. Starlight.
„ 8	9 a.m.	26·65	−10·5	−11	„	„	Clear. Very sharp.
„ „	2 p.m.	26·58	3·5	—	„	„	Clear. Mist on mountains.
„ „	9 p.m.	26·50	−10	—	„	„	Hazy to the W.
„ 9	9 a.m.	26·44	−15	−15·5	„	fresh	Raw. Foggy.
„ „	2 p.m.	26·36	−7	—	„	„	Cold. Raw.
„ „	9 p.m.	26·35	−14	—	„	„	Very hazy.
„ 10	9 a.m.	26·34	−20	−26	„	light	Very clear.
„ „	2 p.m.	—	8	—	„	„	Clear.
„ „	9 p.m.	—	−6	—	S.	very light	„
„ 11	9 a.m.	—	−6	—	„	fresh	„
„ „	2 p.m.	—	24	—	„	light	„
„ „	9 p.m.	—	15	—	„	„	„
„ 12	9 a.m.	—	6	—	„	very light	„

Date.	Hour.	Bar.	Therm.	Min.	Wind.	Force.	Sky.
			°	°			
Feb. 12	2 p.m.	—	6	—	S.	fresh	Clear.
,, ,,	9 p.m.	—	29	—	,,	light	,,
,, 13	9 a.m.	—	21	—	,,	,,	Cloudy. Overcast.
,, ,,	2 p,m.	—	15	—	,,	fresh	,, ,,
,, ,,	9 p.m.	—	34	—	,,	,,	,, ,,
,, 14	9 a.m.	—	30	—	,,	light	,, ,,
,, ,,	2 p.m.	—	26	—	,,	fresh	,, ,,
,, ,,	9 p.m.	—	34	—	calm	—	,, ,,
,, 15	9 a.m.	—	2	—	S.	light	,, ,,
,, ,,	2 p.m.	—	25	—	,,	,,	,, ,,
,, ,,	9 p.m.	—	4	—	N.	,,	,, ,,
,, 16	9 a.m.	—	6	—	calm	—	,, ,,
,, ,,	2 p.m.	—	3	—	N.	light	Clear.
,, ,,	9 p.m.	25·92	3	—	,,	,,	,,
,, 17	9 a.m.	25·99	5	— 4	,,	fresh	Dull. Fog.
,, ,,	2 p.m.	26·05	15	—	,,	light	Thick snow. Fog.
,, ,,	9 p.m.	26·08	5	—	,,	very light	Foggy.
,, 18	9 a.m.	26·08	— 5	—15	,,	light	Overcast.

Meteorological Observations. Jasper House, Spring, 1859. Kept by Mr. Moberly.

Date.	Hour.	Bar.	Therm.	Min.	Wind.	Force.	Sky.
			°	°			
,, 19	9 a.m.	26·24	12·0	—7·0	S.	light	Mountains. Covered to W.
,, ,,	2 p.m.	26·22	33·0	—	,,	fresh	,, Covered to W. and S.
,, ,,	9 p.m.	26·33	26·0	—	,,	,,	Clear.
,, 20	9 a.m.	26·30	29	5·0	,,	,,	Fog on mountains to SW.
,, ,,	2 p.m.	26·20	34	—	,,	high	Snowing.
,, ,,	9 p.m.	26·20	19·5	—	,,	fresh	,,
,, 21	9 a.m.	26·00	19·0	8·5	,,	light	Clear.
,, ,,	2 p.m.	26·10	31·5	—	,,	,,	Mist on mountains to S.
,, ,,	9 p.m.	26·20	19·5	—	,,	,,	Overcast.
,, 22	9 a.m.	26·24	1·5	—10	N.	,,	Clear.
,, ,,	2 p.m.	26·21	28·5	—	S.	,,	Cloud to N.
,, ,,	9 p.m.	26·22	10	—	,,	fresh	Clear. Bright Aurora.
,, 23	9 a.m.	26·22	— 3	—10	N.	light	,,
,, ,,	2 p.m.	26·21	12	—	,,	,,	,,
,, ,,	9 p.m.	26·13	— 3	—	,,	fresh	,, Bright Aurora.
,, 24	9 a.m.	26·24	— 2	— 9	,,	light	,,
,, ,,	2 p.m.	26·11	12·5	—	,,	,,	,,
,, ,,	9 p.m.	26·12	— 3	—	,,	,,	,, Bright Aurora.
,, 25	9 a.m.	26·03	—12	—15	,,	,,	,,
,, ,,	2 p.m.	25·96	27	—	S.	,,	Cloudy.
,, ,,	9 p.m.	26·12	13	—	,,	,,	Overcast to S.
,, 26	9 a.m.	26·24	15·5	9	,,	,,	Clear. Mountains covered to SW.
,, ,,	2 p.m.	26·22	31	—	,,	,,	Cloud to the S.
,, ,,	9 p.m.	26·31	11·5	—	,,	,,	Overcast.
,, 27	9 a.m.	26·21	14·5	0·0	,,	,,	Clear. Sharp.
,, ,,	2 p.m.	26·12	32	—	,,	,,	,,
,, ,,	9 p.m.	26·14	14·5	—	,,	,,	Cloudy to S. and W.
,, 28	9 a.m.	26·16	4·5	— 6	,,	fresh	Clear.
,, ,,	2 p.m.	26·11	29	—	,,	,,	Mountains covered with mist to S.
,, ,,	9 p.m.	26·18	25	—	,,	,,	Overcast.
Mar. 1	9 a.m.	26·22	21·5	11	,,	,,	Cloudy.
,, ,,	2 p.m.	26·18	37	—	,,	high	,, Clearing to S.
,, ,,	9 p.m.	26·18	15·5	—	,,	high	,,
,, 2	9 a.m.	26·12	31	29	,,	fresh	Heavy snow falling.
,, ,,	2 p.m.	26·10	26	—	,,	,,	Clear.
,, ,,	9 p.m.	26·19	22	—	,,	,,	Snowing to W.
,, 3	9 a.m.	26·18	28	14	,,	light	Cloudy to S. and W.
,, ,,	2 p.m.	26·12	33	—	,,	,,	Heavy clouds to SW. and E.
,, ,,	9 p.m.	25·92	28	—	,,	high	Cloudy.
,, 4	9 a.m.	25·92	29	15	,,	light	Light snow falling.
,, ,,	2 p.m.	26·14	31	—	,,	fresh	Clear.
,, ,,	9 p.m.	26·14	26	—	,,	,,	,,
,, 5	9 a.m.	26·24	22	9	,,	light	Cloudy to S. and W.
,, ,,	2 p.m.	26·22	32	—	,,	—	Cloudy.
,, ,,	9 p.m.	25·12	30	—	,,	—	Snowing to W.
,, 6	9 a.m.	25·94	31	29	,,	—	Mountains covered.
,, ,,	2 p.m.	26·26	25	—	W.	—	Heavy snow.
,, ,,	9 p.m.	26·14	14	—	S.	—	Clear.
,, 7	9 a.m.	26·16	12	2	calm	—	,,
,, ,,	2 p.m.	26·12	30	—	S.	—	Cloudy to S.
,, ,,	9 p.m.	26·18	17	—	,,	—	Clear.

Date.	Hour.	Bar.	Therm.	Min.	Wind.	Force.	Sky.
		°	°	°			
Mar. 8	9 a.m.	26·16	7	7	N.	—	Clear.
„ „	2 p.m.	26·08	29	—	S.	—	Cloudy.
„ „	9 p.m.	26·12	13	—	„	—	Clear.
„ 9	9 a.m.	26·18	7	7	N.	—	„
„ „	2 p.m.	26·19	31	—	S.	—	„
„ „	9 p.m.	26·32	20	—	„	—	„
„ 10	9 a.m.	26·29	22	9	„	—	Cloudy.
„ „	2 p.m.	26·08	29	—	„	—	„
„ „	9 p.m.	26·06	26	—	„	—	„
„ 11	9 a.m.	26·14	23	13	„	—	Clear.
„ „	2 p.m.	26·19	33	—	„	—	„
„ „	9 p.m.	26·22	21	—	„	—	„
„ 12	9 a.m.	26·42	19	9	„	—	„
„ „	2 p.m.	26·32	33	—	„	—	Cloudy.
„ „	9 p.m.	26·28	29	—	„	—	„
„ 13	9 a.m.	26·28	27	9	„	—	Overcast.
„ „	2 p.m.	26·31	32	—	„	—	Clear.
„ „	9 p.m.	26·29	21	—	„	—	Cloudy.
„ 14	9 a.m.	25·92	17	9	„	—	„
„ „	2 p.m.	25·91	36	—	„	—	„
„ „	9 p.m.	25·85	33	—	„	—	„
„ 15	9 a.m.	25·96	30	13	„	—	„
„ „	2 p.m.	26·17	32	—	„	—	„
„ „	9 p.m.	26·29	23	—	„	—	„
„ 16	9 a.m.	26·41	22	6	„	—	Clear.
„ „	2 p.m.	26·44	31	—	„	—	„
„ „	9 p.m.	26·46	26	—	„	—	„
„ 17	9 a.m.	26·34	12	12	„	—	Overcast.
„ „	2 p.m.	26·29	39	—	„	—	„
„ „	9 p.m.	26·31	32	—	„	—	„
„ 18	9 a.m.	26·11	34	26	N.	—	Clear.
„ „	2 p.m.	26·28	43	—	S.	—	Cloudy.
„ „	9 p.m.	26·24	29	—	N.	—	Snowing.
„ 19	9 a.m.	26·22	21	20	S.	—	Cloudy.
„ „	2 p.m.	26·26	24	—	„	—	Snowing.
„ „	9 p.m.	26·26	16	—	„	—	„
„ 20	9 a.m.	26·21	19	13	„	—	„
„ „	2 p.m.	25·90	31	—	N.	—	„
„ „	9 p.m.	25·92	17	—	calm	—	Overcast.
„ 21	9 a.m.	25·98	15	9	S.	—	Snowing hard.
„ „	2 p.m.	25·96	35	—	„	—	Clear.
„ „	9 p.m.	25·86	9	—	calm	—	„
„ 22	9 a.m.	25·86	15	4	S.	—	Cloudy.
„ „	2 p.m.	25·89	43	—	„	—	Clear.
„ „	9 p.m.	25·90	25	—	calm	—	„
„ 23	9 a.m.	26·36	19	5	S.	—	„
„ „	2 p.m.	26·38	32	—	„	—	„
„ „	9 p.m.	26·44	23	—	N.	—	Overcast.
„ 24	9 a.m.	26·24	32	5	S.	—	Clear.
„ „	2 p.m.	26·11	33	—	„	—	„
„ „	9 p.m.	26·11	31	—	„	—	Snowing to S.
„ 25	9 a.m.	26·18	35	27	„	—	Clear.
„ „	2 p.m.	26·19	41	—	N.	—	Snowing to N.
„ „	9 p.m.	26·29	26	—	calm	—	Clear.
„ 26	9 a.m.	26·22	24	18	S.	—	„
„ „	2 p.m.	26·24	33	—	„	—	Light snow.
„ „	9 p.m.	26·26	25	—	N.	—	Heavy snow.
„ 27	9 a.m.	26·29	27	13	S.	—	Clear.
„ „	2 p.m.	26·29	29	—	N.	—	Snowing.
„ „	9 p.m.	26·36	23	—	„	—	Heavy snow, 6 inches.
„ 28	9 a.m.	26·46	21	14	S.	—	Clear.
„ „	2 p.m.	26·47	30	—	„	—	„
„ „	9 p.m.	26·54	23	—	„	—	Cloudy.
„ 29	9 a.m.	26·56	26	16	N.	—	Clear.
„ „	2 p.m.	26·52	25	—	„	—	Heavy snow.
„ „	9 p.m.	26·58	19	—	„	—	Cloudy.
„ 30	9 a.m.	26·59	13	5	„	—	Clear.
„ „	2 p.m.	26·59	22	—	„	—	Light snow.
„ „	9 p.m.	26·64	12	—	„	—	Clear.
„ 31	9 a.m.	26·74	12	4	S.	—	Cloudy.
„ „	2 p.m.	26·71	31	—	„	—	„
„ „	9 p.m.	26·76	15	—	calm	—	Clear.
April 1	9 a.m.	26·76	16	1	S.	—	Cloudy.
„ „	2 p.m.	26·71	42	—	„	—	Clear.
„ „	9 p.m.	26·72	22	—	„	—	„
„ 2	9 a.m.	26·69	22	5	„	—	„
„ „	2 p.m.	26·62	42	—	„	—	„
„ „	9 p.m.	26·64	27	—	„	—	„

Date.	Hour.	Bar.	Therm.	Min.	Wind.	Force.	Sky.
1858.		°	°	°			
April 3	9 a.m.	26·74	38	17	N.	—	Clear.
„ „	2 p.m.	26·79	38	—	„	—	Light snow.
„ „	9 p.m.	26·95	32	—	„	—	Snowing.
„ 4	9 a.m.	27·12	29	22	„	—	Clear.
„ „	2 p.m.	27·02	45	—	„	—	„
„ „	9 p.m.	26·56	27	—	„	—	Cloudy.
„ 5	9 a.m.	26·79	25	19	S.	—	„
„ „	2 p.m.	26·64	24	—	„	—	Clear.
„ „	9 p.m.	26·76	30	—	„	—	„
„ 6	9 a.m.	26·36	26	23	N.	—	Heavy snow.
„ „	2 p.m.	26·36	32	—	„	—	„
„ „	9 p.m.	26·32	19	—	„	—	Snowing.
„ 7	9 a.m.	26·59	19	5	S.	—	Clear.
„ „	2 p.m.	26·46	28	—	„	—	„
„ „	9 p.m.	26·34	25	—	N.	—	Snowing.
„ 8	9 a.m.	26·29	28	18	„	—	Cloudy.
„ „	2 p.m.	26·29	18	—	„	—	Snowing.
„ „	9 p.m.	26·39	21	—	„	—	„
„ 9	9 a.m.	26·38	13	12	„	—	Heavy snow.
„ „	2 p.m.	26·39	12	—	„	—	„
„ „	9 p.m.	26·41	13	—	„	—	„
„ 10	9 a.m.	26·36	5	3	„	—	„
„ „	2 p.m.	26·41	23	—	„	—	„
„ „	9 p.m.	26·41	9	—	„	—	„
„ 11	9 a.m.	26·46	13	12	„	—	„
„ „	2 p.m.	26·36	30	—	S.	—	Clearing.
„ „	9 p.m.	26·31	11	—	N.	—	Snowing.
„ 12	9 a.m.	26·56	12	5	„	—	Clearing.
„ „	2 p.m.	26·28	32	—	S.	—	Clear.
„ „	9 p.m.	26·34	28	—	„	—	„
„ 13	9 a.m.	26·38	19	13	calm.	—	„
„ „	2 p.m.	26·39	53	—	S.	—	Cloudy.
„ „	9 p.m.	26·56	25	—	„	—	Clear.
„ 14	9 a.m.	26·41	33	23	„	—	„
„ „	2 p.m.	26·56	53	—	„	—	„
„ „	9 p.m.	26·54	26	—	„	—	„

Regular Meteorological Observations while on the Route.

I.

Date.	Hour.	Locality.	Bar.	Therm.	Air.	Min.	Wind.	Remarks.
			°	°	°	°		
Dec. 14	4 p.m.	4 ms. E. of Redberry Lake	28·00	13	11	—	E.	Overcast.
„ 15	8 a.m.	„ „	27·70	27	26	9·4	„	Raw. Overcast.
„ „	3 p.m.	E. side of the Wide Plain	27·68	28	21·2	—	SW.	High. Cloudy.
„ „	6 p.m.	„ „	27·76	12	10·0	—	calm	Clear.
„ 16	5 a.m.	„ „	27·94	20	12·0	2·0	„	Fine. Clear.
„ „	7 p.m.	Indian Camp at White Lake	28·04	10	5	—	„	„ „ Aurora.
„ 17	7 a.m.	„ „	28·03	8	9	−1	—	Dull. Fog.
„ „	9 p.m.	H. B. Co.'s Post at Pike Lake, 40ft. above lake level	28·18	24	26	—	NE.	High. Cloud. Cold.
„ 18	7 a.m.	„ „	28·26	20	10	10	„	Light. Dull. Snow during night.
„ „	3 p.m.	6 miles E. of Horse Knoll	28·10	20	20	—	calm	Dull. Threatens snow.
„ 19	3 a.m.	„ „	27·64	18	17	10	„	Clear. Fine.
„ „	4 p.m.	E. side of Red Deer Hill	27·70	32	25	—	—	During night high.
„ 20	7 a.m.	„ „	28·06	15	—	—	—	Wind veering from NW. to SE.
„ „	4 p.m.	Fort Pitt	28·48	28	20	—	calm	Fine. Clear.
„ 24	4 p.m.	Mouth of Vermilion River	28·23	—	−9	—	—	Clear. Very cold.
„ 25	6 a.m.	„ „	27·92	—	3·0	−9	—	Dull.
„ „	4 p.m.	Camp beyond the hills near Indian Pond	27·50	20	15	—	N.	Overcast.
„ 26	4 a.m.		27·18	20	28	13	E.	Calm. Dull.
„ „	4 p.m.	1st Lake of the Chain	27·38	20	20	—	NW.	Fine. Clear.
„ 27	6 a.m.	„ „	27·46	6	4	0	—	„ „
„ „	4 p.m.	W. side of the Black Hill	27·40	15	11	—	E.	Overcast. Threats of
„ 28	6 a.m.	„ „	27·37	0	−3	−4	—	Clear. Sharp. [snow.
„ „	4 p.m.	Le Jolli Bois	27·40	15	20	—	calm	High wind from the
„ 29	4 a.m.	„ „	27·00	18	24	3	—	S. during night.
„ „	4 p.m.	"The Pines"	27·28	40	30	—	NE.	High. Drifts snow.
„ 30	3 a.m.	„ „	27·28	20	21	15	—	Fine. Cloudy.
„ „	7 a.m.	Fort Edmonton	27·28	30	—	—	—	„ „

II.

Date.	Hour.	Locality.	Bar.	Ther.	Air.	Min.	Wind.	Remarks.
1858.								
Jan. 9	4 p.m.	17 miles S. of Fort Edmonton	26·72	39	31	—	—	Fine.
,, 10	7 a.m.		26·76	−3	−3	—	NW.	,,
,, ,,	4 p.m.	The "Bad Beaver Dam"	26·38	33	31	—	SW.	Light. Change to NE.
,, 11	7 a.m.	,, ,,	26·60	—	−11	—	—	during day. Very cold.
,, ,,	noon	Woodpecker Creek	26·33	—	−15	—	NE.	Stormy.
,, ,,	4 p.m.	W. side of Battle River	26·46	—	−16	—	—	Calm.
,, 12	7 a.m.	,, ,,	26·48	—	−20	—	N.	Light. Clear.
,, ,,	4 p.m.	4 miles to the W. of Gull Lake	26·10	—	−15	—	SW.	Overcast.
,, 13	7 a.m.		26·12	—	−13	—	,,	,,
,, ,,	noon	Medicine River	26·18	—	−11	—	NW.	Cold.
,, ,,	4 p.m.	Cabrier's Hill	26·13	—	−11	—	NE.	Clear.
,, 14	3 a.m.	,,	26·13	—	−16	—	N.	Fine. Clear.
,, ,,	4 p.m.	Rocky Mountain House	26·29	34	−16	—	W.	Clear.
,, 15	8 a.m.	,, ,,	25·90	40	0	—	NW.	Light. Fine.
,, ,,	4 p.m.	,, ,,	25·88	40	0	—	W.	,, Cloudy.
,, 16	8 a.m.	,, ,,	26·55	40	28	—	NW.	,, Fine.
,, ,,	8 a.m.	,, ,,	26·55	40	10	—	NW.	,, ,,
,, ,,	6 p.m.	,, ,,	26·49	50	18	—	W.	,, ,,
,, 17	8 a.m.	,, ,,	26·54	50	21	—	,,	,, ,,
,, ,,	6 p.m.	,, ,,	26·50	50	26	—	SW.	Very light. Overcast.
,, 18	8 a.m.	,, ,,	26·40	50	36	—	,,	High ,,
,, ,,	6 p.m.	,, ,,	26·34	60	33	—	,,	Fresh. ,,
,, 19	8 a.m.	,, ,,	26·34	58	24	—	NW.	Very light. Fine.
,, ,,	6 p.m.	,, ,,	26·37	59	38	—	,,	,, ,,
,, 20	8 a.m.	,, ,,	26·24	58	26	—	,,	,, ,,
,, ,,	6 p.m.	,, ,,	26·37	45	38	—	S.	Fresh.
,, 21	8 a.m.	,, ,,	25·89	50	24	—	calm	Haze.
,, ,,	6 p.m.	,, ,,	25·92	50	29	—	,,	Dull.
,, 22	8 a.m.	,, ,,	26·04	50	13	—	,,	Snow.
,, 23	6 p.m.	,, ,,	26·34	52	−4	—	N.	Clear.
,, 24	8 a.m.	,, ,,	26·00	42	21	—	SW.	Dull.
,, ,,	6 p.m.	,, ,,	26·18	60	38	—	N.	Clear.
,, 25	8 a.m.	,, ,,	26·26	28	−3	—	calm	Very fine.
,, ,,	6 p.m.	,, ,,	26·28	47	5	—	W.	Overcast.
,, 26	8 a.m.	,, ,,	26·02	30	13	—	NE.	Threatens snow.
,, ,,	6 p.m.	Batiste's River	26·58	30	26	—	N.	Clear.
,, 27	6 a.m.	Saskatchewan River	26·82	25	20	—	,,	,,
,, ,,	noon.	,,	27·10	30	19	—	calm	,,
,, 28	6 a.m.	,,	27·16	22	1	—	—	Cold. Clear.
,, 28	noon.	,,	27·14	20	20	—	—	Gusty. Hazy.
,, ,,	6 p.m.	,,	27·29	10	3	—	NE.	Overcast.
,, 29	6 a.m.	,,	27·38	10	5	—	—	Fine. Cold.
,, ,,	noon.	,,	27·26	18	28	—	—	,,
,, ,,	6 p.m.	,,	27·46	16	14	—	—	Dull.
,, 30	7 a.m.	Fort Edmonton	27·69	10	8	—	—	NE. Cloudy.

III.

Feb. 12	8 a.m.	Fort Edmonton	—	—	−23·5	—	N.	Clear. Cold.
,, ,,	4 p.m.	On the road to Lac Ste. Ann.	—	—	−22	—	N.	Light.
,, 13	6 a.m.	,,	—	—	calm.	—	—	Mercury frozen.
,, ,,	noon.	,,	—	—	−25	—	—	Fine. Clear.
,, ,,	6 p.m.	Lac Ste. Ann	—	—	−28	—	—	Hazy.
,, 14	8 a.m.	,,	—	—	−20	—	—	,,
,, ,,	noon.	,,	—	—	− 8	—	W.	,, Dull.
,, ,,	4 p.m.	,,	—	—	−17	—	N.	Clear.
,, 15	6 a.m.	,,	—	—	—	—	—	Mercury frozen.
,, ,,	noon.	On road to Edmonton	—	—	− 6	—	NE.	Fine. Clear.
,, ,,	6 p.m.	Edmonton (Fort)	—	—	−12	—	N.	Dull.

IV.—Meteorological Observations, 1858. Fort Edmonton to Bow Fort.

Date.	Hour.	Locality.	Bar.	Air.	Min.	Wind.	Force.	Remarks.
Nov. 26	Sunset.	Camps along the Blackfoot track to the South.	27·44	11	—	calm.	—	Air filled with ice crystals.
,, 27	7½ p.m.		27·08	20·5	10·5	NE.	—	Threatens snow.
,, ,,	4 p.m.	,, ,,	26·88	34·5	—	SW.	light	Thaw all day.
,, 28	7 a.m.	,, ,,	26·79	35·5	28·5	,,	fresh	Dull. Wet.
,, ,,	4 p.m.	,, ,,	26·99	27·5	—	NW.	light	Clear and sharp.
,, 29	7 a.m.	,, ,,	27·08	12	10	calm.	—	High gale during night from NW.

Date.	Hour.	Locality.	Bar.	Air.	Min.	Wind.	Force.	Remarks.
Nov. 29	4 p.m.	50 feet above Battle River	26·97	23·5	2·5	NW.	light	Clear. Sharp.
„ 30	7 a.m.	Lake in Wolf track.	27·00	3	2·5	N.	—	Heavy snow.
„ „	4 p.m.	„ „	27·06	— 2	—	„	—	Snowing a little.
Dec. 1	7 a.m.	„ „	27·14	—22	—23	calm.	—	Very clear and cold.
„ „	2 p.m.	Points along Red Deer	27·18	— 3	—	NW	—	Bright and clear.
„ „	3 p.m.	River when travelling	27·20	— 8	—	calm	—	Very clear.
„ „	4 p.m.	up it on the ice. Camps	27·22	—18	—	„	—	„
„ „	6 p.m.	generally 10 to 20 feet	27·23	—32	—	„	—	„
„ 2	7 a.m.	above the level of the	27·20	—22	—37	NW.	light	Cloudless.
„ „	noon.	river.—Mean lat. 52°	27·01	3·5	—	„	„	Cloud to N.
„ „	4 p.m.	2′ N.	26·89	9	—	„	„	Snowing.
„ „	9 p.m.	„ „	26·41	24	—	N.	—	Gusty. Snow.
„ 3	7 a.m.	„ „	26·38	31	9	NW.	—	Snow storms all day.
„ „	4 p.m.	„ „	26·56	21·5	—	„	—	Heavy snow.
„ 4	7 a.m.	„ „	26·83	5	4·5	„	light	Clear. Fine.
„ „	noon.	„ „	26·77	2·5	—	NE.	„	„
„ „	4 p.m.	„ „	26·70	— 5	—	N W.	„	Very clear.
„ 5	7 a.m.	„ „	26·70	4	—4	N.	„	Snow during night. Clear.
„ „	4 p.m.	„ „	26·54	— 6	—	„	fresh	Very cold.
„ 6	8 a.m.	„ „	26·54	—23	—22	NW.	light	Fine. Cloudless.
„ „	4 p.m.	„ „	26·34	—12	—	W.	„	Clear.
„ 7	7 a.m.	„ „	26·26	7	—23	WS.	„	Dull.
„ „	5 p.m.	On high ground south of	25·62	17	—	N.	„	Cloudy.
„ 8	8 a.m.	Red Deer River.	25·87	5	4	NW.	„	„
„ „	4 p.m.	Along the ice in Little	26·05	10	—	calm.	—	„ Snow storms.
„ 9	8 a.m.	Red Deer River in the	25·93	1	0·0	„	—	Snowing gently.
„ „	4 p.m.	outer range of moun-	25·68	— 0·5	—	W.	light	Clear. Mountains clouded.
„ 10	7 a.m.	„ „	25·58	4	—17	calm.	—	Dull. Red sky in E.
„ „	5 p.m.	Waipiuse Creek and Dead	25·18	18	—	NW.	light	„
„ 11	7 a.m.	Man's River, all near the	25·14	— 5	—5·5	NE.	„	„ Snow.
„ „	5 p.m.	Old Bow Fort.	25·05	— 3	—	N.	„	Snow in gusts.
„ 12	7 a.m.		25·01	—17	—27	W.	„	Clear. Cold.
„ „	5 p.m.	„ „	25·18	— 5	—	NW.	„	Cloudy.
„ 13	8 a.m.	„ „	25·16	—17	—28	„	„	Clear. Sharp.
„ „	6 p.m.	High grounds of outer	24·79	— 7	—	N.	„	„ Fine.
„ 14	6 a.m.	range.	24·76	2	— 7	NE.	„	Dull.
„ „	5 p.m.	Prairie along edge of	25·22	— 2	—	NW.	„	„ Overcast.
„ 15	8 a.m.	Woods.	25·26	11	—13	N.	„	Cold. Sharp.
„ „	5 p.m.	High Ground - -	25·74	— 1	—	NE.	„	Clear.
„ 16	8 a.m.	„	25·51	27·5	0·0	SW.	„	Dull.
„ „	9 p.m.	Little Red Deer River, on	26·11	10	—	N.	„	Very clear and cold.
„ 17	8 a.m.	the ice.	26·09	17	5	NW.	„	Dull.
„ „	9 p.m.	„ „	26·12	32	—	E.	light	„ Cloudy.
„ „	10 p.m.	„ „	26·11	27	—	NW.	fresh	Windchanged. Clearing.
„ 18	8 a.m.	„ „	26·49	5	5	W.	—	Clear. Cold.
„ „	7 p.m.	„ „	26·52	13	—	NW.	—	Cloudy.
„ 19	9 a.m.	Red Deer River - -	26·16	29	11	SE.	—	Dull.
„ „	9 p.m.	„ „	26·34	11	—	NE.	—	Cloudy.
„ 20	8 a.m.	„ „	26·58	— 6	—12	N.	—	Clear. Fine.
„ „	7 p.m.	Wolf's Road Prairie -	26·45	2	—	NE.	—	Hazy.
„ 21	5 a.m.	„ „	26·28	5	2·5	„	—	Clear. Sharp.
„ „	7 p.m.	„ „	26·52	— 5	—	N.	—	Snow.
„ 22	3 a.m.	„ „	26·70	— 8	—8	calm	—	Bright clear moonlight.
„ „	8 p.m.	Musquachis - - -	26·78	25	—	W.	fresh	Cloudy.
„ 23	a.m.	„ „	26·54	29	25	SW.	„	Dull. Snow.
„ „	5 p.m.	Black Foot Track - -	26·78	— 4	—	N.	„	Extremely cold.
„ 24	2 a.m.	„ „	27·00	— 9	—9	„	light	Very clear. Cold Aurora.

V.—Meteorological Observations, 1859. Fort Edmonton to Jaspar House.

Jan. 13	8 p.m.	Portage track to the Athabasca River from Fort Edmonton.	27·49	1	—	calm	—	Clear. Sharp.
„ 14	8 a.m.		27·48	—9·5	—11	„	—	Clear and fine.
„ „	6 p.m.		27·30	25	—	NE.	—	Dull. Overcast.
„ 15	8 a.m.		27·36	19	14	NW.	—	Snowing all night.
„ „	6 p.m.		27·64	0	—	N.	—	Snow at intervals.
„ 16	8 a.m.		27·66	— 9	—16	„	light	Fine. Clear.
„ „	6 p.m.	Taken in Athabasca River	27·41	0	—	„	—	„ „
„ 17	7 a.m.	while travelling on the	27·44	10	— 3	NE.	light	Clear.
„ „	7 p.m.	ice; never much above	27·41	21·5	—	„	„	Dull. Haze.
„ 18	8 a.m.	the water level.	27·12	14	12·5	N.	—	Snow during night.
„ „	4 p.m.	„ „	26·84	31	—	SW.	—	Great storm of wind.
„ „	6 p.m.	„ „	26·96	38	—	W.	—	Storm at its height.
„ „	7 p.m.	„ „	27·02	34	—	N.	—	Storm past almost.
„ 19	8 a.m.	„ „	27·47	3	1	W.	fresh	Clear and fine.
„ „	7 p.m.	„ „	27·72	— 7	—	NW.	„	Clear.

Date.	Hour.	Locality.	Bar.	Air.	Min.	Wind.	Force.	Remarks.
1859.				°	°			
Jan. 20	8 a.m.	Taken in Athabasca River	27·80	— 9	—11	NW.	—	Snow all night.
„ „	7 p.m.	while travelling on the	27·60	— 7	—	E.	light	Heavy snow.
„ 21	8 a.m.	ice ; never much above	27·76	1·5	—10·5	„	—	Still snowing (22 in.)
„ „	7 p.m.	the water level.	27·58	— 1·5	—	„	—	Clearing a little
„ 22	8 a.m.	„ „	27·48	— 1	— 5	NW.	—	Clear. Very cold.
„ „	7 p.m.	„ „	27·30	5	—	W.	—	Strong gale. Snow.
„ 23	8 a.m.	„ „	27·14	20	9	„	fresh	Clearing.
„ „	7 p.m.	„ „	27·24	27	—	„	light	Thaw during day.
„ 24	8 a.m.	„ „	27·34	31	12	NW.	—	Heavy snow.
„ „	7 p.m.	„ „	27·38	18	—	calm	—	Clear and fine.
„ 25	8 a.m.	„ „	26·92	26	3·5	W.	—	Dull.
„ „	7 p.m.	„ „	27·01	22	—	„	—	„ High.
„ 26	8 a.m.	„ „	27·10	29	12	„	—	Clear and mild.
„ „	7 p.m.	„ „	26·89	10	—	NW.	—	Snow.
„ 27	8 a.m.	„ „	27·10	9	— 4	„	—	„
„ „	7 p.m.	„ „	26·92	5	—	E.	—	„ Dull.
„ „	8 p.m.	„ „	27·00	— 2	—	NE.	—	Heavy snow.
„ 28	8 a.m.	„ „	26·98	—18	—18	N.	—	Fine. Clear.
„ „	7 p.m.	„ „	26·89	— 5	—	„	—	Clear.
„ 29	8 a.m.	„ „	26·89	—15	—28	„	—	Dull. Snow a little.
„ „	noon	„ „	26·85	—25	—	„	—	Clear. Sundogs.
„ „	7 p.m.	„ „	26·82	—15	—	E.	—	Snowing.
„ 30	8 a.m.	„ „	26·78	10	1	„	—	Dull. Snow.
„ „	7½p.m.	„ „	26·20	—11	—	NE.	—	Very cold.
„ 31	8 a.m.	„ „	26·20	—24	—25	N.	—	Clear. Cold.

VI.—Meteorological Observations in Rocky Mountains, above Jaspar House.

Feb. 10	8 p.m.	All taken up the Valley of	26·18	0·0	—	S.	light	Fine. Clear.
„ 11	7 a.m.	the Athabasca River.	26·17	5	— 9	NE.	—	Very cold.
„ „	9 p.m.	„ „	26·28	4	—	SW.	—	Clear.
„ 12	8 a.m.	„ „	26·30	—10	—15	S.	—	„
„ „	8 p.m.	„ „	26·08	— 3	—	SW.	—	„
„ 13	7 a.m.	„ „	26·10	—18	—23	„	—	„
„ „	noon	„ „	25·85	25	—	S.	fresh	Milder.
„ „	8 p.m.	„ „	25·74	24	—	SW.	—	Overcast.
„ 14	8 a.m.	„ „	25·56	19	14	„	—	„
„ „	9 p.m.	„ „	25·54	10	—	S.	—	High gale. Dull.
„ 15	8 a.m.	„ „	25·54	3	0·5	„	—	Clear. Sharp.
„ „	8 p.m.		25·70	15	—	N.	—	„ Fine.
„ 16	7 a.m.		25·76	0·0	— 2	„	—	Dull.

VII.—Observations made when travelling in Summer of 1858, from Fort Carlton to the Old Bow Fort.

Date.	Hour.	Bar.	Att. Therm.	Thermometer. Dry.	Thermometer. Wet.	Wind. Direcn.	Wind. Force.	Remarks.
1858.			°	°	°			
June 16	noon	—	—	67·0	54·8	SE.	fresh	Overcast.
„ „	7.30 p.m.	27·78	60	60·0	58·3	E b N.	„	Clearing.
„ 17	6.30 a.m.	27·90	50	50·5	46·1	N.	light	Cloud in N. Overcast.
„ „	noon	28·02	55	56·0	48·2	N b E.	„	Overcast.
„ „	8 p.m.	28·14	58	53·5	47·0	„	fresh	„
„ 18	6.30 a.m.	28·14	50	50·0	47·8	NE.	light	„
„ „	noon	28·28	50	49·8	46·1	NNE.	„	Rain.
„ „	9 p.m.	28·36	51	47·5	45·0	„	„	„
„ 19	7 a.m.	28·36	45	47·5	45·0	NE.	„	Dull. Cloudy.
„ „	noon	27·95	60	62·0	55·0	ESE.	very light	Cloudy. Fine.
„ „	8 p.m.	27·58	50	50·0	46·5	E.	„	Overcast. Chilly.
„ 20	9 a.m.	27·30	45	49·0	47·0	SE.	„	Rain.
„ „	2 p.m.	27·20	47	59·0	58·0	E.	„	„
„ „	8 p.m.	27·10	40	60·1	56·0	NW.	fresh	Clearing.
„ 21	7 a.m.	27·24	50	51·0	49·8	SE.	„	Cloudy.
„ „	noon	27·18	70	70·5	58·2	S.	„	Very fine. Cloud.
„ „	9 p.m.	27·14	60	56·2	49·1	„	„	Calm.
„ 22	6 a.m.	27·10	50	54·6	47·2	SSW	„	Clear. Fine.
„ „	1 p.m.	27·25	70	69·0	52·0	SW.	„	Cloud ·2 in NE.
„ „	8 p.m.	27·24	55	51·2	44·9	„	calm	Cloud ·5.
„ 23	4 a.m.	27·28	45	47·0	44·2	„	light	—
„ „	noon	27·48	60	51·0	50·2	W.	fresh	—
„ „	8.30 p.m.	27·5	45	46·0	42·0	SW.	light	Clear. Fine.
„ 24	7 a.m.	27·58	55	55·0	50·0	S.	„	Very fine.
„ „	noon	27·78	70	68·0	54·0	„	„	„
„ „	9 p.m.	27·74	45	48·0	45·0	NW.	„	—
„ 25	7 a.m.	27·70	55	56·0	50·0	NE.	fresh	—
„ „	2 p.m.	27·73	55	58·0	54·2	„	„	—

Date.	Hour.	Bar.	Ast. Therm.	Thermometer.		Wind.		Remarks.
				Dry.	Wet.	Direcn.	Force.	
1858			°	°	°			
June 25	9 p.m.	27·74	55	55·0	53·0	SE.	very fresh	Clearing.
„ 26	8 a.m.	27·65	55	55·5	50·0	S.	light	Very fine. Cloudless.
„ „	noon	27·69	65	65·3	55·1	E b N.	fresh	Cloud ·9..
„ „	9 p.m.	27·88	45	46·5	44·5	SW.	light	Cloudy.
„ 27	6 a.m.	27·91	60	58·0	54·2	S.	„	Very fine.
„ „	1 p.m.	27·92	60	60·0	54·0	SW.	„	Cloudy.
„ „	8 p.m.	27·94	55	57·0	52·0	„	„	Overcast.
„ 28	7 a.m.	27·90	60	58·0	55·0	W b N.	„	Rain.
„ „	2 p.m.	27·8	70	72·0	62·0	SW.	fresh	Cloudy.
„ „	9 p.m.	27·8	60	60·2	58·0	W.	light	Rain.
„ 29	8 a.m.	27·87	55	57·0	55·5	E.	fresh	Dull. Overcast.
„ „	9 p.m.	27·67	60	59·0	55·0	NE.	light	Overcast.
„ 30	9.30 a.m.	27·50	70	65·2	52·7	S b E.	fresh	Cloud·8.
„ „	1 p.m.	27·52	70	67·3	55·0	SW.	very fresh	Cloud·3.
„ „	9 p.m.	27·58	50	50·0	46·0	„	gale	Rain.
July 1	9a.m.	27·60	50	53·0	47·0	„	„	Cold.
„ „	1p.m.	27·68	60	63·0	51·0	WSW.	—	Cloudy.
„ „	9 p.m.	27·75	51	48·0	41·0	SW.	fresh	Clear.
„ 2	9 a.m.	27·83	60	60·2	51·0	„	„	Fine. Clear.
„ „	2 p.m.	27·70	65	54·0	67·0	NW.	„	—
„ „	10 p.m.	27·82	40	43·0	41·0	calm	—	Very clear.
„ 3	5 a.m.	27·88	40	45	41·0	E.	light	Clear. Fine.
„ „	noon	27·50	70	69	58·0	S.	fresh	Overcast.
„ „	10 p.m.	27·49	60	63	57·0	calm	—	Clear.
„ 4	noon	27·62	80	72·2	64·5	S.	light	Cirri ·3.
„ „	8 p.m.	27·61	60	60·0	56·1	—	—	Overcast.
„ 5	7 a.m.	27·55	60	58·0	53·2	NW.	light	—
„ „	3 p.m.	27·40	60	59·5	52·5	W.	fresh	Clearing.
„ „	9 p.m.	27·4	50	51·2	48·0	N.	light	Overcast. Cloud in N.W.
„ 6	8 a.m.	27·60	50	50·5	50·0	W.	„	Rain.
„ „	9 p.m.	27·70	55	54·0	48·5	N.	„	Fine. Clear.
„ 7	7 a.m.	27·62	55	56·2	50·0	SE.	„	—
„ „	1 p.m.	27·64	70	69·0	58·0	S.	„	Fine. Passing clouds.
„ „	9 p.m.	27·58	55	55·5	53·0	E.	„	Cloudy.
„ 8	8 a.m.	27·56	65	65	59	„	„	„
„ „	1 p.m.	27·61	70	68·5	56·2	„	fresh	„
„ „	8 p.m.	27·60	60	54·5	53·9	„	light	Cloud ·2.
„ 9	7 a.m.	27·61	60	58·7	54·3	E b N.	fresh	Clear. Cirri ·1.
„ „	1 p.m.	27·67	75	70·5	61·0	SE.	light	Cirri ·6.
„ „	8 p.m.	27·82	65	60·0	54·4	„	„	Cloudy to W.
„ 10	7 a.m.	27·80	70	66·6	58·1	E.	fresh	Fleecy cloud ·4.
„ „	9 p.m.	27·82	60	58·0	51·0	W.	—	Overcast.
„ 11	9 a.m.	27·7	80	71·0	62·0	calm	—	—
„ „	2 p.m.	27·68	60	79·8	63·2	NW.	—	Rain and thunder.
„ „	9 p.m.	27·17	60	60	53	—	—	—
„ 13	3 p.m.	27·18	60	58	52·5	NW.	fresh	Rain and thunder.
„ „	9 p.m.	27·24	50	51	47	NNW.	„	„
„ 14	7 a.m.	27·28	50	50	43	NW.	„	Rain.
„ „	noon	27·27	60	58	51	„	„	Cloudy.
„ 15	9 a.m.	27·28	50	51	47	N.	light	„
„ „	noon.	27·23	60	63	58	NW.	„	Fine. Clear.
„ „	9 p.m.	27·24	60	61	53	„	„	„ „
„ 16	7 a.m.	27·22	60	61	52	W.	fresh	„ „
„ „	2 p.m.	27·32	75	76	59	„	light	Very fine.
„ „	9 p.m.	27·33	60	63	53	„	„	„
„ 17	9 a.m.	27·28	60	68	59	„	„	„
„ „	9 p.m.	27·14	50	52	50	„	„	Slight fog. Fine.
„ 18	9 a.m.	27·10	65	65	55·2	N.	„	—
„ „	2 p.m.	27·20	75	75	64	„	„	Fine. Cloud in W.
„ „	9 p.m.	27·22	50	50	47	NW.	„	Clearing.
„ 19	8 a.m.	27·30	60	63	57	W.	„	Fine.
„ „	9 p.m.	27·32	60	57	52	„	„	—
„ 20	9 a.m.	27·27	60	60	53	SW.	„	Fine.
„ „	9 p.m.	27·26	55	62	55	„	„	„
„ 21	9 a.m.	27·18	55	57	54	N b E.	fresh	—
„ „	9 p.m.	27·31	60	59	55	„	light	Clear.
„ 22	9 a.m.	27·26	60	58	55	W.	fresh	Dull. Rain.
„ „	3 p.m.	27·08	65	67	58·2	SW.	light	Hazy.
„ „	9 p.m.	26·90	60	60	—	NW.	„	Rain and thunder.
„ 23	6 a.m.	26·97	45	46	44	W.	„	Fine. Fog at sunrise.
„ „	noon.	26·68	65	67	61·5	„	„	Cloudy.
„ „	9 p.m.	26·74	60	60	56	„	„	Thunder clouds.
„ 24	7 a.m.	26·76	50	50·5	47·2	„	„	Cloudy.
„ „	9 p.m.	26·6	45	47	41	NW.	„	Cloud and thunder to SW.
„ 25	9 a.m.	26·64	—	60·5	5	„	fresh	Cloudy.
„ „	2 p.m.	26·78	—	64·5	55	„	light	Cloud in W.

Date.	Hour.	Bar.	Ast. Ther.	Thermometer.		Wind.		Remarks.
				Dry.	Wet.	Direc.	Force.	
1858.								
July 25	9 p.m.	26·70	—	49	47	NW.	light	Clear.
„ 26	9 a.m.	26·62	—	65	59·5	SE.	„	Light clouds.
„ „	3 p.m.	26·71	—	75	64·5	„	„	Clouds gathering to SW.
„ „	9 p.m.	26·61	—	49·5	48	S.	very light	Cloud ·3.
„ 27	9 a.m.	26·59	—	69·5	64	SE.	light	Fleecy clouds ·5.
„ „	3 p.m.	26·62	—	70·4	62	E.	fresh	Fleecy cloud.
„ „	9 p.m.	26·56	—	54·9	52	SE.	„	—
„ 28	9 a.m.	26·55	—	57·5	55	N.	light	Overcast. Much rain during night.
„ „	9 p.m.	26·56	—	49	47	NW.	„	Cloudy. Hoar frost during night.
„ 29	8 a.m.	26·55	—	55	51·5	„	„	Cloud in W.
„ „	9 p.m.	26·86	50	50	48·2	W.	„	Cloudy to E.
„ 30	5½ a.m.	26·82	50	49	46	„	„	Fine. Clear.
„ „	9 a.m.	26·88	60	63·2	54	„	„	Overcast.
„ „	9 p.m.	26·85	50	52·5	49·5	„	„	Clear fog.
„ 31	4 a.m.	26·78	40	42·5	40	„	very light	Thick fog.
„ „	9 a.m.	26·75	65	66·5	61·5	SW.	light	Fine. Clear.
„ „	2 p.m.	26·78	70	70·5	63·5	NE.	„	Overcast. Cloudy.
„ „	9 p.m.	25·71	60	58	55·5	„	„	Thunder clouds.
Aug. 1	9 a.m.	25·73	70	69	59·5	SW.	„	Fine. Clear. Cloud in W.
„ „	2 p.m.	25·75	80	79·5	—	Calm	„	Very clear.
„ „	9 p.m.	25·69	60	60	—	N.	fresh	Thunder. Rain.
„ 2	9 a.m.	25·68	60	63·2	—	W.	light	Fine. Clear.
„ „	9 p.m.	25·77	55	54	—	NW.	fresh	Thunder. Rain.
„ 3	9 a.m.	25·78	75	77·2	—	SE.	light	Fine. Clear.
„ „	9 p.m.	25·80	50	53	—	N b W.	fresh	„ Cold wind.
„ 4	5½ a.m.	26·33	—	49·5	—	—	light	—
„ „	9 p.m.	25·84	—	60	—	NW.	fresh	Overcast.
„ 5	9 a.m.	25·82	—	45	—	„	—	Clearing fine.
„ „	2 p.m.	25·71	—	53	—	NE.	—	—
„ „	9 p.m.	25·66	—	40·5	—	W.	light	—
„ 6	5 a.m.	25·67	—	29	—	„	fresh	Fine. Clear.
„ „	9 p.m.	25·62	—	51	—	NW.	„	Overcast.
„ 7	5 a.m.	25·56	—	41	—	—	—	Dull.
„ „	noon.	25·80	—	61	—	W	fresh	„ Clouds high.
„ „	8 p.m.	25·61	—	47·5	—	Vble.	var.	Clear. Cloud.
„ 8	8 a.m.	25·56	—	53	—	W.	light	„ Fine.
„ „	2 p.m.	25·68	—	78	—	„	—	Fine.
„ „	8 p.m.	25·66	—	47	—	„	light	Clear.
„ 9	8 a.m.	25·57	—	58·5	51·5	Calm	„	Very fine.
„ „	8 p.m.	25·58	—	52	46	W.	„	„
„ 10	8 a.m.	25·46	—	61	55	„	„	Cloudy. Rain.
„ „	2 p.m.	25·48	—	70	58	„	„	„
„ „	8 p.m.	25·39	—	56	50	„	„	„ Mountains capped.
„ 11	8 a.m.	25·42	—	61	53	„	„	Fine.

VIII.—Journal of Thermometrical Observations made at York Factory, H.B.C., from 1st November 1856 to 30th April 1857. Lat. , long. . Time of observations, Noon.

Date.	Zero.		Date.	Zero.		Date.	Zero.		Date.	Zero.		Date.	Zero.		Date.	Zero.	
	ab.	be.		ab.	be.		ab.	be.		ab.	be.		ab.	be.		ab.	be.
Nov. 1	20	—	Dec. 1	12	—	Jan. 1	—	23	Feb. 1	—	27	Mar. 1	—	26	April 1	—	10
„ 2	10	—	„ 2	—	13	„ 2	—	30	„ 2	—	30	„ 2	—	2	„ 2	10	—
„ 3	4	—	„ 3	—	6	„ 3	—	29	„ 3	—	25	„ 3	—	17	„ 3	—	1
„ 4	—	6	„ 4	—	15	„ 4	—	36	„ 4	—	28	„ 4	—	20	„ 4	—	2
„ 5	1	—	„ 5	—	25	„ 5	—	30	„ 5	—	22	„ 5	—	17	„ 5	—	10
„ 6	3	—	„ 6	—	29	„ 6	—	40	„ 6	—	36	„ 6	—	25	„ 6	2	—
„ 7	—	7	„ 7	—	17	„ 7	—	10	„ 7	—	24	„ 7	—	29	„ 7	15	—
„ 8	—	17	„ 8	—	5	„ 8	23	—	„ 8	—	34	„ 8	—	27	„ 8	—	20
„ 9	—	15	„ 9	—	23	„ 9	13	—	„ 9	—	39	„ 9	—	31	„ 9	—	14
„ 10	9	—	„ 10	—	17	„ 10	13	—	„ 10	—	32	„ 10	—	22	„ 10	—	5
„ 11	11	—	„ 11	—	6	„ 11	13	—	„ 11	—	33	„ 11	—	12	„ 11	—	3
„ 12	15	—	„ 12	—	12	„ 12	—	10	„ 12	—	20	„ 12	—	7	„ 12	—	6
„ 13	21	—	„ 13	—	22	„ 13	—	15	„ 13	—	25	„ 13	—	16	„ 13	0	0
„ 14	31	—	„ 14	—	25	„ 14	—	31	„ 14	—	27	„ 14	—	13	„ 14	—	5
„ 15	29	—	„ 15	—	21	„ 15	—	19	„ 15	—	32	„ 15	—	13	„ 15	—	4
„ 16	26	—	„ 16	—	25	„ 16	—	20	„ 16	—	9	„ 16	—	22	„ 16	—	6
„ 17	17	—	„ 17	—	30	„ 17	—	19	„ 17	—	33	„ 17	2	—	„ 17	3	—
„ 18	15	—	„ 18	—	16	„ 18	—	25	„ 18	—	34	„ 18	2	—	„ 18	1	—
„ 19	27	—	„ 19	—	2	„ 19	—	34	„ 19	—	42	„ 19	9	—	„ 19	11	—
„ 20	20	—	„ 20	—	15	„ 20	—	33	„ 20	—	32	„ 20	29	—	„ 20	6	—
„ 21	25	—	„ 21	—	15	„ 21	—	35	„ 21	—	17	„ 21	18	—	„ 21	3	—
„ 22	6	—	„ 22	—	18	„ 22	—	25	„ 22	—	32	„ 22	3	—	„ 22	15	—

Date.	Zero.		Date.	Zero.		Date.	Zero.		Date.	Zero.		Date.	Zero.		Date.	Zero.	
	ab.	be.		ab.	be.		ab.	be.		ab.	be.		ab.	be.		ab.	be.
Nov.23	—	16	Dec.23	—	12	Jan. 23	—	9	Feb. 23	—	7	Mar.23	—	12	Apr.23	13	—
„ 24	—	6	„ 24	—	4	„ 24	—	28	„ 24	—	37	„ 24	6	—	„ 24	20	—
„ 25	8	—	„ 25	—	6	„ 25	—	25	„ 25	—	28	„ 25	9	—	„ 25	26	—
„ 26	14	—	„ 26	—	11	„ 26	—	15	„ 26	—	15	„ 26	14	—	„ 26	16	—
„ 27	—	12	„ 27	—	6	„ 27	—	17	„ 27	—	7	„ 27	16	—	„ 27	26	—
„ 28	—	1	„ 28	3	—	„ 28	—	27	„ 28	—	20	„ 28	9	—	„ 28	18	—
„ 29	13	—	„ 29	—	5	„ 29	—	31				„ 29	12	—	„ 29	20	—
„ 30	—	8	„ 30	—	18	„ 30	—	28				„ 30	14	—	„ 30	30	—
			„ 31	—	15	„ 31	—	33				„ 31	—	6			
Mean	—	7·9	Mean	—	13·5	Mean	—	19·8	Mean	—	26·6	Mean	—	5·6	Mean	—	4·9

TABLE of BAROMETRIC READINGS, 1857.

Date.	Locality.	Bar.	Ther.	Date.	Locality.	Bar.	Ther.
			°				°
June 13	Fort William, H.B.C.	29·25	62	June 24	Swamp Lake (3)	28·66	80
„ 14	1st camp	29·34	49	„ „	Savannah Lake (4)	28·62	87
„ „	Halting place	29·37	62	„ „	Savannah River	28·63	88
„ „	Rise at Kakebeka Falls, 172 ft.	—	—	„ „	Ditto	28·62	82
„ 21		29·07	52	„ „	Lake of the Thousand Isles	28·58	81
„ „	Bad Portage	29·10	61	„ 25	Barrier Portage	28·59	79
„ 22	Dog Portage	29·12	45	„ „	Ditto Ridge	28·51	79
„ „	Dog Ridge (top of)	28·65	52	„ „	Ditto Lake	28·59	79
„ „	Dog Lake	28·80	57	„ 26	Ridge Portage	28·46	79
„ 23	Viscou's Lake	28·67	66	„ 27	Ditto	28·49	62
„ „	Cold Water Lake (1)	28·59	79	„ „	French Portage (E. end)	28·44	67
„ „	Ridge	28·51	79	„ „	Top of Ridge	28·39	68
„ „	Ditto, highest point	28·47	78	„ „	French Portage (W. end)	28·50	81
„ „	Warm Water Lake (2)	28·58	79	„ „	Perch Lake	28·44	74
„ „	Depth of Cold Water Lake 2 ft.	—	—	„ 28	Ditto	28·46	59
				„ „	Two River Portage	28·58	59
„ „	Ditto Warm Water ditto 27 ft.	—	—	„ 29	Sturgeon River	28·66	52
				„ 30	Nimuecan Lake	29·05	51
„ 24	Warm Water Lake(2)	28·72	72	„ „	Rainy Lake	—	—
„ „	Meadow Portage Ridge	28·62	77	„ „	Lake of the Woods	—	—

(Barometer deranged.)

BAROMETRIC OBSERVATIONS on the PRAIRIES, 1857.

Date.	Locality.	Bar.	Ther.	Date.	Locality.	Bar.	Ther.
1857.			°	1857.			°
July 23	Fort Garry to 1 day from Pembina (Mean of 16 days.)	29·03	82	Aug. 14	Camp	28·49	74
„ 24				„ 15	„	28·45	39
				„ 16	Fort Ellice, H.B.C.	28·38	62
„ 28	Pembina 45 feet above River	29·20	72	„ 17	„ 150 feet above level	28·60	60
„ „	Ridge	29·13	76				
„ 29	St. Joseph's	28·90	73	„ „	Poplar Ridge Creek	28·49	64
„ 30	Salt Lake	28·97	80	„ „	Level of Plain	28·45	64
„ 31	Camp of 30th	28·78	60	„ „	Poplar Ridge Creek Level	28·48	63
„ „	Halting place	28·32	96	„ „	Camp on Poplar Ridge	28·29	61
„ „	Camp	28·26	70	„ 18	„ „	28·29	55
Aug. 1	Pembina valley (left bank)	28·18	75	„ „	Pipe Stone River (left bank)	28·12	54
„ „	At River level	28·50	82	„ „	„ „ level	28·23	54
„ „	Second level (right bank)	28·30	83	„ „	Mountain du Poile (top of)	28·07	64
„ „	Camp on Prairie	28·22	77	„ „	River level on starting	28·18	64
„ 2	„	28·31	62	„ „	2nd Poplar Creek level	27·87	64
„ „	Long River (right bank)	28·45	62	„ „	„ Plain level	27·78	64
„ 3	„	28·53	62	„ „	Ridge near Moose Mountain	27·72	67
„ „	Camp	28·47	68	„ 19	„ „	27·65	50
„ 4	„	28·42	61	„ „	East tail of Moose Mountain	27·54	61
„ 5	„	27·72	60	„ „	„ „	27·60	83
„ „	At noon	27·62	65	„ „	Moose Mountain, Creek level	27·97	73
„ 6	Turtle Mountain	27·62	68	„ „	„ Plain level	27·91	72
„ 8	„	28·10	58	„ „	Camp on Plain	27·90	71
„ „	„	28·02	69	„ 20	„	27·72	52
„ 9	„	28·02	65	„ „	Halting Place	27·77	66
„ 10	„	27·98	56	„ „	Souri River, Plain level	27·75	64
„ „	Prairie halt	28·20	78	„ „	„ „	27·72	50
„ 11	Camp of 10th	28·02	62	„ 21	Level of River Straith	28·07	60
„ „	Souri river (left bank)	28·04	82	„ „	Level of River	28·10	60
„ 12	Camp of 11th	27·98	67	„ 22	Level of Plain	28·02	60
„ 13	„ 12th	28·14	58	„ 23	Tail of Moose Mountain	27·35	76
„ 14	„ 13th	28·41	37	„ „	Top of Peak	27·06	77

Date.	Locality.	Bar.	Ther.	Date.	Locality.	Bar.	Ther.
1857.			°	1857.			°
Sept. 7	Fort Ellice (mean) - -	28·26	68	Sept. 16	Moose Jaw Creek (50 ft.) -	27·96	62
„ „	1st Camp at Swamp - -	28·21	50	„ 17	„ „	28·15	29
„ 8	Poplar Ridge Swamp - -	27·89	63	„ „	„ (14 m. up)	28·16	63
„ 9	„ „ - -	27·56	53	„ 19	Cree Camp on Côteau - -	27·47	59
„ „	Small Lake - - - -	27·50	59	„ „	Our Camp below - - -	27·90	65
„ 10	„ - - -	27·66	48	„ 21	High Ridge (N. side) - -	27·64	64
„ 11	Weedy Mountain (W. side of)	27·60	46	„ „	High Plain S. branch of Saskatchewan River.	27·67	57
„ 12	Large Stone Lake - -	27·45	48				
„ „	Qu'appelle Lake Fort - -	27·06	60	„ „	Camp in Elbow Creek - -	27·97	54
„ „	Top of Qu'appelle River bank	27·46	54	„ 22	S. branch Saskatchewan -	28·00	60
„ „	Mission House - - -	27·74	48	„ „	River Aiktow - - -	27·84	62
„ 13	„ - - -	27·76	54	„ „	Summit Level Lake - -	27·79	58
„ „	„ - - -	27·89	58	„ 23	Level at Elbow S. Saskatchewan.	28·04	57
„ „	Top of Bank - - -	27·67	61				
„ „	Fort - - - - -	27·38	63	„ 24	Elbow Creek Camp (mean) -	27·98	52
„ 14	„ - - - - -	27·52	56	Oct. 4	Sandy Hills (mean) - -	27·90	57
„ 15	Duck Lake Camp - -	27·25	51	„ 5	Rabbit Point Camp - -	28·03	59
„ „	Last Wood Point - -	27·34	57	„ 6	Marsh on Burnt Ground -	27·97	40
„ „	Creek - - - - -	27·70	63				

1858. Fort Edmonton, February 21st. Hourly Observations.

Date.	Hour.	Bar.	Therm.	Wind. Direc^{n}.	Wind. Force.	Remarks.
1858.			°			
Feb. 21 *	Mid.	27·68	— 2·0	W.	very light	Clear, except in the E.
„	1	·68	— 2·5	„	„	Clear. Slight cloud, NE.
„	2	·68	— 3·0	—	calm	Very clear.
„	3	·68	— 4·0	—	„	Very clear. Faint Aurora.
„	4	·69	— 3	W.	very light	„ „
„	5	·69	— 6	SW.	light	„ No Aurora.
„	6	·68	— 5·5	„	„	„ Rosy daybreak.
„	7	·68	4	W.	„	„ „
„	8	·68	6	„	„	„ „
„	9	·72	16	SW.	„	„ „
„	10	·74	27	W.	„	„ „
„	11	·76	27	„	very light	„ Mild.
„	noon	·74	27	„	„	Fine. Light clouds forming.
„	1	·74	28	SW.	light	Overcast.
„	2	·70	27	„	„	„
„	3	·69	26·5	„	„	Clearing. Fleecy clouds.
„	4	·69	24·5	„	„	„ „
„	5	·64	23·5	W	„	„ „
„	6	·60	23	„	„	„ Gusty.
„	7	·59	22	„	„	„ „
„	8	·52	19	„	moderate	„ „
„	9	·50	17·5	SW.	fresh	Partially overcast.
„	10	·46	17·5	„	„	Overcast. Stormy.
„	11	·42	15·5	W.	„	„ Gusty.
„	12	·40	15·0	„	„	„ „
Mean	—	27·64	13·6			
Feb. 22	Mid.	27·38	12·5	W.	light	Overcast.
„	1	·38	11·5	„	„	„
„	2	·36	11	—	calm	Partially overcast.
„	3	·33	10	—	„	Hazy. Cloud in NW.
„	4	·32	10	—	„	„ „
„	5	·32	10	—	„	„ Cloud in E.
„	6	·32	10	—	„	Overcast.
„	7	·28	12	W.	very light	Dull. Overcast.
„	8	·26	14	SW.	light	„ „
„	9	·21	18·5	W.	„	„ „
„	10	·20	21	NW.	„	„ „
„	11	·16	27·5	W.	„	„ „
„	noon	·10	33	„	„	Clearing in W. Cloudy in E.
„	1	·12	39·5	„	„	Light fleecy clouds.
„	2	·12	43	„	„	Cloudy. Dull.
„	3	·13	42·5	„	very light	„ „
„	4	·14	41·5	—	calm	„ „
„	5	·14	40	—	„	„ „
„	6	·15	37·5	—	„	Overcast.
„	7	·15	35	—	„	Clearing.
„	8	·15	33·5	—	„	„

* As the 21st Feb. falls on a Sunday, the hourly observations are taken also on 22d.

Date.	Hour.	Bar.	Therm.	Wind.		Remarks.
				Direcn.	Force.	
1858.						
Feb. 22	9	27·15	33°	—	Calm	Clearing.
,,	10	·17	33	—	,,	Overcast. Dull. Dead calm.
,,	11	·18	33	—	,,	,, ,, ,,
,,	12	·20	34·5	SW.	light	Close. Overcast. Dull.
Mean	—	27·21	25·4			
—	Mid.	Barometer returned to Fort Carlton.	—	—	—	—
March 21	1		—	—	—	—
,,	2		—	—	—	—
,,	3		—	—	—	—
,,	4		—	—	—	—
,,	5		—	—	—	—
,,	6		—	—	—	—
,,	7		27·5	NE.	light	Overcast. Chilly.
,,	8		28	,,	,,	,, ,, Occasional snow.
,,	9		29	,,	,,	,, ,,
,,	10		30·5	W.	,,	,, ,,
,,	11		33	NE.	,,	Clearing. Mild.
,,	12		34	E.	,,	Clouds breaking up in S. Mild.
,,	noon		35	NE.	,,	Overcast.
,,	1		37	W.	,,	,,
,,	2		38·5	,,	,,	Clouds in patches. A little snow.
,,	3		40	,,	,,	Clouds from E. to S.
,,	4		39	,,	,,	Partially clear.
,,	5		38	NE.	,,	Densely overcast.
,,	6		35·5	,,	,,	Overcast. Raw.
,,	7		34	,,	,,	,, A few dim stars.
,,	8		33	,,	,,	Clear starlight.
,,	9		32·5	,,	,,	Overcast.
,,	10		32	,,	,,	Dense clouds in the W.
,,	11		32	,,	,,	Overcast.
,,	12		32	,,	,,	,,
Mean	- -	- -	33·1			
March 22	Mid.	Barometer returned to Fort Carlton.	—	—	Calm	Chilly. Overcast.
,,	1		32·0	—	,,	Cloudy in N. and NW.
,,	2		30·5	E.	,,	Stars dim.
,,	3		30	—	Calm	,,
,,	4		29·5	—	,,	,,
,,	5		29	NE.	light	Overcast.
,,	6		29	E.	,,	,,
,,	7		30	W.	,,	,,
,,	8		30·5	,,	,,	,,
,,	9		32·5	,,	,,	Fog.
,,	10		34	E.	,,	Clearing.
,,	11		38	SE.	moderate	Overcast. Very mild.
,,	Noon		45·5	,,	light	,,
,,	1		46	E.	,,	,,
,,	2		46	,,	,,	,,
,,	3		46	,,	,,	,, Chilly.
,,	4		44	,,	,,	,,
,,	5		41·5	SE.	moderate	,,
,,	6		40	,,	,,	Haze round the moon.
,,	7		37	—	calm	,,
,,	8		37	—	,,	,,
,,	9		36	—	,,	Overcast and chilly.
,,	10		36	E.	very light	,,
,,	11		35·5	SW.	light	,,
,,	Mid.		35	,,	,,	,,
Mean	- -	- -	36·2			
April 21	1	Barometer returned to Fort Carlton.	26	E.	very light	Clear. Stars brilliant. Chilly.
,,	2		24	—	calm	,, ,, ,,
,,	3		23	—	,,	,, Faint Aurora.
,,	4		22	—	,,	,, Daybreak.
,,	5		20	—	,,	,,
,,	6		25	W.	light	Fine. Clear.
,,	7		28	,,	very light	,,
,,	8		47	SW.	,,	Haze. Warm.
,,	9		55	,,	,,	Clear. Warm.
,,	10		59·5	E.	,,	Clear. Fleecy clouds in E.
,,	11		57	W.	moderate	Cloudy and rather chilly.
,,	noon		55	E.	light	Cloudy and rather mild.

Date.	Hour.	Bar.	Therm. in Air.	Wind. Direc^{n}.	Wind. Force.	Remarks.
			°			
April 21	1	Barometer returned to Fort Carlton.	54	E.	light	Clear. Mild. Fleecy clouds.
,,	2		52·5	,,	,,	Cloudy and mild.
,,	3		50	,,	,,	,,
,,	4		50	,,	,,	,,
,,	5		48	,,	,,	Partially cloudy and mild.
,,	6		46	NE.	,,	,, ,,
,,	7		42	,,	,,	,, ,,
,,	8		40	,,	,,	Overcast. Chilly.
,,	9		38	,,	,,	,, ,,
,,	10		36·5	W.	very light	,, ,,
,,	11		35	,,	,,	,, ,,
,,	12		34	,,	,,	,, ,,
,,			—	—	—	—
Mean	- -	- -	40·3			

1859. Fort Edmonton. Term Day. Hourly Observations.

Hour.	Bar.	Therm. in Air.	Max. Therm.	Remarks.
		°	°	
		20th January.		
12	27·93	−4·5	—	Overcast. Snow.
1	27·94	−5·0	—	
2	27·97	−6·0	—	,, ,,
3	27·97	−6·0	—	Wind from N. Fresh. Overcast.
4	28·0	−8·0	−9·0	,,
5	27·95	−9·0	—	Slightly overcast. Lt.
6	27·91	−8·5	—	,, ,,
7	27·91	−8·4	—	,, ,,
8	27·91	−8·5	—	,, ,,
9	27·91	−8·0	−9·2	Overcast. Snow.
10	27·90	−8·0	—	,, ,,
11	27·88	−5·5	—	Snow and overcast. Light N.E.
12	27·86	−6·3	—	Snow.
1	27·84	−5·5	—	,,
2	27·81	−5·0	—	,,
3	27·80	−6·0	−7·0	,,
4	27·82	−7·0	—	,,
5	27·83	−9·2	—	,,
6	27·84	−9·2	—	,,
7	27·87	−9·5	—	,,
8	27·90	−10·0	—	,,
9	27·90	−10·0	—	Overcast. Very calm.
10	27·95	−10·0	—	Overcast.
11	27·98	−11·0	—	Slightly overcast.
12	28·30	−11·6	—	Partially clear.
Means	27·91	−7·8	−8·4	
		1st February.		
1	27·59	−9·0	—	Overcast. Light snow.
2	27·62	−8·9	—	,,
3	27·65	−10·0	—	Partially clear.
4	27·65	−8·9	−7·9	,,
5	27·68	−9·0	—	,,
6	27·70	−10·8	—	,,
7	27·70	−0·8	—	,,
8	27·75	−19·7	—	Snow. Overcast.
9	27·76	−6·0	−5·0	Slightly overcast.
10	27·80	−5·5	—	,,
11	27·84	−4·8	—	Partially clear.
12	27·85	−4·5	—	,,
1	27·85	−4·0	—	,,
2	27·85	−5·5	—	,,
3	27·88	−5·5	−5·0	Clear.
4	27·90	−5·5	—	,,
5	27·92	−6·5	—	,,
6	27·96	−9·0	—	,,
7	27·98	−12·0	—	,,
8	27·98	−15·0	—	Clear.
9	28·00	−18·0	−16·5	,,
10	27·99	−22·0	—	,,
11	28·10	−23·9	—	,,
12	28·00	−25·5	—	,,
Means	27·83	−10·4	−8·6	
		21st February.		
1	27·14	20·0	—	Partially clear.
2	27·14	18·0	—	,,
3	27·14	17·5	16·0	,,
4	27·14	15·3	—	Overcast.
5	27·16	13·5	—	,,
6	27·20	11·2	—	Partially clear.
7	27·21	11·0	—	,,
8	27·14	10·7	—	Slightly overcast.
9	27·25	11·0	10·0	Clear.
10	27·26	11·5	—	Partially clear.
11	27·22	12·0	—	—
12	27·17	11·8	—	—
1	27·13	11·5	—	Snow.
2	27·14	14·0	—	Partially clear.
3	27·14	12·7	11·5	,,
4	27·29	9·7	—	,,
5	27·34	8·0	—	Slightly overcast.
6	27·37	7·0	—	Overcast.
7	27·38	3·5	—	,,
8	27·37	3·5	—	Partially clear.
9	27·40	1·8	1·2	Slightly overcast.
10	27·42	0·5	—	,,
11	27·43	0	—	,,
12	27·44	0	—	,,
Means	27·25	9·6	9·6	
		1st March.		
1	27·32	3·0	—	Clear. Very calm.
2	27·29	1·4	—	,, ,,
3	27·29	−0·3	—	,, ,,
4	27·28	−2·0	—	,, ,,
5	27·29	−4·4	—	,, ,,
6	27·29	−5·0	—	Fine. Bright.
7	27·33	−0·2	—	,, ,,
8	27·34	0·2	—	,, ,,
9	27·32	2·1	—	,, Wind light, W.
10	27·31	8·0	—	Clear. Bright. Wind W b N.
11	27·30	14·2	—	Cir-cum. ·5. Wind fresh, NW.
12	27·30	19·6	—	Cir-cum. ·6. Wind light, NW.

Hour.	Bar.	Therm. in Air.	Max. Therm.	Remarks.	Hour.	Bar.	Therm. in Air.	Max. Therm.	Remarks.
		°	°				°	°	
1	27·31	24·9	—	Cir-cum. ·4. Wind light, NNE.	7	27·32	25·2	27·0	Partially clear. Wind
					8	27·34	22·5	—	„ [ENE.
2	27·29	27·4	—	Cirri ·1. Wind light, NE.	9	27·32	20·0	18·0	„ „
					10	27·33	17·5	—	„ „
3	27·30	29·5	—	Clear. Wind calm.	11	27·34	15·0	—	„ „
4	27·30	30·0	—	„ „ ENE.	12	27·33	15·0	—	Clear. Calm.
5	27·31	30·0	—	„ „ „					
6	27·31	28·0	—	„ „ „	Means	27·31	13·4	22·0	

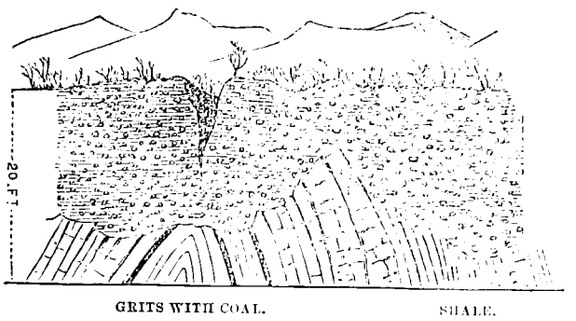
TERM DAY. METEOROLOGICAL REGISTER. FORT PITT, SASKATCHEWAN. Lat. , Long. , Alt. .

Date.	Hour.	Barometer.	Therm.	Wind.	Remarks.
1857.					
Dec. 21.	Mid.	28·46	5·0	calm	Hazy. Cloud ·2 in NE. Faint Aurora.
„ „	1 a.m.	28·44	4	„	„ „
„ „	2 a.m.	28·42	3·5	„	„ Aurora disappeared.
„ „	3 a.m.	28·39	3·5	„	„ „
„ „	4 a.m.	28·36	3	„	„ „
„ „	5 a.m.	28·31	3	„	Stars seen towards zenith.
„ „	6 a.m.	28·29	2·5	„	„ „
„ „	7 a.m.	28·25	3·0	very light, N.	Clearing.
„ „	8 a.m.	28.25	5·5	„	Fleecy clouds ·5.
„ „	9 a.m.	28·24	7·5	„	Cloud ·9
„ „	10 a.m.	28·26	10	calm	Overcast.
„ „	11 a.m.	28·22	14	„	„
„ „	noon.	28·18	16	„	„
„ „	1 p.m.	28·14	18·5	„	„ Threatens snow.
„ „	2 p.m.	28·11	20	„	„ „
„ „	3 p.m.	28·14	17	very light, SW.	Clearing. Cloud ·5.
„ „	4 p.m.	28·18	14	„	„
„ „	5 p.m.	28·17	13	calm	Clear.
„ „	6 p.m.	28·13	11	„	„
„ „	7 p.m.	28·10	11	„	„ [snow.
„ „	8 p.m.	28·07	11	very light, N.	Fleecy clouds rising from N.E. Threatens
„ „	9 p.m.	28·06	14·5	„	„ „ „
„ „	10 p.m.	28·06	15	„	„ „ „
„ „	11 p.m.	28·04	14	very light, NE.	Clearing.
„ „	mid.	28·03	14	calm	Clear. Slight haze towards horizon.
Means -	—	28·21	10·1		

JASPAR HOUSE, February 1st, 1859. HOURLY OBSERVATIONS.

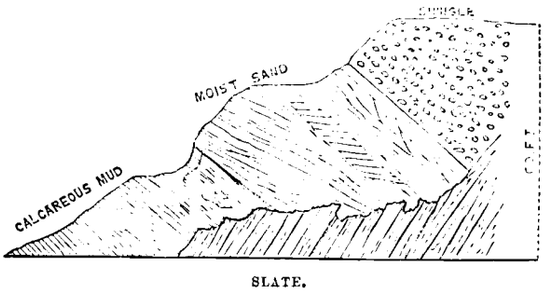
Hour.	Barom.	Therm.	Wind.		Remarks.
			Dir.	Force.	
1859.					
mid.	26·30	−11	N.	light	Sky clear.
1	·33	−12	„	„	Still clear. Wind variable.
2	·36	−13	„	fine	„ „
3	·35	−12	„	light	Sky overcast.
4	·36	−12	„	fine	Clear.
5	·38	−11·5	„	light	Passing clouds.
6	·40	−11	„	„	„
7	·44	−10·5	„	„	Cloudy.
8	·48	−10·5	„	„	„
9	·52	−8	„	„	„
10	·52	−4	„	„	„
11	·52	−0	—	calm	Overcast.
noon.	·52	1	S.	very light.	Cloudy.
1	·53	3·5	„	„	„
2	·55	4	„	light	Clearing.
3	·60	3	„	„	Clear and fine.
4	·60	−0·5	„	„	Cloudy to W.
5	·64	−6·5	SW.	„	Clear and fine.
6	·64	−11	„	„	„ „
7	·68	−15	„	„	„ „
8	·70	−17	„	„	„ „
9	·66	−17	„	fair	„ „
10	·68	−18	„	„	„ „
11	·68	−16	S.	light	Clear. Aurora.
mid.	—	—	—	—	—
Means -	26·01	−9·0			

Sect. No. 1.



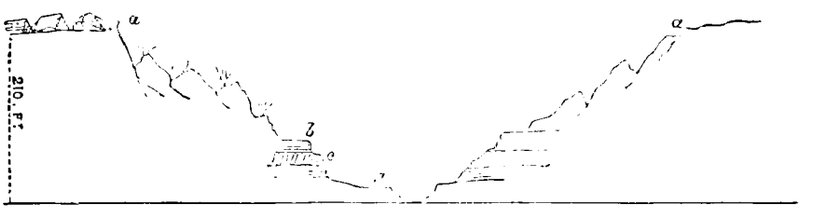
Shingle Terrace. Left bank N. Saskatchewan. Base of Rocky Mountains.

Sect. No. 2.



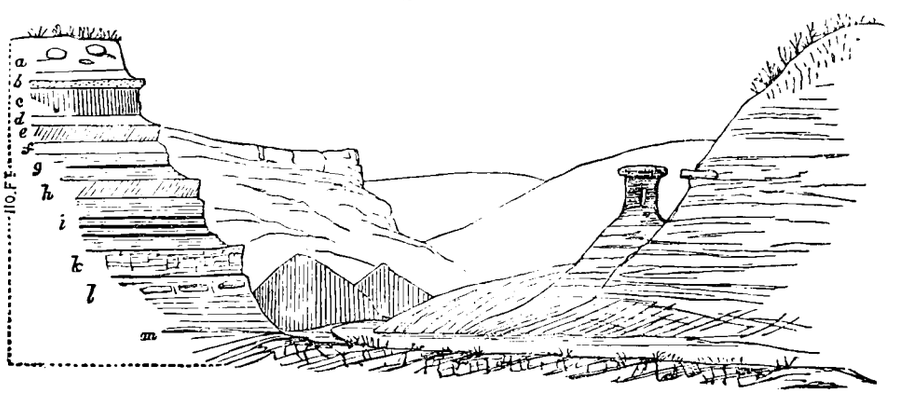
Shingle Terraces. Mouth of Kicking Horse River. Valley of Columbia R. Rocky Mountains.

Sect. No. 3.



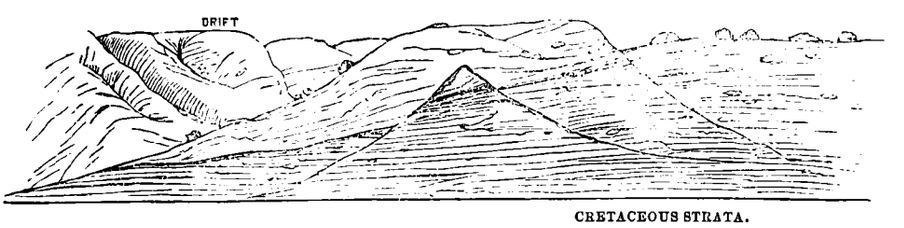
Valley of N. Saskatchewan, near Birch Gully, showing the leaf beds and drift.

Sect. No. 4.



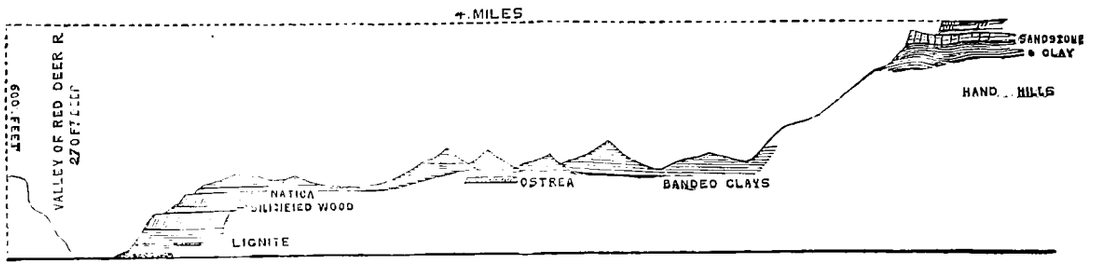
Valley of Souri River at La Roche Percée. Lignite strata.

Sect. No. 5.



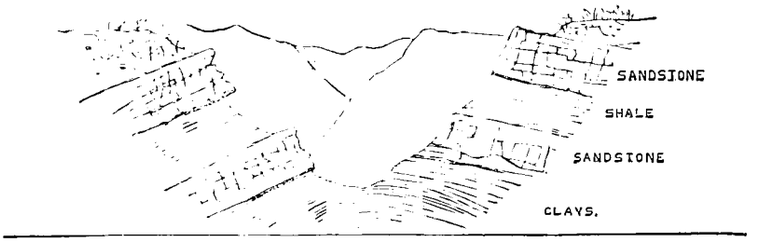
South Saskatchewan. Base of Grand Coteau. Junction of drift and cretaceous strata.

Sect. No. 6.



Red Deer River to the Hand Hills.

Sect. No. 7.

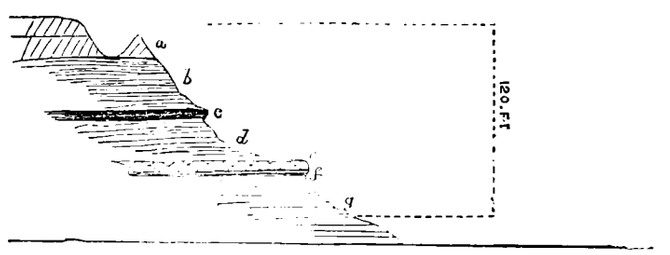


Coulée in Hand Hills, showing a disturbance of the strata.

Sect. No. 8.

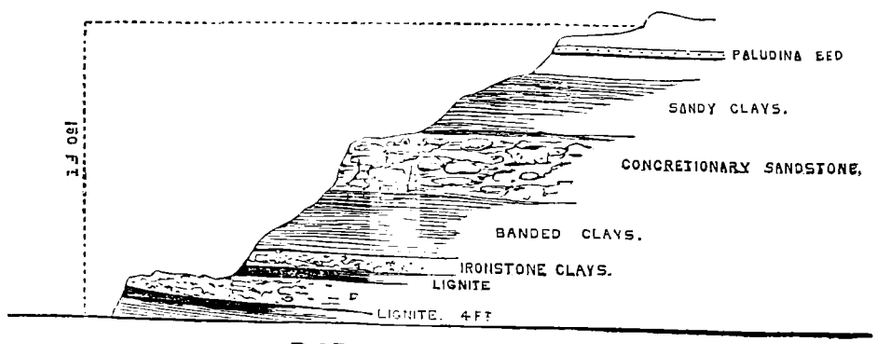
Shell Creek, near Hand Hills.

Sect. No. 9.



Red Deer River. Lignite group.

Sect. No. 10.

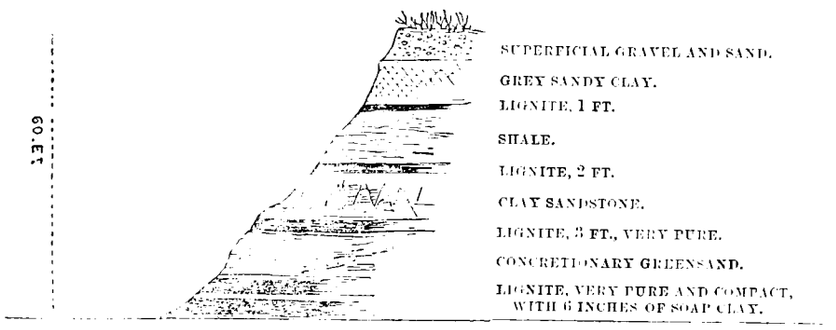


Red Deer River. Lignite group.

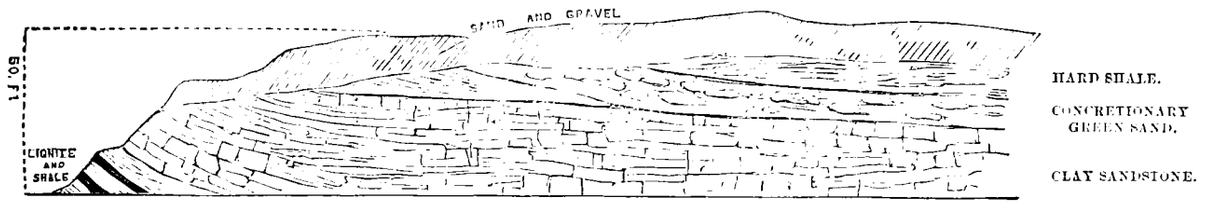
Sect. No. 11.

North Saskatchewan. Lignite and gravel beds, near Edmonton.

Sect. No. 12.

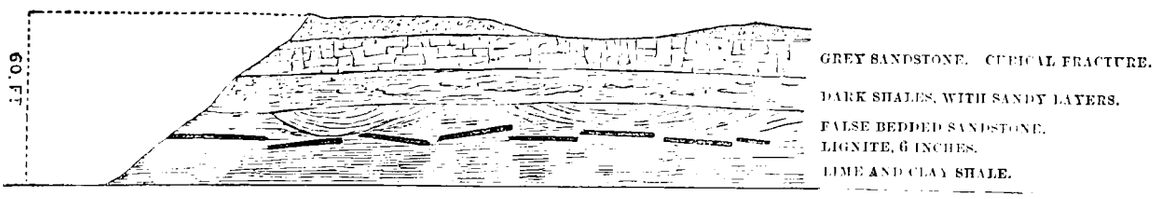


Sect. No. 13.



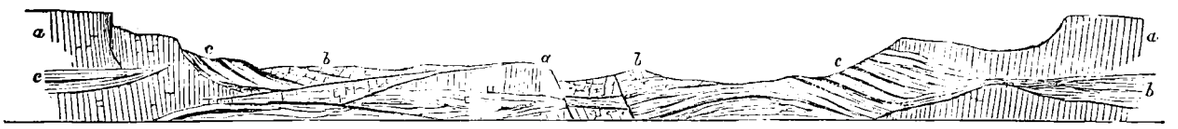
North Saskatchewan. Lignite group. Rocky Mountain House.

Sect. No. 14.



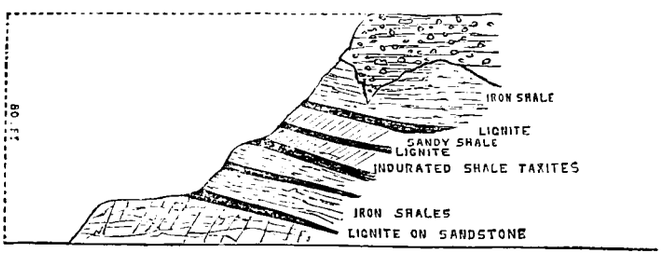
North Saskatchewan. Lignite group. Rocky Mountain House.

Sect. No. 15.



Ideal section of the lignite group at the Mountain House, showing the variation in the beds.
a, coarse-grained sandstone ; *b*, concretionary greensand ; *c*, shales with lignite.

Sect. No. 16.

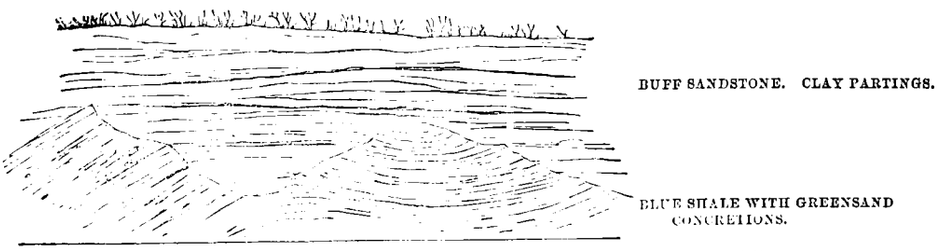


North Saskatchewan. Lignite group. 3 miles above Mountain House.

Sect. No. 17.

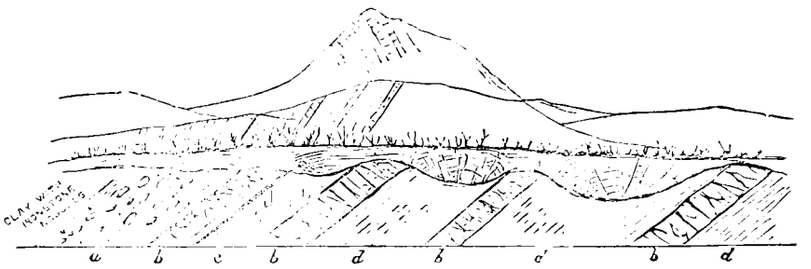
N. Saskatchewan. 5 miles above Mt. House. Shingle deposited on eroded surface of lignite.

Sect. No. 18.



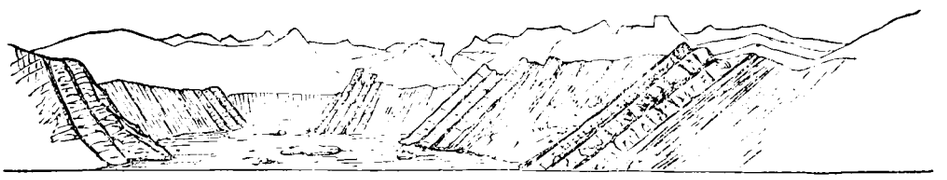
N. Saskatchewan. 20 miles above Mt. House. (Sandstone on group 2 of lignite group.)

Sect. No. 19.



a, septaria clays (Cretaceous?); *b*, sandstones; *c*, shale with coal; *d*, earthy shale.
Bow River. 10 miles below Old Fort. Base of Rocky Mountains.

Sect. No. 20.



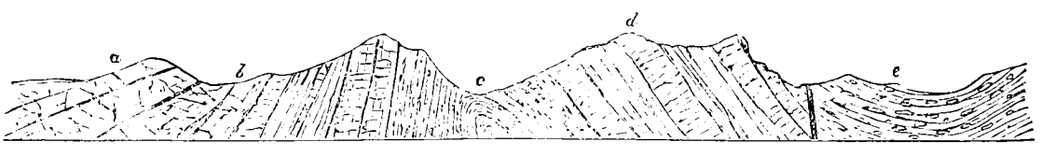
Bow River. Grits and shales. 15 miles from Old Fort. Base of Rocky Mountains.

Sect. No. 21.

Little Red Deer River. Exterior range. Rocky Mountains. (7 miles.)

Heavy bedded sandstones, with clay partings and carbon streaks, becoming gradually altered and disturbed. Beneath them at *r*. chocolate-coloured arenaceous shales.

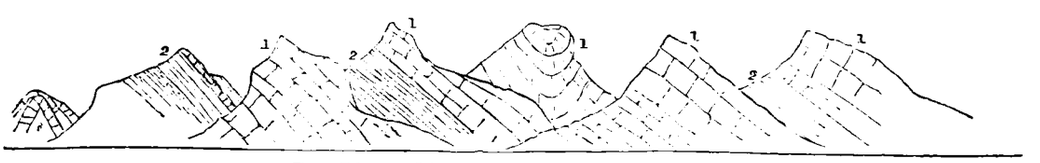
Sect. No. 22.



Deadman River. Below Old Bow Fort. Base of Rocky Mountains.

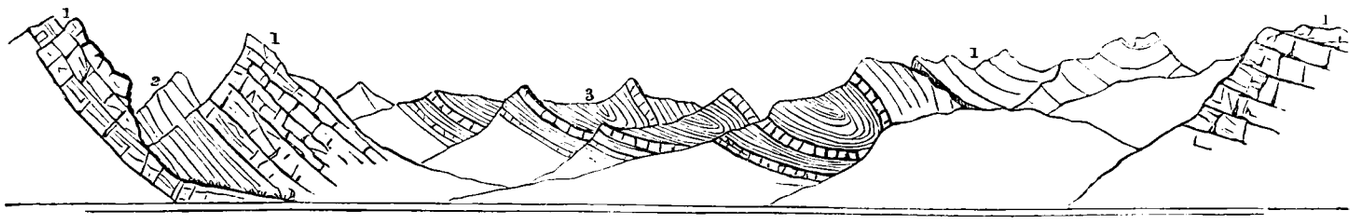
a, concretionary clay sandstone; *b*, hard sandstone and shale; *c*, carbonaceous shales, with nodules of ironstone and thin seams of coal; *d*, grits and shales, as on Bow River. Streaks of carbon; *e*, clay with ironstone nodules. (*Cret.* Bacutile Septaria clays?)

Sect. No. 23.



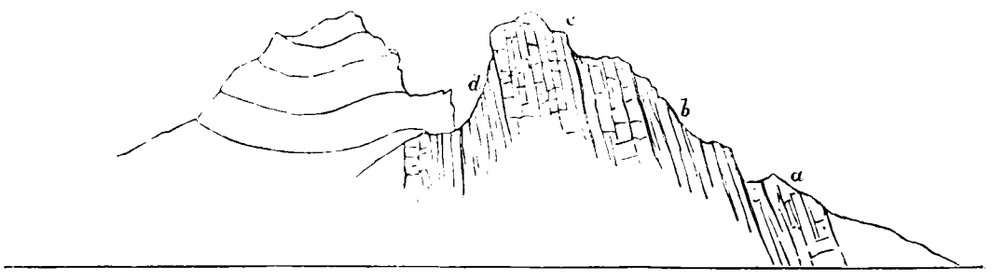
Bow River. First range. 3,000 ft. above the eye.

Sect. No. 24.



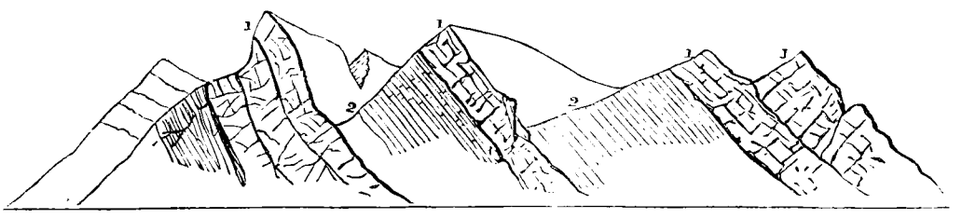
Bow River. First longitudinal valley.

Sect. No. 25.



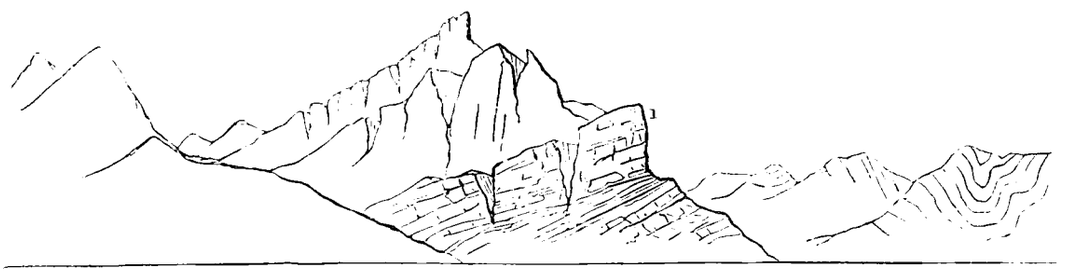
Bow River. Mountain. East side of first valley.

Sect. No. 26.



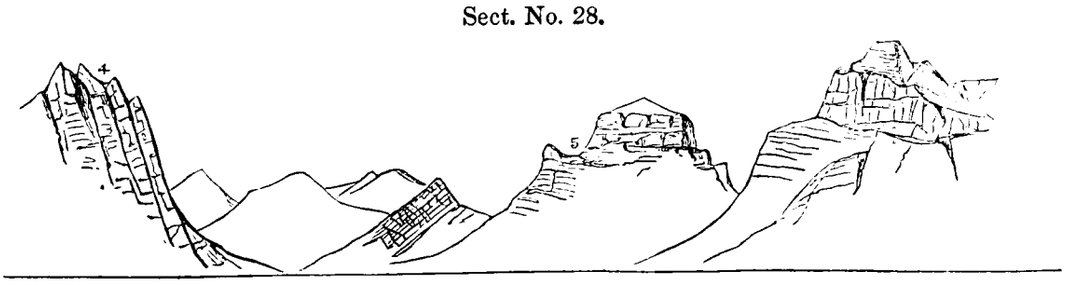
Bow River. Second range. 3,500 ft. above the eye.

Sect. No. 27.



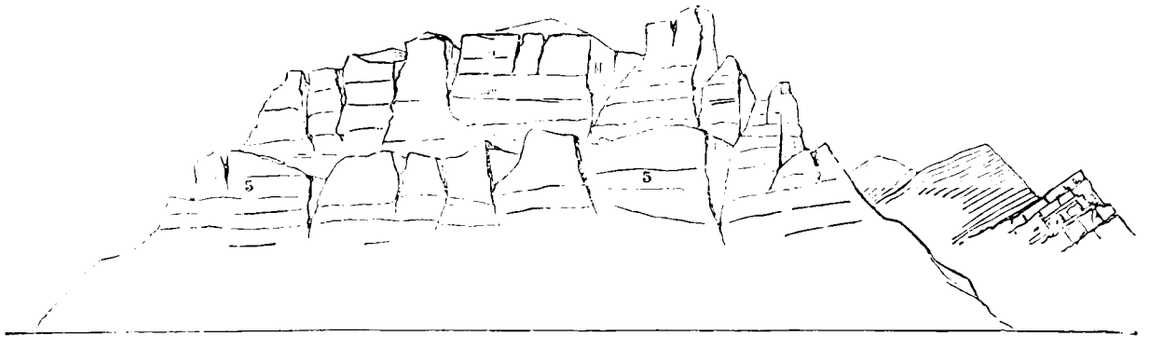
Bow River. Cascade Mountain. 4,521 ft. above the eye.

Sect. No. 28.



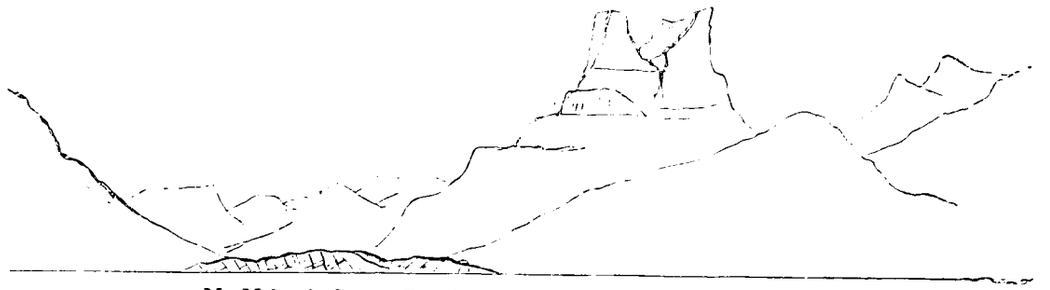
Bow River. Second longitudinal valley. Mt. Bourgeau.

Sect. No. 29.



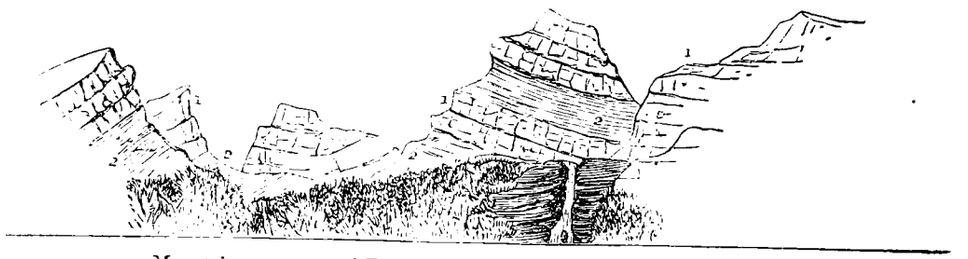
Castle Mountain, in second longitudinal valley. 5,000 ft. above the eye.

Sect. No. 30.



Mt. Molar, in Second Longitudinal Valley. 3,000 ft. above the eye.

Sect. No. 31.

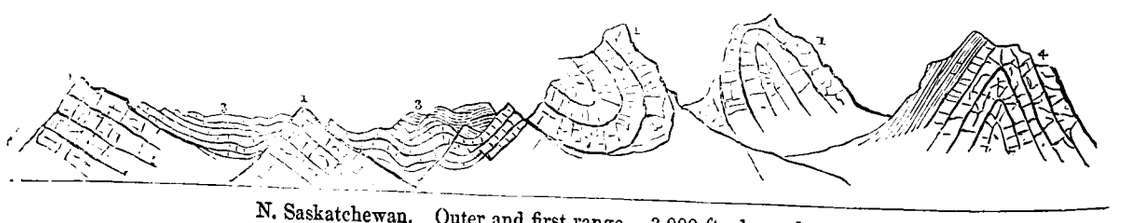


Mountains at source of Pipe Stone Creek. Second longitudinal valley.

Sect. No. 32.

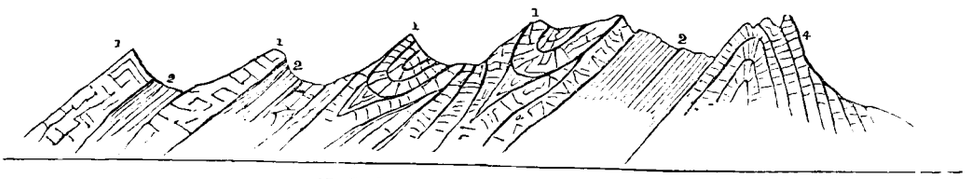
Mt. Murchison (?) From Pipe Stone Pass, alt. 7,000 ft. 6,000 ft. above the eye.

Sect. No. 33.



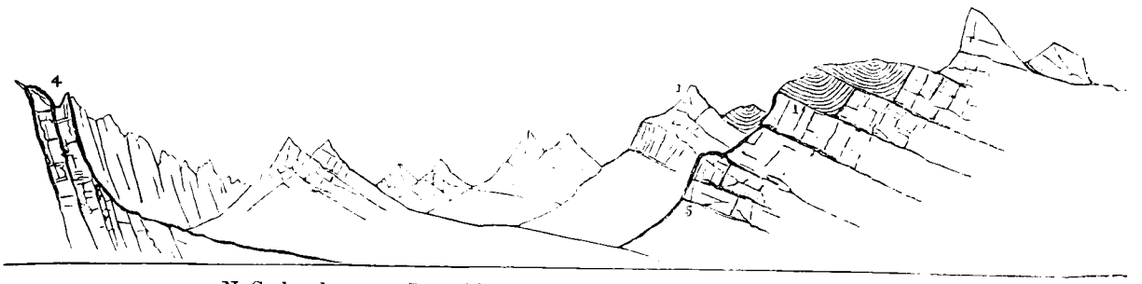
N. Saskatchewan. Outer and first range. 3,000 ft. above the eye.

Sect. No. 34.



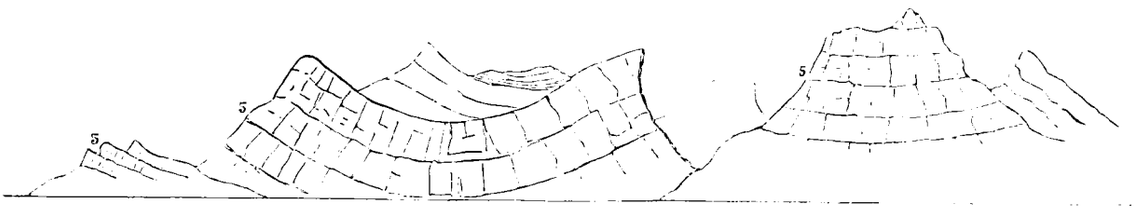
N. Saskatchewan. Second range.

Sect. No. 35.



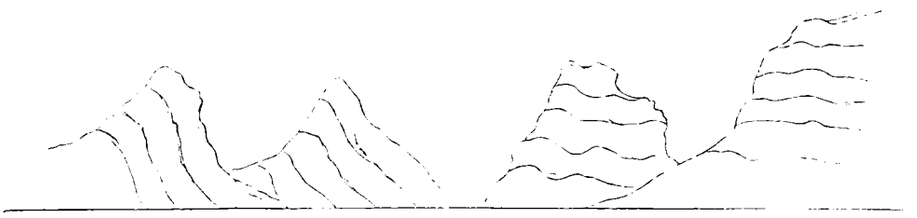
N. Saskatchewan. Second longitudinal valley. 5,500 ft. above the eye.

Sect. No. 36.



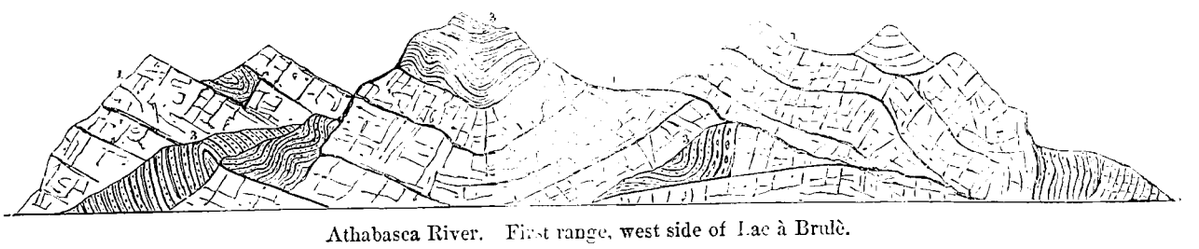
N. Saskatchewan. Third range.

Sect. No. 37.



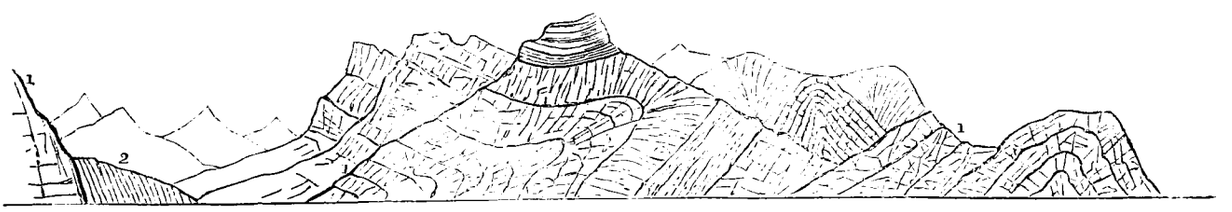
Valley of Siffleur River. Second longitudinal valley.

Sect. No. 38.



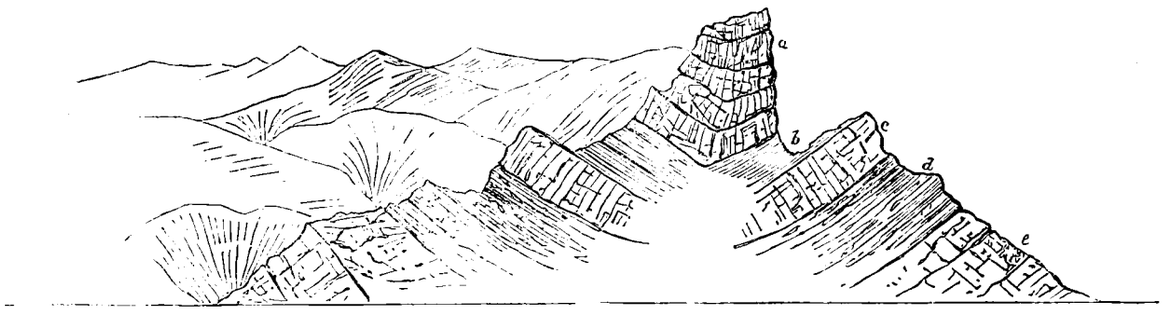
Athabasca River. First range, west side of Lac à Brulé.

Sect. No. 39.



Athabasca River. First range.

Sect. No. 40.

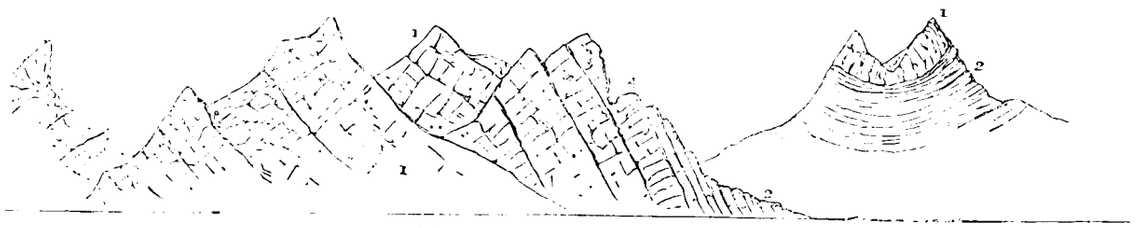


Athabasca River. Miette's Mount. First range. 5,713 ft. above the eye.

Sect. No. 41.

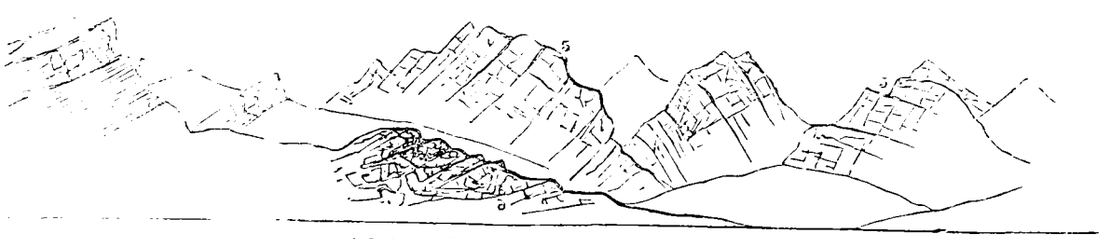
Snake River, north of Jasper House. First longitudinal valley.

Sect. No. 42.



Athabasca River. Second range.

Sect. No. 43.

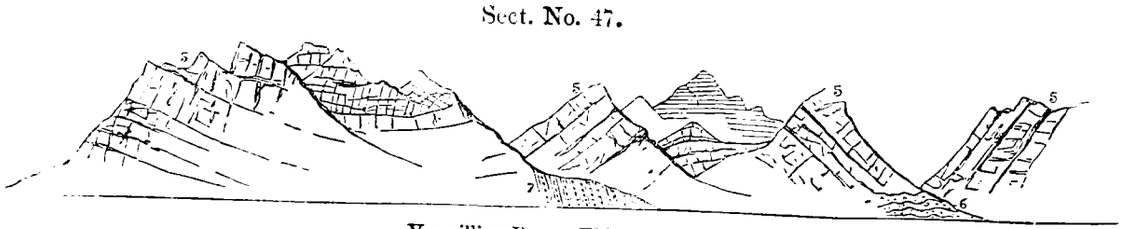


Athabasca River. Second longitudinal valley.

Sect. No. 44.

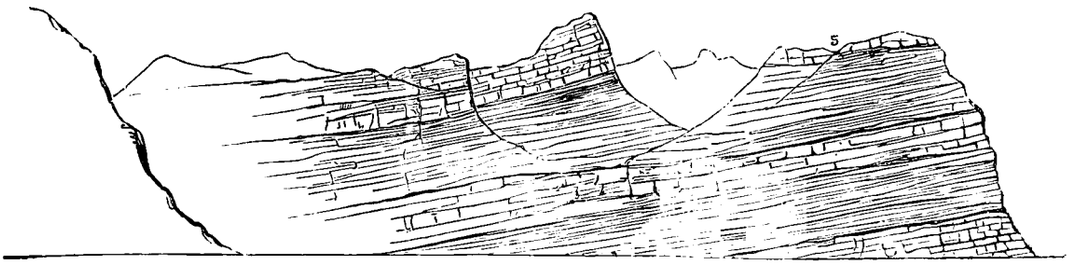
Valley of Glacier Valley. Source of N. Saskatchewan.

Sect. No. 47.



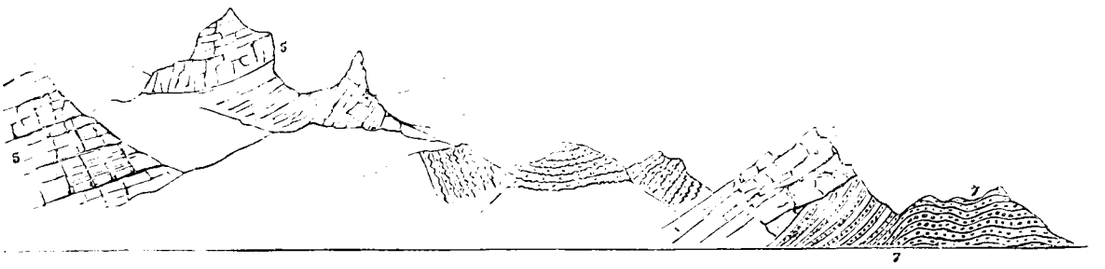
Vermillion Pass. Third range.

Sect. No. 48.



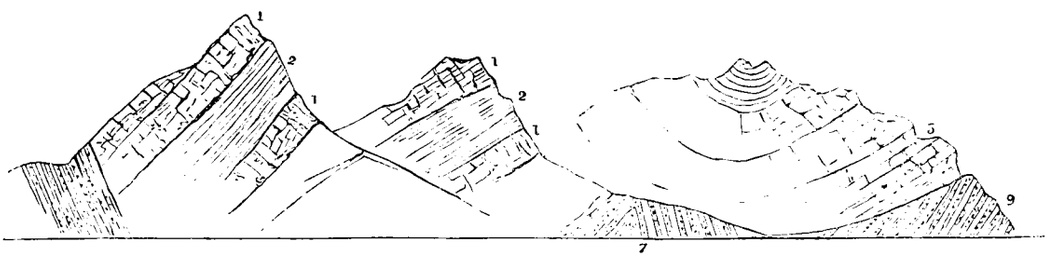
North Saskatchewan. Third range, West Section of.

Sect. No. 49.



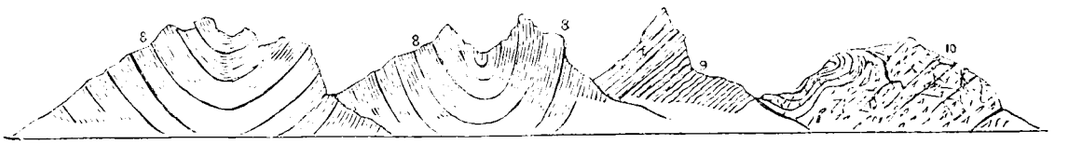
Blaeberry Pass. Third range to third longitudinal valley.

Sect. No. 50.



Kootanie River to Columbia Lakes. West part of third range.

Sect. No. 51.



Fourth range. Tobaco Plains to Baddler's Lake. Kootanie River.

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For Her Majesty's Stationery Office.

The following maps were bound in this place and are now in the accompanying map portfolio.

- A general map of the routes in British North America explored by the expedition under Captain Palliser (in 2 parts)
- Geological sketch, s.e. Vancouver I.
- " " Nanaimo
- Plans of Nanaimo, showing coal mines
- Sections, Vancouver I. to York Factory, and [illegible] to Rocky Mtns.

EXPLORATION—BRITISH NORTH AMERICA.

PAPERS

RELATIVE TO THE

EXPLORATION

BY CAPTAIN PALLISER

OF THAT PORTION OF

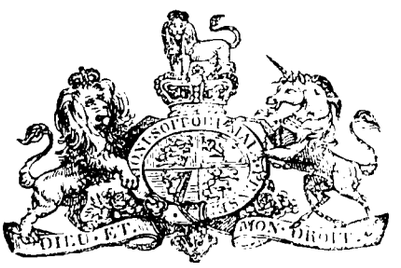
BRITISH NORTH AMERICA

WHICH LIES BETWEEN

THE NORTHERN BRANCH OF THE RIVER SASKATCHEWAN AND THE FRONTIER OF THE UNITED STATES; AND

BETWEEN THE RED RIVER AND ROCKY MOUNTAINS.

Presented to both Houses of Parliament by Command of Her Majesty.
June 1859.



LONDON:
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PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1859.

SCHEDULE.

PAPERS

RELATIVE TO THE

EXPLORATION OF BRITISH NORTH AMERICA.

No. 1.

No. 1.

COPY of INSTRUCTIONS from the SECRETARY of STATE to Captain PALLISER.

SIR, Downing Street, March 31, 1857.

WITH reference to the Letter which, by my directions, was addressed to you on the 28th inst., I have now the honour to communicate to you Special Instructions for your guidance in the conduct of the Expedition for exploring that portion of British North America which lies between the northern branch of the River Saskatchewan and the frontier of the United States, and between the Red River and the Rocky Mountains.

Having completed all preliminary arrangements necessary for the future safety and success of the Expedition, it is the desire of Her Majesty's Government that you should proceed by the Sault Ste. Marie on Lake Superior to Fort William, and from thence by the Kaministaquoia as far as the Kakabeka Falls, and that you should ascertain the precise geographical position of the point at which the White Fish River falls into the Kaministaquoia. From thence it is desired that a party should be detached to explore the country to the westward towards the height of land, and, as far as may be practicable, without long delay, to determine the height and direction of the watershed for some distance on either side of the line due west from the White Fish River.

If this preliminary Exploration should lead you to think such a measure practicable, it would be desirable that you should detach a small party, lightly equipped, and supplied with provisions for a few days' march, who should pursue a line directly to the westward, meeting the ordinary canoe route either at Cross Lake or Sturgeon Lake.

From the point at which this party shall rejoin the rest of the Expedition you will proceed by the ordinary route to Fort Garry on the Red River.

In regard to the entire region lying between Lake Superior and Lake Winipeg, it is desirable that, in addition to the ordinary observations upon the physical features and geology of the country, the attention of all the members of the Expedition should be directed to ascertain the relative levels of all the points which can be recorded and laid down with topographical accuracy; as, for instance, the height of the falls and rapids on the streams which lie along the canoe route, and the relative height of the several points in the watershed between the above-mentioned lakes which may be visited by the Expedition. In case, as is probable, the botanical collector should not accompany the separate exploring party, information should nevertheless be obtained as to the nature and quantity of timber which may be found on the line of march.

From Fort Garry you will start, as soon as you have organized your party, in a westwardly direction, taking such a course as you shall consider most advisable for acquiring additional knowledge of the country on either side of the Bow River or south branch of the Saskatchewan River during the remainder of the season of 1857, and you will make arrangements in advance for wintering the Expedition at Carlton House, where you will meet Lieut. Blakiston.

At the commencement of the season of 1858 you will start, as soon as the weather is sufficiently open and favourable, to explore the country between the two branches of the Saskatchewan River and south of the southern branch, and thence proceeding westward to the head waters of that river, you will endeavour, from the best information you can collect, to ascertain whether one or more practicable passes exist over the Rocky Mountains within the British territory, and south of that known to exist between Mount Brown and Mount Hooker.

Great care must be taken that the Expedition shall return to Fort Garry in sufficient time to allow them to reach England, viâ Fort Pembina and the United States, in the fall of 1858.

In the event of you yourself desiring to proceed westward from the Rocky Mountains to Vancouver's Island, Her Majesty's Government consent to your doing so only under the express conditions that the homeward conduct of the Expedition can with perfect prudence be entrusted to the charge of Lieut. Blakiston or Dr. Hector, and that the expenses of your travelling from Vancouver's Island are defrayed from your own resources; and, further, that the Indian war now raging in the country west of the Rocky Mountains shall have terminated.

It being the desire of Her Majesty's Government that the Expedition should, as far as practicable, be made available for extending general as well as special scientific knowledge, I have to impress upon you the importance, in addition to maintaining a regular series of instrumental observations, of regularly recording the physical features of the country through which you will pass, noting its principal elevations, the nature of its soil, its capability for agriculture, the quantity and quality of its timber, and any indications of coal or other minerals.

Separate Instructions will be furnished by Major-General Sabine, Sir Roderick Murchison, and Sir William Hooker for the guidance of the scientific gentlemen attached to the Expedition.

The result of your surveys and observations should be embodied in a Journal of the Expedition, to be kept with the utmost practicable regularity. A duplicate of that Journal, and of any special observations and reports on the geology and natural history of the country, should be completed at all convenient stations, and forwarded at every favourable opportunity to England, addressed to Her Majesty's Principal Secretary of State for the Colonies, Downing Street, London.

In full reliance upon your ability and discretion, Her Majesty's Government have not hesitated to entrust to you the conduct of the Expedition, with the express understanding that the scientific gentlemen of your party will consider themselves subject to your authority, and bound to be guided explicitly by the orders which your experience may suggest for the safety of the Expedition and for the complete success of the objects for which it is undertaken.

In the event of any unforeseen accident which might deprive the Expedition of your services as leader, the command of the party may be entrusted by you either to Lieut. Blakiston or to Dr. Hector, and you will furnish a duplicate copy of these Instructions to whichever officer you may select for that purpose.

In conclusion, I cannot too earnestly impress upon you the necessity for the utmost caution in the selection of the line of route to be taken by the Expedition, and in avoiding all risk of hostile encounters with any native tribes who may inhabit the country through which you may pass.

I have to request that you will communicate to me, for the information of the Lords Commissioners of the Treasury, the mode in which the expenditure incurred by you while in the territories under the control of the Hudson's Bay Company is to be defrayed, and you will understand that the limits of expense prescribed for the Expedition cannot be exceeded unless under circumstances of urgent necessity, which you will at once report for the information of Her Majesty's Government.

I have, &c.
(Signed) H. LABOUCHERE.

Captain Palliser
&c. &c.

No. 2.

No. 2.

Copy of REPORT from Captain Palliser to Her Majesty's Secretary of State for the Colonies.

Sault Sainte Marie, June 10, 1857.
(Received July 3, 1857.)

Sir,

I have the honour to report my arrival here at 4 o'clock A.M. this morning. We started from Liverpool in the "Arabia" steamer, which left England at 3 P.M., May 16, and landed at New York at 6 P.M. on the 28th May.

Immediately on landing, we experienced some difficulty with the Custom House at New Jersey, and subsequently were enabled to pass our instruments through, owing to the kind assistance of Mr. Pompelly, of New York, whose acquaintance we casually made at our hotel next morning. Mr. Pompelly, aided by Mr. Wheatley, well known as an

accomplished mineralogist in the scientific world, accompanied us on the 29th May to the Custom House, and having explained the objects of our Expedition, and representing it as one directed by Her Britannic Majesty's Government, these gentlemen at length succeeded in accomplishing our object of passing the instruments, saddles, guns, &c., but not until they had called on the Solicitor of the Customs, and conferred with the Superintendent, and several of the subordinate officers of the Custom House. I have entered into these minutiæ, as I consider the kindness of these two gentlemen (Mr. Pompelly and Mr. Wheatley), and their anxiety in the furtherance of international science, deserving of the highest praises.

I am much concerned at having to report, about this date, the bursting of one of our new barometers. I am fully convinced that this accident has not occurred from the relaxation of Dr. Hector's vigilance over the barometers, which has been most unremitting. I therefore had the instrument examined by the first makers in New York, who agreed that it might have arisen from the tightness of the metal fittings enclosing the cistern, which prevented its due expansion with a great rise in temperature, such as we experienced on landing at New York.

Mr. Pompelly, however, most kindly applied for us, and obtained one of the New York Observatory barometers, until such time as ours could be repaired and forwarded to Carlton House, or otherwise reclaimed.

On the morning of 2d June we started for Detroit, viâ Elmira and the Niagara Falls. At Detroit we were detained several days, as the steamer to the Sault Sainte Marie had not yet returned; she, however, arrived on Saturday the 6th, reporting much ice still floating on Lake Superior, and also that Sir George Simpson was still detained at the Sault Sainte Marie by the ice. We have, therefore, no longer any reason to regret the delay of our departure from England, as all progress, owing to the very unusual lateness of the season, would hitherto have been denied us.

On my arrival this morning at the Sault Sainte Marie, I have found my two birch canoes and 16 rowers awaiting me, and have made an arrangement with the captain of the steamer to take us up, with men, boats, luggage, and all, to Isle Royale; and as the steamer is now starting I must conclude my Report.

And remain, &c.

Her Majesty's Secretary of State for the Colonies.

(Signed) JOHN PALLISER.

No. 3. No. 3.

Copy of REPORT from Captain Palliser to Her Majesty's Secretary of State for the Colonies.

Fort Garry, Hudson's Bay Company's Territories,
July 16, 1857.
(Received October 3, 1857.)

Sir,

In continuation of my Report, dated Sault Sainte Marie, June 10, 1857, I have now the honour of acquainting you with our further progress.

Owing to the unusual lateness of the season, Lake Superior was crowded with floating ice, offering great difficulties even to a steamer, and, after consulting experienced persons, I determined to accept the further assistance of the steamer "Illinois," whose captain agreed, for the sum of $300, to take up my two canoes on deck, 16 voyageurs, and ourselves across the lake, and leave us near Isle Royale, about eight hours' paddling distance from Fort William.

Although this might have appeared a large sum (*i.e.*, £61 5*s.*), yet subsequently I had reason to congratulate myself on adopting that course, for, shortly after, the men and canoes were taken up, we came on fields of ice, and the captain, after pushing his way for several miles, fell in with a schooner that warned him to return and try a course along the north shore of the lake.

At length, after deviating 70 miles from his course, he succeeded, and came in sight of the island at daybreak of the 12th June, four miles to the north-east.

We then launched, loaded, and started in our canoes, having avoided not only seven or eight days' journey, but also the risk of being stopped altogether by the ice.

We reached the mouth of the Kaministoquoiah at nightfall, and arrived at Fort William at 10 P.M. on the 12th June, where we learned that Sir George Simpson had only preceded us eleven days, having been eight days on the north shore of Lake Superior, where his canoe had been broken on the ice.

On Saturday, 13th June, we started, and encamped some miles from the fort, and on Sunday, the 14th, arrived at the mouth of the White Fish River. I halted here, and, according to my instructions, organized a party, consisting of myself and Dr. Hector, three voyageurs, and three Indians, and ascended the White Fish River. I chose these small birch canoes, on account of their drawing but very little water; they could merely carry two paddlers and one passenger each, while the third, with two paddlers, took the provisions for the party, consisting of eight people in all.

I can readily understand why the existence of this river has been denied, as its mouth could be easily passed unobserved by those only travelling in canoes on the Kaministoquoiah, owing to its taking a sudden bend before flowing into that river, and therefore appearing much like a recess of the Kaministoquoiah.

The White Fish River varies in breadth from 40 to 60 yards, and is 5 feet deep at its mouth; but useless for purposes of navigation, owing to the frequency of the rapids. We punted up a considerable portion of the stream at intervals, when the rapidity of the river prevented us from paddling. In the first day of our journey up the river, the barometer indicated a proximate ascent of 75 feet in 12 miles, and on the second day a further rise of 100 feet in six miles. Here a very large tree fell on one of the canoes, and dashed it to pieces, I myself narrowly escaping by jumping out of the way. The rain was very severe, and the men very much exposed, being obliged frequently to get out up to their middles in water to assist in bringing up the canoes.

Owing to the accident which befel our boat with the provisions, we were obliged to return the next day.

Dr. Hector and I started accordingly on foot at 6 A.M., June 14th, straight through thick woods, in the direction of the falls of the Kakabeka, distant by our calculation 27 miles, taking two Indians with us, and sending back the remaining canoes with the third Indian, and the three voyageurs to the camp at the mouth of the White Fish River, with directions for the whole party to go on to the falls of Kakibica, and meet us there.

On leaving the course of the White Fish River, we ascended a steep bank into a region of larch woods, and, contrary to our expectations from the previous reports, found no difficulty in pushing forward at the rate of 3½ miles through the country intercepted between the White Fish and Kaministoquoiah Rivers; and, if we could take our experience of that portion of the country for a fair average of the whole, I do not apprehend any difficulty in connecting, either by means of railroad or a common road, the country around Fort William with the south shore of Sturgeon Lake, but the accident which occurred to our boat and provisions took place before we reached the watershed which must necessarily exist between the head of White Fish River and the waters which flow into Lake Winipeg; and therefore it still remains to be seen what amount of difficulty to overcome the watershed will present at that point compared with that which it offers, both on the Old Portage Route and the Northern Portage Route, which we have followed.

All this time heavy rain fell with little intermission, and detained us for several days after we had arrived at the Kakabeka Falls.

On the 23d we reached the height of land, and next morning crossed the Savannah Portage into the Savannah River, and commenced the descent of the watershed towards Lake Winipeg.

On the 1st July we arrived at Fort Frances on Lac la Pluie, and, while at breakfast in the fort, a large number of Indians formed a deputation, headed by their chiefs with their soldiers, and led by the old chief of the Lac la Pluie nation. It seems that they had heard a rumour of my arrival, and had organized this deputation for some time previously. This fact I would not have taken up your time by dwelling on, were it not for the high tone which the old chief took in his harangue, which contained in it more than the mere ordinary imagery with which they make speeches for the sake of obtaining presents.

He said, "I do not ask for presents although I am poor, and my people are hungry, but I know that you have come straight from the great country, and we know that no man from that country ever came to us and lied. I want you to declare to us truthfully what the great Queen of your country intends to do to us when she will take the country from the Fur Company's people. All around me I see the smoke of the white man to rise. The 'long knives,' (*i.e.* the Americans) are trading with our neighbours for their lands, and they are cheating them and deceiving them. Now, we will not sell or part with our lands."

It was of no use to try and cut him short by any assurances that I was not employed to treat for the sale of his lands; and I told him confidently that if he did not wish to

part with his lands, and also if he and his people behaved as always they had done, that is, quietly and peaceably, with the white faces, I would assure him that the Queen would never send soldiers to deprive them of their lands by force.

Here an Indian (not of their nation, but of a friendly neighbouring tribe) muttered to him in a low tone, "Make him put it into writing on a piece of paper; make him, I say; and now I have said it, for its nothing to me one way or the other, but I know the whites on the other side where we are, and I say make him put it into writing." But the orator said aside to him, "No, what he will say he will keep to." "Now," continued he aloud, "what is to become of us? we have no more animals; they are all gone, and without skins the Company will not give us goods from their store; and only for the little fish we take we would starve, and many of us do starve and die." I answered that they were to blame for not endeavouring to cultivate their lands and find other resources for maintaining themselves besides hunting. He answered. "There are none to show us, and we have no implements to do it with."

He then objected to Mons. Bourgeau collecting plants, and requested that Dr. Hector should not take away any mineral specimens as long as we were in his territories. He also begged that the great Queen might be made acquainted with their unhappy condition, and that she might know that his heart was grieved by reason of all those of his children who died by hunger. He asked me to promise that I would acquaint the great Queen of these things, and to see her myself.

But I satisfied him that I would write his words to the big men that were in the habit of giving good advice to the Queen, and so we parted good friends.

All this, insignificant as it may appear, was of some importance to us, as the chiefs, with their old leader and orator, were highly excited. There were upwards of 200 Indians inside the fort, 100 of whom were armed, and our party consisted of myself and interpreter, and my three companions, and the agent and storekeeper of the fort.

The conference lasted two and three quarter hours, in which period I heard and replied to five speeches, and the gentlemen in charge of the post seemed greatly relieved at the Indians quietly leaving the fort on the successful issue of the conference.

On the 5th July we camped on Sturgeon Lake, at the mouth of what has hitherto been called Sturgeon River, and, according to my instructions, I started with Dr. Hector to explore back again in a south-east direction towards the White Fish River.

We had not proceeded far, when what appeared merely a river turned out to be a passage to a very large lake.

We pushed across in an easterly direction, and searched the opposite shore for an outlet, found a very fine waterfall, and walked up the woods without much difficulty for about a mile and a half, when we came on another lake whose dimensions appeared not far inferior to those of the first. And from all I have seen, both immediately on the route and whenever I have deviated (which I have often on foot for hours while the men were resting or cooking), I have come to the conclusion that the whole country between the watershed and Sturgeon Lake is but a mass of lakes and islands. The traversing of this country can only be effected in winter by means of sledges and snow shoes when the lakes are frozen, and the underwood, the swamp, and fallen timber are filled up by the snow, over which there is then no difficulty in travelling on snow shoes; and as I was aware that this was not the proper season for carrying out the investigation, on account of the large staff of men, canoes, and provisions which I would have required, and the details of which (*i. e.* those connected with running a road through a woody, swampy, and lake country) would be far better carried out by a professional engineer with a sufficient staff of assistants and lumberers, the providing of which would perhaps more immediately be the duty of the Canadian than that of Her Majesty's Government at home. It is much to be regretted that the means of so many miles of deep and valuable water carriage should be rendered unavailable by so great a number of small, insignificant portages.

Many of these difficulties, however, are to be overcome by engineering, at but a trifling expense, and if ever the country becomes inhabited it will hereafter enjoy much facility for steam-boat communications.

On Wednesday July 8th we reached the Island Portage, the last on the route, whence there is uninterrupted communication by water all the way across Lake Winnipeg to Lower and Upper Fort Garry, and as far as Fort Pembina on the other side of the frontier.

We reached Lower Fort Garry on Saturday the 11th, rode to the English Protestant Church on Sunday, about four miles distant, and were much surprised to find a large attentive congregation of Scotch people and half-breeds of various shades of colour.

The summer here is very warm, and crops seem quite, by the rapidity of their growth now, to make up for the long dreary winter of this country. The resources of the

country are not half developed. The indolence of the people is truly wonderful, and seems even to have the effect of corrupting those who have arrived with previously active habits. Hunger and want do not seem a sufficient stimulus to arouse them to exertion. The Hudson's Bay Company do not import more than one quarter of the goods sufficient for the use of the settlement, their equipment having always been far short of what is required, and purchasers with means and produce are refused the articles they want on that account. The want of adventure and energy pervades all classes. There is no labouring class whose labour can be depended on for a day; they hunt during three months of the year, and beg, borrow, and starve during the remaining nine. Their grievances appear imaginary, and indolence the cause of all their trouble. This character is mainly that of the half-breeds. Of the Scotch there are many that do well, but would succeed far better if they could reckon on obtaining any regular labour. The only hold the Settlement has on the enlightened members of its society is the security of property here, and good laws, as compared to the insecurity on the American side. Should the American legislature obviate that difficulty, all the industrious and valuable portion of the population would soon flock over to the other side.

Thunder storms are of frequent occurrence here, and though apparently not severe, yet frequently fatal to human life. While I was writing the above, a flash of lightning has fallen on an Indian tent, and killed one man and three women. I found two of them fearfully burnt, but the remaining two, though quite dead, are seemingly untouched. I have myself frequently, on Lac la Pluie, and elsewhere on the route, observed the lightning to flash upwards from the earth to the impending cloud, when it often presents the appearance of a forked string of bright beads.

I purpose leaving this on Monday morning with Dr. Hector, Mr. Sullivan, and Monsr. Bourgeau and thirteen men, all well armed. We shall go as far as the frontier at Pembina, and thence along the boundary to Turtle Mountain, thence to Beaver Creek, and from thence right across to the elbow on the Lower Saskatchewan. My horses, about thirty in number, stand me an average of 20*l.* each, and the men's wages at the rate of 40*l.* per year. Traversing the Lower Saskatchewan is, I regret to say, not unattended with danger. Sir George Gore was reported as having been decoyed into a conference with the Sioux, about a year ago, and he and his party were robbed of their baggage, horses, clothes, arms, and ammunition, and he himself, without even a shirt, was obliged to take refuge at Fort Union, fortunately not too far away to enable them to reach alive.

I have the honour to enclose you my Secretary Mr. Sullivan's astronomical observations, and I have desired Dr. Hector to communicate his geological researches to Sir R. Murchison. Monsr. Bourgeau has been most successful in his botanical collections, and is preparing a case of Flora and seeds for Sir Wm. Hooker, which I trust will arrive safely in England before the end of October next.

I have endeavoured to embody as many of the principal incidents recorded in my journal as the short space in an official letter will permit, and I hope to have the honour of continuing this report as soon as I have reached my winter quarters at Fort Carlton.

I have, &c.
(Signed) JOHN PALLISER.

Her Majesty's Secretary of State
for the Colonies.

Enclosure in No. 3.

Locality.	Barometer.	Thermometer.	Chronometer Times.	Error on G.M.T.	Ind. Er.	Observed Alts.	Observed Azs.	Longitudes.	Latitudes.	Variations.
		°	d. h. m. s.			° ′ ″	° ′	° ′ ″	° ′ ″	° ′
Trembling Portage - -	29·1	61	June 21 3 3 31	+2 39·9	4 40+	⊙ 94 36 26	N. 103 53 E.	89 59 48 W.	48 31 5 N.	6 21 E.
On Kaministoquoia - -	28·9	56	„ 21 8 50 46·5	2 39·9	4 40	95 4 52	N. 243 54 E.	89 58 10 W.	48 40 00	5 14 E.
In lat. 48° 45′ N. - -	28·8	57	„ 22 15 59	2 43·2	4 40	Varn. by hr. ∠	N. 91 36 E.	89 53 0 W.	48 45	8 54 E.
In lat. 48° 55′ N. - -	28·75	69	„ 23 2 20 53	2 44·7	4 40	Ditto	N. 91 49 E.	89 53 48 W.	48 55	9 5 E.
Savannah Portage - -	28·62	84	„ 25 2 0 45	2 49	4 40	⊙ 72 23 25	N. 88 35 E.	90 5 0 W.	48 53	6 53 E.
Perch Lake - - -	28·44	81	„ 27 12 17 22	2 54·5	4 40	30 30 10	N. 279 40 E.	91 12 0 W.	48 35	8 14 E.
In lat. 48° 27′ N. - -	29·05	51	„ 29 1 16 57	3 3·9	4 40	Varn. by hr. ∠	N. 75 30 E.	92 30 0 W.	48 27	9 53 E.
Fort Francis - - -	29·0	85	July 1 4 19 96	3 5	4 40	⊙111 1 38	N. 118 15 E.	93 30 0 W.	48 36	9 31 E.
In lat. 48° 50′ N. - -	29·45	83	„ 3 3 34 32	3 12	5 51	95 25 11	N. 101 00 E.	93 58 0 W.	48 50	11 20 E.
In lat. 49° 26′ N. - -	29·39	85	„ 4 3 20 9	3 14	5 51	89 6 6	N. 96 35 E.	94 48 0 W.	49 26	10 17 E.
In lat. 50° 15′ N. - -	- -	- -	„ 6 3 2 29	3 16	5 51	84 29 16	N. 91 25 E.	95 17 19 W.	50 15	13 7 E.
Lake Winipeg - -	- -	- -	„ 10 10 9 3	3 28	5 51	74 26 40	N. 244 49 E.	96 34 0 W.	50 33 48	14 41 E.
Ditto - - - - -	- -	- -	„ 11 2 29 0	3 30	5 2+	73 33 3	N. 84 43 E.	96 30 25 W.	50 23	14 9 E.

N.B. The Tabulated Longitudes are not deduced from the Tabulated Altitudes—the *Variations* only.

JOHN WM. SULLIVAN,
Secretary to the Expedition.

Approved as correct.
JOHN PALLISER,
July 17, 1857.

Locality.	Barometer.	Thermometer.	Chronometer Times.	Error on G.M.T.	Ind. Er.	Mean of Observed Alts.	Latitude.	Longitude.	Remarks.
		°	d. h. m. s.			° ′ ″	° ′ ″	° ′ ″	
Fort William - -	29·5	64	June 13 1 41 18·6	+2 20·3	4 40+	68 41 20	48 24 10 N.	89 26 10 W.	All the results are deduced from a mean of five observations.
Trembling Portage - -	29·1	61	„ 21 2 44 55·4	2 39·9	„	88 43 14	48 31 5	89 59 48	
Dog Portage, W.E. - -	28·8	57	„ 22 2 29 17·2	2 42·3	„	83 37 24	48 46 11	89 54 45	W.E. = West End.
Dog River, R.B. - -	28·75	69	„ 23 2 14 14·5	2 44·7	„	78 28 12	48 56 0	89 54 48	R.B. = Right Bank.
Savannah Portage - -	28·62	84	„ 25 2 4 27·1	2 49·6	„	74 41 8	48 53 2	90 13 46	L.B. = Left Bank.
Barrier Portage - -	28·85	79	„ 26 10 31 23	2 52	„	63 59 56	48 45 58	90 51 24	S.S. = South Shore.
French Portage - -	28·39	79	„ 27 4 1 36·6	2 54	„	109 17 10	48 40 0	91 11 30	
Camp Portage - - -	28·37	81	„ 29 13 21 47	3 1·5	„	11 48 20	48 15 57	92 28 28	
In lat. 48° 27′ 5″ N. - -	28·4	94	„ 30 1 9 54·5	3 3·9	„	53 10 20	48 27 5	92 30 4	
Fort Francis - -	28·41	73	July 1 11 52 3·8	3 3·4	„	40 57 0	48 36 15	93 33 33	
Rainy River, L.B. - -	28·5	86	„ 3 3 40 27	3 9·3	5 51+	99 7 40	48 50 0	94 14 19	
Portage de Bois - -	29·06	86	„ 4 2 29 20	3 11·7	„	75 30 48	49 26 8	94 48 7	
Winipeg River - -	29·0	89	„ 5 2 58 49·8	3 14·1	„	84 28 40	49 55 0	94 45 30	
Ditto R.B. - -	28·95	92	„ 6 2 52 35·6	3 16·1	„	81 26 3	50 15 6	95 17 19	
Lake Winipeg, S.S. - -	29·0	93	„ 11 2 24 30·7	+10 55	5 2+	72 26 0	50 22 58	96 30 25	

JOHN WM. SULLIVAN,
Secretary to the Expedition.

Approved as correct,
JOHN PALLISER,
July 17, 1857.

No. 4. No. 4.

Copy of a REPORT from Captain Palliser to Her Majesty's Secretary of State for the Colonies.

Fort Pembina, Hudson's Bay Company's Territories,
July 27, 1857.

Sir, (Received October 3, 1857.)

In continuation of my Report of the 16th July, I have the honour to inform you of the departure of the Expedition from Fort Garry to Fort Pembina, on the 21st instant.

I have now engaged twelve men, thirty horses, two small waggons, and five carts. In consequence of the absence of buffalo in this portion of the country, I am obliged to carry along with me a considerable quantity of provisions to last until we arrive sufficiently far to the westward to fall in with these animals. For this purpose I found the small heavy carts of the country not sufficient, and, contrary to the advice and prejudices of the people, bought two small American waggons, and have found them most efficient.

I was not disappointed with the class and condition of the horses obtained for me by the Hudson's Bay Company, as I have all along been aware that the half-breeds of Red River have taken their best horses to the summer buffalo hunt.

I have, in order to save as much extra travelling as possible to the horses, sent on four men, with four carts and ten horses, straight to Beaver Creek, with orders to await our arrival in that quarter; while Dr. Hector, Mr. Sullivan, and myself take the route thither, viâ Pembina and Turtle Mountain. This arrangement will serve to recruit my horses, whose pasture hitherto has not been good.

On leaving Fort Garry we crossed the river Assineboine, and proceeded up the Red River for nine or ten miles, in a course a little east of south, through copse and light timber. We crossed the river Sall nine miles from Fort Garry, a river about twenty-five yards wide, but not put down on the maps. Shortly after this we emerged on the open prairie over a well-defined road, indicating a far greater amount of traffic than I had expected to find.

Owing to the peculiar distribution of the wood, which consists principally of fine oak trees, and is confined principally to the right bank of the river, the tortuous course of which is very distinctly marked by jutting promontories, called by the people "points," I observed that the agricultural resources of the country were not merely confined to Red River Settlement, for the country through which we passed assumed fully equal and in some places even superior advantages, being more elevated above the river. I had an opportunity of noting the nature of the soil, where a settler was digging for marl about six feet deep, and again at Pembina, where I had a special examination made. It consists of about one foot of black vegetable mould resting on a free clay loam of a light grey colour, but very deficient of sand.

The banks of the rivers in this country are composed of remarkably tenacious clay mud, rendering access to them very difficult, and great care is required in passing a cart or waggon across. On 22d we crossed Rivière qui Grate, situated thirty-eight miles south of Fort Garry: this river, as well as the Rivière Sall, we passed in pontoons. The ferryman here was a very intelligent American, who had recently arrived in the country by a route from the Lake of the Woods, following the course of Reed Grass River.

He described the first twenty-five miles west of the Lake of the Woods as being flat and swampy; he partly paddled and partly dragged his canoe over a slightly rising country until he reached Reed Grass Lake, out of which a river of the same name flows. The country about the head waters of this river is swampy, but the lower half of its course, according to his account, flows through a dry and finely wooded country; but he described the river as shallow and swift, only fit for very small canoes.

I observed large pieces of driftwood scattered about the higher spots of the prairie, indicating the extent to which the whole country is flooded in spring. By measurement, I ascertained that last spring the water rose thirty-five feet above the present level of the stream, and it is by no means unusual for the flood to reach ten feet higher. Opposite Fort Pembina the river is about eighty yards wide and twelve feet deep; in dry seasons it falls five feet lower. From Mr. Iddings (an American Civil Engineer, whose name will appear in this Despatch), I ascertained that the river is fifteen feet deep 200 miles further up, but there its width is reduced to ninety feet, and the frequent occurrence of sharp bends in its course would make it difficult to ascend in steamboats.

The mouth of Pembina River, which flows from the west into Red River, is situated about two miles south of the boundary line. Upon this river, at a distance of about twenty-five miles from this, I am informed that there is a thriving American town called San Josef's, which, owing to its recent establishment, is not yet recognized in our maps.

On Friday, July 24th (the day after my arrival here), my Secretary Mr. Sullivan and I took the meridian altitudes of the sun, in order to find the locus of the 49th degree of north latitude, and to determine the direction of the Boundary line.

We were shown at the same time a post driven into the earth to indicate a similar observation taken by Mr. Nicolay, an American gentleman, well known in the American scientific world.

On this occasion I availed myself of the valuable assistance of Mr. Iddings, the gentleman to whom I have alluded above, and who is commissioned to lay out lots of land from the frontier line southward, purchased by an American Land Company; and this gentleman, with my Secretary Mr. Sullivan, placed another post at about 300 yards in the direction of true west, making the necessary allowance for the variation of the compass here, which Mr. Sullivan found to be 14° E.

Mr. Iddings informed me that the Land Company by whom he is employed intend to build a town here, and establish a railway station, about two miles distant from the posts whose positions we have established. As yet the place is but a wild waste. The Hudson's Bay Company's Fort, where we have been residing for the last two or three days, is a very small shabby establishment, and the American one, situated about two miles on the other side of our present line, is still smaller and more wretched in appearance.

It, however, professes to be a Post Office, and carries a mail, said to be a monthly one, from St. Paul's; but as the Postmaster is away at present, and left the place under care of an Indian woman, who speaks no other language but her own; consequently I cannot form very accurate ideas as to the safety of any letters committed to its care. Still however, I am induced to forward these by the assurance of an intelligent half-breed, who told me that the Post Office here is "a very lucky one."

Enclosure. Enclosed is a Note of the Observations made on the direction of the Boundary line, drawn up and signed by myself and the two gentlemen engaged in the survey.

I have, &c.

(Signed) JOHN PALLISER, Captain,
Commanding the North American Exploring Expedition.

Encl. in No. 4.

Enclosure in No. 4.

NOTE of OBSERVATIONS at PEMBINA by Captain PALLISER, Mr. IDDINGS (U.S.), and Mr. SULLIVAN.

AN Observation taken at the above place by Mr. Nicolay in 1848–49 places a post in latitude 49° 0′ 0″ N.

An Observation taken by Capt. Palliser places the same post in latitude 48° 59′ 49″ N.

Mr. Iddings (U.S. Civil Engineer), and my Secretary Mr. Sullivan, after ascertaining the variation of the compass at place, erected a second post, distant from the first 270 yards due east thus determining the direction of the Boundary line.

JOHN PALLISER, Captain,
Commanding British North American Expedition.
C. W. IDDINGS, C. E. (U.S.)
JOHN SULLIVAN, Secretary,
and Astron. Assistant to the Expedition.

No. 5.

No. 5.

COPY of a REPORT from Captain PALLISER to HER MAJESTY'S SECRETARY OF STATE FOR THE COLONIES.

Montreal, Canada East, December 8, 1857.

SIR, (Received December 29, 1857.)

IN continuation of my Report of the 27th July 1857, I have the honour to inform you of the further progress of the North British American Exploring Expedition.

On September the 28th I arrived at San Joseph, an American town, about seven miles south of the British frontier line; the population consists of British as well as American half-breeds, whose chief dependence is on the proceeds of the buffalo hunt, and while the more youthful part of the male population are away on the hunt, the then defenceless inhabitants are subject to the inroads of the Sioux Indians. These Indians last year attacked that settlement, stole almost all the horses, and shot a woman and the

schoolmaster; indeed hardly a year passes over without some similar depredations. Although that bend of the Pembina River on which St. Joseph is situated is inside the United States territory, yet the greater part of the river's course is through the British dominions. It is an important river, and may hereafter prove valuable as affording facilities for navigation. I have therefore had its course correctly laid down in our charts.

On the 4th August we reached Turtle Mountain, a hill rising out of the prairie to about three hundred feet; it is thirty miles long, ten broad. This hill is one of a series that we have since traced scattered irregularly in a line from S.E. to N.W. The boundary line passes through the summit of this mountain, throwing the "Souris" or Mouse River into the British possessions. This river has hitherto been wrongly laid down in all maps, and I have therefore also paid strict attention that its course should be carefully laid down in our charts.

August 15th. We reached Fort Ellice on Beaver Creek. Here I found the men I had sent direct from Fort Garry with the ten horses, and as these had now more than a week's rest, I took these ten horses on an expedition to "La Roche Percée," leaving the horses that had been hitherto travelling with myself to recruit.

Proceeding on a S.W. course from Fort Ellice, we arrived on the 18th of August at Moose Mountain, one of the chain of hills above mentioned; it, like the Turtle Mountain, is covered with dense woods, lakes, and swamps.

On the 20th August we arrived again on the Mouse or "Souris" River, and here Dr. Hector first discovered coal of a very fair quality. From this point of the Mouse River an hour's ride brought us to the "Roche Percée;" a singular appearance is here produced on the rocks and stones by combined action of the atmosphere and water; the layers of sand and clay forming these being unequal in hardness, are worn accordingly in grotesque shapes, affording more astonishment to the Indians and half-breeds visiting the spot than interest to the geologist on a more close examination.

Here I was visited by a large number of Stone Indians, celebrated as the greatest horse thieves in the country. However, I concealed all apprehension for my horses. I also discovered that meat was a very scarce article among them, as they had not fallen in with buffalo for many days. I had, however, been fortunate enough to kill two bulls that morning, and secured their good offices and the safety of my horses by giving them the meat, inviting them to cook and prepare their own feast, to which I added some tea, sugar, and flour, desiring them in return to guard my horses all night, which injunction they regarded as a compliment, and faithfully performed.

The following day we returned, and reached Fort Ellice on the 25th of August.

On examining the horses I had left behind at this post when I started for "Roche Percée," I found them not sufficiently recruited to proceed westward to the Elbow. I therefore determined to wait a few days longer. I likewise found that my guide and interpreter was so frightened at the prospect of entering the Blackfoot country, that he gave me very false interpretation as to the facilities of the route I intended (according to my instructions) to adopt. I therefore started a messenger to Mr. Christie, the chief officer of the Hudson's Bay Company, requesting the services of Mr. M'Kay, the officer in charge of Fort Ellice, as an interpreter to accompany me on the expedition. Mr. Christie on receiving my letter rode three day's journey to meet me at Fort Ellice, and brought with him a gentleman to put in Mr. M'Kay's place; thereby putting the valuable services of the latter at my disposal. In the meantime on the 7th of September, finding my horses sufficiently rested to resume operations, I started the Expedition under Dr. Hector for the Qui Appelle Lakes, and remained behind at Fort Ellice until I should see or hear from Mr. Christie, whose subsequent arrival on September 9th, set Mr. M'Kay at liberty, and after accounts were made up and transferred, I started on horseback, accompanied by M'Kay and two of my men, who had remained behind for the purpose, and overtook the Expedition in three days at the Qui Appelle Lakes, about 135 miles west of Fort Ellice.

On Sunday, September 13th, we remained at the Qui Appelle Lakes. Here the Hudson's Bay Company have a small trading post, the most western fort in the territority, and there we found a large camp of Crees arrived for trading. I sent for Mr. Pratt, the missionary, requesting him to come and pay us a visit. He is a pure Cree Indian, educated at Red River. He reports the Crees as beginning to apprehend scarcity of buffalo, and many are most anxious to try agriculture. He thinks that if they had agricultural implements, such as spades, hoes, and ploughs, they certainly would commence operations. This opinion I found pretty general among the people of the Hudson's Bay Company, and I am persuaded much good could be done by importing the simpler kinds of agricultural implements. Pratt has set the Indians an excellent example himself, and

grows capital Indian corn, barley, and potatoes. The Qui Appelle Lakes may be considered the most western part of the territory east of the Rocky Mountains, to which the Hudson's Bay Company trade; westward of this I may say is unknown, and the whole country in this latitude is untravelled by the white man.

Among the Indians that had come to trade was a man Mr. M'Kay was acquainted with. This man was a remarkable exception to the generality of Indians: they call him "the Peacemaker," and twice within the last two or three years he pushed his way alone into the Blackfoot country, and walked into the enemy's camp unarmed, with the peace-pipe in his hand, exhorting them to peace, and offering them the alternative of killing him. The result on each occasion was a treaty of peace to the Crees and a present of horses to the Peacemaker. I engaged this Indian to guide us to the Elbow.

On September the 14th we started from Qui Appelle Lakes for the Elbow on the south branch of the Saskatchewan, sometimes called the Bow River. On September 16th we again camped on Mouse or Souris River, at a tributary called by the Indians Moose Jaw Creek, in longitude 106°; up to this point in our journey we had suffered no inconvenience from want either of wood or water; here, however, our guide, the Peacemaker, advised us to bring wood along in our carts, as we should see no more until we came to the Saskatchewan, which we first came in sight of at sunset on the 21st of September.

We were now in the heart of the buffalo country. This region may be called a buffalo preserve, being the battle-ground between the Crees and Blackfeet, where none go to hunt for fear of meeting enemies, and where those who go to war abstain from hunting. The whole region as far as the eye could reach was covered with buffalo, in bands varying from hundreds to thousands. So vast were the herds that I began to have serious apprehensions for my horses, as the grass was eaten to the earth, as if the plain had been devastated by locusts. However, the timber on the small tributaries of the river kept off the buffalo, and so a little grass was obtained for the horses, for the buffalo shuns the timber until mid-winter.

At the Elbow I found a large tributary flowing from the east into the Saskatchewan, and I despatched Dr. Hector with one or two men to trace the course of this river, which I find flows from the most western of the chain of "Qui Appelle" Lakes, being navigable to large boats the whole way. Hence I have been able to ascertain that there exists a valuable water communication between the South Saskatchewan and Red River, and that a good sized boat, and even perhaps a small steamer, might descend from the South Saskatchewan, ascend the West Qui Appelle River, cross the Qui Appelle Lakes, and then descend the Qui Appelle into Red River.

After the Doctor's return from exploring the western "Qui Appelle" we commenced our ascent from the Elbow, and reached the 109° meridian of longitude on the 28th of September. This magnificent river rivals the Missouri in size and volume, and even at this (the lowest state of water during the whole year) was navigable for craft of any size, as I found by sad experience, having been so unfortunate as to lose one of my waggons in the channel of the river at a depth of sixteen feet, where I subsequently crossed it. All particulars of this river, its timber, capabilities, &c., will be found in my journal, which I hope to have the honour of forwarding to England next spring. The 109° of longitude is the furthest point to the westward that I have this season explored. At this point I crossed the river to the north side, and started on a north-east course for Carlton, my winter quarters, where we arrived on the 8th of October.

I have endeavoured to conduct the Expedition with the greatest economy, and feel happy to say that I have as yet no apprehension of the grant for 3,000*l.* for the first year ending March 31st, 1858, being overdrawn, although I received and obeyed my orders to adopt the canoe route in June last, a most expensive one, and one for which I never estimated. Also a large amount for instruments (per Lieut. Blackiston) over which I have had no control. I have now paid all the men engaged, and discharged them with the exception of four, who remain at Carlton through the winter, to hunt, cook, chop, and look after the horses, and one at Red River to accompany me on my return early next spring, before the breaking up of the ice. I hold now for Her Majesty's Government forty horses, together with carts, harness, arms, instruments, &c., to the value of 1,000*l.* and upwards. The horses, owing to the great care and watchfulness which has been exercised towards them, will be far more serviceable next season than they were the last one, owing to the wretched condition in which I was obliged to receive them. Three days after the arrival of the Expedition at Fort Carlton, and as soon as I had paid off the men and made further necessary arrangements for sending them home to Red River, also as soon as I had arranged matters for the gentlemen and the men who were to winter there, I started on hired horses with Mr. M'Kay for Canada, finding it necessary to see and confer with Sir George Simpson, for the purposes and objects of the Expedition, also in order to put

myself in communication with the Colonial Office at home, with a view of receiving further instructions, to which I shall beg leave to draw your attention at the conclusion of this letter.

I started from Carlton (Upper Saskatchewan), October 11th; reached Touchwood Hills October 15th; Fort Pelly, October 18th; Fort Ellice, October 23d; and on the 1st of November arrived at Red River. This portion of my journey was very cold, accompanied with snow, almost every day, yet not sufficient to delay me or cause me much inconvenience. At Red River I found very great difficulty in obtaining horses and a guide to Crow Wing, Minnesota Territory, but at length succeeded for the sum of 65*l.* in obtaining the services of a half-breed, named Robert Tate, and his horses, to take me there, a distance of about five hundred and twenty miles. For this sum I was supplied with a horse to ride, besides the horses necessary to carry our baggage, bedding, and provisions. Unfortunately, however, my horse was killed at Pembina, and I had to go on foot about four hundred and fifty miles of the way: the snow, however, was so deep, and the weather so cold, that it did not much signify, and we arrived at Crow Wing on the 19th of November.

From Crow Wing there is stage conveyance to St. Paul's and Prairie "Le Chien," partly by coach, and principally by waggons and sleighs. At Prairie "Le Chien" is the railway terminus, from which I proceeded, viâ Chicago and Detroit, to Montreal.

On my arrival here, I lost no time in conferring with Sir George Simpson, and settling the accounts of the Expedition for this year. I have therefore, according to my instructions, drawn on Her Majesty's Paymaster-General for 2,000*l.*, thus leaving a balance of 350*l.* to meet a few small accounts not yet received at Lachine from the more remote posts of the Hudson's Bay Territory, also the stores from York factory for winter clothing and consumption sent by boat this summer to Carlton.

While I was at Red River on my way to this, I made my arrangements for proceeding next spring with the Expedition by engaging twenty men, and ordering them to proceed on the 10th of March 1858, with a sufficient number of dog sleighs to convey their provisions up to Carlton, in order that all may be in readiness for as early a start as the season will permit. My course will be in the first instance to visit Eagle Hills, and thence to strike for the south branch of the Saskatchewan, and renew my explorations at that point where I left off at the end of September. I regret that I am obliged to engage so many men, as their pay and small rations will increase the expense of the Expedition; but with a smaller number it would be the height of imprudence to venture into the south-western part of the Blackfeet and Pegan country. A smaller number would only invite the Indians to attempts on the horses. It is true I have hitherto only travelled with thirteen men, but the Indian camps I have met (with one exception at Roche Percée) were small ones, but next year the camps I shall fall in with are much larger, and to meet this I must increase the number of my men to thirty in all, viz., four men at Carlton; one man at Red River still under pay; five at Carlton to commence pay on April 1st, 1858, at 15*l.* for six months; and 20 from Red River to commence pay March 10th 1858, at 20*l.* for six months. After this dangerous country shall have been traversed, much fewer men will suffice, by returning to the settlement on the Hudson's Bay Company's beaten track viâ Edmonton, but the country the Expedition will have to traverse next year in order to fulfil its objects will be so great that it would be impossible to fulfil my orders of sending the Expedition back in time to reach St. Paul's in the fall of 1858.

Under these circumstances, I think it of great importance that Her Majesty's Government should communicate to me further orders; and I should suggest that my services be taken for another season, and that the Expedition should winter in the country between the forks of the Red Deer River, and the Rocky Mountains in the winter of 1858. Thus all the objects in investigating and exploring the country, for both physical and scientific purposes, would be fully attained.

I intend to leave this for New York immediately, there to await the favour of an answer to this letter, and whether it will be the pleasure of Her Majesty's Government to extend the time granted for the Expedition until the fall of 1859.

Should Her Majesty's Government wish to consult with me in person, there would be sufficient time to convey their intention to do so to New York, and for me to repair to the Colonial Office, London, and afterwards return in sufficient time to reach Fort Carlton in spring.

All the chief expenses of the Expedition have been incurred; viz., a most expensive canoe route, also arms, provisions, &c., and finally a large number of horses bought; all of which expenses will have to be undergone for the next Expedition which will have to succeed mine, in the event of our being recalled in 1858, with our explorations

incomplete, owing to too short a space of time for examining so large a territory; add to this the fact, that the mineral resources of the British Rocky Mountain territory are utterly unknown, and the assurances of more than one gentleman in the service of the Hudson's Bay Company of having found specimens of nikel, lead, and gold in that region.

My address will be, St. Nicholas Hotel, New York, U.S.; and anxiously awaiting your further commands,

I remain, &c.

Her Majesty's Secretary of State
for the Colonies.

(Signed) JOHN PALLISER, Captain,
Commanding North British American
Exploring Expedition.

No. 6.

No. 6.

COPY of a REPORT from Captain PALLISER to HER MAJESTY'S SECRETARY OF STATE FOR THE COLONIES.

Fort Garry, Red River, May 3, 1858.

(Received June 26, 1858.)

SIR,

I HAVE the honour to report my arrival at this post, on my way to join the Expedition, and recommence my explorations this year from Fort Carlton.

I shall still be obliged to wait for some days until the grass is sufficiently forward to enable me to proceed on horseback.

Although the snow has disappeared, yet, owing to the cold northerly winds that now prevail, the grass is now quite as backward as it usually is at this period of the year, although the winter has been an extraordinarily mild one; I hope, however, that I may be able to start on or about the 10th instant.

I accomplished my voyage from Crow Wing (Minesota territory) to this place in a month, in a canoe, assisted by two half-breeds. We punted up the Crow Wing and Leaf Rivers, carried the canoe across the height of land from Leaf Lake to Ottertail Lake, but in attempting to cross the latter to the south shore we narrowly escaped being crushed in the ice; however we extricated ourselves, and were consequently obliged to extend our portage along the eastern shore round to the mouth of Ottertail River (the principal head of Red River). Down this river we ran all the rapids but one, making there quarter mile portage, joined the main stream of Red River at "Bois des Sioux," and came down to Fort Garry.

Six Enclosures.

I have the honour to enclose you Lieutenant Blakiston's letter on the subject of the Hudson's Bay and York Factory voyage up to Carlton on the Saskatchewan; likewise Dr. Hector's Geological Report of 1857, which I will thank you to be so kind as to place in the hands of Sir Roderick Murchison.

I have received an English translation of Mons. Bourgeau's Report of the Botany and Flora of the country, which I should likewise have had the honour of forwarding to you, but, on reading the document, I find it so full of mistakes that it was attempted by an incompetent person. I therefore prefer deferring its transmission until after my arrival at Carlton, when I shall forward Mons. Bourgeau's Report in the original, with a request at the same time to have it placed in the hands of Sir William Hooker.

I have likewise received the map of the country, copied out by Lieut. Blakiston from the detached charts we ourselves made on the route. Unfortunately he made but one copy, and as I have not the means here of making a copy for myself, I will likewise defer forwarding it until after my arrival at Carlton.

I have the honour of forwarding the Astronomical Observations enclosed in a letter from my Secretary, Mr. Sullivan.

I have, &c.

(Signed) JOHN PALLISER, Captain,
Commanding North British American
Exploring Expedition.

P.S.—As almost the whole of my recent voyage has been through United States territory, I have not intruded a more detailed account on your attention; and I only wish further to observe, that my descent of the whole of the Red River from its principal source, has enabled me to judge of its great facilities for Steam Boat Navigation.

J. P.

Her Majesty's Secretary of State
for the Colonies.

Enclosure 1. in No. 6.

Encl. 1. in No. 6.

Fort Carlton, Saskatchewan River, 3d January, 1858.

SIR,

As the subject of a communication between Red River Settlement and some civilized portion of the British Dominions is beginning to attract some amount of public attention, and as two indifferent routes are at present in use, one of which, namely, that from Canada, via Lake Superior, Rainy Lake, and the Lake of the Woods, you have this last season traversed, and will no doubt have made a report on the same, while during the same season I have passed the other, namely, from England, via York Factory, on Hudson's Bay, and Lake Winnipeg, I have the honour to lay before you my observations on the same for the information of Her Majesty's Government.

Description of Boats used in River Navigation.

In the first place, the mode of transporting passengers and goods between York Factory, Hudson's Bay, and Red River, which is at present, and has been for many years in use, is by means of large wooden boats built in the country, and well adapted for this kind of navigation. Each boat is of the following construction:—Length of keel 30 feet, over all 42 feet, which gives considerable shear equally to both stem and stern-post; breadth of beam 9 feet, sharp at both ends, depth inside 3 feet, and when loaded with 70 "pieces" (about 56 cwt.), besides the crew, oars, sail, mast, &c. draws two feet of water; it is steered by means of a long sweep passing through a ring made fast to the stern-post, except under sail when a rudder is shipped.

Voyages.

Each boat is manned by one steersman, one bowsman, and six or seven middlemen, who, mostly half breeds of French-Canadian or British descent, labour in the service of the Hudson's Bay Company for very moderate wages; their food, however, which consists of "pemmican" and flour, being supplied by the Company, as much as they have need of: in fact, were it not that they have plenty of good working food, they certainly could not continue this labourious work.

Up-passage.—Description of the Route.

The spring floods having subsided, the upward journey is performed as follows:—Leaving York Factory, which is situated on the left bank of Hayes River, five miles above its mouth, it is possible with a fair wind to sail about six miles to the head of the tide, at which place poles and the tracking line are obliged to be used for the purpose of passing some shoal places; from this sailing or "tracking" (hauling the boat in the manner of a canal barge by a line with four men walking on shore), with occasional poling over shoal places, is continued for a couple of days, after which the continual bends of the river and the strength of the current prevent the use of the sail, the mast, a rough pole, is therefore thrown overboard, and tracking with occasional poling is continued until the Rock Portage is reached, 124 miles above York Factory.

Work of Men.

Tracking is hard work for the voyagers, they take it turn about, an hour and a half at a time, in fact this river work, to say nothing of the "carrying" at the portages where many are injured, is very laborious and trying, particularly considering the fact of their being almost continually in wet clothes, from the necessity of frequently jumping into the water for the purpose of lifting the boat over stones, and their having to "track" over all sorts of ground under the high alluvial banks, often where scarcely foothold can be obtained.

Time occupied.—Nature of the Country.

This 124 miles of river, in my case, travelling with a brigade of six boats, lightly loaded, namely, with 50 pieces, was accomplished in six days. The river runs in a deep channel through alluvial soil, where not a piece of rock is seen, save the boulders in the bed of the river; from this first impediment westward to Lake Winnipeg the geological formation is primitive, the rock, which is nearly always at the surface, being granite and schist, and the whole country being but little elevated above the water.

Description of the Route.

Portage after portage, with occasional intervening lakes, succeed one another in rapid succession, over some of which the boats have to be carried, but at others hauled up the rapids by ropes, and the cargoes carried over land; suffice to say, that in the next 40 miles 20 portages are made, taking five days. After this two lakes of considerable size, Knee and Holey Lakes, are passed with four portages between them, soon after which the River Wepinapanis narrows so much that the oars sometimes touch granite rock on each side, which rises vertically to a considerable height. Before emerging from this narrow gorge which continues for some miles, some very bad rapids have to be surmounted, and again before arriving at White-water Lake a portage for cargoes and boats of two-thirds of a mile has to be made, in order to avoid the White Falls. The end of a narrow lake is within a few yards of the source of the Echiamamis, a small stream whose waters flow to the westward; when sufficient water is only kept for the passage of boats by two dams six miles apart, these were formerly the work of beavers, but are now kept up by the passing boats. At the passage of a boat a portion is pulled away, the boats run through, and it is again shut securely. This stream, which on account of dams has little or no current, is for the most part through marsh, and so narrow that the Willows nearly meet over head, and the boat sometimes touches the bank on each side. At a distance of 358 miles from Hudson's Bay, Lea River is entered, when, by making the last of the 35 portages, and pulling against stream, Norway House, a post of the Hudson's Bay Company is reached, from which to Lake Winnipeg is but 20 miles without rapids.

Up-passage, Distance, and Time.

Thus, from York Factory to Norway House, a distance of 400 miles, is accomplished only after laborious work for three weeks. The time for the passage across Lake Winnipeg to Red River, 300

miles, depending entirely on the wind, may be taken on an average at seven days; making the entire distance from York Factory, Hudson's Bay, to Red River Settlement, 700 miles, in four weeks on the upward passage.

Down Passage.

The passage down stream from Norway House to York Factory, being accomplished in nine days, making about half a dozen portages, at three of which the boat is carried over, one being the two-thirds of a mile portage, all the other rapids being "run," not, however, without considerable risk, makes the passage from Red River to York Factory sixteen days.

Entire Passage.

Thus to go to and from Red River to Hudson's Bay without stoppages, is about seven weeks.

Another Route.

The outlet of the waters which are collected in Lake Winnipeg from the Saskatchewan, Swan River, Red River, &c. is from the north end of the Lake by Nelson River, which flows into Hudson's Bay at the mouth of Hayes River; but the falls and rapids are said to be so very heavy on this river, besides its being the longer route, that it is now never used.

Impossibility of Improvement for Steamers.

It has been proposed to improve the former route in order to allow of the passage of steamers, this however from the foregoing description will be seen to be impossible: for, if by cutting through solid granite and swamp and the construction of locks, the portages could be avoided and the smaller rivers widened, yet in the lower rivers the want of water could only be overcome by dredging, which operation would be entirely destroyed by the spring floods; and I think that it would be the opinion of any observing person passing through this route, that it would be impossible so to improve it as to allow of the navigation of anything larger than the boats (previously described) at present in use; and certain it is, that the future produce of the vast western plains could never be transported in this manner.

Hudson's Bay.

But were a route practicable there exists a consideration, which is above all others; namely, that from the outlet of Hudson's Bay being so far north, and the amount of ice in the bay itself, vessels cannot remain more than six weeks out of the whole year at York Factory, with a chance of afterwards being able to make their way out again to the Atlantic.

Natural Outlet.—Land Route proposed.

No doubt the natural outlet of this great western district is across an easy country to the water of the Mississippi and Missouri, which if first established the West is lost to Britain. It behoves us, therefore, to establish a route through our own territory, for the encouragement of emigration to, and the transport of the future produce from Red River and the great Western Plains to Canada. Now, as the water route from Lake Superior to Red River which you have traversed is of a still more amphibious nature than the more northern one described in this report it seems natural that we should look for a land route; I would therefore suggest a search for such a one, considerably to the north of the eastern part of the canoe route, namely, from a port on the north shore of Lake Superior crossing to the north end of the Lake of the Woods, which, as well as being quite as convenient for the lake navigation by steamers, would be on the line of a continuous railway from other portions of Canada and the United States; besides being much more preferable in a military point of view, than a route near the boundary line.

Means of Transport.

Steamers will no doubt navigate Lake Winnipeg and Red River, but the Saskatchewan being distributed at its mouth by a large rapid, and at other places by minor ones, besides the upper part containing numerous shifting sand bars, will likely be little used for navigation, particularly on account of the very level nature of the country westward from Red River and Lake Winnipeg, so suitable to the formation of Railways, which I doubt not will be the first means of transport on a large scale on these plains.

Postal Communication through United States.

At present there exists no postal communication between Canada and Red River except through the United States.

I have, &c.
(Signed) THOMAS BLAKISTON,
Lieut. R. Artillery.

John Palliser, Esq.,
&c. &c.

P.S.—By the arrival of the packet, I hear that the Canadian Government having granted a sum of 5,000*l.* for the establishment of a route between Lake Superior and Red River: an engineering party is at present employed in laying out a road from the Lake of the Woods to the settlement of Red River, to form the western section of the route.

29th January, 1858.

T.B., Lieut. R.A.

Enclosure 2. in No. 6.

Encl. 2. in No. 6.

Fort Carlton, Hudson's Bay Territories,
December 12, 1857.

SIR,

IN compliance with your desire I have drawn up a general report, embodying the principal geological results of the exploratory journey made during the past season, in anticipation of a more detailed report to be completed during the leisure of the winter.

This report I have the honour of communicating herewith.

I have, &c.
(Signed) JAMES HECTOR.

To John Palliser, Esq., Commander of the North British Exploring Expedition.

Enclosure 3. in No. 6.

Encl. 3. in No. 6.

FIRST GENERAL REPORT on the GEOLOGY of the COUNTRY examined by the Expedition under the command of John Palliser, Esq., during the Season of 1857.

THE journey made by the Expedition during the first season has embraced two very different methods of travelling, marking regions of distinct geological structure and physical appearance. The first of these is the canoe route from Lake Superior to Lake Winipeg: the second, the journey across the plains from Fort Garry to Fort Carlton.

The general structural features of the country travelled over on the canoe route, so far as they can be learned from a single line of traverse, have already been well described by Mr. Keating, Sir John Richardson, Dr. Bigsby, and others, but from the complicated relations of the rocks of which it is composed, no detailed observation can be of any value until they are extended in every direction by means of an elaborate topographical and geological survey.

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, and other metamorphic rocks, with intrusions and outbursts of granite, probably of very different ages. From observations made in the course of our journey, it appears that there are two distinct directions of strata in the rock which compose this axis, marking it into two districts, one from Lake Superior to Rainy Lake, the other from Lake of the Woods to Lake Winipeg. Not only the general strike of the altered and upheaved rocks in these two districts, but also the direction in which the water courses affect the principal descents, and the manner in which the lakes in each of them are arranged, all indicate a different direction of the elevating and disturbing force, in other words, two different axes.

These seem to converge towards the south, including an angle of about 25°, the eastern one being directed from the north-east to south-west, while the western one lies much more nearly north and south. In each of these there is a great central district, where nothing but rounded bosses of granite are seen occurring as ridges and islands, which rise little above the level of the flooded country in which they occur. On either side of these two granite districts metamorphic rocks are ranged, with great seeming irregularity as regards their order and dip, but still on the whole preserving their direction very consistently with the bearing of either of the two axes to which they belong. There are besides many minor outbursts of granite as dykes and intrusions, but they do not seem to interfere with above-mentioned general bearings of the country. In a sketch map (sheets 1 and 2) * which accompanies this report, copied from Sir John Franklin's second voyage, the "strikes" have been laid down, and a section drawn at right angles, expressing the various levels, obtained partly by observation and estimate, and partly from authorities cited in Sir John Richardson's "Boat Voyage."

* See Maps 1 and 2 at the end of this Report.

By referring to these it will be observed, that in the district between Lake Superior and Rainy Lake the summit level is reached by an abrupt and rapid ascent in a direction at nearly right angles to the main eastern axis. Then follows a long traverse, almost along the summit of that axis, and then an abrupt but comparatively short descent to Rainy Lake again at right angles to the axis.

The first great step in the ascent from the east is made at the Kakabica Falls, where, from a succession of faults which mark the commencement of the more highly metamorphosed rocks, a sudden elevation is effected, the summit level of which is 179 feet above Lake Superior at Fort William.

Sheet 3† is a sketch map of this part of the River Kaministoquoiah, showing what is probably the structure of the fall.

† See Map 3 at the end.

About one mile below the fall a fine section is exposed in the form of a cliff 130 feet high, crossing the country from north-east to south-west, consisting of a dark argillaceous schist in thin fissile beds from one to two inches in thickness, very much jointed, and having many small veins of quartz, and sometimes calcspar, included both in the lines of bedding and in the joints. These beds are quite horizontal, and through their whole thickness the river has cut its way back to the present position of the fall in a manner similar to that in which the river-bed below the Niagara Falls has been formed. At Lazy Portage, and at various points in the River Kaministoquoiah below the fall, and also at several of the rapids in the lower part of the White Fish River, small sections of the same beds were seen, but all dipping to south-south-east at 30°. But on ascending the latter river to a point south-west from the Kakibica Falls, there a section is exposed of the same strata, horizontal, like these at the fall, but only five feet high. Again, on the River Kaministoquoiah, above the fall at Friar's Portage, the strata have acquired 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 have become changed in character, having mica developed in them, and also greater abundance of quartz veins than before. Immediately afterwards in the course of the ascent true granite occurs, and, after several alternations, the schisteuse flags reappear at Upper Island Portage, but now dipping at a high angle to the north-west. The positions of these sudden changes in the dip of the strata have been laid down on the map (Sheet 3) as lines of fault.

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. At the Dog Portage another sudden rise takes place in the water level, for the rocky high grounds, which for a long way below have been skirting the river at some distance, forming as it were the limits of a wide valley, here converge and form a granite barrier across the river, the summit of which is about 719 feet above Lake Superior, and 440 feet above the river at the lower end of the portage, but only 140 feet above the lake level at the upper end, thus making a rise in the water level of 297 feet in the short distance two and a half miles. As the portage road passes right over the top of this hill, and leads to a point in the lake far from the exit of the river, the nature of the falls which produce this sudden change in level could not be examined, but the mass of the hills seem to be granite. Although this is not the highest point of land over which we passed during the route, still it is probable that this hill is as high as any portion of the rocky axis of the country, as those along the lake are even inferior to it in elevation, while 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, as will be afterwards described.

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, and by referring to the map (Sheet 1) it would be seen that the route follows a chain of small lakes, which are in most cases detached from one another, being separated by rocky barriers, over which the canoes and cargoes are carried. 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 thirty-five feet, so that the total descent in this part of the route cannot amount to very much. This chain of lakes may, in fact, be considered as occupying a line parallel with the summit of the watershed, and the country in which they lie is almost wholly composed of granite, occurring in broad rounded eminences, nowhere rising to 100 feet above the level of this half-drowned country. It is probable that this granitic belt is expanded considerably where the Old Portage route crosses it, and that the whole chain of lakes between Lake Rasiganagah and Sturgeon Lake lies within it. It is this belt which will form the great obstacle to the formation of any kind of road across this watershed.

From Sturgeon Lake in Bad River there is a considerable descent to the south, which forms the only exception to the general north-westerly descent of the waters to Rainy Lake.

From the Lake of the Cross to Lake Namucan the descent is rapid, and the river channel crosses the strata of gneiss and bedded greenstones at right angles, following a direction of the dip.

Rainy Lake has its length agreeing with the strike of the strata, which is here more nearly east and west than before.

Between Rainy Lake and the 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. The descent from the Lake of the Woods to Lake Winipeg is by successive groups of falls, between which the river forms lake-like expansions, which lie generally at right angles to its main course.

The first part of the river Winipeg flows across vertical strata, and then enters a granitic district very similar to that passed through between the Lake of the Thousand Isles and Sturgeon Lake.

In Sheet 2, it will be seen that the strike of the rocks in this region is generally a little to the east of north, and the nature of the strata is very similar to that of the country east of Rainy Lake but less disturbed by dykes. The exact western limit of the axis at Lake Winipeg was not seen, but the quantity of loose unworn fragments of lower Silurian limestone scattered about on the banks of the river and on the shore of Lake Winipeg, indicate the immediate neighbourhood of these strata. At the Seven Falls a large ortho-ceratite was found among the shingle on the river margin.

The distribution of the drift on this axis is very interesting. On the east side for a considerable way above the Kakibica Falls the country is covered with an alluvial deposit of red marl earth. Along the Kaministoquoiah this forms the high terraced banks of the river, for instance, opposite the mouth of the White Fish River, there are three of these terrace levels at the elevations above the river of 20, 60, and 90 feet. There are scarcely any boulders in this deposit, and when any are seen they are in spots from which this alluvial deposit has been removed and the underlying rock surface exposed.

On the summit level there is a great deposit of drift, consisting of coarse red sand with many boulders large and small. This deposit forms a flat swampy plain level, and well wooded towards the west, but towards its eastern margin, as at Cold Water Lake, worn into deep dry gullies and round pot-holes or conical depressions without any exit. The thickness of this deposit must be about 200 feet. The highest level of it measured was 883 feet above Lake Superior.

The banks of the lower part of Rainy River are composed of a rich alluvial deposit of a light grey colour, containing a large proportion of white sand. It is distinctly stratified in some parts and is only elevated about ten feet above the river level; no boulders occur in it. As a very slight rise in the level of the Lake of the Woods or a depression of Rainy Lake would suffice to connect these two lakes along the course of this river, it is not improbable that this deposit has been formed in such an extension of the former lake. But the upper part of the same river has the banks high and terraced, and boulders are plentiful, showing that at this level there is also a deposit of true drift.

Below the Seven Portages on the Winipeg River there again the river flows through a smooth channel, and the banks are composed of a deposit of soft white marl earth, the river being at first only slightly depressed, but soon from its rapid descent the banks become high as the level of the deposit remains the same. At Rat Portage, however, it retires from the river on either side, and below the falls at that place is replaced by another on another level through a cutting in which the river runs to its mouth at Fort Alexander. The banks of the lower part of the river are very distinctly terraced.

The estimated levels of the drift deposit at Rainy River, the Seven Portages, and at Rat Portage, are respectively 450, 350, and 270 feet above Lake Superior, and deducting 195 feet from each, as the probable elevation of Lake Winipeg above that lake, we have the levels above it at 255, 155, and 75 feet.

Glacial scratching was very distinctly seen at many points on the route. The direction is almost always north and south. Hardly a surface in the two granitic tracts did not present distinct scratchings. They were seldom to be seen, however, on the southern exposure of rock surfaces, if these sloped much, but the more a surface with a northern exposure sloped, the better they seemed to be marked.

A map has been prepared of the country traversed by the expedition between Fort Garry and Fort Carlton, on which the results obtained have been as far as possible laid down. A copy of this map accompanies this report.* * See Map at end.

The country around Fort Garry is a level plain of drift, which consists of a light-coloured marly loam rather deficient in sand with beds of white tenacious clay. Only a few boulders are to be seen scattered over the surface of this plain, generally angular fragments of the Fort Garry limestone of large size. At the Settlement the river is sunk from forty to seventy feet below the level of this plain, but nearer its mouth it flows through a level swampy country, elevated only a few feet above its surface. At the Lower Fort, eighteen miles below Fort Garry, which latter is situated at the junction of the Assineboine with Red River there is a section of magnesian limestone exposed in the bed of the stream when the water is low, and which is then quarried for building purposes. As the river was high when we were there, this section was not visible, but from among the fragments lying on the bank several fossils were obtained, such as Favosites, Septæna, &c., and some poor specimens of Receptaculites, but Major Seaton, the officer in command of the troops stationed at the Upper Fort, kindly offered to make as complete a collection as he could when the state of the river allows of the beds being examined, and when the search will be facilitated by the labours of the quarrymen. This limestone is of a light buff colour with purple blotches, very hard and with a sharp angular fracture. At Stony Hill, about fifteen miles north-west from the Upper Fort, there is an isolated bluff of limestone, rising from the plain level to the height of eighty feet. The south and western exposures are abrupt and water worn, it having evidently been at one time an island; and indeed, during the great floods which have several times inundated the Settlement, it has been one of the few spots upon which the inhabitants can take refuge, reaching it by means of boats. The beds of limestone are horizontal or nearly so, and are slightly different from those at Fort Garry in their mineral aspect, having a more crystaline fracture and the colour being of a reddish hue. No fossils can be discovered in newly-fractured portions, but on the weathered surfaces a few obscure remains of fossils are to be seen projecting along with silecious and gritty particles from a dull floury surface.

After leaving Red River, along the whole route to Fort Carlton, at only five localities were any of the strata observed which must underlie the drift throughout this vast extent of country. At Long River, lat. 49° 8′ N., long. 98° 35′ W., a tributary of Pembina River flowing northwards, and again at Forked Creek, a deep gully that joins the valley of the Assineboine in lat. 50° 6′ N., long. 101° 18′ W. sections were observed of a compact shale, of a light greenish drab colour, not occurring in continuous layers, but as fragments with irregular concoidal surfaces which have been produced by the desication of what was originally thin continuous beds of clay. Sometimes it makes a nearer approach to a slaty character. Among these beds are bands and nodules of a hard deep brown-coloured clay ironstone, and perpendicular fissures are common, which are filled up with splintery iron shale. A careful examination of these beds at Long River did not afford any fossils, and a long search of those at Forked Creek only yielded six or seven very minute specimens, among which were scales of fishes (clenoids?), a small bivalve, and several obscure impressions. Throughout these shales there occurred ochery calcareous tubes, about a half line in diameter, traversing the layers perpendicularly. At both these places the thickness of the strata exposed amounts to about 30 feet. At Long River they dip to the south, but not with regularity. At Forked Creek the strata are strictly horizontal, and were seen in two creeks two miles apart, having exactly the same characters. No clue could be discovered to their relations with other rocks, as the sections only occurred in deep bends in the creeks, for all else was obscured by drift. At Long River they were covered by about six feet of pure white sand, very incoherent, and over this lay the ordinary drift, consisting of light grey calcareous earth. At Forked Creek they were overlayed by about 20 feet of drift.

At Fort Ellice the banks of the Assineboine are 200 feet high; and at one point there, a recent slide had taken place, a partial section of the bank was displayed. The upper part of this section consisted principally of comminuted fragments of the same *Long River shale*, with local beds of pure sand, also the more common grey drift.

At a part of this slide which was cut by a bend of the river, strata of tenacious calcareous clay were visible, of a dark purple black colour, but with the weathered surface decomposing into a red ferruginous earth. Along with these clay strata were two beds of soft clay ironstone, about four feet apart, the lower one a half-foot thick, and rather compact, the upper one concretionary, forming thick nodulated masses, the upper surfaces of which were calcareous, and very like decomposed coral.

At the elbow of the south branch of the river Saskatchewan, at the point where it meets the great Prairie ridge, known farther south as the "Coteau des Prairies," similar clay beds were seen, having the ironstone concretions occurring in great profusion, and in several of these were found fragments of chalk fossils, inoceramus, baculites, and others. As the mineral resemblance to those beds at Fort Ellice is perfect, there can be no doubt as to their similarity in age. At the elbow the section is one of great interest, from the relation of these beds to the drift by which they are covered. Sheet 4 is a sketch map of the river a little above the elbow, with a section exhibiting the manner in which the beds occur. In the section, the pale blue colour represents the soft clay strata, which are almost horizontal, while the ochre tint represents the drift. This latter thins out as it nears the "Coteau," which is probably mainly composed of the clay strata, with only a thin covering of drift on its eastern aspect. As this part of the river was the western limit of our journey this year this point could not be determined. Seeing that the under surface of the drift lies unconformably with these soft clay strata, it is evident that the eroding agency has had its western limit here, the cause of which was certainly not the hardness of the beds that it encountered. Portions of these soft strata have been formed by the action of the river into conical mounds, which present a most extraordinary appearance. As no grass has time to grow on them, from the constant attrition of their surface, they are perfectly black, and their outline is broken into terraces by the successive lines of ironstone concretions, which, from their hardness, retain the soft strata underneath them. There is a large quantity of gypsum disseminated

throughout these beds, occurring as transparent selanite crystals in radiating groups. There are no large beds or masses of it.

From Fort Ellice a trip was made for a few days' journey to the south-west, in consequence of the reports by the Indians of wonderful stones that occur on the banks of the Assouri River. The place is called by the half-breed hunters La Roche Percée. The route followed to this place passed by the eastern end of Moose Mount, which will be described afterwards in connection with the drift, and of which it seems to be entirely composed. The ascent to the base of this hill was about 400 feet above the Assineboine at Fort Ellice, and in continuing southwards until we struck the Assouri, a descent of about 100 feet was made. Thus the probable height of the plain through a cutting in which the Assouri runs in this place is 300 feet above the Assineboine, while the valley of the river is 165 feet deep, so that the difference of level between the two rivers amounts to about 135 feet.

The direction of the Assouri here is easterly, and Sheet 5 is a rough map of a portion of it, with a view of its north bank. The whole prairie here is covered with a most extraordinary profusion of boulders, which are fragments of granite, gneiss, limestone, &c. In the valley, a group of strata is exposed, a section of which is given in Sheet 6, as follows:—

	Feet.
a Drift with boulders from	4 to 7
b Mud stone	1
c Incoherent sandstone, fine grained, with hard concretions impregnated with iron, which weather concentrically	10
d Porous calcareous scinter	1
e Hard dark blue ironstone shale, decomposing into deep orange coloured splinters	2½
f Gritty limestone	2
g Ash coloured clay in thin indistinct layers, very soft, with one bed of coal nine inches in thickness	8
h Hard blue limestone	3
i Same as *g*, but with three beds of coal, ten, eight, and six inches in thickness	15
k Gritty limestone	2
l Brightly coloured marls and shales, with selanite in small fragments	10
m Very course grained incoherent sandstone more than	20

No trace of fossil remains were found in any of these beds to indicate their age.

The coal does not occur as well-defined beds, but graduates into the shales on both surfaces. It is not visible until a light ashy deposit is removed from the exposed edge of the bed, produced by the soft clay washing down from the strata above. The coal is of several qualities, some having quite the appearance of compact Cannell coal of fine quality, some like the more glistening bituminous coal friable, and only to be obtained in small cuboidal fragments, while some can hardly be distinguished from charcoal. Where we crossed the Assouri, between Turtle Mount and Fort Ellice, fragments of similar coal were picked up in the bed of the stream, no doubt derived from these seams. Also at the elbow of the south branch of the Saskatchewan like fragments were found, so that we may expect to meet with similar beds in the course of our journey up that river during the next year. A rough analysis of an averaged specimen of this coal on a small scale give the following results:—

Aqueous and volatile matter	40 per cent.
Carbon	50 „
Light oranged colour ash	10 „

In the first of these groups there seem to be an unusual deficiency of tar and coal gas. It burns in the air with difficulty, without flame.

The sandstone which forms bed C, is composed of very fine pure grains of quartz, hardly cohering, but in the upper parts of the bed, there occur concretions impregnated with iron and of a reddish hue, which are comparatively hard, and decompose concentrically. It is this irregular disintegration of this bed that gives rise to the curious appearances that have rendered this spot an object of great superstition among the Indians. The lower sandstone wears away from under the hard concretions, which, from their peculiar manner of weathering, assume the forms of compressed spheres, and sometimes long cylinders like the boilers of a steam engine, and these are left elevated on pillars of the white sandstone. The gullies which join the main valley are thus peopled with grotesque forms, some exactly resembling the ruined nave of an ancient abbey, while those concretions which have just reached the surface, but have not yet become isolated by the disintegration of the bed below, may be taken for gigantic tombstones, and so further the illusion. The sandstone at the base of the section is also very incoherent, but composed of larger grains. The strata are not found in the same proportion and order in different parts of the valley, but they are always horizontal. The thickest bed of coal that was seen was one foot, but the ashy clays were at some places very much thicker than at others. The marly shales (lettered I.) have quantities of gypsum embedded with them, but only in small detatched crystals. In regard to their probable age the description of the upper beds of the cretaceous system given by M. Jules Marcou in the 75th page of his "Revue Explicative d'une Carte Géologique de l'Amerique du Nord," seems to be that of very similar beds to those seen here. The position of "Roche Percée" is lat. 49° 6′ N., long. 103° 59′ W.

The whole country traversed by the Expedition during the last year has been overspread by superficial deposits of great thickness. Although these might be all included under the group of Northern Drifts in the ordinary acceptation, still it is probable that they consist of deposits of very different ages, and circumstances of deposition. Three boldly marked levels were observed of different mineral composition as well as geographical distribution. To the first of these belong the deposits of the wide flat plain upon which the Red River Settlement is situated; this forms the first prairie level. Its composition is marked by a preponderance of argillaceous marl and a deficiency of sandy matter, and it is invariably stratified in thin layers. Underlying this, at various depths from the surface, is a bed of stiff light-coloured clay, and which forms the immediate margin of the river in many points. The upper parts of the deposit contain leaves and fragments of wood and reeds, and the whole has quite the

appearance of a fresh-water deposit, indicating a time when Lake Winipeg covered a much more extensive area than it at present occupies.

The surface of this deposit must be from 75 to 100 feet above the lake, but it slopes from the west towards Red River, and at St. Joseph's, where the second prairie level supervenes, it may be 100 feet higher. The first prairie level has a very irregular outline to the west. Pembina Mount at St. Joseph's is formed by the eastern limit of the second prairie level at that place. It follows a northerly course as an abrupt terrace, varying from 200 to 300 feet above the first level for about 30 miles, when it turns to the north-west, and assumes at the same time a more gentle slope, up which our route lay. Sheet 8* is a rough reduction of the larger map, having the different levels exaggerated, so as to render them more distinct. Colours have been used to represent the probable range of these different levels.

* See Map 8 at nd.

The composition of the second great level is very different from that of the first. Sand is the preponderating ingredient. Thus at St. Joseph's, where the banks of the river Pembina present a fine section of it, the material is coarse red sand with gravel and bolders, very similar to that observed on the eastern limit of the drift beds on the summit of the water-shed between Lakes Superior and Winipeg. There are no signs of stratification in any part of this deposit, as seen at Pembina Mount. Further west, however, it assumes a light grey colour, and contains a considerable portion of lime. At Fort Ellice, as before mentioned, the upper portions of it consist entirely of fragments of the Long River shale. That the whole thickness of this level at every point is not formed of drift, is proved by the discovery of the shale beds at Long River and Forked Creek, forming as it were a nucleus to it. Notwithstanding that this level is everywhere cut to a great depth by rivers and creeks, very little can be learned of its nature at different points, as slides at the banks of the gullies are but rarely seen. The slide near Fort Ellice of the banks of the Assineboine has been spoken of in connection with the beds, probably of cretaceous age, which are visible at the base of it. Another similar slide was seen at the Qu'Appelle Lakes, which are a succession of dilatations of the rivers of that name lying in the bottom of a deep wide valley cut through this second level. This slide did not expose the bank quite to the base, but as far as was visible consisted of a stiff sandy clay, of a light red colour, with patches of blue clay and gravelly beds. In fact, the characters of this level, as far as regards its mineral composition, seem to be very variable and local. Boulders are tolerably plentiful all over it, but occur in greatest quantity upon the sides and summits of ridges and mounds, which are irregularly dispersed over this level, rising abruptly and generally to the height of about 50 feet. A great deal of this level is clothed with clumps of poplars. There are, however, some large tracts of bare plain.

The third level is what is spoken of by the hunters as La Grande Prairie. The route of the expedition did not traverse this level at all, its westerly course meeting it only at the elbow of the south branch of the Saskatchewan, at which place the approach of winter compelled us to turn northward. There are, however, two hills, or mountains, as they are termed by the hunters, viz., Turtle Mount and Moose Mount, which seem to be detached outliers of this level, their summits having nearly the same elevation as that of the summit of this level. These hills are very much alike, consisting of irregularly disposed ridges and cones of very coarse drift, highly charged with boulders. Some of these cones have very steep sides, and rise to the height of 300 feet from their base, and their summits are about 600 feet above the second prairie level. The northern aspect of these hills is very irregular, as also their central mass, being mostly densely wooded, and enclosing numerous small lakes, but their southern aspect is a long gentle slope utterly devoid of trees, and being continuous with the level prairies beyond, which reach as far as the true eastern limit of this level the "Coteau de Prairies."

The Great Prairie ridge of the hunters has a direction from north-west to south-east, with its northerly aspect very much furrowed in the same manner as has been mentioned in reference to its two outliers, Moose Mount and Turtle Mount. At Roche Percée this ridge was about ten miles to the south, and the extraordinary profusion of boulders at that place, and the thin layer of drift, which covered the coal bearing strata, together with the facts which were observed with a similar proximity to the "Coteau" at the elbow of the Saskatchewan, all indicate that the drift has at the "Coteau" its south and westerly boundary.

(Signed) JAMES HECTOR, M.D.

Fort Carlton, December 14, 1857.

Enclosure 4. in No. 6.

SIR, Fort Carlton, Saskatchewan, June 7, 1858.

DURING the latter half of last October I proceeded to Fort Pitt and obtained the horses which you had ordered at that place for the service of the expedition. On my return I made observations for latitude and longitude at various places on the route, and constructed a rough map of the country between Fort Pitt and Carlton.†

Encl. 4. in No. 6.

I found, on my arrival at this place, that Lieut. Blakiston was busily engaged making preparation for carrying on a system of magnetical and meteorological observations during the winter months. We commenced the observations on November 12, each member of the Expedition taking six hours watch during the day and four during the night, in rotation. I continued on duty at the Fort until February 25, when a scarcity of provisions being felt, I proceeded to Pike Lake, where fish at least could be got. While I remained at the lake, which was from March 1 until April 2, I was employed chiefly in obtaining fish, and in that short time caught upwards of 100 jack fish, besides a few white fish.

There has been a great scarcity of provisions throughout the Saskatchewan district; the Indians have been reduced to eating their horses, and hunting wolves and foxes for food, as not a single buffalo has appeared for many miles on either side of the river, except at Edmonton where they have been so thick as to defy the hunters running them.

† This map has been reduced and incorporated into the long map, which will be found at the end of these reports.

On April 1, Dr. Hector, who according to your orders had been to Edmonton on business connected with the Expedition, arrived at Pike Lake on his way to Carlton; so I accompanied him to this place, where we arrived on April 7.

Throughout the winter, as previously, I have kept up regularly the journal of the Expedition, and although it is meagre in detail during the depth of winter, yet as the spring advanced I have been very careful to note everything characteristic of its advancement. In addition I have taken the temperature of the river daily from the breaking up of the ice till now, and noted either its increase or decrease of volume very carefully. I learn from Dr. Hector that he has a number of like observations which he took in the autumn before the ice formed on the river, so an interesting comparison may be instituted between the two sets of observations.

During our stay at Carlton I have made a complete series of observations for latitude and longitude, and frequently in the winter I have taken observations to ascertain how my chronometers behaved. Thirteen lunar distances are worked for the longitude of this place, and I have as many more yet to work.

In the many spare hours which I have had in common with the other gentlemn of the Expedition, I have collected a large number of insects and other animals and various shells, for the purpose of getting them forwarded to England. There is one squirrel in the collection which is undoubtedly new; it resembles the Arctomys Hoodii, but is much smaller, and is not patched with light hairs on the dark stripe as is that animal.

I have, &c.
(Signed) J. W. Sullivan,
Secretary to Expedition.

Captain Palliser, Commander of
North British American Exploring Expedition.

Encl. 5. in No. 6

Enclosure 5. in No. 6.

Observations of the Temperature of Soil at various Depths, and the Depth of the Frozen Ground.

Fort Edmonton, 1858.

1. On the 22d February commenced digging a hole in the field behind the fort, on the top of the high bank on which the mill stands. In three days reached the depth of 4 feet 6 inches; ground still hard frozen. The digging was discontinued in consequence of the man being required for something else.

2. March 3d. The digging recommenced to-day, but as the ground must have frozen in the bottom of the old hole, a fresh one has been commenced 6 × 4 ft. in the same field, but on a level with the fort at a distance of 12 yards from the pickets. The soil is the same as that displayed in the last hole; dark loam for 9 inches, then a yellow reddish earth, enclosing fragments of the beds associated with the coal, also angular pieces of the coal itself, rounded fragments of gneiss, quartz, &c.

March 4th. The hole is now dug to the depth of 4 feet 10 inches, the last 3 feet through fine light red sand, which was so dry as almost to look like unfrozen earth, however it got so much softer, and broke down so fine after it was extracted, that there is no doubt that it is still frozen. But besides, a bed has been reached of a white earthy clay, including fragments of coal, so hard frozen as to resist the pick and the borer, and which on being thawed softens completely.

This afternoon I bored a hole with the auger in the bottom of the dug hole and intended to carry it down three feet, but the clay bed proved too hard for the augur to pierce, so after I got down three inches, I placed the thermometer in it, packed it round with soil, and then filled the large hole with a foot or two of hay to prevent the temperature of the atmosphere during the night from influencing it.

March 5th. Thermometer, at 5 feet, at 8 a.m., 30°; surface, 20°.

The unfrozen soil was at length reached to-day, at the depth of 7 feet 6 inches, in a bed of sand with rounded stones, and the line of frozen soil was easily perceived. The hole is dug for 4 inches below it, and then four inches more were bored, and the thermometer placed in it at the depth from the surface of 8 feet 2 inches.

March 6th. Thermometer, at 8 a.m., 33° (at 8 ft. 2 in. from surface); surface, 38°.
" " at noon 33° " " " 49°.

3. March 2d. In the field behind the fort, at a short distance from the pickets (20 feet) bored a hole one inch in diameter to depth of two feet, placed thermometer at bottom, having its bulb covered with tow, and being enveloped in a metallic case; then rammed in a plug of tow above it so as to prevent the air having any access to it. The following are the readings of thermometer:—

March 3d, at 8 a.m., 18°·5; surface, 20°.
" at noon, 18°·5 " 24°.
" 4 p.m. 18°·5 " 24°.

4. March 3d. Increased the depth of hole to 3 feet, and adjusted the thermometer as in 3. Readings as follows:—

March 4, at 8 a.m. 21°·5; surface 23°.
" at noon, 21°·5; " 30°.
" 4 p.m. water had filled it, from the melting of the snow, and hot water had to be poured down to get thermometer out.

5. February 25th. After three days' thaw the surface of the field behind the Fort is converted into a soft mud to the depth of three inches, and the ground is thawed to the depth of eight inches. This is on a slope where no water has lodged.

February 27th. The ground this morning is as hard frozen as ever again. The frost of twenty-four hours, having a minimum temperature of 0·5 having proved sufficient to re-solidify it to the full depth to which it had been softened.

James Hector, M.D.

Enclosure 6 in No. 6.

Fort Carlton, Hon. Hudson's Bay Company,
Saskatchewan, June 8, 1858.

SIR,

In accordance with your instructions, that I should make every effort to engage twelve or fifteen men, and obtain at least 15 horses for the use of the Expedition during the next season, conveyed in your letter written from *Touchwood Hill Post*, and dated 16th October last, during the early part of the winter I made every inquiry as to the facilities for carrying out your wishes. The result of this inquiry convinced me that it was necessary that I should make a winter journey, at least as far as Fort Edmonton, as it is only there that any half-breed population is to be found not under direct engagement to the Hudson's Bay Company.

Accordingly, having obtained dogs, and completed all other arrangements, I left Fort Carlton on the 14th of December.

Up to this time I had taken my share in the hourly observations which Lieutenant Blakiston was engaged in carrying on, and which commenced on the 12th of November, and previously to that time I made a six days' trip to the north-west for sixty miles, to examine the Thickwood Hills, which bound the Carlton Plains in that direction by an abrupt densely wooded terrace, about 500 feet in height.

From Fort Carlton to Fort Pitt, the next highest Company's post on the river, I found the distance to be 199 miles, but the track I followed is about twenty-miles longer than the usual one, but was preferred, as it is so much easier for the dogs to follow a track already beaten, than open a new one through the snow. We skirted a range of hills which forms a continuation of the Thickwood Hills to the west, and passed over many lakes, the principal of which are Redberry Lake, seven miles wide and ten miles long, and Jack Fish Lake, eight miles wide and twelve miles long. At the latter of these I found a small temporary post of the Company's, which was only in the course of erection. I heard here that the buffalo had been very numerous, but that they had all been passing to the south-west, and now none were to be seen but a few straggling bulls.

We reached Fort Pitt on our seventh day from Fort Carlton. It stands on the left bank of the Saskatchewan, at a point where it takes a bend to the north. Before reaching the latter place, however, it makes a great sweep to the south, passing along the base of the Eagle Hills, which I had observed as a blue line skirting the southern horizon.

Fort Pitt is in latitude 53° 30′ N., and longitude (Lefroy) 109° 10′ W.

Mr. Sullivan, during a visit to Fort Pitt, in Oct. last, found the long. by chron. obs. to be 109° 8′ W.

On the 24th of December, accompanied by Mr. Simpson, the gentleman in charge at Fort Pitt, I started for Edmonton House. With the exception of the first day's journey, our road lay along the south side of the river, so as to cut off a great bend which it makes to the north between the two places. The country now passed through was on a much higher level than that before reaching Fort Pitt, agreeing with the summit of the hilly ground which was then skirted, and from this level other hills again rose. The rise of the country to Edmonton is very inconsiderable; nevertheless, when the distance is considered, hardly amounting to 1,000 feet.

For the first few days after leaving Fort Pitt, we found the plains covered with buffalo; and early one morning I was fortunately at a camp of Indians just as they had filled their *pond* with about 100 of them, and were carrying on an indiscriminate slaughter. The *pond* is an enclosure of stakes and branches of trees interwoven, having one broad entrance, but which is so constructed that the buffalo, once driven in, cannot again escape. At almost every camp of Indians, of which nine were passed since leaving Carlton, I saw one or more of these ponds, and I believe the number of buffalo killed in this manner in each year throughout the Saskatchewan district is enormous. After the pond is filled they must of course slaughter every animal before they can remove any of the meat.

The country to the south of the river through which we passed is more generally wooded than it is reported to have been some twenty or thirty years ago, but the wood is all of a worthless character, consisting of small poplars, with only a few clumps of spruce in the swamps as Edmonton is approached.

On the 30th of December, our sixth day from Fort Pitt, we arrived at Edmonton House. The distance I found to be 191 miles. The snow had been rather deeper than formerly, so as to render the rate of travelling slower.

Edmonton House, which is a large establishment, and the residence of the chief factor, who controls the district, is built on a high point on the left bank of the river. There is a windmill behind the fort, and a good deal of land enclosed for cultivation. The river is here 200 yards wide, and enclosed by banks 160 feet high, in which are exposed sections of the beds which contain coal. This coal occurs in three or four beds; the principal of which is from four to six feet thick. It is of very inferior quality, burns with no flame, but rather smoulders away, leaving a plentiful ash. The beds associated with it are of grey sandy clay, containing ironstone, nodules, and also argilo-calcareous shales. It is used in the forge at the fort, and is found to answer tolerably well.

The half-breed settlement, where I expected to find men, I found to be situated about fifty miles to the west of Edmonton, but as I learnt that all the population was absent on the plain hunting, I did not visit it at this time.

On the 9th of January I started for Rocky Mountain House, for the first three days travelling due south nearly, and afterwards turning to the west for three days more, arriving at that place on the 14th. The distance I found to be 157 miles, but there was little or no snow on the ground, so that it was very hard work for the dogs. The road lay over a succession of wooded ridges, the western slopes of which were covered with young poplars, while the eastern slopes and the swampy valleys between support a growth of spruce.

From a rising ground, known as Gabriel's Hill, I obtained the first view of the mountains the evening before I arrived at the fort.

I found the Mountain House to be an establishment about the size of Fort Pitt, but in a very ruinous condition, owing to its being abandoned every summer, when it is generally adopted as a residence by several families of Indians, who prove anything but improving tenants.

It stands on the left bank of the river which is 150 yards wide, and about half a mile above the mouth of Clear Water River, a large branch which joins the Saskatchewan from the S.E.

I remained here until the 26th, making excursions in every direction for the purpose of examining

the beds exposed in the banks of the main river and its tributary, which are very interesting. They belong to the same series as those at Edmonton, and coal is found abundantly, although no bed that was observed is more than two feet thick. The principal feature of the river here, however, is the occurrence of thick beds of incoherent sandstone of coarse texture which forms cliffs sometimes 100 feet high, overhanging the river, giving it a very different character from the tame sloping banks lower down in its course.

The Mountain House is at the distance of not less than 100 miles from the main chain of the Rocky Mountains, which are nevertheless distinctly seen from it as a chain of snow clad peaks. The principal chain is, however, screened by a nearer range, distant about 45 miles. The view of the mountains occupies the arc of the horizon, from south by east to west by north. The near or Brazeau's range, merges with the main range towards the north, but lying more east and west than the line of lofty peaks at its southern extremity, it is far distant from them.

I made an attempt to reach this near range, but failed in forcing a road through the dense pine woods with which the whole country is covered.

For a short time after my arrival the place was reduced to great straits for provisions, but a camp of Blackfoot Indians arrived, bringing with them a small quantity of dried provisions so as to give temporary relief.

I met six of the principal chiefs of the Blackfoot Natives, and explained to them the objects of the Expedition, and the course it would likely pursue when passing through their country, and obtained a promise from them that they would take steps to prevent the young braves of the nation from stealing our horses or otherwise molesting the party. I gave each a small present and a paper in which their promise was embodied. The lat. of the Mountain House is 52° 29′ N., the long. by account 115° 2′ W.

By a comparison of observations made with the barometer during my stay, and those at similar times at Fort Carlton, I found its altitude above that place to be 2,029 feet.

The mean temperature for the time I was there is 10° higher than for the same time at Fort Edmonton, but for many days a soft south-west wind blew, which does not seem to have affected the temperature at Edmonton in the same degree, which accounts for this great difference.

Having obtained all the information concerning the country which might be of use to you in making your plans for next year, and learnt the names of the best guides, &c., I started on my return to Edmonton House on the 26th of January. In order to obtain a clearer understanding of the structure of the country, I descended on the ice of the river all the way, and found the distance to be 211 miles. As we were only sparingly supplied with provisions we had to go very fast, and reached Edmonton after having slept only three times. The last day of the journey, as we had nothing left to eat, we did not think it worth while stopping, so we travelled 21 out of the 24 hours, and in that time went 90 miles.

The coal bearing strata are exhibited more or less continuously throughout the whole of this portion of the river, but about 130 miles above Edmonton the last of the sandstone bluffs is seen, and the strata assume the argillaceous character which they present at that place. Sections and a minute description of these strata, along with my journal, will be, however, submitted to you.

The month of February was occupied at Fort Edmonton in making an examination of the surrounding country and other observations. I made an excursion to Lake St. Ann's, to visit the Settlement and Roman Catholic Mission there, under the superintendence of M. Le Combe. It is 50 miles W. by N. from Edmonton, and consists of 45 houses in three little villages on the west shore of the lake, which is about 14 miles long and 7 wide. There is a nice little chapel, but at the time of my visit all the inhabitants, with the exception of three or four families, were absent on the plain.

On the 7th of March I set off to the plains to meet the Freemen, having heard that they were now all together and on their return. I met them in the neighbourhood of Battle River, and succeeded in engaging the guides and men I wanted. These freemen seem to be a thriving class, and have none of that love of personal display and extravagance which is such a blot on the character of the Red River half-breeds.

On the 15th of March I left Edmonton, and continued to descend the Saskatchewan on the ice. Four miles below Fort Edmonton I saw the coal for the last time, and at the distance of 80 miles the associated beds disappear, and the clay strata with the ironstone nodules which were first seen at the elbow of the south branch last year, and which are of cretaceous age, take their place in the bank of the river, to all appearance having the coal bearing strata conformably superimposed.

As we approached Fort Pitt we found the snow on the river, and also all over the country, to be very deep, so that for the first time throughout the whole trip we had to take to snow shoes in earnest, which says a great deal for the unusual mildness of the winter, or rather the absence of snow, for the cold at some periods was very severe. I found the distance by the river to be 251 miles. The heat of the sun, from melting the surface of the snow, caused us to travel during the night, and rest in the day, during this part of the journey. I arrived at Fort Pitt on the 21st of March, but finding that letters had missed me on the road, I had to wait there until the 30th. The ice on the river was now getting so bad that it could no longer be safely travelled on, so that I had to return by the usual track to Fort Carlton. On the 1st of April I reached Jack Fish Lake, where I found Mr. Sullivan, he having been obliged to leave Carlton on account of the scarcity of provisions.

At this place I had to give up the use of sleighs, as the ground was now quite bare. I had *travailles* made for my dogs after the method of the Indians, and along with Mr. Sullivan in this manner we reached Carlton on the 8th of April.

Here I found the men you had engaged at Red River, and who had only arrived the day previously. As the people at the Fort were next thing to starving, I at once despatched them to the nearest point where buffalo were to be found, so that they might hunt for themselves.

Until the 7th of May I was occupied at Carlton, when I again started for Fort Pitt to meet the men I had engaged, and whom I had directed to come to that place with the Company's annual brigade of boats. I had already sent up a supply of clothing, &c. for them.

I got to Fort Pitt on the 10th, but the unusual lowness of the river delayed the brigade, so that it did not reach that place until the 15th and 18th. I then got the horses ordered from the Company,

and which were in readiness at Fort Pitt, and sent the men at once to a rendezvous to the south of the Eagle Hills, where in all probability they will meet in with the party of Red River men. I did this, as it was impossible for them to be fed at Fort Pitt, as the buffalo were distant many days. Two of the party are to come on to Carlton, to guide us back, so as to avoid any chance of missing them.

On the 22nd of May I left Fort Pitt to descend the river along with the brigade, and so complete the survey of it (which I had made during the winter, from about one day above the Mountain House) as far as Carlton. The distance, by the river, between the two places is about 235 miles, and it occupied us seven days. These boats draw only one and a half to two feet water, and are led by guides long used to navigate the river, yet from the shallowness of the water, and the great intricacy of the channel, the boats were constantly running aground, keeping the men constantly wet from morning to night, from having to jump into the water every time to shove them off.

The river above Carlton is certainly unnavigable except for the smallest craft, and even then only with great difficulty.

While at Fort Pitt, waiting for the brigade, I had an opportunity of examining the cretaceous beds, and obtaining a few more of the characteristic fossils. At about ninety miles above Carlton, or about forty-five miles above the elbow of the north branch, they were observed for the last time in a section of the flank of the Eagle Hills.

From Mr. Swanston, the gentleman in charge at Fort Edmonton, I received a valuable meteorological register which he had kept, with a thermometer furnished by myself, continuously from the 1st of January till the 15th of May.

By a comparison of barometer readings at Edmonton during the months of January and February, with the similar readings at Carlton, the approximate difference of altitude between the two places is found to be 922 feet.

This meteorological register, with all other meteorological and other observations, along with the journal of this trip, will be submitted to you as soon as completed.

I have, &c.,
James Hector, M.D.

To Captain Palliser, commanding North British
America Exploring Expedition.

No. 7.

No. 7.

Copy of REPORT from Captain Palliser to Her Majesty's Secretary of State for the Colonies.

Fort Carlton, Saskatchewan, June 5, 1858.

Sir, (Received September 6, 1858.)

I have the honour to report my arrival at this post on the 4th of June.

Owing to the absence of buffalo during the winter my hunters, as well as those belonging to the Fort, have had to go to great distances in order to get meat, which they obtained in such small quantities that the Hudson Bay Company's officer in charge of this post was obliged to scatter the men with their families all over the plains in search of food. Even Dr. Hector and Mr. Sullivan were obliged to leave this post and go to Forts Pitt and Edmonton in order to lessen the consumption of meat, for which the supply here was quite inadequate; fortunately, however, the winter has been an unusually mild one, otherwise the consequences might have been very serious indeed.

I am happy to say that I have been most fortunate with regard to the horses; very few have died, and almost all the rest are in good working condition, and in far better order than when I started last year from Red River.

I am now about to start with the main branch of the Expedition to the Forks of Red Deer and Medicine Rivers, and despatch Lieut. Blakiston with a branch expedition, viâ Forts Pitt and Edmonton, in order to carry on the magnetic determinations at those posts, as well as to bring us supplies overland in carts, ordered up in boats from Norway House last winter, to meet us at the Forks above mentioned. Lieut. Blakiston, with the supplies, will join the main branch of the Expedition, and we shall proceed to an old Fort at the foot of the Rocky Mountains not far from the boundary line, thence I shall trace the boundary line to the westward, and afterwards take a course to the northward in search of a pass practicable for horses over the Rocky Mountains within the British territory.

I purpose then to send the Expedition into winter quarters at Edmonton, and proceed with one or two men across the Rocky Mountains to meet Captain Hawkins.

I am in receipt of your last communication of the 29th of March, conveying the suggestion of the Geographical Society, viz., "to deposit for Captain Hawkins' use at Fort Assineboine the records of my observations to the north of the 49th parallel." Fort Assineboine was situated on a tributary of the Mackenzie River which flows into the Arctic Ocean; the post has for several years ceased to exist, and I hope to avail myself of an easier way to communicate with Captain Hawkins, as I learn that Mr. Dallas of the Hudson Bay Company is crossing the mountains by way of the boat encampment

and Athabasca portage, and the men who return with the boats down the Columbia can take back despatches from me. I intend to adopt this means of communication in case I might subsequently fail in finding a practicable pass for horses across the Rocky Mountains within the British territory, and so fail in having a personal interview with Captain Hawkins.

I enclose letters from Lieut. Blakiston and Dr. Hector, and Mr. Sullivan, concerning their operations during the winter of 1857–58. Also M. Bourgeau's botanical report, which I shall feel obliged by your submitting to Sir William Hooker.

I have likewise the honour of enclosing the map of our explorations in 1857, containing also my route from Red River this spring.*

* * * * * *

As soon as my men are all collected from the plains where they have been in search of food, and making provisions, I shall start the Expedition. This will probably be effected about the 12th of this month.

I would strongly recommend Her Majesty's Government at the termination of my Explorations to attach Lieut. Blakiston to Capt. Hawkins' staff, in order to continue across the Rocky Mountains his very valuable series of magnetic and meteorological observations.

I have, &c.,
(Signed) JOHN PALLISER,
Captain Commanding
N.W. America Exploring Expedition.

Her Majesty's Principal Secretary of State
for the Colonies.

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* This map has been reduced and incorporated into the long map, which will be found at the end of these reports.

No. 8.

COPY of REPORT from Captain PALLISER to the Right Hon. Lord STANLEY, M.P.

Fort Edmonton, Saskatchewan,
October 7, 1858.

MY LORD, (Received January 25, 1859.)

I HAVE the honour to report the safe return of myself and my secretary, Mr. Sullivan, to winter quarters; also the return of Lieut. Blakiston with the branch expedition I had sent to explore the Kootanie Pass. I have also to report the return of Mons. Bourgeau, whom I also sent on a botanical tour into the Rocky Mountains, with directions to follow any route where he thought he could best further the interests of botany. Arrival at Edmonton.

I am rejoiced to say that I have completely succeeded in discovering not only a pass practicable for horses, but one which, with but little expense, could be rendered available for carts also. This pass will connect the prairies of the Saskatchewan with Her Majesty's Possessions on the west side of the Rocky Mountains. The pass is situated precisely where I had long supposed, and this impression was communicated by me to Her Majesty's Government previous to my appointment to the command of the Expedition. Have discovered a Pass within British Possessions.

I shall now endeavour to give a summary of the movements of the Expedition, since the commencement of June 1858 up to the present period; also of the branch expedition of the gentlemen whom I dispatched at different times for that service.

Early in the month of June, I despatched Lieut. Blakiston, by Fort Pitt and Fort Edmonton, on the north branch of the Saskatchewan River, in order to carry on the magnetic determinations at those posts, as well as to bring us supplies overland, which supplies were every day expected up in the boats. I then started with Dr. Hector, M. Bourgeau, and Mr. Sullivan, for the Eagle Hills, with the intention of exploring the region of country between the north and south branches of the Saskatchewan or Bow River. I was then accompanied only with the men I had engaged at Red River Settlement, and with them went as far as the Cross Woods, where I left them along with the gentlemen, with orders to await my return. I then started with two men and one pack-horse, rode about 80 miles in quest of my St. Ann's Brigade, whom I had sent on the prairie to the south of the Eagle Hills in search of buffalo, the game being so scarce that I could not run the risk of keeping so large a party together. After two days' ride I found their camp; they had not only lived well, but had been able to comply with my directions, to dry meat for us, for we had started almost without provisions. I lost not an hour in leading them to join my Red River Brigade, and on the fifth day reached the Expedition at the Lizzard Lake. Here we passed our first Sunday. Movements of the Expedition. Red River Brigade. St. Ann's Brigade.

All my Red River men belonged to the Church of England, consequently I read prayers for them; but also, the St. Ann's men, half breeds, who, although of the Catholic persuasion, asked and obtained leave from me to attend Divine worship, and I conducted the lessons and half the prayers in Cree through the medium of an interpreter. I mention this circumstance to show the respectful tendency and absence of bigotry of these men, in their appreciation of Divine service. Service on Sundays

Our supply of provisions was very small; we had meat only for three days, and about three stones of flour, for a party consisting of my three companions, myself, and 28 men. I had, however, tea and sugar remaining from last year's store, which, together with what I brought from Red River Settlement, has lasted us pretty well through the season. Scanty supply of provisions.

The absence of all flour and vegetables did not inconvenience either us or the men in the least, and I found the tea very useful in counteracting the injurious effects of the swamp water, which otherwise might have produced many cases of dysentery.

The country surrounding the Eagle Hills and Lizzard Lake is rich, and wood abundant, but the timber is not of a valuable description, being chiefly poplar and willow. Here I learned that the war had broken out between the Cree and Blackfoot nations, and that a large number of Indians were on their way to pay me a visit. Knowing that they would have little or no provisions to trade, and fearing their importunity, I made a few forced marches and got into the Blackfoot country. Eagle Hills. Arrival in Blackfoot country.

On the 22nd June we reached 108th degree of west longitude, in lat. 52° N. The ground offering very bad pasture, was very inferior land, and we travelled the prairie without wood, depending on a scanty supply of buffalo dung, which we collected in order to cook our meals. Absence of wood.

Ear Hills Grand Coulée,

After passing the Ear Hills on 24th of June, we reached the Grande Coulée, and camped near a lake three miles long and two wide, where we at length found some wood, (willow and poplar, with a few birch). We were here out of provisions, but fortunately

Buffalo.

fell in with bands of buffalo. The weather was very cold and stormy, and the rain fell in torrents. We killed, however sufficient buffalo for our present wants. Here I had the

Lose a horse.

misfortune to lose one of my finest horses while cutting up a buffalo. The horse was attached to the dead bull's horn, and took fright at one of the men coming over the brow of the hill with a load of brushwood; he broke his halter and made his escape on the plain. Instantly, four of my best mounted men started in pursuit; the rain poured in torrents, driven by the storm against their faces. They continued till dark night in vain; the intrepid fellows, without a coat or a blanket with them, passed the night on the broad prairie, with not a shrub to shelter them from a terrific thunderstorm, and as soon as day dawned, took up the horse's tracks, mounted and recommenced their pursuit. All their exertions, however, were in vain, for, unfortunately, the horse was a very swift powerful animal, a finer one than any in pursuit of him.

Delay by sickness.

In consequence of the severity of the weather, and the great hardships the men had undergone, one of them was seized with acute inflammation of the lungs, which delayed us for eight days. This time I could hardly consider lost, as the weather continued very wet, and the horses were much in want of rest.

Guarding horses.

We were now in the Blackfoot country and had to guard our horses strictly every night, I myself and each of the gentlemen with me keeping watch in turn, and during the daytime keeping scouts on the "look-out" in every direction.

March resumed.

At length, on 3rd July, Antoine Shaw was sufficiently recovered to be removed and the Expedition continued its course to Battle River, the weather very cold and stormy, with several severe hail showers, the stones striking so hard as to cause pain to ourselves and the horses.

I will not occupy your Lordship's time with minute details of our journey from this, as the prairie was neither well provided with wood nor rich in pasture, but will pass on to the period of our arrival at the Battle River.

Battle River.

On 7th July we arrived at Battle River, a large but unnavigable tributary of the Saskatchewan, crossed the stream, and encamped in about lat. 52° N., long. 111° W. Here we found fine rich soil, well adapted for pasture and agricultural purposes. The river at this point takes a wide sweep to the south; instead therefore of continuing up the stream to the southward and then again to the northward (*i.e.* round the bend of the river), I determined on holding my direct course, and dispatched Dr. Hector with two men on horseback and one pack-horse to follow the bend of the river, and meet the Expedition again, where I proposed re-crossing the stream, about 40 miles to the westward. The Doctor reached me on the 11th, the day after I arrived at my second crossing place, having

Fertility of the country. Pines.

laid down that portion of the river, and fully confirmed my expectations as to the fertility of the country through which it flows. Here, also, we had seen the first pines since our departure from the north branch of the Saskatchewan, and although *now* no longer in large number, still there are indications of their having existed here in great abundance, and of a large size. Unfortunately the Indians have a most disastrous habit of setting the prairie

Effect of prairie fires.

on fire for the most trivial and worse than useless reasons. If a war party returns, if a hunting party starts, even if a single individual wishes to signal his camp, the invariable method resorted to is "firing the prairie." The result is, all their invaluable timber, such as pines and deals of every kind, perish for ever off the face of the earth, leaving nothing hereafter to spring up in their place but willows and poplars. Hence, year after year willows are sacrificed for ever, which would bring wealth, warmth, and the means of transport to the future settler, who might till the soil and navigate its streams.

Cross Battle River a second time. Circees.

At our second crossing place of Battle River, I was visited with great ceremony by a large camp of Circees. These Indians, though differing widely from the Blackfeet, and speaking another language, are allies to the latter. They are very poor and troublesome, and sometimes riotous and disorderly. Although, the old men and chiefs were well disposed towards us, we had reason to congratulate ourselves that our party was so strong, otherwise I do not think the chiefs would have succeeded in their endeavour to keep the young men from attempts on our horses. We spent an anxious night, all keeping watch, and the next day we made them a few presents, exchanged a few tired horses, and parted on very good terms.

Splendid soil westward of Battle River.

Our course to the westward from Battle River continued through a soil of fine vegetable mould two feet deep upon a substratum of sand. This portion of country was no doubt formerly forest lands, but now converted into prairie by the frequent occurrence of fires which overrun the country.

On 14th July, when nearly out of provisions, buffalo were discovered to our south at a great destance. I dispatched Mr. Sullivan with the hunters, followed by three carts to hunt, being uncertain as to whether we should again find buffalo to the westward. On the return of the carts, I gave orders to remain here a few days, to slice and dry provisions for at least ten days' consumption. Halt to make provisions.

I started from this encampment in a W.N.W. direction to the Bull Lake, and left orders that the Expedition should go on their course to the Red Deer River, where I would again join them. The Bull Lake is nine miles long and seven broad, and is connected to the Red Deer's River by an insignificant stream insuing from the southern extremity of the lake. I think this lake would be a desirable place for a settlement, the soil is good, and the lake is in proximity to the Red Deer River, a large navigable tributary of the south branch of the Saskatchewan. There is, however, no valuable timber at the lake itself, but ample quantity could be obtained both at the Red Deer River and its tributary, the Medicine River, where the white spruce and rough barked poplar are in abundance. Bull Lake.

On July 24th we camped on the edge of the woods, in lat. 51° 52′ N., long. 114° 10′ W. I determined there to await the arrival of Lieut. Blakiston, who was to join us after having gone by the regular cart track, *viâ* Edmonton, in charge of ammunition, flour, and a few articles for Indian presents. We waited three or four days, and with difficulty supported ourselves on deer, which were very scarce, as the Assineboines had hunted there all the spring. At length, on 29th, I directed Dr. Hector to proceed to the forks of Medicine and Red Deer rivers, and bury a letter for Lieut. Blakiston, informing him that we were obliged to move onward from scarcity of provisions, and acquainting him how he was to steer his course in order to fall on our trail. Cache Camp. Send to meet Lieut. Blakiston.

On July 30th we again broke up camp; and, as I intended to send a part of the Expedition by the same route to winter quarters from the Rocky Mountains, I there made a "cache" of all the articles that we could possibly dispense with, in order to lighten the Expedition as much as possible, and enable us to abandon the carts for a time, hide them, and proceed with pack-horses. Start again.

All these arrangements being completed, we started at 8.30 A.M.; and as we were camped at 1 o'clock for dinner, Lieut. Blakiston, with his carts and horses, overtook us. He brought us the news that the boats had not arrived, and he was obliged to leave without the stores; but he succeeded in bringing me some ammunition from Edmonton, which, after all, was the only thing of vital importance. Lieut. Blakiston's arrival.

We were now without provisions, but still continued our course. In the evening, however, two of my scouts came into camp, and reported a large band of buffalo about twelve miles to S.E. The next morning we started before sunrise, and travelled till 9 o'clock, when we came within hearing distance of the tramping of the animals. Here we camped, saddled the runners, and started after our game: we had an admirable run, and killed sixteen. All hands then went to work to prepare and dry meat for the period that we should travel among the Rocky Mountains; because I was aware that, once we entered that range, we should have little or no chance of finding anything to eat. We all worked hard slicing and drying, made our provisions, and were ready to start on 4th August. Buffalo.

As I had ample time before the close of this season to seek for the pass, the existence and place of which I was in search of, I determined to ride to the boundary line and examine the country from the mountains eastward, and took with me Mr. Sullivan. I left Dr. Hector and Lieut. Blakiston, and M. Bourgeau, to proceed to the Old Bow Fort, or Chesterfield House, with the main body of the Expedition under charge of Dr. Hector, with orders that, as soon as they had arrived at the site of the Old Fort, he should place the carts in "cache," dispatch the gentlemen on their different missions, proceed upon his own, and direct the remainder to await my secretary's return from the boundary line: M. Bourgeau to enter the mountains and proceed with three men and seven horses on a botanical exploration, wherever he thought best; Dr. Hector with another party, to go on a geological tour; Lieut. Blakiston to proceed through the mountains by the two known Kootanie passes, returning by the southern one. Arrangements for exploration.

I started at noon from our camp, known as Slaughter Camp, lat. 51° 20′ N., long. 113° 45′ W., and kept on a southern course along the prairie. We only found salt lakes; and though we rode till 11 P.M., we camped without fire or water, but next morning reached the Lower Saskatchewan or Bow River, in lat. 50° 55′ N. We crossed the river after breakfast, found it very deep, our horses as well as ourselves being obliged to swim. The country we passed over on the north side of the river has a wretched soil; but when on the south side, the appearance and soil changed greatly for the better. We crossed numerous well-wooded rivers,—many of them containing valuable timber, such as Slaughter Camp. Start for the boundary line. Nature of country.

pines, spruce, &c.,—the valleys and neighbouring soil of which were rich and desirable for cultivation; but whenever we struck out on the broad prairie, we generally found the soil worthless, except here and there in small swamps. Although my journey to the western extremity of the boundary line was necessarily a rapid one, I determined on a visit to the "Cypres Hills." I was anxious to see this part of the country, in consequence of having heard many reports of its wonderful timber and fine rich soil. I found great tracks of splendid timber wasted by fire; there still remains, however, many valuable pines, and the land is rich and capable of producing several grain crops in succession without manure.

Cypres Hills.

Reach boundary line. Its locus. Chief Mountain.

On August 8th, we arrived at the 49th parallel, the prairie stretching to the east, utterly devoid of wood save in the valley of the Great Belly River. The locus of 49th parallel is very strongly marked by a high prominent mountain, called the Chief's Mountain, in full view of which the Indians meet in the autumn, and perform some characteristic dances. I only remained one day, which I devoted to riding in an easterly direction, and climbing elevations to obtain an extensive view of the country to the east, but saw nothing but prairie of the poorest kind, and destitute of timber. The next day I arrived late in camp, and we started for the Old Bow Fort, where we arrived on 14th August.

Old Bow Fort.

The site of the Old Bow Fort is in lat. 51° 9′ N., long. 115° 4′ W., at the foot of the Rocky Mountains. The chimneys of the place are still standing. The Hudson's Bay Company have long abandoned the post, many of their servants having lost their lives in its defence. Although the timber here, consisting of fine prush, Banksian pine, spruce and red pine is valuable, the soil is scanty, the river valley being occupied by immense deposits of shingle.

Scarcity of game.

On my arrival at the Bow Fort I found my hunters waiting for me. They had been out in every direction, but could not fall in with buffalo; they had also found elk and deer very scarce. In addition to this, they were in great fear of the Blackfeet and Blood Indians, whose return from the south-east would soon be daily expected. I was therefore obliged to alter my plans and desire them only to await the arrival of M. Bourgeau, and afterwards to proceed to the forks of Red Deer and Medicine rivers, and there to await the return of Mr. Sullivan, whom I was to send in charge of my branch expedition as soon as I had searched for my pass back from the mountains, I myself proposing to proceed westward to meet Captain Hawkins and visit Vancouver. I regret, however, that a letter from Lieut. Blakiston was handed to me by one of my men acquainting me, that "his "position in Her Majesty's service would not allow of his considering himself in any "way connected with the Exploring Expedition under my command."

Resignation of Lieut. Blakiston.

Derangement of my plans.

This step of Lieut. Blakiston deranged my plans a little, and is partly the reason why I have determined on wintering on this side of the mountains.

Start to explore the mountains. Kananaskis River.

On the 18th of August I started to seek for the new pass across the Rocky Mountains, proceeding up the north side of the south branch of the Saskatchewan or Bow River, passing the mouth of Kananaskis River. Five miles higher up we crossed the Bow River and entered a ravine. We fell upon Kananaskis River and travelled up it in a south-westerly direction, and the following day we reached Kananaskis Prairie, known to the Indians as the place "where Kananaskis was stunned but not killed." On the 21st we passed two lakes about two miles long and one wide. We continued our course, winding through this gorge in the mountains among cliffs of a tremendous height, yet our onward progress was not impeded by obstacles of any consequence; the only difficulty we experienced was occasioned by quantities of fallen timber caused by fires. I observed that many, indeed most of these tremendous fires are caused by lightning, and in one or two places traced their progress where the foot of man could never have trod.

Reach height of land.

Altitude of, the only obstacle.

Fallen timber.

Columbia Lakes.

On the 22nd of August we reached the height of land between the waters of Kananaskis River and a new river, a tributary of the Kootanie River. We remained here for the rest of the day, occupied with observations. Our height above the Bow Fort was now 1,885 feet, or above the sea 5,985 feet. Next morning we commenced our descent, and for the first time we were obliged to get off and walk, leading our horses down a precipitous slope of 960 feet over loose angular fragments of rock. This portion over, our route continued for several days through dense masses of fallen timber, destroyed by fire, where our progress was very slow, *not* owing to any difficulty of the mountains, but on account of the fallen timber, which we had first to climb over and then to chop through to enable the horses to step or jump over it. We continued at this work from daybreak till night, and even by moonlight, and at length reached the Columbia Portage on the 27th of August. Here I devoted a day to ascending some heights in search of a view of the Columbia River. After climbing several mountains in rain, I at last was astonished to find myself right upon the bank of the lake from which the Columbia rises, at a height of about 2,300 feet over the surface. Climbing a high tree in order to overlook the woods which inter-

cepted my view, I saw both the Columbia lakes, the Columbia rising out of the southern, flowing into the northern one, out of which it bends to the westward previous to taking its northern course to the boat encampment. The most southerly of these lakes is in lat. 50° 7′ N., long. 115° 50′ W.

Meet with the Kootanies.

On the 30th of August we arrived in lat. 49° 36′ N., long. 115° 37′ W. on the Kootanie River, where we found a camp of Kootanie Indians. These are the most wretched-looking fellows I ever met; men, women, and children, all living on berries, the men naked and the women nearly so; yet strange to say they possess a wonderful number of horses, and those very superior to the Indian horses on the east of the Mountains. Although these people were starving and destitute of clothes and ammunition, still they possess an enormous quantity of very fine horses. Yet I had considerable difficulty in training horses for the Expedition, and those I did succeed in training were not from among their best horses, neither could I obtain more than one or two horses for mere trade, although they were most anxious to exchange horses even greatly to their own disadvantage.

Trade horses.

I had eleven horses with me. Most of them were in wretched condition, and many of them worn-out, unserviceable animals, yet these were eagerly exchanged and good ones given in their stead, particularly when a little present of two plugs of tobacco and fifteen balls and powder were advanced. Indeed, only for my having effected these exchanges of horses I hardly think I should have succeeded in bringing back all the horses I had started with from the Old Bow Fort, some of which had also been with me on my previous rapid trip to the boundary line.

The road to Colville.

I learned from the Kootanies that there was a very plain easy road to Fort Colville, distant eight days from their camp; but as they had quarrelled with the Flat Heads, not one would volunteer to come with me as guide. However, that circumstance would not have deterred me from proceeding westward to meet Captain Hawkins and visiting Vancouver, had I known what Lieut. Blakiston's intentions were, and, indeed, it was not until after his return to Edmonton that he could communicate them to me. I merely state them without note or comment.

Ignorance of Lieut. Blakiston's intentions.

Statement concerning Lieut. Blakiston.

On the 11th August Lieut. Blakiston resigned his place in the Expedition; Lieut. Blakiston then took three men, an Indian guide, and ten horses belonging to the Expedition, when no longer an officer of the Expedition. This irregular proceeding I pointed out to Lieut. Blakiston, but said I would let that pass. However, on requesting Lieut. Blakiston for the map of his route through the two Kootanie Passes, I was surprised by a positive refusal to give me any maps, or the benefit of any observations whatever.

Enclose copy of Lieut. Blakiston's Letter.

I have nothing further to write on the subject, save to submit Lieut. Blakiston's letter of 11th August 1858, which I have the honour to enclose.

Start to re-cross the mountains.

On September 6th I started to re-cross the mountains by the Kootanie Pass, and was surprised to find that pass also within the British territory.

British Kootanie Pass.

We entered it in lat. 49° 11′ N., long. 115° 21′ W. in the valley of the Elk River, and came out on the east side of the mountains in lat. 49° 32′ N., long. 114° 35′ W. in the valley of Little Belly River. It is one frequently used, but not the general pass of the Kootanie Indians, who have a preferable one in the American territory.

Height of land.

On September 7th we passed the height of land, a formidable ascent, where we had to walk and lead the horses for two hours. This is the height of land which constitutes the watershed. We encamped for the night in a small prairie, after making a considerable descent. On the 8th of September our course continued through woods and swamps, for about 15 miles, till we arrived at another ascent; this was also a severe ascent, though not so formidable as that of the day previous; we reached its summit about four o'clock, through a severe snowstorm, the snow falling so fast as to make me very apprehensive of losing the track. We descended that evening, and camped on the eastern side, and next day arrived at the eastern extremity of the pass. I regret that I cannot give the altitudes on this pass, as our barometer was broken by one of the horses. It is, however, far from being so favourable as the more northern one by which I entered on Kananaskis River, which has but one obstacle in height of land to overcome, and where the whole line of route is free from swamps and marshes.

Aneroid barometer broken.

I will not take up your Lordship's time with an account of our journey from the Kootanie Pass to Edmonton, as I have given a description of the greater part of the country already.

Arrival of Dr. Hector.

I have great pleasure in reporting the arrival of Dr. Hector while I have been writing this letter. I have been very anxious about him, knowing how badly off he must have been for provisions. He has had a very severe journey, and much trouble in

finding game enough to support himself and party. He has amassed a large stock of information in the mountains, geographical as well as geological. He is very anxious to penetrate further across to the west, but unfortunately my instructions prevent me from permitting him to do so, however desirable I might consider such a journey to be. In addition to being an accomplished naturalist, Dr. Hector is the most accurate mapper of original country I have ever seen, and is now an experienced traveller. By long and severe journeys with dogs and snow shoes last winter, in connexion with his hard trip this autumn, he has laid down the whole north branch of the Saskatchewan, and the south branch from where we met it to the glaciers of its source; and there is no department of the Expedition in which he is not only competent, but willing to assist.

He has laid down the Saskatchewan.

I have the honour of enclosing Dr. Hector's report of his explorations, and there are two facts connected with that portion of country to which I wish particularly to draw your attention.

Enclose his report.

1st. Dr. Hector followed the Bow River right up to the main watershed of the continent, then followed it until he reached a transverse watershed, which divides the waters of the Columbia and those of the north Saskatchewan on the one hand, from those of the Kootanie and south branch of the Saskatchewan, on the other. There he found the facilities for crossing the mountains so great, as to leave little doubt in his mind of the practicability of constructing even a railroad connecting the plains of the Saskatchewan with the opposite side of the main chain of the Rocky Mountains.

His route. Double watershed.

On the practicability of a railroad.

2nd. Dr. Hector informs me, that the water-line of the mountains is not identical with their geological axis; this axis he was unable to reach, and had only opportunity of examining what are called flanking ranges, therefore the most important geological results relating to the Rocky Mountains of North America remain as yet unascertained, because, in conformity with my instructions, I was obliged to order Dr. Hector not to advance further than the axis of the watershed of these mountains; and I take this opportunity of recommending Her Majesty's Government to alter that part of my instructions, and direct my movements in the following manner:—That, as soon as my explorations are completed on the east side of the mountains (for now there remain only 6° of longitude in the country of the boundary line), I should send Dr. Hector to complete his exploration, and then meet me at Fort Colville, whence we could return home to England by Panama, and the British West Indian mail steamer from Chagres, a far cheaper route than recrossing the whole continent of North America. Besides this, it will enable me to dispose of all my horses to great advantage, and even make money to credit side of the Expedition in the account for horses. The Hudson's Bay Company are very short of horses, and allow me 20*l.* each for 25 horses now, and have promised to purchase all the others I can spare next year. I have now 53 horses, almost all of which are sure to outlive the winter; I have lost but three or four this year, and may lose five this winter; however, I have not neglected any precaution in my power, and have cut and stacked hay for them, and am constructing a shelter for those that may require it after Christmas.

The water-line not identical with the geological axis.

Recommend alteration of instructions.

Mode of return. Economy of Western route. Sale of horses.

As to my expenditure this year, it is not easy to give an exact statement, as the accounts are all priced at La Chine, and I am too far distant to go down and settle them, as I did last year. They will, however, hardly exceed 2,000*l.* by more than I can counterbalance by the sale of the horses. The expenses of next season will exceed 1,500*l.* if anything at all is to be done But if Her Majesty's Government are really apprehensive of the grant of 1,500*l.* being overdrawn, I have but one course to pursue, that of abandoning the completion of the boundary line, and all discoveries in the Rocky Mountains, and returning home in the beginning of the season. It is quite true that my expenses for this financial year will not have been so great as those for the financial year 1857-8; but any one acquainted with this expensive country will inform Her Majesty's Government that 1,500*l.* is hardly sufficient to cover a season's explorations, particularly when the salaries and home journey expenses are to be deducted from it.

Expenditure.

I feel greatly honoured by the confidence Her Majesty's Government have hitherto placed in me, and should Her Majesty's Government consider the importance of ascertaining the practicability of a railroad across the Rocky Mountains, as well as a more extended acquaintance of the geological structure of those mountains themselves, worth the further sacrifice of a few hundred pounds, I would propose that the Government grant me the whole of the 1,500*l.* for expenses in this country alone for the next season, independent of salaries and the homeward travelling expenses, the former of which will an ount to 570*l.*, and the latter, I hardly think, will exceed an equal sum, if I am allowed to adopt the route I propose as most conducive to the interests of science as well as the purposes of economy. The only objection that can be urged to this proposition is, that Captain Hawkins and his party have been sent to the west side of the

1,200*l.* more required.

Possible objection.

mountains. But their work, as far as I understand, will confine them to the neighbourhood of the 49th parallel, and they will not have the same facilities for accomplishing those objects as I shall, starting from the eastward in a higher latitude, where the country is safe and a small party can travel, nor could they effect them as rapidly and economically as I could.

Plans for next year.

My plan is to send Dr. Hector to pursue his discovered route, which my instructions compelled him to abandon, while I and my secretary, Mr. Sullivan, will follow a different line of traverse to the Pacific, so as to ascertain as much as possible of the nature of the country lying between the mountains and the sea north of the 51st parallel.

Botanical collection. M. Bourgeau.

M. Bourgeau, who has made a magnificent collection of Alpine plants during his tour in the mountains, will return to London, *viâ* Pembina and St. Paul's, in order to fulfil his botanical engagements for 1860. I have to express my thanks to him for his most unceasing exertions, not only in his botanical labours, but for his zeal and care as manager of the provisions and stores of the Expedition, and his anxiety to assist me in every possible way.

Mr. Sullivan

I have also to express my satisfaction with my secretary, Mr. Sullivan, not only for his zeal and assiduity in carrying on the astronomical observations, but also for his assistance and exertions for the interests of the Expedition, particularly with regard to the horses; also by his care and regularity with the accounts, which, in a country where everything is conducted on a system of "barter," are of a very complicated nature.

The maps.

I have the honour to enclose two maps.* The first contains the routes of the whole Expedition, together with those of the branch parties. The other is a rough enlargement of a portion of this, in order to display with greater clearness our different routes of exploration while in the mountains. The map is not final as regards the mountains, as Dr. Hector's longitudes are by account, and may require correction; the remainder, however, is completed, and I beg it may be preserved, as we have no time to make a copy.

Great haste.

We have barely returned from the plains into Fort Edmonton in time to receive and answer our letters by the "fall boats," which start again immediately after they are unloaded, to anticipate the setting in of the ice. Our time, therefore, is very short, and although I have troubled your Lordship with a long letter, yet I have been obliged to omit a great deal of information contained in the journal.

Fort Edmonton.

Fort Edmonton is the largest trading post in the Saskatchewan; a little agriculture is carried on; they grow tolerable wheat, and grind it in a windmill. The potatoes are excellent, and horned cattle continue out the whole winter, and still are thriving. However, I cannot observe much as yet; my whole time has been occupied with the men's accounts and the correspondence.

Red River Brigade. St. Ann's Brigade.

The Red River men return to Carlton by the boats, where I have made arrangements for their conveyance to Red River Settlement, and give them the balance of their pay in orders on the Hudson's Bay Company. The Lake St. Ann's men are paid in goods, as money is not known in this country, and I am now giving them value for their wages in goods ordered by me for the Expedition, charging them the Company's prices. It would be impossible to send an account down now, but I will forward one by the winter express, along with the whole corrected map of the Expedition, and the observations.

My original instructions.

I must now beg leave to draw your Lordship's attention to that portion of my original instructions of March 31, 1857, which direct me as follows:—

"You will endeavour from the best information you can collect to ascertain whether one or more practicable passes exist over the Rocky Mountains within the British territory, and south of that known to exist between Mount Brown and Mount Hooker."

In accordance with these instructions, I first obtained the best information I could collect, which proved so vague as to be utterly valueless. I then directed Dr. Hector to undertake the more northern search (*i.e.* between the two branches of the Saskatchewan River), I myself, accompanied by Mr. Sullivan, undertook the search from the south branch of the Saskatchewan to the pass of the probable existence of which I had informed Her Majesty's Government before receiving the command of the Expedition. I directed Lieut. Blakiston to undertake the Kootanie Passes supposed to be in American territory. Lieut. Blakiston threw up his command in order to carry out that object independent of me, but with the assistance of Mr. Sullivan, I was also able to effect that portion of what was to have been his duty myself. This comprised the southernmost pass

Vagueness of Indian reports.

Summary.

* The maps have been reduced and incorporated into the long map, which will be found at the end of these Reports.

within the British territory. Lieut. Blakiston's exploration may perhaps have a value hereafter as a corroboration of my own.

Indian knowledge of the mountains inadequate.

The fact is that the knowledge the Indians possess of the mountains is very small, even among those said to "know the mountains," their knowledge is very limited indeed. This is easily accounted for by the scarcity of the game, which offers no inducement to the Indians even to go there. I fear if Dr. Hector leaves this country without completing his pass, much difficulty might arise hereafter in finding the exact point of the western exit of the valley, as it is very small and the woods dense, and no one could find it as the Doctor himself. Besides, the most unfavourable result would even be desirable in that case, as it would set the question of the possibility of the easy construction of a railway across the Rocky Mountains for ever at rest.

Desirable that exploration continue.

Enumeration of discovered passes.

I will now enumerate the several psses which have been discovered and laid down.

1st. From south branch Saskatchewan to Kootanie River:
Two, *i.e.* Kananaskis Pass and Vermillion Pass:

2nd. From Kootanie River to Columbia:
Two, *i.e.* the Lake Pass and Beaver Foot Pass.

3rd. From south branch Saskatchewan to north branch:
One, *i.e.* the Little Fork Pass.

4th. From south branch Saskatchewan to Columbia:
One, *i.e.* the Kicking Horse Pass.

British Kootanie Pass.

In addition to these discovered passes, the Northern Kootanie Pass has been laid down, and found to be entirely within the British territory, and I have named this the British Kootanie pass.

Captain Hawkins.

With regard to the expressed wish of Her Majesty's Government that I should communicate with Captain Hawkins, I beg to state that I shall endeavour to find an opportunity of doing so.

In conclusion, I have to acknowledge the receipt of your Lordship's courteous expressions on the subject of my letter of 13th March 1858. I have also to acknowledge the receipt of the abstract account for the financial year 1857–58.

I have, &c.
(Signed) JOHN PALLISER, Capt. Waterford Artillery Militia,
Commanding N. British America Exploring Expedition.

The Right Hon. Lord Stanley, M.P.
&c. &c. &c.

Enclosure 1 in No. 8.

Enclosure 1 in No. 8.

Sir, Fort Edmonton, Saskatchewan, October 9, 1858.

I have the honour to report the safe arrival of myself and party at this place on 7th current, being exactly eight weeks from the time of our separation from the remainder of the Expedition.

After your departure to the boundary line on August 3, according to your instructions I conducted the Expedition without loss of time to the site of the Old Bow Fort, and arrived there on the afternoon of the 7th. On the 5th we began to ascend considerably, and saw the last of the real plains. From this point our way lay over a succession of parallel ranges of hill, wooded in some parts to their summits, but not rising to more than 800 or 1000 feet above the plain. On the morning of the 7th, we first struck the south branch of the Saskatchewan at the mouth of Dead Man's River, and from this point, we followed it up until we reached the Old Fort on the same day. Its site is marked only by a group of mud and stone chimneys, the remainder of the fort having been constructed of timber, all of which has long ago been removed and used by the Indians as firewood. A small stream joins the river from the west at this place, and the main stream itself makes a bend from a north to an easterly course.

Our camp was pitched within three miles of the mountains, which rose behind as ranges of bald inaccessible cliffs to the height of from 3,000 to 4,000 feet above the eye.

We fortunately met with a large camp of Assineboines at this place, from whom I traded pack saddles and other articles which were required for our mountain work.

In conjunction with Lieutenant Blakiston, observations were made on the temperature of boiling water, to determine the altitude of the place, and to find the errors of our aneroids. The corrected mean readings for the time of our stay compared with the mean for Carlton, showed the altitude above that place to be 2,225 feet, or above the sea 4,100 feet. Our aneroids, and also the sympiesometer for great altitudes, I am glad to say, still gave a very close approximation to true readings, notwithstanding the great increase of elevation.

On 11th August M. Bourgeau and I started and camped together about 11 miles up the valley of Bow River, on the banks of a lake formed by a dilatation of the river in consequence of the valley being barred by immense deposits of rounded shingle. Our road was rather a bad one, on account of the fallen timber which impeded our path, the valley not having been frequented by the Indians for many years.

This first portion of the valley cuts through five parallel ranges of mountains at right angles to their axes. These are composed of beds of crystalline and compact fossiliferous limestone (most likely of

carboniferous age) dipping at 30° to W.S.W., but having several obscure plications. Two well marked peaks occur on either side of the valley, which M. Bourgeau named "Grotto" and "Pigeon" peaks.

After passing the former of these, the following morning (having taken leave of M. Bourgeau, who remained to examine this mountain) I entered a wide trough-like valley, running to S.S.E., through which I contrived to follow up Bow River in the opposite direction for three days. This trough continues to run through the mountains, beyond the points where the river leaves and enters it, the latter being between "Cascade" and "Rundle" Mountains.

"Cascade" Mount which is known to the Indians as the "place where the water falls," rises as a series of precipices to the height of 4,521 feet above a small level plain at its base, and is so abrupt that its summit is in view at a horizontal distance of 2,200 yards. It may be taken as a type of the mountains in this portion of the chain, all being equally precipitous and inaccessible.

Bounding the valley to the south is the "Windy" Mount of M. Bourgeau, which he has made the subject of an elaborate botanical examination.

From the Cascade Mount the river valley again changes its direction, passing at right angles to the chain so as to cross the "Saw-back" range, which are composed of the same strata as before, but now almost vertical, having only a slight inclination to W.S.W.

After following up the valley which then was reached, to N.W. for three days, on the 18th I arrived at "Castle" Mount opposite the entrance to the "Vermillion" Pass. I had already passed three small tributaries, by following up either of which, the height of land can be crossed to the Kootanie River, but judging from Indian report, none of these were so promising as this one, by which I now resolved to cross the water-line of the mountains.

The mountains now began to wear a different aspect, more massive, and evidently much loftier. They are composed of white and pink quartzose sandstone, almost passing into a quartzite in some parts, and in others into a fine conglomerate. Their minute description, as well as other geological points, will, however, form the subject of a more special report.

Having devoted a day to the examination of Castle Mount, and to prepare the flesh of a moose we had killed, on the 20th I crossed Bow River, without swimming the horses and unloading their packs; and, after a six hours' march through thick woods, reached the height of land the same afternoon.

By careful barometric readings I found the rise from the river to be 539 feet: and I consider the rise of the river, to where I crossed it from the Old Bow Fort camp, to be 300 feet, thus giving for the height of land 940 feet. The small stream along which we had ascended here ends in two small lakes, the water of which is beautifully clear: and 200 yards further on, and at 17 feet above the level of the upper lake, we came on a rapid turbid stream, flowing to the S.W., which was the head of the Vermillion River, the principal branch of the Kootanie River.

The height of land is in 51° 8′ 30″ N., longitude by account 116° 35′ W. It is in a wide valley, between outlying shoulders of two snow-clad mountains, which I named after Mr. Ball and Colonel Lefroy, the latter being to the west. The ascent to the watershed from the Saskatchewan is hardly perceptible to the traveller who is prepared for a tremendous climb, by which to reach the dividing ridge of the Rocky Mountains, and no labour would be required, except that of hewing timber to construct an easy road for carts, by which it might be attained.

The three following days were occupied in the descent of Vermillion River, which, after flowing to S.W. by W. for nine miles, suddenly changes its course to S.E. for 18 miles, when it again changes to S., escaping into a wide valley to join a much smaller stream, which is the Kootanie River.

In its course of about 40 miles it descends 1,227 feet, so that at its junction with the main stream it is 383 feet below the Old Fort.

It becomes of considerable size a very short way from its source, as it receives large tributaries from glaciers which occupy the valleys of Mounts Lefroy, Ball, and Goodsir. The valley through which it flows is contracted only at one point "The Gorge," near its lower part, where two lofty mountains seem to close in on the stream, without, however, in reality causing any great difficulty in passing along its base.

A road for carts down the valley of Vermillion River, from the height of land to the Kootanie River, could be cleared without difficulty, for, supposing the road to follow a straight line along the river, and the descent to be uniform, which it almost is, the incline would only be 40 feet in a mile, or 1 in 135.

The absence of any abrupt steps, either in the ascent or descent, together with the small altitude to be passed over, form very favourable points in the consideration of this pass as a line of route.

There is some confusion as to which is called the Vermillion and which the Kootanie River in the accounts given by Indians, so I have thought it better to confine the former name to the large stream by which I descended, and consider the smaller stream into which it flows as the Kootanie River. This accords better with nature of the valleys, as the Kootanie River, although an insignificant stream, before receiving the Vermillion River flows S.E. through a magnificent valley from three to five miles in breadth.

The forks of Kootanie and Vermillion River are in lat. 50° 50′ N. long. by account 116° 40′ W. (I may state that, in reference to all my longitudes, I did not trust to the reckoning by distances travelled alone, but obtained them by a system of bearings, combined with numerous observations for latitude.)

I should have liked very much to have descended the Kootanie River for some distance, to find if there is any gap in its valley by which a passage could be effected to the west without following down the stream; but my orders to confine myself to the water-line of the mountains, and which required me to be back at Fort Edmonton early in October, limited me to a less extended circuit in the mountains than I should then have required to make: besides, judging from the absence of all tracks since leaving the valley of the south branch, there did not seem to be the slightest prospect of procuring game on the west side of the watershed, and we were now beginning to be pinched for provisions.

Ascending the Kootanie River, therefore, on 27th, I reached the height of land which divides it from one of the principal tributaries of the Columbia River, called Beaver Foot River. The watershed is in a large morass, with several lakes occupying the bottom of a deep wide valley, common to the two streams, although flowing in opposite directions. The line of watershed is so little marked that it is impossible to cross even on foot between the two streams without going in water. On either side of it

the stream is dilated into wide shallow lakes, the surfaces of which were crowded with the gaudy flower of the Nuphar lutea. The altitude of this watershed I considered to be 3,834 feet above the sea, or 266 feet below the Old Fort.

It is on 51st parallel of latitude, in longitude 117° 10′ W. On the north side of the valley are Mount Goodsir and Pyramid Mountain, and on the south is the Brisco range, which although of no great elevation (about 2,000 feet above the eye) run, as an unbroken wall, to S.S.E. My Indian declared that the river we had now struck was the head of the north branch of the Saskatchewan, and wished to follow it down, but if my barometer and sympiesometer were acting with any approach to accuracy we were now about on a level with what I had found to be the elevation of the Mountain House during last winter, so that this could not be the case. In addition, the change in the vegetation, especially the occurrence of cedar, convinced me that we were really on a branch of the Columbia.

I accordingly only followed it for two days, and on 29th reached the mouth of a large tributary, to N.W. This river is much larger than the Vermillion River, and about four times the size of the stream into which it flows, being about equal to the south branch at the point when we left it.

Here I received a severe kick in the chest from my horse, rendering me senseless, and disabling me for some time. My recovery might have been much more tedious than it was, but for the fact that we were now starving, and I found it absolutely necessary to push on after two days.

Where it receives Beaver Foot River, Kicking Horse River bends back on itself, including an angle of only 20°, and after passing over a fine fall of about 40 feet flows on to N.W.

The mouth of Beaver Foot River is about 318 feet below the height of land where we first struck it.

As I was quite unable to move, I sent my interpreter, Peter Erasmus, to ascend Mount Hunter, which is included in the angle of Kicking Horse River. He ascended for 3,496 feet, and obtained a view, to the west, of snow-clad peaks as far as the eye can reach. Over the tops of Brisco's range, and all to the left of S.W., he could perceive no mountains, so that if that portion of country is occupied by any they must be of very inferior altitude.

It was my intention to have crossed Brisco's range on foot, but my unfortunate accident quite unfitted me for the task.

The angle of Kicking Horse River is in lat. 51° 10′ N., long. 117° 26′ W.

While traversing this valley, since coming on the Kootanie River, we have had no trail to follow, and it did not seem to have been frequented by Indians for many years. This makes the absence of game all the more extraordinary. The only animal which seemed to occur at all was the panther. The Indian saw one, and in the evenings we heard them calling, as they skirted round our camp, attracted by the scent.

The bottom of the valley is occupied by so much morass, that we were obliged to keep along the slope, although the fallen timber rendered it very tedious work, and severe for our poor horses, that now had their legs covered by cuts and bruises.

The timber along Beaver Foot River is mostly young, but there are the remains of what had been a noble growth of forests, consisting of cedar, pines, and spruce, among the latter of which is the magnificent pruche, which sometimes reaches four yards in circumference. I also saw a few young maples (Negundo fraso). Berries of many kinds were very abundant, and, indeed, had it not been for this we would have suffered much from hunger.

On 31st August we struck up the valley of Kicking Horse River, travelling as fast as we could get our jaded horses to go, and as I could bear the motion, and on the 2nd Sept. reached the height of land. In doing so we ascended 2,021 feet. Unlike the Vermillion River, the Kicking Horse River, although rapid, descends more by a succession of falls than by a gradual slope. Just before we attained the height of land, we ascended more than 1,000 feet in about a mile, down which the stream leaps by succession of cascades.

This height of land is 5,120 feet above the sea, and is lat. 51° 24′ N., long. 117° 20′ W. The water-line is in a flat valley, clothed with fine open forests of spruce, lying between Mount Vaux and the eastern end of the Waputteehk Mountains.

Here, to our great joy, we found tracks of game again.

On the morning of the 3rd, we followed down a small stream over a wooded plain for about six miles, and only descended about 50 feet from the height of land, when we came to a large river, flowing to S.E., which the Indian at once recognized as the south branch, from which we had been absent about two weeks.

The same afternoon he killed a moose, which relieved us from want, and we also fell in with a band of Assineboines, who had just come over by a direct pass from the north branch to this place.

We had several days of severe weather at this time; a great deal of snow with thunderstorms. I delayed here with the Indians on account of our horses requiring rest, and also to get them to dry our moose-meat properly for us, as we lost more than half of the last from its not being well prepared.

On 8th September I started to ascend the south branch, not following the pass by which the Indians had come, and which they described as very easy, but to endeavour to pass from its head waters to those of the west branch.

All the mountains on both sides of us were now snow-clad; and those on the south side having their valleys occupied by glaciers, some of great size.

In two days we reached the height of land by a gradual ascent. Here the south branch issues from a lake about four miles long, the upper end of which is fed by a glacier which descends from a magnificent *mer de glace*, occupying the elevated valleys of Mount Balfour. There is a small stream, however, which flows into this lake from a fine plain which forms the upper of the valley. Following up this, we come to where it rises from a group of springs, and, a few yards further on, a second group gives rise to the waters of the north branch. We dined at this watershed, which is the highest point we passed over with the loaded horses, being 6,347 feet above the sea. Snow was lying under the shade of the trees, notwithstanding the clear midday sun. Lat. 51° 40′ N., long. 117° 30′ W.

The first part of the descent from this height of land was a great contrast to our ascent of the south branch to reach it: for, in the course of two miles, we had descended about 1,000 feet.

Four miles from the height of land, the small stream which originates there receives a large branch from S.E., which, as it rises in a glacier, descending from the same *mer de glace*, as that which feeds the lake at the head of south branch. This feeder of the north branch I called the Little Fork: it flows to N.W. through a rugged valley between Mount Murchison and Mount Balfour. The former of these, which is a most massive mountain, the Indians consider to be the highest of all the Rocky Mountains.

I afterwards measured two of its highest peaks, the one above the angle of the main river and the little fork, the other to the south of the Kootanie plain, on the main river. They are, respectively, 15,789 and 14,431 feet above the sea. I hope I may have yet an opportunity of visiting Mount Brown and Mount Hooker, so as to obtain their altitudes relatively to Mount Murchison. The great size of these mountains, some of which are formed of groups 60 to 80 miles in circumference, prevents the proper appreciation of their altitude: besides not only here, but all through that portion of the range I have seen, there is an absence of striking peaks.

From the point where I met the north branch, I ascended to the place known to the Indians as the "Ice," and from which the largest fork of the north branch rises. The river is large at this place, and flows through a very wide valley, winding through shingle beds which must be covered by every spring flood, as they are clothed by a matting of Dryas integrifolium, Epilobium alpinum, and other Alpine plants, the seeds of which have been carried down from their natural habitats by the mountain torrents,

It occupied two days to ascend to the foot of the great glacier; but one of these was occupied in cutting a road through fallen timber along the banks of the Glacier Lake. This lake is about seven or eight miles long, and about four wide, and is formed by the damming up of a narrow valley between Mount Forbes and Mount Lyell.

The upper part of this valley is occupied by glaciers communicating with immense fields of ice which cover the mountains all round it. The foot of the glacier is about 4,320 feet above the sea. It is easy of ascent, as it terminates by a rounded slope, to reach which, from the floor of the valley, I had only to scramble over the series of moraines which lie in front of it. That portion lying within the valley is about five miles long and three wide; it is 600 feet deep at its lower part, but its surface at the upper end is 1,560 above the valley at its base. It is fed by a narrow spout-like glacier from the *mer de glace* above. I ascended Sullivan's Peak to the north of it, having an altitude of 7,858 feet, and obtained a splendid view of the immense mass of ice which envelopes the mountains to the south and west, obliterating all their valleys.

The stream which issues from the Glacier Lake is much larger than either the main fork or the little fork. The former of these two I ascended for some distance, and saw that it took its rise in the glaciers of a mountain to S.S.E. Up this river there is said to be a pass direct to the Columbia, which was the one first used by trappers in the time of the North-West Company, as far as I could make out from the accounts of the Indians. Mount Forbes, which lies between the Glacier Lake and the great fork of the north branch, I found to have an altitude of 13,400 feet.

Descending the valley of the north branch as it sweeps round the base of Mount Murchison, on the 16th, I reached the Kootanie plain, where the valley becomes much expanded, and is occupied by fine level plain, free from wood, like true prairie. This spot is famous among the Indians for the abundance of game, but it had been well hunted during the summer, so that there was now none left. Buffalo at one time were very numerous here, and their bones and dung showed that this must have been not many years ago. I remained here a few days to examine the mountains, which * the valley. * Sic.
One to the west of the plain I ascended, and found to be 8,913 feet above the sea. On the east side of the valley is what I consider to be the continuation of the Saw-back range, so that the Kootanie plain lies in the same trough-like valley of the mountains as that in which Castle Mountain stands, and which is continuous to the north-east of Mounts Richardson and Murchison.

While resting here the Indian shot some of the big horns, the meat of which, when fat, is certainly the finest of all animals in the country. They occur only along the outer range of the mountains. The rams alone frequent the high portions of them, and the ewes keep by the river margins, especially where craggy. The true animal of the mountains is the white goat, which always keeps at high altitudes, and is only met with toward the axis of the chain. It never descends into the valleys, summer or winter, except at certain places, to eat a kind of white clay, which occurs among the recent deposits in the valleys of the mountains.

The valley of the north branch cuts through the mountains more directly than that of the south branch, and is accordingly much shorter.

Throughout it is very much wider than the valley of any other river I have seen in the mountains, and it is skirted by terrace levels consisting of deposits of shingle, white calcareous clay, and sand the whole way up to the great fork. Its descent is not great, amounting only to 300 feet from the glacier lake to where it issues from the mountains. Having passed a large tributary from the north, which I named Waputtechk or "White Goat" River, I passed out of the mountains on the afternoon of the 18th, after having been 38 days travelling in them. The following day we arrived at Big Horn river, where I determined to give my horses a week's rest, as they were so reduced as to be quite unfit for the long trip which still remained before reaching Edmonton. The feeding along this tributary of the Saskatchewan which enters it between the main chain and Brazeau's range is exceedingly fine, consisting almost entirely of vetches. Besides, I wished to get a series of observations for chronometer rate, so as to determine, if possible, the exact longitude of this place, and by comparing that with the longitude of Bow Fort, obtain the direction of this portion of the chain, as the two places occupy similar positions with reference to it. The latitude of the point where the north branch leaves the mountains is 52 °20′ N. The longitude I have not yet ascertained, but by account 117° W.

While resting at this place, the Indian killed several ewes of the big horn, the flesh of which we dried to serve as provision to take us to Edmonton. Here we were met by a band of Assineboines, who came and camped beside us, and from whom I obtained a fresh horse for one that was too much reduced to proceed further. The weather was again very unsettled at this time, and several inches of

snow fell, which continued to lie on the mountains. We started for the Rocky Mountain House on the 27th. and. leaving the north branch to the south, passed through a nick in Brazeau's range. This range is formed of limestone beds tilted up at an angle of 30° to W. They are wooded to their summits on the west side, and rise to about 2,000 feet above the valley.

Having again met the north branch, we followed it down through thick forests, till, on the night of the 31st, we reached the Mountain Fort in lat. 51° 28′ N., long. 115° 7′ W. The fort is deserted all summer, being only a winter post for the Blackfeet. The traders had not yet arrived, so we found it looking very desolate, with the courtyards choked with weeds, and all the windows and doors were standing open. We took possession of it for the two nights we were at this place, but did not find it so comfortable as our camp fire.

On 2nd October I left the Mountain House for Edmonton, following the road I had travelled between the two places last winter. We were again out of provisions; but as we were now travelling among poplars, we had no difficulty in supporting ourselves on rabbits.

A severe snow storm, which covered the ground to the depth of 18 inches, quite fatigued our horses, so that we had to load our riding horses; and in this manner only with difficulty reached this place on the 7th.

I remain, &c.

Capt. Palliser, &c. &c. JAMES HECTOR, M.D.

Enclosure 2 in No. 8.

Enclosure 2 in No. 8.

CHARGES against Lieut. BLAKISTON in account British North American Exploring Expedition, under the Command of Captain PALLISER.

	£	s.	d.
August 12, 1858—To use of ten horses from August 12 to September 28, 1858, at 2s. per diem—2s. - - - - - - -	47	0	0
To use of three men from August 12 to September 28, 1858, at £3½ per month—£3½ - - - - -	15	0	0
To goods for payment of Indian - - - -	2	0	0
	£64	0	0

See Captain Palliser's letter to Her Majesty's Principal Secretary of State for the Colonies, page 33, of October 7, 1858.

Enclosure 3 in No. 8.

Enclosure 3 in No. 8.

Site of Old Bow Fort, Base of Rocky Mountains,
August 11, 1858.

Sir,

After our conversation on the 3rd inst., from which I infer that private matters influence you in your public duties, my position in Her Majesty's service will not allow of my considering myself any longer in any way connected with the Exploring Expedition under your command.

I shall, however, carry out to the best of my power what I had undertaken previously to our conversation above referred to, namely, to survey the Kootanie Pass, and in the event of my reaching Edmonton in sufficient time, proceed with the Red River men by water to Fort Carlton, and arrange for their transport to Red River.

I have, &c.

(Signed) THOMAS BLAKISTON,
Lieutenant, Royal Artillery.

John Palliser, Esq.,
Commanding Exploring Expedition.

No. 9.

COPY of REPORT from Captain PALLISER to HER MAJESTY'S PRINCIPAL SECRETARY OF STATE FOR THE COLONIES.

Fort Edmonton, Saskatchewan, January 10, 1859.

MY LORD, (Received April 8, 1859.)

I AVAIL myself of the opportunity afforded by the Hudson's Bay Company's Winter Express to send a few lines to your Lordship, although I have nothing of any importance to communicate, owing to the advance of the winter season having put a stop for the present to the further progress of the Expedition.

Shortly after our arrival at winter quarters here, Dr. Hector started as soon as the snow was sufficiently deep for sleighing to ascend the Red Deer River, with the object of examining the remainder of a portion of country previously visited last fall. I also started myself in a south-easterly direction to examine the country surrounding Beaver Lake.

I am happy to say that the horses are enduring the severities of the winter very fairly; I have lost but two as yet, and I trust that the rest, with but few exceptions, will outlive the winter. They are at present removed about twenty miles from the fort, for fear of being stolen by the Indians; they are guarded by three of my men stationed there, and constantly visited either by my Secretary, Mr. Sullivan, or by myself. The horses we ride backward and forward for that purpose are being stabled at the fort.

The fort is built altogether of wood, consisting of one good sized house two storeys high, inhabited by Mr. Christie, the officer in charge of this post and the Company's traders, and also by ourselves during our stay here. Adjoining this house are the store-houses of the Company, containing their goods and furs, besides the log houses inhabited by the men engaged by the Company together with their wives and families; the whole is surrounded by wooden pickets or piles, firmly driven into the ground close together, and about 20 feet high.

In shape it is an irregular hexagon, about 100 yards long and 70 wide, and contains a population of about 40 men, 30 women, and 80 children, almost entirely supported on buffalo meat, the hauling of which, for sometimes upwards of 250 miles across the plains, is the source of great and most fruitless expense. Indeed, the labour and the difficulty of providing for a consumption of 700 lbs. of buffalo meat daily, and from so great a distance, would frequently become very precarious, were it not for an abundant supply of fish from Lake St. Anne, about 50 miles to the west of the fort, whence they are capable of hauling 30,000 or 40,000 in a season; these are a fine wholesome white fish, averaging four pounds weight each. Besides this, great quantities of provisions are traded here, it is the principal depôt for provisions, as the several brigades of boats are most supplied from this place. Few fine furs are traded here, those which are obtained being chiefly from half-breeds, belonging to a Settlement recently made at Lake St. Ann's.

There is a Roman Catholic Mission, under the direction of two French priests, who have induced the half-breeds to cultivate the ground, and sometimes they realize very fair crops of barley and potatoes.

A very little agriculture is feebly carried on about Fort Edmonton, owing partly to the want of acquaintance with even the leading principles of agriculture, and principally from the disinclination of both the men and women to work steadily at any agricultural occupation.

I have the honour of enclosing a letter from Dr. Hector on the subject of the geology of that portion of country which was explored last year by the expedition, also the astronomical observations of last year, which I request may be forwarded to the Geographical Society. I shall reserve my observations, and those of my secretary, Mr. Sullivan, on the longitude of Edmonton until the state of the atmosphere will allow (perhaps) of greater accuracy, for it is important that its longitude should be more accurately ascertained than any one has obtained it hitherto.

I also enclose a separate record of observations taken on the comet, which I will feel much obliged by your Lordships forwarding to the Astronomical Society.

As I had the honour to communicate my plans and intentions already to your Lordship in my letter of October last, I shall not take up any more of your time.

I have, &c.

(Signed) JOHN PALLISER, Captain,
Commanding N.W. British American
Exploring Expedition.

Her Majesty's Principal Secretary of State
for the Colonies, &c.

P.S. I am unable, as yet, to forward the accounts of the present financial year, as they have not yet arrived from Montreal, where they are sent to be priced by Sir George Simpson. J. P.

Encl. 1. in No. 9.

Enclosure 1. in No. 9.

Fort Edmonton, Saskatchewan,
January 10, 1859.

SIR,

I HAVE the honour to make the following report of my geological observations during the past season, in which is embodied only the principal results and general features of the country examined, the details being reserved for a more elaborate study and comparison than can be executed here.

On starting from Fort Carlton on 14th of June, 1858, we crossed the low track of prarie land which is bounded to the west by that line of high ground, which has been traced from longitude 103° W. sweeping to the N.W. to meet the south branch of the Saskatchewan at the elbow, known as the "Coteau des Prairies," and from that point being continued to the north branch as the Bad Hills and Eagle Hills, while across that river it re-appears as the Thickwood and White Lake Hills. The average elevation of these plains above Carlton (which is built upon the first river level, 35 feet above the water) is 250 feet, or 2,125 feet above the level of the sea, and on it rests isolated portions of the higher level which have survived the general denudation, rising as rounded hills from 300 to 400 feet in height, such as Moose Hill on the south branch, and the two Minetonass Hills (Creefor Hill by itself), one of which is opposite to Carlton and the other to Forte à la Corne. These plains are plentifully strewn with erratic blocks of all sizes, being fragments of the rocks of the Granitic belt, which runs to N.W. from Lake Superior to the Arctic Sea, with others of Magnesian limestone and buff coloured quartoze rock of Silurian age, which crops out all along the western flank of that range. A very remarkable line of the Magnesian limestone boulders occurs at the distance of 20 miles above Carlton, crossing the country from the Thickwood Hills in a southerly direction towards the Moose Hills on the south branch.

This limestone contains the same indistinct fossiliferous markings as that at the Stoney Hill behind Fort Garry. Some of these masses are of immense size, being made up of portions of several beds which only loosely cohere to form the block. They are all sub-angular, without any glacial markings, although some have their sides highly polished and smoothed from the buffalo rubbing against them. One of these blocks was measured, and computed to be 140 tons.

The nearest known point where this limestone occurs in situ, from whence these block may have been derived, is 170 miles distant to N.E.

Disregarding, for the sake of clearness, the order in which the country was examined, I now give at once, an account of the whole "drift" phenomena observed.

As we travelled to the west the drift was found to preserve the same mineral character of variable proportions of sand and clay, having boulders interspersed, but chiefly with the clay predominating. The boulders, however, decrease in size, and those of limestone become very rare as the higher plains are gained. At Fort Edmonton, for instance, I found it difficult last winter to procure fragments, with which to make lime for medicinal purposes, although the river bed is strewn with those of other rocks. Its depth also becomes much less, forming only a superficial covering to older strata, when observed in the river sections to the west of the Eagle Hills.

As we approached the Rocky Mountains, it quite disappears from the table lands, and is only to be found in depressions of the plain through which streams run, and even the existence of true drift in these places is rendered doubtful, owing to the prevalence of more recent deposits, which have been formed of its re-arranged materials.

At the altitude of 4,000 feet above the sea, and at the distance of 50 miles from the mountains, there however occurs a very extraordinary group of blocks of granite, resting upon a high plateau, formed of sandstone strata, to be afterwards mentioned. These blocks are of great size, one having been estimated to weigh 250 tons. Although lying miles apart, they seem to consist of the same rock, viz. a mixture of quartz with red felspar, the latter predominating, with only faint traces of mica disseminated in very minute flakes. No granitic rocks have been met with on this side of the watershed of the mountains, and it is not probable that any such exist, at least between the two branches of the Saskatchewan.

These blocks present smooth surfaces, although in general they are rhomboidal in form. Some are cracked into several pieces, which are quite detached, but have evidently at one time formed part of a whole.

If these blocks were derived from the granitic belt to the east, as I believe all the other boulders on the plains to have been, then they must have travelled at least from 100 to 450 miles. From the fact however, that they are almost on the western verge of the drift deposit, and that the boulders imbedded were found as a rule to diminish in size in that direction, it may be that the presence of these large blocks is due to very different agencies, different at least in the time of their occurrence.

Close in, along the base of the mountains, neither on the high plateaus or in the profound valleys by which these are traversed, was there observed any traces of the drift, or its dispersed erratics. Within the outer range of the mountains, which are comparatively low and wooded to their summit, the valleys are occupied by immense deposits of rounded shingle, composed of fragments of the various rocks which have been found to compose the mountains. This shingle, which in some places is loose, and mixed with a large proportion of sand and gravel, in others is cemented by calcareous matter into a solid conglomerate. It fills up the valleys not only along the edge of the mountains, but also right into their interior, forming beautifully marked terrace levels along the streams. This is well exhibited on the north branch of the Saskatchewan, where these deposits skirt its wide valley for nearly 70 miles of its course through the mountains, expanding where it widens so as to form extensive plains, as at the Kootanie plain, and always affording a margin of level ground along the river, rendering the road very practicable.

Towards the upper ends of the valleys the calcareous matter of these deposits so increases as to replace altogether the shingle, when it becomes a fine gritty calcareous mud of glistening whiteness. This same deposit has a much larger development in the valleys on the west side of the watershed, forming terrace levels in exactly the same manner. I observed no shingle beds with it there, however, that apparently being replaced by fine sand and gravel.

In the valley of Bow River, there is much less of this calcareous matter in the deposit, it having more of a loose sandy nature, and except at the entrance to the valley in the neighbourhood of the Bow fort, rarely exhibiting the terrace levels.

In the smaller gorges, where streams come down from the mountains, it is replaced by an angular "brecchia," of which patches cling in the most singular positions. This latter deposit is most likely of the nature of glacier maraines, although it is found wher no glacier occurs anywhere in the neighbourhood. I found, however, that the glaciers in the chain had, at one time, extended a considerable degree beyond their present limits, and therefore, at that time they possibly may have existed in portions of the mountains where now there are none.

The terrace deposits seem to reach pretty nearly the same altitude in different parts of the mountians viz., about the height of 1,000 feet above the level of the plains at their eastern base.

I found that, in crossing the different heights of land, the easiness of the pass corresponded with the degree to which these deposits had remained untouched, owing to peculiarities in the form of the valleys. In the case of every height of land, whether of those examined by Captain Palliser or by myself, with the single exception of the Vermillion pass, the slope is gradual to the east, but to the west the descent is with extreme rapidity. This arises from these deposits, having being scooped out close up to the rocky nucleus of the height of land, by currents acting from the western side of the chain, while on the east the erosion has been much more feeble.

How much this may depend on the difference between the width of the valleys which pass through the flanking chains on the east side of the height of land form those on the west, I am not prepared to say, until the nature of the country to the west has been ascertained.

Currents acting on the chain while submerged, would of course be greatly modified in their action by any such differences.

Respecting the age of these deposits I am in doubt. They extend towards the east along the river valleys, at least shingle deposits of the same nature are found at a considerable distance from the mountains, in the valleys of the north and south branches, and of the Red Deer River. Its relations to the drift has not been distinctly ascertained, as the boulders which mark its presence are only in that district of country found on rounded knolls away from the rivers.

From observations made last summer on the south branch, and during the winter on the north branch of the Saskatchewan taken with those of this season, I found that the group of sandy clays with crystals of selenite and concretionary nodules of ironstone, which latter contain fragments of cretaceous fossils, extend from the Snake Portage (which is in lat. 54°, and long. 111° 30′ W. nearly) upon the north branch, in a south-south-easterly direction to the elbow of the south branch, the distance in a straight line between these two places being 240 miles. The north branch, which flows from the Snake Portage to south-east, exhibits in its banks sections of these clays until they disappear under the great depth of drift at the Eagle Hills, thus crossing this formation very obliquely, it forming a strip of not more than 60 miles in breadth; whether this strip be continuous or not cannot be ascertained, as the high plains which lie between the arms of this great river, nowhere are cut to a sufficient depth to reach their level.

It is difficult to observe any dip, but I think they must have a slight inclination to north-east. At the Snake Portage these clays are of a clear blue colour, soft, and having selenite crystals in tolerable abundance. At Fort Pitt and at the elbow of the south branch they have much the same character,

being of a dark purple brown colour, with the septariæ very frequent, and the selanite only so in some parts. At the Eagle Hills they are not so moist, and form rather a compact shale of a bluish buff colour, much stained with feruginous streaks; it cracks up into very small fragments with conchoidal surfaces, the septariæ are neither so abundant. This formation here, if dried and hardened, would much resemble the shales observed at Long River, and at Fork Creek on the Assineboine during the summer of 1857. A little way above the Snake Portage (which place I again visited this autumn) hills rise above the plain level on both sides of the river to about 300 to 500 feet, such as the Black Hills, Snake Hills, and Egg Lake Hills; these consist of coarse grits formed of pink and green grains with a small amount of calcareous cement, quite the same as those observed in the neighbourhood of the Mountain House. They are in thin beds which weather into spheroidal masses, and between these beds of blue and purple clay are found. It is the same sandstone as is found throughout the Edmonton and Mountain House coal basins, forming the floor upon which they rest.

These basins are divided from each other by a great thickness of buff-coloured sandstone of much the same texture, but not so distinctly bedded, which forms a high ridge crossing the country from Red Deer River at the Nick Hills, by the Musquachis on Battle River to the north branch at Abraham's Gates. At these places it forms lofty precipices which I think must be similar to those described as the ramparts on the Mackenzie and Peace rivers.

On Red Deer River, in lat. 52° 12′ N., long. 113° W., an extensive deposit of coal was discovered associated with the same sands and clays as at Edmonton, The coal forms beds of much greater thickness however, one group of three beds measuring 20 feet, of which 12 feet were pure coal, the remainder being carbonaceous clays. At one place this coal was on fire, the whole bed exposed in a cliff about 300 yards in length being in a glow, the constant sliding of the bank continuing to supply a fresh surface to the atmosphere. For as long as the Indians remember this fire had never been extinguished, summer or winter.

A heavy sulphurous and limey smell pervades the air for miles around.

The extent of this coal deposit along Red Deer River is for 14 miles. In following up the river it is succeeded by the sandstone cliffs, apparently by substitution, as neither the coal group nor the beds of sandstone have any perceptible dip, and this is exactly the same manner in which the passage is effected between the same groups at the Mountain House.

Lower down on the river the coal is succeeded by white marls and sands, with beds of calcareous grit, which weather to a bright red colour. Among these beds there occur a great profusion of fragments of silicified exogenous wood. This group, however, was better exhibited on Battle River, where they dip to north-east at a very low angle. The valley of that river above its elbow is about 14 feet deep, and exhibits in its banks phenomena somewhat like those at La Roche Percée. The strata consist of banded clays and orange-coloured splintery limestone, with one bed quite filled with fragments of silicified wood, of an ashy or black colour. Towards the upper part of the section the clays are filled with sandy concretions, in some of which I found a few beautifully preserved fossils, the principal of which was a small avicula, a cardium, and other litoral shells.

There is also a bed of nine inches in thickness, composed entirely of rolled fragments, of a species of ostrea, cemented together by coarse sand. This bed I detected at several points along the valley, and by using it as a test, found that the whole group had a gentle inclination to north-east. At the point where we crossed Battle River a second time, in lat. 52° 28′ N., long. 111° 30′ W., in the bed of the stream, and at the foot of the section described above, the first coal met with in our progress westward was observed. Whether this be the same coal, however, as that on Red Deer River and at Edmonton, or a thin bed, such as was observed at La Roche Percée, and of quite a different age, I was unable to determine. If the former, then it is certainly overlaid by the Ostrea and Avicula beds; and these fossils when compared at home will throw much light on the true age of this coal. (I regret to say, that owing to the bursting of the hoops of the kegs in which they were packed for carriage to Edmonton from the Bow Fort, some of these fossils, as well as others, were lost on the road; but I hope yet to have an opportunity of procuring another set.)

This group of strata, characterized by the light-coloured marls which were found in Battle and Red Deer Rivers, was not observed along the north branch. The distance between the two points where they were found on the former rivers was 50 miles in a line due west.

The superficial strata which compose the prairie country preserve their horizontal character, as the Rocky Mountains are approached, until within 40 miles of the eastern limits of the true chain. At this distance they commence to undulate at first gently, but soon assuming most intricate plications. The section along the Little Red Deer River displays the structure of the near range, which is wholly made up of the plications of the more superficial strata. The grits and clays of the Snake Portage again re-appear in this section, and are seen not only to change from their almost horizontal arrangement, but also to lose their original mineral character, the clays becoming indurated and converted into hard shales with a smooth soapy streak, while the sandstone beds are cleared in their original lines of false bedding, and rendered so very much harder, that in the summer, when I observed isolated sections I was not sure of their identity, and only removed my doubts this winter by an examination of the continuous section afforded by Little Red Deer River.

From under this group the septaria clays arise, also much altered in character, but I obtained fragments of the same fossils that were found at Fort Pitt, and the elbow of the south branch of the Saskatchewan, so that I have no doubt of their identity. They are found on the west side of the outer range in the valley which intervenes between it and the main chain.

The Rocky Mountains, as far as the west side of the watershed, consist of parallel ranges running from N.N.W. to S.S.E. between the north branch and Bow River, but south of that changing to nearly

north and south. These ranges are in groups, divided from one another by trough-like valleys traversing the length of the chain. The two eastern ranges from the Bow Fort to the Sawback range are mainly composed of a blue limestone, sometimes cherty, sometimes compact, and sometimes crystalline, with fossils which belong either to the carboniferous or devonian epoch. As a rule, these strata dip to the west, the same beds are, however, exhibited again and again, being thrown up in plications of great magnitude. Behind the Bow Fort, the mountains rise as huge cliffs made up of the cut-edges of these strata, elevated to the height of 3,000 feet. Borne up on these limestones is a mass of strata composed of micaceous sandstone, with particles of carbon disseminated. This group also appears along Bow River and Deadman's River, after they leave the mountains. Along with these sandstones are intercalated carbonaceous shales, among which are to be found traces of coal and carboniferous plants, of which latter one was a calamite, somewhat like calamites cannæ formis of the coal measures at home.

Resting on the flanks of the limestone ranges are patches of the septaria clays and grits which are recognised at a distance by their earthy appearance. Such patches are found throughout the mountains at different points. Thus at the Vermillion River, the beds which, by their decomposition, give rise to enormous quantities of ochre along the courses of the smaller stream, seem to belong to this group. At the angle which this river makes, about fourteen miles from its source, there is a small patch of about one square mile in extent which presents an unmixed soil of ochre of a light reddish yellow colour, without a trace of vegetation on its surface.

To the west of the Sawback range the limestone was not observed, that range being composed of its bed cropping out vertically along the east side of a valley, in which stands Castle Mount composed of horizontal beds of a hard quartoze sandstone, passing into a conglomerate, and capped by brown slaty shale. At the Kootanie plain, on the north branch of the Saskatchewan this shale is seen to underlie the limestone.

The mountains which compose the height of land of the Vermillion pass consist of the same rocks as the Castle Mount, but in descending Vermillion River a white slate is met with, which again is succeeded by a deep blue compact limestone, associated with a clay schist, curiously banded with red layers. On the north branch of the Satkatchewan, the mountains at its source are composed of this blue limestone and banded schist.

The very complicated relations of these strata renders it impossible to form any sound view regarding their thickness or relative positions from data collected during one rapid survey, especially when it is remembered that they compose one of the most massive mountain chains in the world, the topography of which had to be learned step by step as the survey was made.

The most singular fact is, that no trace of the eruptive rocks which have caused the great convulsive movements of this portion of the earth's crust should be found in connexion with the dividing line of the mountains, from which the waters are thrown into the Gulf of Mexico, Hudson's Bay, the Arctic and Pacific Oceans. The direction of these waters seems altogether to be determined by the arrangement of the superficial deposit filling up the valleys.

Towards the lower part of the Vermillion River, the schists are fractured by slaty clearage, but which is not very perfect. More to the south, however, from Mr. Sullivan's notes, I find that the mountains along the east side of the Kootanie river valley are composed of true clay slate, which also forms those at both heights of land crossed by Captain Palliser's party.

I have, &c.

(Signed) JAMES HECTOR, M.D.

John Palliser, Esq.
&c. &c.

Enclosure 2 in No. 9.

OBSERVATIONS for LATITUDE made by Dr. HECTOR when detached from the Expedition.

Date.	Place.	Obs. Mer. Alt. corrected for I.E.		Longitude by Account.		Latitude.	
				W.		N.	
1857:			° ′ ″	° ′ ″		° ′ ″	
December 14	Four miles E. of Redberry Lake	* Polaris	108 20 0	106 56 0		52 42 0	
„ 19	English Creek	⊙	26 13 0	108 56 0		53 16 0	
„ 19	E. angle of Red Deer Hill	* Polaris	110 53 0	109 3 0		53 28 0	
„ 20	Fort Pitt	* „	110 4 30	109 18 0		53 35 0	
„ 20	„	* Jupiter	97 46 0	-		53 34 0	
„ 22	„	⊙	26 32 0	-		53 34 0	
1858:							
March 29	„	⊙	79 20 30	-		53 34 0	
January 5	Fort Edmonton	⊙	28 26 0	113 49 0		53 29 0	
„ 5	„	* Polaris	109 50 0	-		53 30 0	
„ 8	„	⊙	28 0 0	-		53 32 0	
February 10	„	⊙	44 2 0	-		53 30 0	
„ 11	„	⊙	44 42 0	-		53 30 0	
„ 20	„	⊙	50 51 30	-		53 31 0	
March 4	„	⊙	59 51 0	-		53 31 0	
„ 6	„	⊙	61 26 30	-		53 30 0	
„ 7	„	⊙	62 9 30	-		53 31 0	
January 11	Crossing Place, Battle River, on Mountain Ho. Track.	* Jupiter	99 34 0	114 6 0		52 41 0	
„ 14	Rocky Mountain Fort	* Polaris	107 53 0	115 30 0		52 29 0	
July 9	Elbow of Battle River	⊙	119 37 0	111 5 0		52 19 0	
August 12	Rocky Mountains, Bow River, First Lakes	⊙	107 19 30	115 16 0		51 1 44	
„ 14	Rocky Mountains, Bow River, The Nick	⊙	105 59 0	115 30 0		51 2 26	
„ 15	Rocky Mountains, Bow River, Cascade Mount	⊙	105 10 0	115 40 0		51 9 18	
„ 18	Rocky Mountains, Bow River, Castle Mount	⊙	103 10 0	116 0 0		51 10 42	
„ 21	Rocky Mountains, Vermillion River, The angle	⊙	101 20 0	116 26 0		51 6 0	
„ 22	Rocky Mountains, Vermillion River, Snow Creek, S. from Mount Ball	⊙	100 49 0	116 19 0		51 2 45	
„ 24	Rocky Mountains, Kootanie River, N. of Forks	⊙	99 48 0	116 26 0		50 52 0	
„ 26	Rocky Mountains, Kootanie River, its source	⊙	98 11 0	116 40 0		51 0 37	
„ 28	Rocky Mountains, Bearerfort River	⊙	96 28 30	116 52 0		51 9 30	
„ 30	Rocky Mountains, Kicking Horse River Falls	⊙	95 0 0	116 55 0		51 10 0	
September 1	Rocky Mountains, Kicking Horse River Falls	⊙	93 18 0	116 57 0		51 16 30	
„ 3	Rocky Mountains, Bow River, Noore's Creek	⊙	91 38 0	116 38 0		51 22 40	
„ 8	Rocky Mountains, Bow River, Noore's Creek	⊙	87 44 0	116 43 0		51 28 0	
„ 9	Rocky Mountains, Bow River, its source	⊙	86 34 0	117 0 0		51 40 0	
„ 11	Rocky Mountains, N.B. Saskatchewan, E. end of Glacier Lake	⊙	86 36 0	117 30 0		51 54 0	
„ 12	Rocky Mountains, N.B. Saskatchewan, W. end of Glacier Lake	⊙	83 54 0	117 39 0		51 52 16	
„ 14	Rocky Mountains, N.B. Saskatchewan, 4 miles above mouth of Little Fork	⊙	82 16 0	117 22 0		51 56 30	
„ 18	Rocky Mountains, N.B. Saskatchewan, 4 miles below Wapattuk River	⊙	78 45 30	116 46 0		52 18 0	
„ 20	Rocky Mountains, N.B. Saskatchewan, Sheep River	⊙	76 41 0	116 40 0		52 24 0	
„ 23	Rocky Mountains, N.B. Saskatchewan, Sheep River	⊙	74 21 0	-		52 23 30	
„ 28	Saskatchewan River, N.B. Miry Creek	⊙	70 14 0	116 10 0		52 30 0	
„ 29	N. branch Saskatchewan	⊙	69 35 30	116 0 0		52 26 0	
October 1	S.E. of Mountain, in woods	⊙	67 20 30	115 25 0		52 23 30	
„ 5	Bad Bearer Dam	⊙	42 50 30	113 58 0		53 5 0	
November 29	Battle River, Bear Hill	⊙	30 55 0	113 55 0		52 46 26	
December 1	Red Deer River, mouth of Blind River	⊙	31 10 0	114 0 0		52 18 13	
„ 2	„ 10 miles above last	⊙	31 6 0	114 10 0		52 12 36	
„ 4	Red Deer River, 5 miles above Medicine River	⊙	30 55 0	114 20 0		52 1 26	
„ 6	Red Deer River, 20 miles above last	⊙	30 47 0	114 40 0		51 50 28	
„ 9	Little Red Deer River	⊙	30 52 0	114 45 0		51 29 28	
„ 10	„ „ source of	⊙	30 55 0	114 50 0		51 21 40	
„ 15	Edge of Plain, Stoney Camp	⊙	30 7 0	114 45 0		51 25 24	

Enclosure 3 in No. 9.

OBSERVATIONS on the COMET at the HUDSON BAY COMPANY'S FORT, EDMONTON 1858.

Approximate Mean Time at Place.	Chronometer Time of Observation.	Observed Distances.	Object.	Error of Chronometer on G.M.T.	Remarks.
1858.	D. H. M. S.	° ′ ″		M. S.	
Sept. 20th, 8 P.M.	20 15 37 30	34 24 0	Arcturus ? -	9 59 slow.	
„ 24th, 8 P.M.	24 15 19 34	28 43 20	Arcturus ?		
	24 37	74 7 40	Capella.		
	7 4	127 45 2	Moon - -	- - -	Mean of five sights.
	16 4 43	102 7 30	α Aquilæ.		
	8 30	21 16 45	η U. Major.		
	11 4	22 54 40	ζ U. Major.		
	14 51	22 7 20	ε U. Major.		
	18 45	56 13 30	Polaris.		
„ 28th, 8 P.M.	28 14 50 22	20 6 20	η U. Major. -	10 10	
	54 2	24 37 10	ζ U. Major.		
	56 5	24 38 0	ε U. Major.		
	15 9 15	20 49 50	Arcturus ?		
	12 47	96 0 20	α Aquilæ.		
	15 44	59 18 30	Polaris.		
Oct. 2d, 8 P.M. -	2 15 25 25	23 59 20	η U. Major.		
	27 41	29 52 30	ζ U. Major. -	10 30	
	29 38	31 52 30	ε U. Major		
	34 0	9 40 0	Arcturus ?		
„ 5th, 8 P.M. -	5 14 56 43	1 13 50	Arcturus ? -	10 20	At present the comet has changed to S. of Arcturus.
	59 46	31 53 0	η U. Major.		
	15 3 45	38 14 55	ζ U. Major.		
	5 40	40 59 20	ε U. Major.		
	7 44	72 33 50	Polaris.		
	10 29	104 18 30	Capella.		
	12 19	80 23 20	α Aquilæ.		
„ 12th. 8 P.M. -	12 14 38 3	32 39 30	Arcturus ? -	10 0	
	40 6	31 44 40	α Cor Borealis.		
	42 1	58 56 50	α Lyræ.		
	44 1	62 34 50	α Aquilæ.		
	47 8	59 55 30	η U. Major.		
	48 59	66 35 50	ζ U. Major.		
	53 22	95 32 20	Polaris.		
	51 10	70 16 50	ε U. Major.		
	57 16	134 23 40	Capella.		
	15 1 34	110 6 20	α Pegasi.		

Approximate Mean Time at Place.	Chronometer Time of Observation.	Observed Altitude of the Comet. (Doub.)	Error of Chronometer on G.M.T.
1858.	D. H. M. S.	° ′ ″	M. S.
Sept. 27th, 8 P.M. -	27 14 43 42	34 59 40	10 8 slow.
	53 1	32 36 30	
	54 54	32 11 35	
	57 17	31 40 25	
	58 21	31 21 30	
	15 0 34	30 50 0	
	3 3	30 15 10	
„ 28th, 8 P.M. -	28 14 37 45	36 22 20	10 10 slow.
	40 47	36 33 52	
	42 17	35 11 0	
	43 23	34 54 10	
	44 31	34 36 30	
	46 2	34 13 25	
	48 28	33 34 10	

N.B.—The index error of sextant +5′ 58″ is to be applied to each sextant reading which is tabulated in this sheet.

The name of the star to which (?) is affixed I am not quite sure of; it is probably Arcturus.

JOHN PALLISER, Captain,
Commanding North-west British America
Exploring Expedition.

Enclosure 4 in No. 9.

RECORD of ASTRONOMICAL OBSERVATIONS during Seasons 1857–58.

LONGITUDES OBTAINED BY OBSERVATION.

Locality.	Latitude by Observation or by Account.	Approximate M. T. P.	Mean of Chronometer Times corrected for E. on G.M.T.	Mean of Observation Altitudes, corrected for.	Longitude.
	N.	1857.	D. H. M. S.		W.
	° ′ ″			° ′ ″	° ′ ″
Fort William, H.B.C.	48 24 5	June 13, 8 A.M.	13 1 43 39	68 44 7	89 24 50
Trembling Portage	48 30 0	„ 21, 9 A.M.	21 2 47 35	88 45 41	89 58 48
Dog Portage (w. end)	48 45 0	„ 22, 9 A.M.	22 2 31 59	83 39 51	89 53 45
Dog River (r. bank)	48 55 0	„ 23, 8 A.M.	23 2 16 59	78 30 39	89 53 48
Savanah Portage	48 53 0	„ 25, 8 A.M.	25 2 7 17	74 43 35	90 13 46
Barrier Portage	48 45 0	„ 26, 5 P.M.	26 10 34 15	64 2 23	90 50 24
French Portage	48 40 0	„ 27, 10 A.M.	27 4 4 33	109 19 37	91 11 32
Camp Portage	48 25 0	„ 29, 7 P.M.	29 13 24 48	11 48 20	92 27 28
	48 27 0	„ 30, 7 A.M.	30 1 13 58	53 12 49	92 30 4
Fort Frances, H.B.C.	48 36 15	July 1, 6 P.M.	1 11 55 8	40 59 27	93 33 33
Rainy River	48 50 0	„ 3, 9 A.M.	3 3 43 36	99 13 31	94 14 19
Portage de Bois	49 26 0	„ 4, 9 A.M.	4 2 42 42	75 36 39	94 48 7
Winipeg River	49 55 0	„ 5, 8 A.M.	5 3 2 4	84 34 31	94 45 30
Ditto	50 15 0	„ 6, 8 A.M.	6 2 55 52	81 31 54	95 17 19
Winipeg Lake	50 33 48	*	*	*	96 33 56
Ditto	50 23 0	„ 11, 8 A.M.	11 2 35 26	72 21 2	96 30 25
Upper Fort Garry	49 52 6	„ 16, 8 A.M.	16 2 47 47	74 49 20	96 52 27
Post on boundary line, near Pembina	48 59 12	„ 25, 3 P.M.	25 10 15 1	73 43 58	96 46 13
Prairie	48 52 0	„ 28, 3 P.M.	28 10 39 34	65 34 4	97 17 29
St Joseph	See separate paper.				
Prairie	49 10 0	July 31, 4½ P.M.	31 11 5 27	56 51 56	98 10 39
Ditto	49 8 0	Aug. 2, 4 P.M.	2 10 3 51	76 28 2	98 33 45
Ditto	49 8 0	„ 3, 5 P.M.	3 11 6 37	56 18 32	98 47 15
Ditto	49 8 0	„ 4, 8 A.M.	4 1 43 38	45 42 32	98 48 24
Ditto	49 0 32	„ 5, 4 P.M.	4 10 31 20	67 37 43	99 1 25
Turtle Mount, E. Flk.	49 0 0	„ 5, 5 P.M.	5 11 46 16	43 6 52	99 16 50
Ditto	49 6 0	„ 7, 5 P.M.	7 11 21 48	50 23 27	99 21 43
Fort Ellice, H.B.C.	See separate paper.				
✗ Saskatchewan elbow of S. branch	See separate paper, pp. 52, 53, 54.				
Qui'Appele Lakes, 12 miles S. of	50 20 0	Sept. 13, 3 P.M.	13 10 26 33	49 31 28	103 45 45
Saskatchewan, S. branch of	50 52 48	„ 27, 3 P.M.	27 11 32 31	25 19 17	107 41 7
Red Deer Lakes, 6 miles N. of	51 20 0	Oct. 3, 9 A.M.	3 3 43 15	20 27 9	107 32 15
Prairie	51 40 0	„ 4, 9 A.M.	4 4 44 59	26 43 30	107 37 51
Ditto	52 5 0	„ 5, 2 P.M.	5 9 28 40	24 18 40	107 21 0
Ditto	52 12 0	„ 6, 2 P.M.	6 9 43 4	22 11 31	106 51 0
1858.					
Eagle Hills	52 18 0	June 21, 7 A.M.	21 2 9 22	26 52 32	107 28 15
Ditto, 3 miles S. of Lizard Lake		„ 21, 4 P.M.	21 11 30 33·5	33 23 19	107 28 16
Eagle Hills, at Stoney Lake	52 14 0	„ 22, 3 P.M.	22 9 46 39	48 40 29	107 35 4
Prairie	52 14 0	„ 23, 9 A.M.	23 3 15 19·4	42 22 11	108 11 33
Ditto	52 16 0	„ 24, 7 A.M.	24 2 8 16·4	25 59 17	108 27 27
Ditto	52 21 0	„ 25, 7 A.M.	25 2 30 14·6	29 7 5	108 44 25
Wiquatinow, Valley of	52 28 39	„ 26, 8 A.M.	26 3 49 47	40 54 2	108 51 39
Ditto ditto	52 28 39	„ 27, 8 A.M.	27 3 50 43	41 1 6	108 52 36
Prairie	52 30 0	July 2, 4 P.M.	2 11 20 15	35 53 22	109 2 30
✗ Ditto	52 34 25	„ 4, 8 A.M.	4 3 28 5	36 46 25	109 23 45
Ditto	52 36 0	„ 8, 7 A.M.	8 2 32 13·5	27 27 4	110 23 45
Battle River, 1st crossing of	52 35 39	„ 7, 9 A.M.	7 4 12 44·7	42 9 5	110 50 7
Ditto 2d crossing of	52 28 23	„ 10, 7 A.M.	10 2 55 48·6	30 4 31	111 29 45
✗ Dried Mount Camp	52 24 29	„ 14, 4 P.M.	14 11 47 15·6	32 59 22	112 14 35

* This observation was accidentally cleaned from slate, leaving however the result as tabulated.

+ These three observations marked thus, may be a little too far to the west, as an examination of chronometer rate, on arrival at Carlton, showed it to have changed.

✗ Indicates lunar distances observed.

N.B. Frequent examinations of chronometer rate, since the date of the last tabulated longitude, showed us that the rate was unsteady. All longitudes that are determined since that, are the results of lunar distances. The longitude of Carlton is the result of the accompanying distances, observed while we remained there.

LATITUDES BY OBSERVATION.

Locality.	Date.	Observed Mean Altitude, Corrected for Index Error.	Longitude by Observation or by Account.	Latitude.
	1857.	☉ ° ′ ″	W. ° ′ ″	N. ° ′ ″
Fort William, H. B. C.	June 13	129 11 16	89 24 50	48 24 5
Dog Lake (S. shore)	„ 22	128 51 27	89 45 0	48 46 11
Prairie Portage	„ 24	128 27 37	89 45 0	48 56 16
Fort Frances, H. B. C.	July 1	128 28 41	93 33 33	48 36 15
La Pluie River	„ 2	128 29 21	93 50 0	48 47 18
Lac de Bois	„ 4	126 4 53	94 48 0	49 33 45
Winipeg River	„ 6	124 6 1	95 20 0	50 21 38
Lake Winipeg	„ 10	122 45 51	96 33 56	50 33 46
Upper Fort Garry	„ 16	123 19 28	96 52 27	49 52 6
Prairie	„ 22	120 56 52	97 0 0	49 28 45
Post on Boundary Line near Pembina	„ 25	120 40 22	96 46 13	48 59 12
Prairie	Aug. 1	117 4 14	97 56 0	49 6 53
Ditto	„ 2	116 33 54	98 20 0	49 7 47
Ditto	„ 4	115 36 50	98 50 0	49 4 40
St. Joseph	—	See separate paper.		
Turtle Mount, E. Falkland	„ 5	115 12 27	99 16 50	49 0 32
Ditto	„ 7	113 54 47	99 21 43	49 6 2
Prairie	„ 12	109 59 37	100 5 0	49 36 3
Ditto	„ 14	107 49 17	101 10 0	50 4 20
∝ Fort Ellice, H. B. C.	„ 17	105 15 0	101 48 0	50 14 32
Ditto	„ 21	102 37 40	101 48 0	50 24 24
Prairie	Sept. 11	87 28 35	102 10 0	50 23 40
Ditto	„ 18	81 58 55	106 0 0	50 26 26
Ditto	„ 19	81 9 45	106 50 0	50 27 59
Ditto	„ 20	79 50 55	107 10 0	50 44 45
∝ Saskatchewan, Elbow of S. Branch	„ 22	77 42 7	107 37 30	51 1 24
Saskatchewan, S. Branch of	„ 27	74 5 7	107 41 7	50 52 48
Red Deer Lakes, six miles N. of	Oct. 3	68 23 47	107 32 0	51 23 45
Prairie	„ 4	66 54 27	107 32 0	51 45 16
Ditto	„ 5	65 32 27	107 0 0	52 3 7
Ditto	„ 7	63 3 27	106 30 0	52 31 40
∝ *Fort Carlton, H. B. C.	—	See separate paper, pp. 50, 54, 57.		
Jack Fish Lake	„ 23	59 56 37	108 10 0	53 2 6
	1858.			
Eagle Hills	June 21	121 48 35	107 28 15	52 17 59
Prairie	„ 23	121 53 35	108 11 33	52 14 37
Wiquatinow, Valley of	„ 26	121 16 45	108 52 10	52 28 39
∝ Sand Hills	July 4	120 5 20	109 22 0	52 34 25
Battle River, 1st crossing of	„ 8	119 14 30	110 50 7	52 35 39
Ditto 2d do	„ 10	118 59 45	111 29 45	52 28 23
∝ *Dried Meat Camp	„ 14	118 0 5	112 18 45	52 24 29
Bull Lake, 3 miles S.E. of	„ 18	116 42 55	112 34 0	52 23 24
Dead Man's Creek	„ 20	116 6 45	113 3 0	52 19 25
Nick Hills	„ 23	115 8 45	113 40 0	52 12 52
Camp	„ 24	115 18 0	114 0 0	51 55 43
∝ *Cache Camp, Edge of the Woods	„ 26	114 31 40	114 10 15	51 52 52
Prairie	Aug. 1	112 47 55	113 55 0	51 19 12
∝ Slaughter Camp	„ 2	112 14 5	113 50 0	51 20 47
Bow River, 1st crossing of	„ 4	112 3 55	113 50 0	50 54 46
Most N. Tributary of Belly River, 1st crossing of	„ 6	112 34 30	113 45 0	50 6 23
Tributary of Belly River, 1st crossing of	„ 7	113 9 5	113 53 0	49 32 31
Chief's Mountain, 6 miles N. of	„ 8	113 29 35	113 50 0	49 5 6
Tributary of Belly River, 2d crossing	„ 10	111 22 25	113 58 0	49 33 50
*Woods	„ 13	106 56 25	114 20 0	50 52 49
∝ *Old Bow Fort, Site of	„ 15	105 10 20	115 4 30†	51 8 46
Kananaski's Pass in Rocky Mountains	„ 19	103 5 25	115 12 0	50 54 17
Ditto	„ 20	102 44 25	115 12 0	50 45 3
Ditto	„ 21	102 20 35	115 21 0	50 37 1
Ditto	„ 22	101 38 45	115 21 0	50 37 49
Ditto	„ 23	100 55 55	115 27 0	50 38 55
Ditto	—	—	—	—
Tributary of Kootanie River	„ 24	100 32 15	115 30 0	50 30 14
Forks, Kootanie River	„ 26	99 14 50	115 43 0	50 27 21
Kootanie River	„ 27	98 48 40	115 40 0	50 19 24
Ditto	„ 28	98 24 40	115 42 45	50 10 13
Ditto	„ 29	98 0 0	115 33 0	50 1 14
Tobacco Plain, commencement of	„ 30	96 54 25	115 33 0	49 42 41

† See pp. 60 and 62.

LATITUDES—*continued.*

Locality.	Date.	Observed Mean Altitude, Corrected for Index Error.	Longitude by Observation or by Account.	Latitude.
	1858.	⊙ ° ′ ″	W. ° ′ ″	N. ° ′ ″
∝ Stray Camp	Sept. 2	95 12 55	115 27 0	49 58 15
British Kootanie Pass, W. end of	„ 6	93 49 5	115 22 0	49 11 21
Ditto Height of Land	„ 7	92 47 25	114 58 0	49 19 44
British Kootanie Pass, E. end of	„ 9	90 52 15	114 30 0	49 32 3
Middle Tributary of Belly River, coming from Crow Lodge	„ 10	89 44 25	114 25 0	49 47 0
Most N. Tributary of Belly River, 2d crossing of	„ 11	88 0 40	114 21 0	50 12 16
High Wood River, 4 miles N. of	„ 12	86 28 30	114 18 0	50 35 29
Bow River, 7 miles S. of	„ 13	84 59 0	114 10 0	50 57 16
*Red Deer River	„ Observation of Polaris		114 13 0	52 4 45
Battle River, 3d crossing of	„ 18	77 42 25	114 0 0	52 39 44
∝ *Fort Edmonton	„ 22	72 52 40	- - -	53 31 43
Ditto	„ 24	71 18 41	- - -	53 31 44
Ditto	Red. to Mer.		- - -	53 32 11
Ditto	Red. to Mer.		- - -	53 31 59
Ditto	Mer. Alt. of Moon.		- - -	53 32 13

* Indicates Latitude obtained by other methods.
∝ „ Lunar Distances observed.

N.B.—The Longitude of Edmonton is omitted as a series of Lunar Distances are being taken for that purpose.

FORT CARLTON.—Lat. 52° 32′ 30″ N.

1857. December 22d, at 5H. 30M. P.M., (M. T. at place nearly), the following distance was taken between Jupiter and Moon's F. L. (Jupiter E. of Moon). Index Error + 5′ 0″. Error of Chronometer on M. T. at place 6H. 57M. 21S. fast. Approx. Error on G. M. T. 10M. slow. Mean of 5 sights.

	D. H. M. S.		° ′ ″
Mean of Chron. Times	22 12 23 33·1	Mean of dists.	50 46 53
Error on M. T.	— 6 57 21·0	Index Error	+ 5 0
	22 5 26 12·1		50 51 53

To compute True and Approximate Alt. of ☀ *s′* and *s*.

M. ⊙'s R.A.	R.A. of Jup.	Cor.	Cor.	Jup. N.P.D.	½ M. Dist.	In Arc.
H. M. S.	H. M. S.	S.	″	° ′ ″	H. M. S.	
18 3 57·27	2 16 48·48	7·06	16·9	12 25 44	18 6 0·6	1 22 15·5
1 58·28	3·75	1.76	12·5	9	5 26 13·1	60
5·09	2 16 44·73	12·5	84·5	12 25 35	23 32 13·7	82 15 30
18 6 0·64		3·75	202·8		2 16 44·7	
			211·25	77 34 25	21 15 29	20 33 52
			8·6		2 44 30·9	

$$\text{Sin. } \theta = \sqrt{\text{sin. } l' \text{ . sin. } p \text{ . cos.}^2 \frac{H}{2}}$$

$$\text{Sin. } \frac{z}{2} = \sqrt{\text{sin.} \left(\frac{l'+p}{2} + \theta \right) \text{ . sin.} \left(\frac{l'+p}{2} - \theta \right)}$$

$\frac{H}{2}$ . . . . 2 cos.	° ′ ″ 20 33 52 =	19·942810.
p . . . . . sin.	77 34 25 =	9·989702
l' . . . . . sin.	37 7 30 =	9·780717
	57 20 55	19·713229
θ . . . . . sin.	45 27 22	9·856614
	sin. 103 18 17 =	9·988185
	sin. 11 23 33 =	9·295630
		19·283815
	sin. 26 0 15	9·641907
	2	
	52 0 30	
s' . . . . . +	37 59 30	
Ref.	+ 1 13	
s	38 0 43	

To compute True and Approximate Altitude of ☽ m' and m.

½ M. Dist.	In Arc.	☽'s R. A.	Cor.	Cor.	☽'s N. P. D.
H. M. S.		H. M. S.			° ′ ″
23 8 36·23	0 11 48·6	23 7 37·55	116·6	153·15	6 9 49s.
0 23 37·51	60	58·3	29·14	·3	7 39
0 11 48·59	11 48 36	23 8 36·23	·5	459·45	6 2 10
	2 57 9		58·30	7·39	96 2 10

By Formulæ (1) and (2).

	° ′ ″	
2 cos.	2 57 9 =	19·998848
sin.	96 2 10 =	9·997586
sin.	37 7 30 =	9·780717
	66 34 50	19·777151
sin.	50 41 15	9·888575
	sin. 117 16 5 =	9·948840
	sin. 15 53 35 =	9·437501
		19·386341
sin.	29 33 43	9·693170
	2	
	59 7 26	
m'	30 52 34	

☽' S. D.	Cor.	Cor.	☽'s H. Px.	Px. Alt. = H. Px. Cos. App. Alt.	
				Px. nearly.	T. Px.
′ ″	″	″	′ ″		
15 34·7	+·6	21·9	57 2.4	3416 = 3·533518	3416 = 3·533518
·3	·5	·5	·9	Cos. m' = 9·933671	Cos. m'' = 9·937238
15 35·0	3·0	1095	57 3·3	2932 = 3·467189	2956 3·470756
Aug. 7·7	·3	·9	Red. 7·0		49·16
15 42·7			56 56·3		

	° ′ ″	
m' =	30 52 34	
Px. —	49 16	
	30 3 18	
Ref . . . +	1 35	
	30 4 53	

	° ′ ″	
d =	50 51 53	
☽'s S. D. —	15 43	
	50 36 10	

Rejecting seconds :—

$d = 50\ 36\ 0$ ∴ 10″ is to be added to D = T. Cent. Dist.
$s = 38\ 0\ 0$ } Alts. to be used in Computation.
$m = 30\ 4\ 0$ }

$$\text{Cos. } \theta = \sqrt{\text{sec. } m \text{ . sec. } s \text{ . cos. } x \text{ . cos. } (x - d) \text{ . cos. } m' \text{ . cos. } s'}$$

$$\text{Sin. } \frac{D}{2} = \sqrt{\sin. \left(\frac{m' + s'}{2} + \theta\right) \text{ . sin. } \left(\frac{m' + s'}{2} - \theta\right)}$$

	°	′	″	
$d =$	50	36	0	
$s =$	38	0	0	sec. = ·103468
$m =$	30	4	0	sec. = ·062762
	118	40	0	
	59	20	0	cos. = 9·707606
	8	44	0	cos. = 9·994935
$s' =$	37	58	47	cos. = 9·896652
$m' =$	30	51	41	cos. = 9·933696
	34	25	14	19·699119
	44	59	24	cos. 9·849559
	79	24	38	sin. = 9·992540
	10	34	10	sin. = 9·263463
				19·256003
	25	7	38	sin. 9·628001
		2		
	50	15	16	
	+		10	
	50	15	26	
N. A. Dist. at 12h.	50	32	12	P. L. = ·2634
		16	46	P. L. = 1·0368
T. G. M. T.	12	30	47	·7670
T. M. T. at P.	5	26	13	
Longitude	7	4	34 W	
	60			
	4,424	34	0	
Longitude	106	8	30 W	

Elbow South Branch, Saskatchewan.—Lat. 51° 1′ 26″ N.

1857. September 22d at 4h. 15m. P.M. (M.T. at Place nearly) the following Distance was observed between Sun and Moon. Error of Chronometer on M. T. at Place, 7h. 16m. 50s. fast. Index Error + 4′ 17″. Approximate Error on G.M.T. 10m. fast.

	D	H.	M.	S.		°	′	″
Mean of Chronometer Times -	22	11	35	51·7	Mean of Dists.	52	29	4
Error - - - - -	−	7	16	50	Index Error	+	4	17
T M.T. at Place - - -	22	4	19	1·7		52	33	21

☉'s N.P.D.	Cor.	Cor.	Eq. of T.	½ App. Hr. L.	In Arc.	½ (l + p.)
° ′ ″	″	″	M. S.	H. M. S.	H. M. S.	° ′ ″
0 14 11·3 N.	58·53	·864	4 19 1·7	4 19 1·7	2 13 16·52	89 56 56
11 7·2	11·4	11·4			60	38 58 34
0 3 4·1	23412	3456	7 21 5		133 16 31	128 55 30
89 56 56	64383	9504	9 85			
	667·42	9·8496	7 31 35		33 19 7·8	64 27 45
	11·7·2					

$$\text{Sin. } \theta = \surd \text{ sin. } l' \text{ . sin. } p \text{ . cos. } ^2\frac{H}{2}$$

$$\text{Sin. } \frac{z}{2} = \surd \text{ sin. } \left(\frac{l'+p}{2} + \theta\right) \text{. sin. } \left(\frac{l'+p}{2} - \theta\right)$$

$\frac{H}{2}$ . . .	2 cos.	33 19 8	= 19·844028
l' . . .	sin.	38 58 34	= 9·798588
p . . .	sin.	89 56 56	= 9·000000
	sin.	64 27 45	19·642616
	sin.	41 30 18	9·821308
	sin.	105 58 3	= 9·982913
	sin.	22 57 27	= 9·591118
			19·574031
	sin.	37 45 40	9·787015
		2	
		75 31 20	
s' . . .		14 28 40	
		+ 3 29	
s . . .		14 32 9	

To compute True and Approximate Altitude of ☽, m' and m.

R. A. of M. ☉.	☽'s R. A.	Cor.	Cor.	☽'s N. P. D.	½ Hr. L.	In Arc.
H. M. s.	H. M. s.		″		H. M. s.	
12 5 10·65	15 15 26·19	121·8	92·01	22 36 20 s.	12 7 2·35	0 34 58·63
1 48·42	40·6	40·6	2	3 4	4 19 1·7	60
3·28						
	15 16 6·79		18402	22 39 24	16 26 4·05	34 58 38
			3·4	112 39 24	15 16 6·79	8 44 40
					1 9 57·26	

By Formulæ (1) and (2).

	2 cos.	8 44 40	= 19·989846
	sin.	112 39 24	= 9·965122
	sin.	38 58 34	= 9·798588
		75 48 59	19·753556
	sin.	48 50 59	9·876778
	sin.	124 39 58	9·915126
	sin.	26 58 0	9·656551
			19·571677
	sin.	37 38 28	9·785838
		2	
		75 16 56	
		14 43 4	

☽'s S.D.	Cor.	Cor.	☽'s H. Px.	Px. in A. = H. Px. in Cos. App. Alt.	
				Px. nearly.	
14′ 47″·5	—″·7	—2″·7	54′ 9″·6	3240 = 3·510545	3240 = 3·510545
·6	11·4	11·4	2·5	cos. m' = 9·985514	cos. = 9·987186
14 46·9	798	108	54 7·1	3134 3·496059	3146 3·497731
Aug. 3·6	·6	297	Red. 6·7		
14 50·5		3078	54 0·4		
		2·5			

	°	′	″
m' =	14	43	4
Px. −		52	26
	13	50	38
Ref. +		3	38
m =	13	54	16

	°	′	″
d =	52	33	21
☽'s S. D. +	14	50	
⊙'s S. D. +	15	59	
	53	4	10

Rejecting seconds :—

	°	′	′	″	
d =	53	4	0		∴ 10 is to be added to D = T. Cent. Dist.
s =	14	32	0		Alts. used in Computation.
m =	13	54	0		

3. . . . . $\sqrt{\sec. m \cdot \sec. s \cdot \cos. x \cdot \cos.(x - d) \cdot \cos. m' \cdot \cos. s'} = \cos. \theta$

x being $\frac{1}{2}(m+s+d)$.

4. . . . . $\sqrt{\sin.\left(\frac{m'+s'}{2}+\theta\right) \cdot \sin.\left(\frac{m+s'}{2}-\theta\right)} = \sin. \frac{D}{2}$

d =	53	4	0		
s =	14	32	0	sec. =	·014124
m =	13	54	0	sec. =	·012908
	81	30	0		
	40	45	0	cos. =	9·879420
	12	19	0	cos. =	9·989887
	14	28	31	cos. =	9·985991
	14	42	48	cos. =	9·985525
	14	35	39		19·867855
	30	15	36	cos.	9·933927
	45	24	15	sin. =	9·852527
	16	12	57	sin. =	9·446002
					19·298529
	26	28	57	sin.	9·649264
			2		
	52	57	54		
			+ 10		
	52	58	4		
N. A. Dist. 12 H.	53	11	50	P. L.	3450
		13	46	P. L.	1·1164
		30	28		7714
T.G.M.T.	11	29	32		
T.M.T. at P.	4	19	2		
Longitude	7	10	30	W.	
	60				
	4)430	30	0		
Longitude	107	37	30	W.	

FORT CARLTON.—Lat. 52° 52′ 30″ N.

1858. May 19th, at 1H. 10M. P.M. (M. T. at Place nearly) the following Lunar was taken (Sun W. of Moon). —Index Error +3′ 30″. Error of Chronometer on M.T. at Place, 6H. 40M. 5S. fast, and Approximate Error, on M. T. 12M. slow.

(Mean of 10 sights.)

	D.	H.	M.	S.
Mean of Chronometer Time - -	19	7	48	33·9
Error - - -	—	6	40	5·0
T. M. T. at P. - - -	19	1	8	28·9

	°	′	″
Mean of Dists. -	89	3	32
Index Error -	+	3	30
	89	7	2

To compute True and Approximate Altitude of ⊙, s' and s :—

⊙'s N. P. D.	Cor.	Cor.	Eq. of T.	⊙'s ½ App. Hr. L.	In Arc.	½ sum ($l'+p$).
° ′ ″	″	s.	M. s.	H. M. s.	H. M. s.	° ′ ″
19 46 9·9	31·77	·118	3 48·67	1 8 28·9	0 36 8·3	70 9 36
4 14·2	8	8	·99	3 47·7	60	37 7 30
19 50 24·1	254·16	·994	3 47·73	1 12 16·6	36 8 18	107 17 6
70 9 35·9	4 14·2			0 36 8·3	9 2 4	53 38 33

$$\text{Sin. } \theta = \sqrt{\text{sin. } l' \cdot \text{sin. } p \cdot \cos.^2 \frac{H}{2}}$$

$$\text{Sin. } \frac{z}{2} = \sqrt{\text{sin.}\left(\frac{l'+p}{2} + \theta\right) \cdot \text{sin.}\left(\frac{l'+p}{2} \sim \theta\right)}$$

		° ′ ″	
$\frac{H}{2}$	2 cos.	9 2 4	= 19·989160
p	sin.	70 9 36	= 9·973425
l'	sin.	37 7 30	= 9·780717
		53 38 33	19·743302
	sin.	48 5 5	9·871651
	sin.	101 43 38	= 9·990839
	sin.	5 33 28	= 8·986096
			18·976935
	sin.	17 56 6	9·488467
		2	
		35 52 12	
s'		54 7 48	
R and Px.		+ 36	
s		54 8 24	

To compute True and Approximate Altitude of ☽, m' and m :—

M. ☽'s R. A.	☽'s R. A.	Cor	Cor.	☽'s N. P. D.	½ M. Dist.	In Arc.	½ ($l'+p$).
H. M. s.	H. M. s.	″	″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
3 47 27·53	10 0 5·06	125·95	143	13 51 36·9	3 48 48·35		76 10 46
1 18·85		2·9		2 23	1 8 28·9	2 31 36·4	37 7 30
1·97	10 0 30·01	12	2·23	13 49 13·9	4 57 17·2	60	113 18 16
3 48 48·35		25·08		76 10 46	10 0 30·1	151 36 26	56 39 8
					5 3 12·9	37 54 6	

By Formulæ (1) and (2) :—

		° ′ ″	
$\frac{H}{2}$	2 cos.	37 54 6	= 19·794228
l'	sin.	37 7 30	= 9·780717
p	sin.	76 10 46	= 9·987240
		56 39 8	19·562185
	sin.	37 9 41	9·781092
	sin.	93 48 49	= 9·999037
	sin.	19 29 27	= 9·523298
			19·522335
	sin.	35 14 20	9·791167
		2	
		70 28 40	
m'		19 31 20	

☽'s S. D.	Cor.	Cor.	☽'s H. Px.	Px. in A. = H. Px. Cos. App. Alt.	
				Px. nearly.	T. Px.
′ ″	″	″	′ ″		
15 53·7	−6·6	−24·2	58 12·1	3469 = 3·540204	3469 = 3·540204
4·5	8·2	2·0	16·4	cos. m' = 9·974302	cos. m'' = 9·976702
		8·2		3·514506	3288 3·516906
15 49·2	132	16·4	57 55·7		
Aug. 5·0	528		7·0		
15 54·2	54·12		57 48·7		
	4·5				

	° ′ ″		° ′ ″
m' =	19 31 20		89 7 2
Ref.	+ 2 40	☉'s S. D.	+ 15 50
	19 34 0	☽'s S. D.	+ 15 54
Px.	− 54 48		89 38 46
	18 39 12		

Rejecting seconds :—

d = 89 39 0 ∴ 14″ is to be subtracted from D = T. Cent. Dist.
s = 54 8 0
m = 18 39 0 } Alts. used in Computation.

3. . . . . $\cos.\theta = \sqrt{\sec.s \cdot \sec.m \cdot \cos.x \cdot \cos.(x-d) \cdot \cos.m' \cdot \cos.s'}$
x being $\frac{1}{2}(s+m+d)$

$$\text{Sin.}\frac{D}{2} = \sqrt{\sin.\left(\frac{m'+s'}{2}+\theta\right) \cdot \sin.\left(\frac{m'+s'}{2}-\theta\right)}$$

	° ′ ″	
d =	89 39 0	
s =	54 8 0	sec. = ·232176
m =	18 39 0	sec. = ·023426
	162 26 0	
	81 13 0	cos. = 9·183834
	8 26 0	cos. = 9·995278
	54 7 24	cos. = 9·767930
	19 31 8	cos. = 9·974296
	36 49 16	19·176940
	67 11 24	cos. 9·588470
	104 0 40	sin. = 9·986884
	30 22 8	sin. = 9·703777
		19·690661
	44 27 25	sin. 9·845330
	2	
	88 54 50	
	− 14	
	88 54 36	
N. A. Dist. 9H.	89 18 32	P. L. 2845
	23 56	P. L. 8763
	46 4	5918
T. G. M. T.	8 13 56	
T. M. T. at P.	1 8 59	
Longitude	7 5 27 W.	
	60	
	4)425 27 0	
Longitude	106 21 45 W.	

FORT CARLTON.—Lat. 52° 52′ 30″ N.

1858. May 20th at 2H. 30M. P.M. (M. T. at Place nearly), the following Lunar was taken (Sun W. of Moon) Index Error +1′ 55″. Error of Chron. on M. T. at Place 6H. 39M. 37·3S. Approx. Error on G.M.T. 12M. slow.

(Mean of 9 Sights.)

	D. H. M. S.		° ′ ″
Mean of Chronometer Times -	20 9 11 49·6	Mean of Distances	102 5 43
Error - - - -	— 6 39 37·3	Index Error -	+ 1 55
T.M.T. at Place - -	20 2 32 12·3		102 7 38

☉'s N. P. D.	Cor.	Cor.	Eq. of T.	½ App. Hr. L.	ln Arc.	½ (l′+p).
° ′ ″	″	S.	M. S.	H. M. S.	H. M. S.	° ′ ″
19 58 52	30·9	14·0	3 45·84	2 32 12·3	1 17 58·4	69 56 11
4 56·7	9·6	9·6	1·34	3 44·5	60	37 7 30
20 3 49						
69 56 11	1854	840	3 44·5	2 35 56·8	77 58 24·	107 3 41
	2781	1260				
	296·64	1·314	+ to M.T.	1 17 58·4	19 29 36	53 31 50
	4 56·7					

$$\text{Sin. } \theta = \sqrt{\text{sin. } l' \text{ . sin. } p \text{ . cos.}^2 \tfrac{H}{2}} \quad \ldots\ldots\ldots\ldots (1)$$

$$\text{Sin. } \frac{z}{2} = \sqrt{\text{sin. } \left(\frac{l'+p}{2} + \theta\right) \text{ . sin. } \left(\frac{l'+p}{2} - \theta\right)} \quad \ldots (2)$$

		° ′ ″	
$\frac{H}{2}$	2 cos.	19 29 36	= 19·948730
p	sin.	69 56 11	= 9·972810
l'	sin.	37 7 30	= 9·780717
		53 31 50	19·702257
	sin.	45 13 0	9·851128
	sin.	98 44 50	= 9·994919
	sin.	8 18 50	= 9·160156
			19·155075
	sin.	22 12 40	9·577537
		2	
s'		44 25 20	
		45 34 40	
	R. & P	+ 50	
s		45 35 30	

To compute True and Apparent Altitude of ☽, m', and m.

M. ☉'s R. A.	☽'s R. A.	Cor.	Cor.	☽'s N. P. D.	½ Hr. L.
H. M. S.	H. M. S.	S.	15·1	° ′ ″	H. M. S.
3 51 24·09	10 50 46·9	117·65	36	7 42 28·3	3 52 58·7
1 28·70	1 10·5	1·96		9 3·6	2 32 12·3
5·91			906		
	10 51 57·5	36	453	7 33 24·7	6 25 11
3 52 58·7		117 6			10 51 47
		558	543·6	82 26 35	
					4 26 46
		70·56	9 3·6		
					2 13 23
		1 10·5			

By Formulæ (1) and (2).

		° ′ ″	
$\frac{H}{2}$	2 cos.	33 20 48 =	19·843748
l'	sin.	82 26 35 =	9·996211
p	sin.	37 07 30 =	9·780717
		59 47 2	19·620676
	sin.	40 15 9	9·810338
	sin.	100 2 11 =	9·993303
	sin.	19 31 53 =	9·524166
			19·517469
	sin.	35 0 47 =	9·758734
		2	
		70 1 34	
m' . . .		19 58 26	

′s S. D.	Cor.	Cor.	′s H. Px.	Px. in A. = H. Px. Cos. App. Alt.	
				Px. nearly.	T. Px.
′ ″	″	″	′ ″		
15 40·7	− 6·2	− 22·6	57 24·4	3419 = 3·533899	3419 = 3·533899
5	9·6	9·6	18·0	Cos. m' = 9·973078	Cos. m'' = 9·975452
15 35·7	372	1356	57 6·4	3·506977	3231 3·509351
Aug. 5·5	558	2034	7·0		
15 41·2	59·52	216·9	56 59·4		53·51
	5	18·0			

	° ′ ″
m' =	19 58 26
R. & P.	− 51 16
m =	19 7 10

	° ′ ″
d =	102 7 38
	+ 15 41
	+ 15 50
	102 39 9

Rejecting Seconds :

d = 102 39 0 ∴ 9″ is to be added to D = T. Cent. Dist.

s = 19 7 0 } Altitudes used in Computation.

m = 45 36 0 }

$$\text{Cos. } \theta = \surd \text{ sec. } s \text{ . sec. } m \text{ . cos. } x \text{ . cos. } (x - d) \text{ . cos. } m' \text{ . cos. } s'.$$

$$\text{Sin. } \frac{D}{2} = \surd \text{ sin. } \left(\frac{m' + s'}{2} + \theta\right) \text{ . sin. } \left(\frac{m' + s'}{2} - \theta\right)$$

	°	′	″		
d =	102	39	0		
s =	19	7	0	sec. =	·024635
m =	45	36	0	sec. =	·155111
	167	22	0		
	83	41	0	cos. =	9·041485
	18	58	0	cos. =	9·975757
	19	58	16	cos. =	9·973066
	45	35	30	cos. =	9·844954
	32	46	48		19·015008
	71	13	55	cos.	9·507504
	104	0	43	sin. =	9·986881
	38	27	5	sin. =	9·793686
					19·780567
	50	57	52	sin.	9·890283
			2		
	101	55	44		
		+	9		
	101	55	53		
N. A. Dist. at 9H. . . .	101	37	2	P. L.	2970
		18	51	P. L.	9800
					6830
T. G. M. T. . . .	9	37	21		
T. M. T. at P. . .	2	32	12		
Longitude	7	5	9 W.		
	60				
	4)425	9	0		
Longitude	106	17	15 W.		

The following are the results of other Lunars taken at Fort Carlton :—

			° ′ ″
1857.	Dec. 27th	Jupiter and Moon	106 10 15 W.
,,	,, 28th	,, ,,	106 13 45
1858.	Jan. 18th	Aldebaran and Moon	Not worked.
,,	,, 21st	Sun and Moon	106 19 15
,,	Apr. 20th	,, ,,	106 14 0
,,	,, 23rd	,, ,,	106 18 37
,,	May 22nd	,, ,,	106 17 30
,,	,, 18th	,, ,,	106 15 0
		Mean of Longitudes	106 15 28 W.

N.B.—These Lunars worked at full length, are the greatest and least observed.

	°	′	″	
They are	106	8	30	W.
	106	21	45	
	106	17	15	
		47	30	
Mean	106	15	50	

	°	′	″	
	106	15	28	W.
	106	15	50	W.
			78	
Longitude	106	15	39	W.

OLD BOW FORT, SITE OF THE.—Lat. 51° 9′ 0″ N.
BASE OF ROCKY MOUNTAINS.

1858. August 15th at 3H. 40M. P.M. (M. T. at Place nearly) the following Lunar was observed:—(Sun and Moon) Index Error + 5′ 25″. Error of Chronometer on M. T. at Place, 7H. 29M. 30s. fast. Approximate Error on G. M. T. 15M. slow.
(Mean of 9 sights.)

	D. H. M. S.		° ′ ″
Mean of Chronometer Times - -	15 11 6 13·4	Mean of Distances -	84 4 51
Error - - -	— 7 29 30	Index Error - -	+ 5 25
	15 3 36 43		84 10 16

To compute True and App. Altitude of ⊙
s' and s.

⊙'s N. P. D.	Cor.	Cor.	Eq. of T.	½ M. Dist.	In Arc.	½ (l' + p).	l
° ′ ″	″	s.	M. S.	H. M. S.	H. M. S.	° ′ ″	
14 5 13·4 N.	47·13	·49	4 17·01	3 36 43·4	1 46 15·9	76 3 39·	90 0 0
8 52·5	11·3	11·3	5·33	4 11·5	60	38 51 0·	51 9 0
13 56 20·9	14139	147	4 11·48	3 32 32	106 15·54	114 54 39·	38 51 0
	51843	539					
76 3 39				1 46 15·9	26 33·58	57 27 19·	
	5325539	5·537	— to M.T.				
	8 52·5						

$$\text{Sin. } \theta = \sqrt{\sin l' . \sin p . \cos \frac{H}{2}}$$

$$\text{Sin. } \frac{z}{2} = \sqrt{\sin \left(\frac{l'+p}{2} + \theta\right) . \sin \left(\frac{l'+p}{2} - \theta\right)}$$

		° ′ ″	
$\frac{H}{2}$	2 cos.	26 33 58 =	19·903084
p	sin.	76 3 39 =	9·987018
l'	sin.	38 51 0 =	9·797464
		57 27 19	19·687566
θ	sin.	44 15 26	9·843783
	sin.	101 42 45 =	9·968041
	sin.	13 11 53 =	9·358539
			19·326580
	sin.	27 25 25	9·663290
		2	
		54 50 50	
s'		35 9 10	
R. and P. . . .		+ 1 14	
s		35 10 24	

To compute True and App. Altitude of ☽
m' and m.

R. A. of M. ⊙	R. A. of ☽	Cor.	Cor.	☽'s N. P. D.	½ M. Dist.	In Arc.	½ (l'+p).
H. M. S.	H. M. S.			s.	H. M. S.	H. M. S.	° ′ ″
9 34 24·62	14 51 23·75	121· 1	98″·7	° ′ ″ 21 32 58·6	9 36 16·3		
1 48·42	41·2	2·06	2	3 17·4	3 36 43·4	0 49 32·6	111 36 16
3·28						49 32 36	38 51 0
9 36 16·32	14 52 4·95	20	197·4	21 36 16	13 12 59·7	12 23 9	150 27 16
		41·2			14 52 4 9		
			3 17·4	111 36 16			75 13 38
					1 39 5·2		
					0 49 32·6		

By Formulæ (1) and (2).

		° ′ ″	
$\frac{H}{2}$	2 cos.	12 23 9	= 19·979546
P	sin.	111 36 16	= 9·968366
l	sin.	38 51 0	= 9·797464
		75 13 38	19·745376
	sin.	48 14 15	9·872688
	sin.	123 27 53	9·921284
	sin.	26 59 23	9·656894
			19·578178
	sin.	37 58 28	9·789089
		2	
		75 56 56	
m'		14 3 4	

☽'s S. D.	Cor.	Cor.	☽'s H. Px.	Px. in A.=H. Px. Cos. App. Alt.	
				Px. nearly.	T. Px.
′ ″	″	″	′ ″		
15 6·7	− 4·8	− 17·4	55 19·7	3296 = 3·517987	3296 = 3·517987
4·5	·4	1·5	16·9	Cos. m' = 9·986809	Cor. m'' = 9·988430
15 2·2	11·3	11·3	55 2·8	3197 3·504796	3210 = 3·506417
Aug. 3·7	4·52	45	Red. 6·7	53·17	53·30
15 5·9		165	54 56·1		
		16·95			

	° ′ ″
	14 3 4
R. and P.	− 49 45
m	13 13 19

	° ′ ″
d =	84 10 16
⊙'s S. D. +	15 50
☽'s S. D. +	15 6
	84 41 12

Rejecting seconds :—

	° ′ ″	
d =	84 41 0	∴ 12″ is to be added to D = T. Cent. Dist.
s =	35 10 0	Alts. used in Computation.
m =	13 13 0	

$$\text{Cos. } \theta = \sqrt{\text{sec. } m \,.\, \text{sec. } s \,.\, \cos. x \,.\, (x - d) \,.\, \cos. m' \,.\, \cos. s'}$$

x being $\frac{1}{2}(m+s+d)$

$$\text{Sin. } \frac{D}{2} = \sqrt{\sin.\left(\frac{m'+s'}{2}+\theta\right).\sin.\left(\frac{m'+s'}{2}-\theta\right)}$$

	° ′ ″		
d =	84 41 0		
s =	35 10 0	sec. =	·087523
m =	13 13 0	sec. =	·011658
	133 4 0		
	66 32 0	cos. =	9·600118
	18 9 0	cos. =	9·977833
	35 8 46	cos. =	9·912587
	14 2 45	cos. =	9·986818
	24 35 45		19·576539
	52 6 39	cos.	9·788269

	° ′ ″		
	76 42 24	sin. =	9·988205
	27 30 54	sin. =	9·664624
			19·652829
	42 6 27	sin.	9·826414
	2		
	84 12 54		
	+ 12		
	84 13 6		
N. A. Dist. 12H.	84 33 4	P. L.	3306
	19 58	P. L.	9550
	42 45		6944
T. G. M. T.	11 17 15		
T. M. T. P.	3 36 43		
Longitude	7 40 32 W.		
	60		
	4)460 32 0		
Longitude	115 8 0 W.		

OLD BOW FORT, SITE OF THE.—Lat. 51° 9′ 0″ N.
BASE OF ROCKY MOUNTAINS.

1858. August 16th, at 4H. 39M. P.M. (M. T. at Place) nearly, the following Distances were observed (Sun and Moon), Index Error + 5′ 25″; Error of Chronometer on M. T. at Place, 7H. 29M. 21s. fast; Approximate Error on G. M. T. 10M. slow.

(Mean of 9 sights).

	D. H. M. S.		° ′ ″
Mean Chronometer Times -	16 12 8 33·0	Mean of Distances	95 33 31
Error - - - -	— 7 29 21·0	I. Error - -	+ 5 25
T. M. T. at Place - -	16 4 39·12		95 58 56

To compute True and Apparent Altitude of ⊙
s′ and *s*.

⊙'s N. P. D.	Cor.	Cor.	Eq. of T.	½ M. Dist.	In Arc.	½ (*l′* + *p*).
N.						
° ′ ″	″	*s*.	M. S.	H. M. S.	H. M. S.	° ′ ″
13 46 22·2	47·67	·513	4 5·25	4 39 11·7	2 17 36·4	76 23 24
9 46·3	12·3	13·3	6·3	3 58·9	60	38 51 0
13 36 35·9	14·301	1539	3 58·95	4 35 12·8	137 36 24	115 14 24
76 23 24·1	572·04	6156				
	586·34	6·309	— M. T.	2 17 36·4	34 24 6	57 37 12
	9·46					

		° ′ ″	
$\frac{H}{2}$	2 cos.	34 24 6	= 19·833012
p	sin.	76 23 24	= 9·987630
l'	sin.	38 51 0	= 9·797464
		57 37 12	19·618106
	sin.	40 6 34	9·809053
	sin.	97 43 46	9·996036
	sin.	17 30 38	9·478395
			19·474431
		33 5 41·5	9·737215
		2	
		66 11 23	
t . . .		23 48 37	
Ref. and Par.		+ 2 1	
s . . .		23 50 38	

To compute True and Apparent Altitude of ☽ m' and m.

M ☉'s R. A.	☽'s R. A.	Cor.	Cor.	☽'s N. P. D.	½ M. Dist.	—	—
H. M. S.	H. M. S.	″	S.	° ′ ″	H. M. S.		
9 38 21·18	15 44 1·01	128·7	7·07	25 6 59·5	9 40 22·9		
1 58·28	44·1	2·1	2·1	2 28·4	4 39 11·7	0 42 35·2	115 9 28
3·44	15 44 45	21	707	25 9 28	14 19 34·6	60	38 51 0
9 40 22·9		21	1414	115 9 28	15 44 45·1	42 35 12	154 0 28
		42	148·4		1 25 10·5	10 38 48	77 0 14
		44·1	2·28		0 42 35·2		

		° ″ ′	
$\frac{H}{2}$	2 cos.	10 38 48	=	19·984918
p	sin.	115 9 28	=	9·956716
l'	sin.	38 51 0	=	9·797464
				19·739098
	sin.	47 46 38		9·869549
		77 0 14		
	sin.	124 46 52		9·914523
	sin.	29 13 36		9·688656
				19·603179
	sin.	39 17 30		9·801589
		2		
		78 35 0		
m'		11 25 0		

☽'s S. D.	Cor.	Cor.	☽'s H. Px.	Px. in A. = H. Px. Cos. App. Alt.	
				Px. nearly.	T. Px.
′ ″	″	″	′ ″	″	″
14 54·3	−2·7	−10·1	54 34·6	3267 = 3·514149	3267 = 3·514149
·1			·4	Cos. m' = 9·991321	Cos. m'' = 9·992619
	·2	·9			
14 54·2	·4	·4	54 34·2	3·505470	3211 3·506768
Aug. 2·9			Red. 6·7		
	·08	·36			53·31
14 57·1			54 27·5		

	° ′ ″
m' =	11 25 0
Px.	− 53 31
	10 31 29
Ref.	+ 4 37
	10 36 6

	° ′ ″
d =	95 38 56
☉'s S. D.	+ 15 50
☽'s S. D.	+ 14 57
	96 9 43

Rejecting seconds—

	° ′ ″	
d =	96 10	0 ∴ 17″ is to be subtracted from D = T. Cent. Dist.
s =	23 50	0 } Alts. used in Computation.
m =	10 36	0 }

Cos. $\theta = \surd$ sec. m . sec. s . cos. x . cos. $(x-d)$. cos. m'. cos. s'.

Sin. $\frac{D}{2} = \surd$ sin. $\left(\frac{m'+s'}{2}+\theta\right)$. sin. $\left(\frac{m'+s'}{2}-\theta\right)$

Computation.

	° ′ ″		
d =	96 10 0		
m =	10 36 0	sec. =	·007475
s =	23 50 0	sec. =	·038710
	130 36 0		
	65 18 0	cos. =	9·621038
	30 52 0	cos. =	9·933671
	11 24 54	cos. =	9·991323
	23 47 59	cos. =	9·961402
	17 36 26		19·553619
θ =	53 15 45	cos.	9·776809
	70 52 11	sin.	9·975329
	35 39 19	sin.	9·765602
			19·740931
	47 54 38	sin.	9·870465
	2		
	95 49 16		
	− 17		
	95 48 59		
N. A Dist 12h.	95 40 9	P. L.	3383
	8 50	P. L.	1·3091
T. G. M. T.	12 19 15		9708
T. M. T. at P.	4 39 12		
Longitude	7 40 3 W.		
	60		
	4)460 3 0		
Longitude	115 0 45 W.		

	° ′ ″
Result by Lunar of 15th . . .	115 8 0 W.
„ „ 16th . . .	0 45 W.
	8·45
Longitude of Site of Old Bow Fort	115 4 22 W.

JOHN PALLISER, Capt.,
Commanding N.B. America Exploring Expedition.

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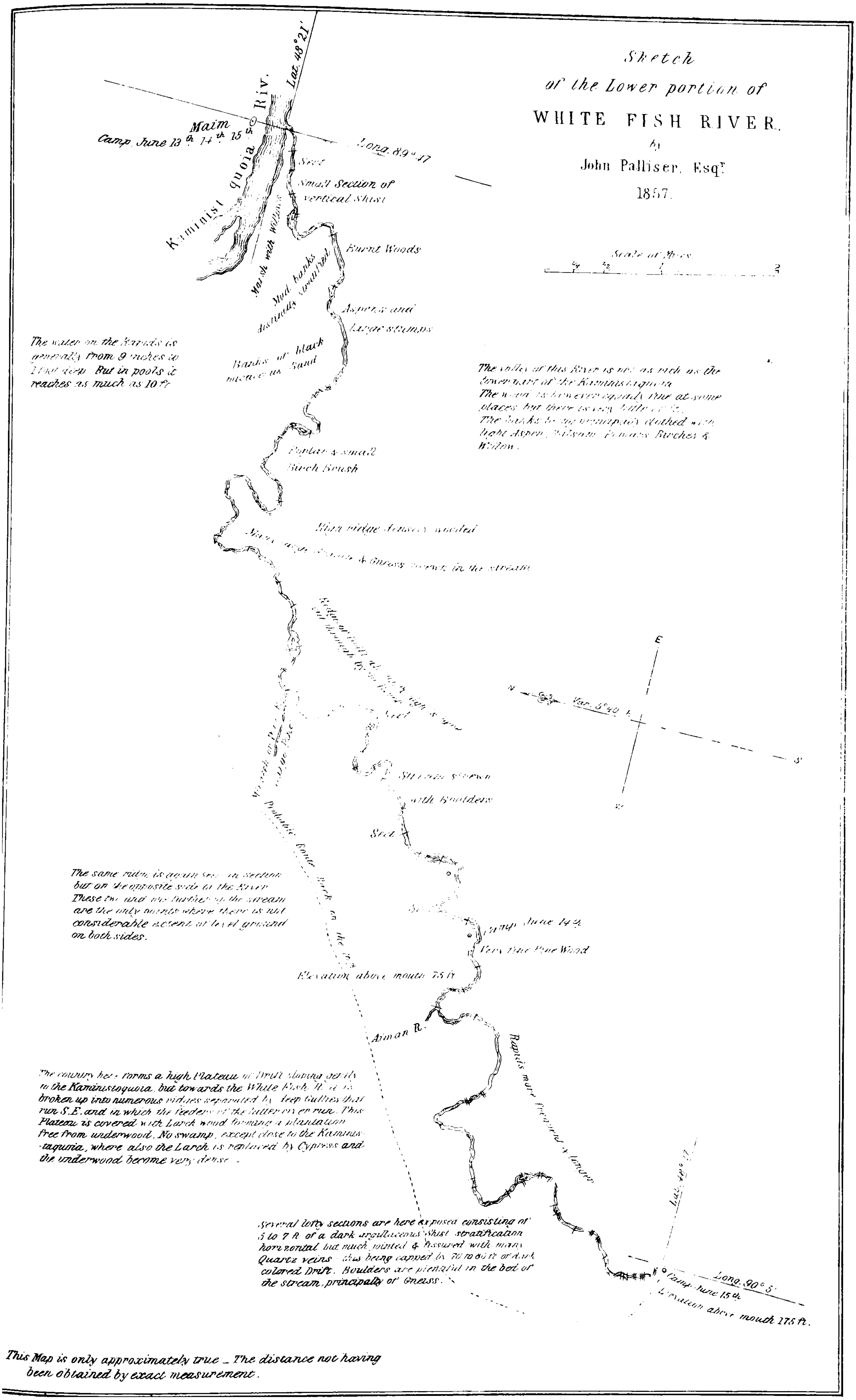
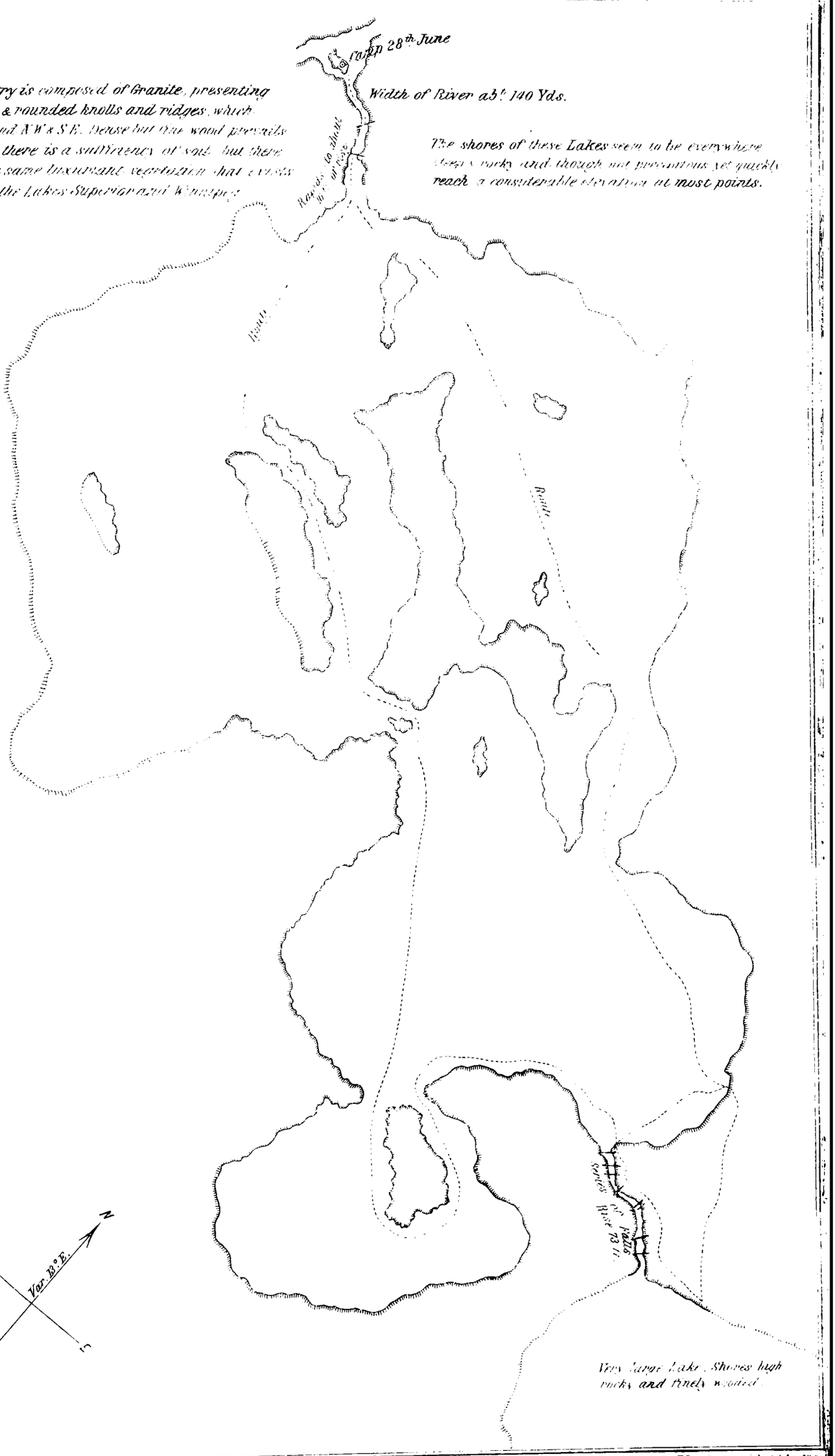
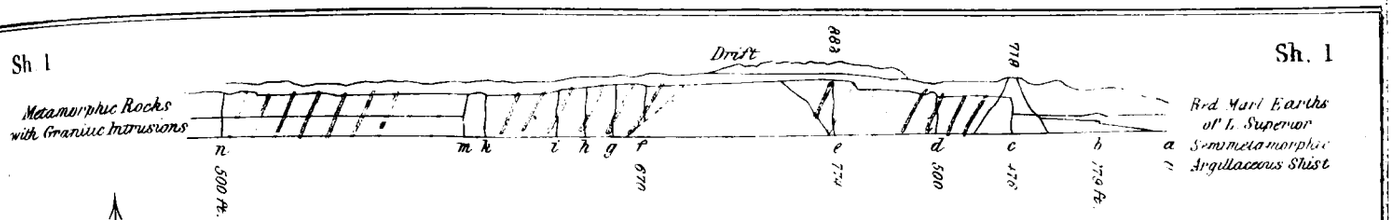
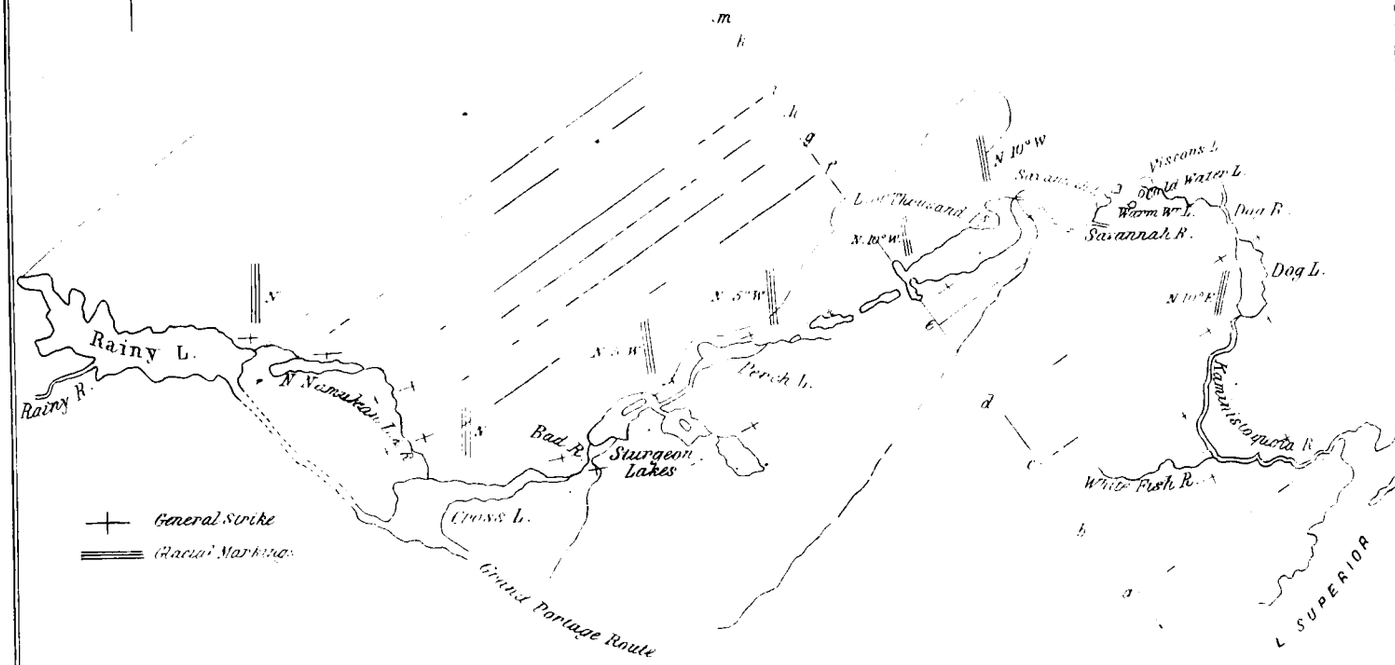

Sketch
of the Lower portion of
WHITE FISH RIVER.
by
John Palliser, Esqr.
1857.
Scale of Miles
Kaministquoia Riv.
Maim
Camp June 13th 14th 15th
Lat. 48°21'
Long. 89°47
Small Section of
vertical Shist
Burnt Woods
Aspens and
Large stumps
Poplar & small
Birch Brush
The water on the Rapids is generally from 9 inches to 1 foot deep. But in pools it reaches as much as 10 ft
Streams strewn with Boulders
Camp June 14th
Very fine Pine Wood
Elevation above mouth 75 ft
Arman R.
Several lofty sections are here exposed consisting of 5 to 7 ft of a dark argillaceous Shist stratification horizontal but much jointed & fissured with many Quartz veins - this being capped by 70 to 80 ft of dark colored Drift. Boulders are plentiful in the bed of the stream, principally of Gneiss.
Long. 90°5'
Camp June 15th
Elevation above mouth 175 ft.
This Map is only approximately true _ The distance not having been obtained by exact measurement.


Camp 28th June
Width of River abt 140 Yds.
Rapids to about 1/2 a mile
The Country is composed of Granite, presenting smoothed & rounded knolls and ridges, which latter trend N.W. & S.E. Dense but fine wood prevails wherever there is a sufficiency of soil, but there is not the same luxuriant vegetation that exists towards the Lakes Superior and Winnipeg.
The shores of these Lakes seem to be everywhere steep rocky and though not precipitous yet quickly reach a considerable elevation at most points.
Rapids
Rapids
Series of Falls Rise 73 ft.
Very large Lake. Shores high rocky and timbered.
N.
Var 13° E.
N
E.
S.

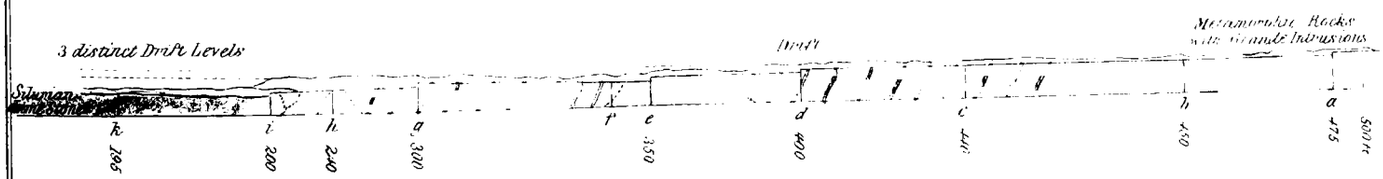
Sh 1

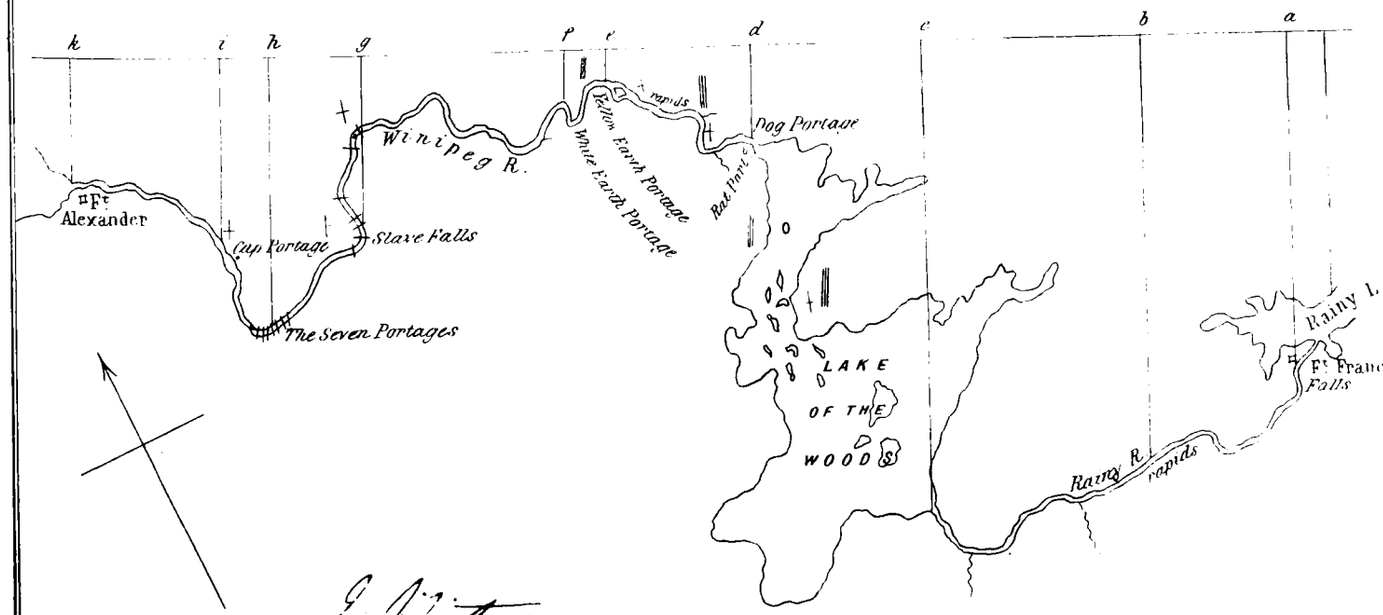
Sh. 1



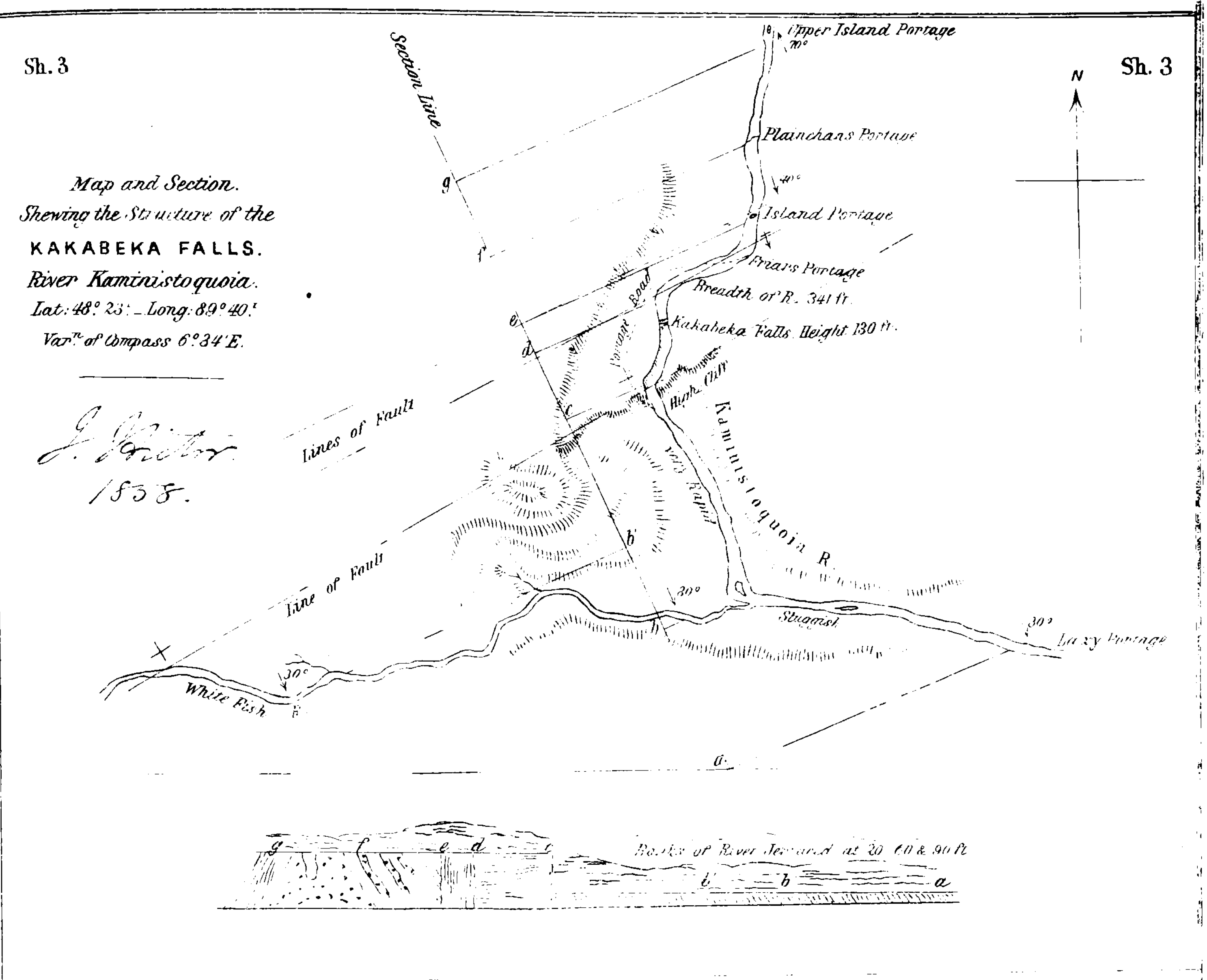


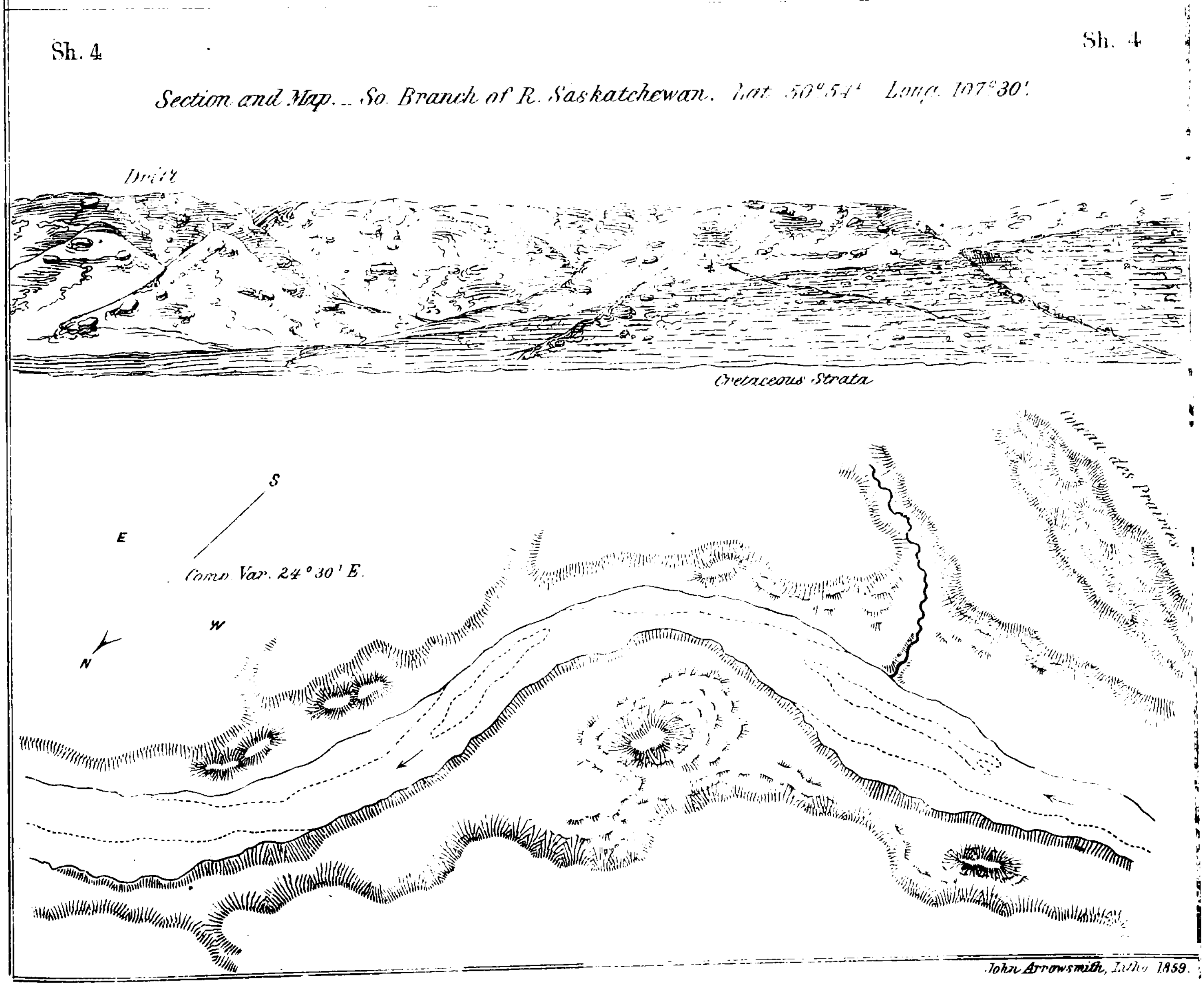
Sh. 2





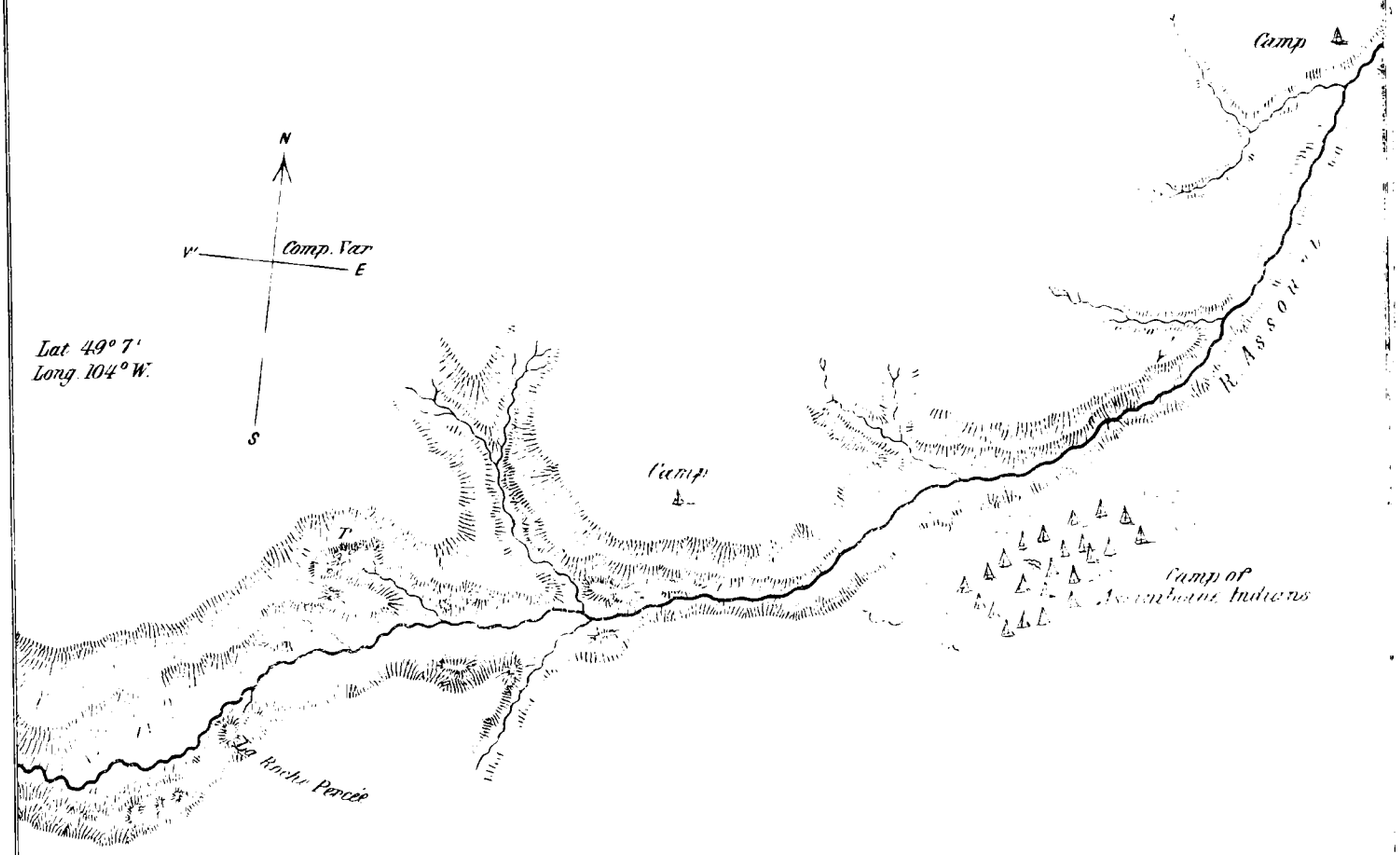
J. Foster. 1858.


Sh. 3
Sh. 3
Map and Section.
Shewing the Structure of the
KAKABEKA FALLS.
River Kaministoquoia.
Lat: 48° 23' _ Long: 89° 40'.
Varn. of Compass 6° 34' E.
1858.
N
Section Line
Upper Island Portage
Plainchans Portage
Island Portage
Friars Portage
Breadth of R. 341 ft.
Kakabeka Falls Height 130 ft.
High Cliff
Kaministoquoia R.
Lines of Fault
Line of Fault
White Fish
Stugeon
Lazy Portage
Rocks of River Terraced at 20, 60 & 90 ft.
g f e d b' b a


Sh. 4
Sh. 4
Section and Map. _ So. Branch of R. Saskatchewan. Lat. 50° 54' Long. 107° 30'.
Drift
Cretaceous Strata
Coteau des Prairies
S
E
W
N
Comp. Var. 24° 30' E.
John Arrowsmith, Litho. 1859.

Sh. 5.

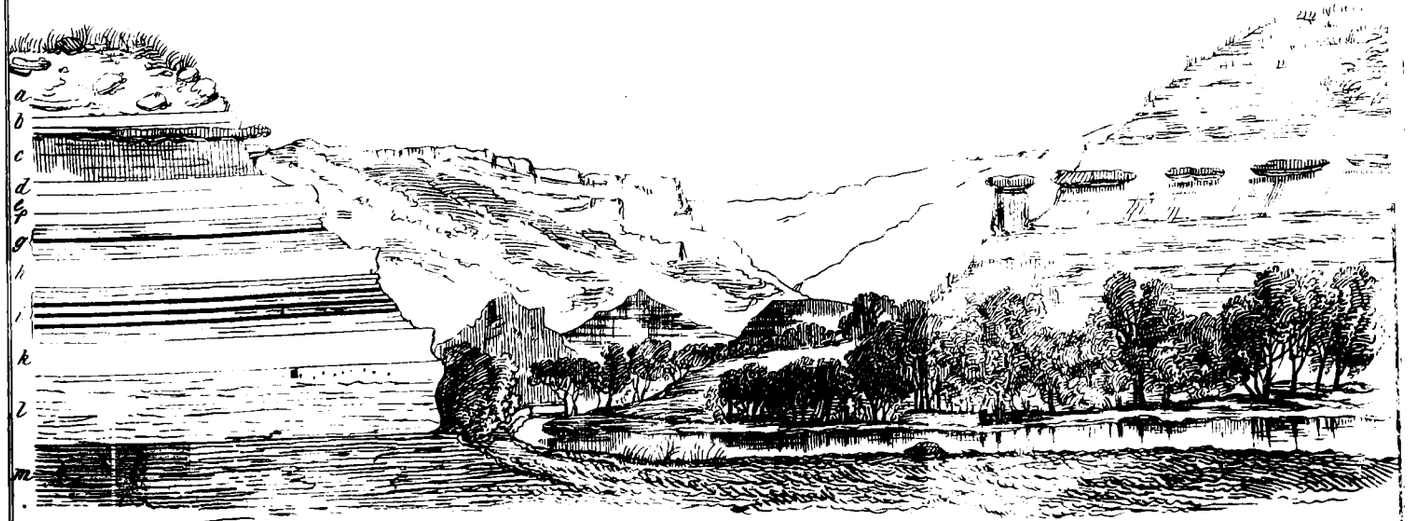
Sh. 5



Sh. 6

Sh. 6

Section of the Valley of the Assoun R. at "La Roche Percée"



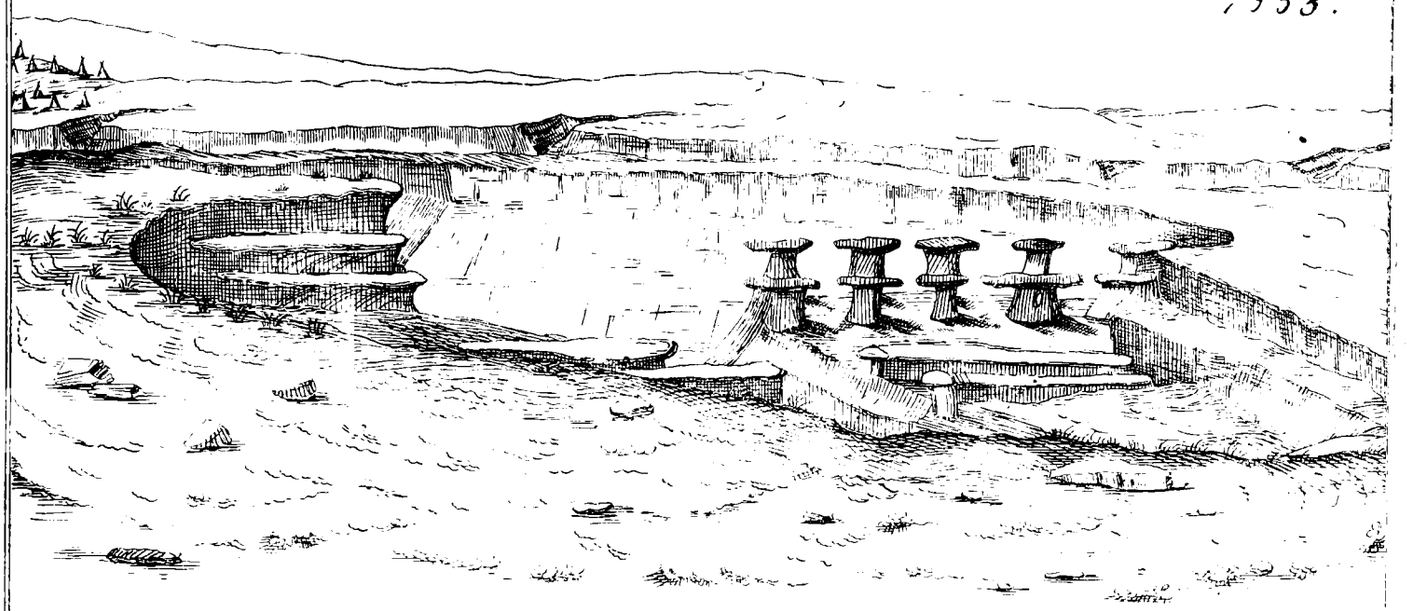
John Arrowsmith, Lithe. 1859

Sh. 7

Sandstone Concretions.

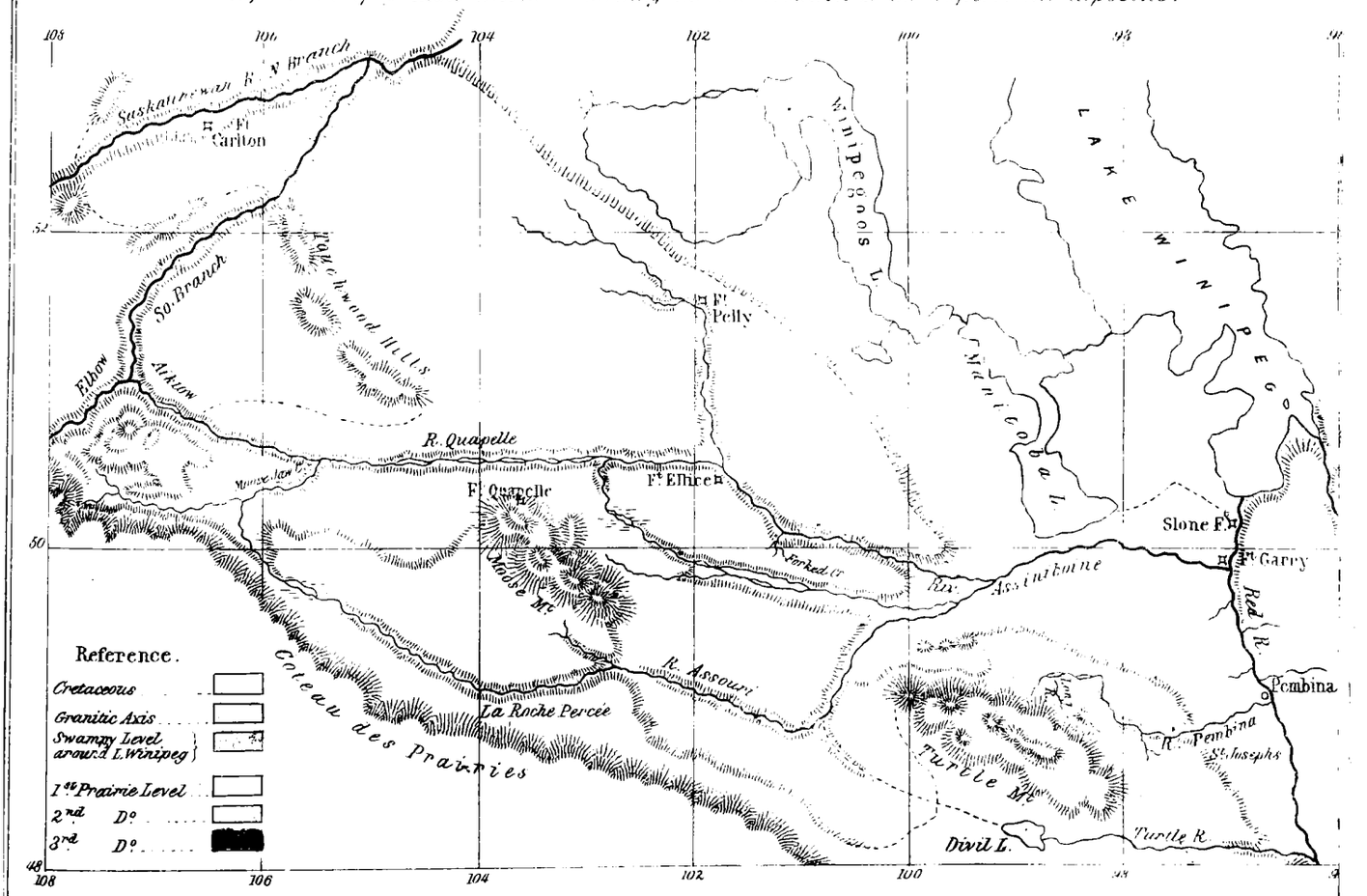
Creek on Assouri R. (Roche Percée.)

J. Richardson, 1855.

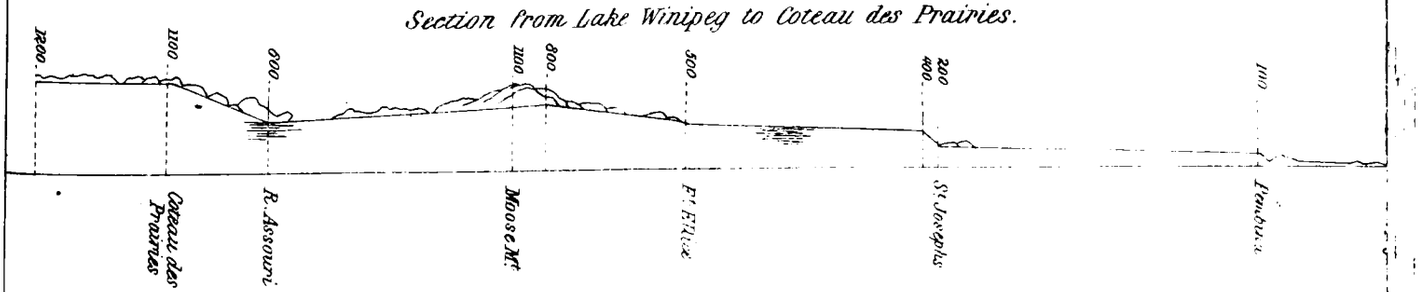


Sh. 8

Map of Winipeg Lake Basin - Shewing the distribution of the Superficial deposites.

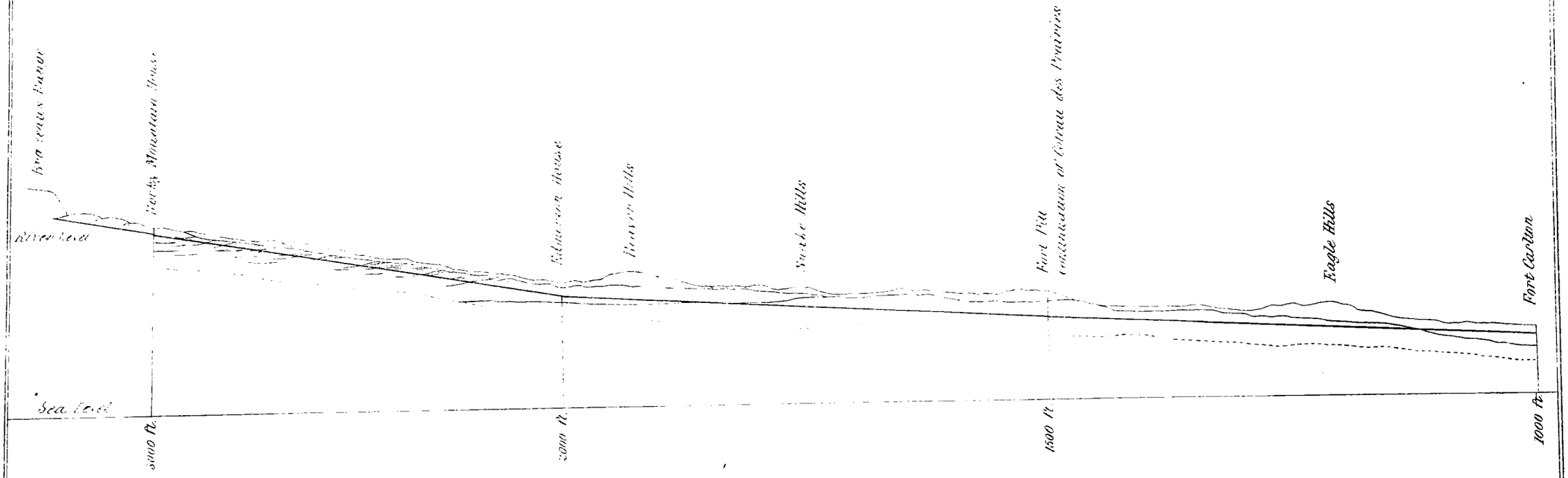


Section from Lake Winipeg to Coteau des Prairies.



John Arrowsmith, Lithr.

SECTION ... SASKATCHEWAN RIVER. NORTH BRANCH. FORT CARLTON TO MOUNTAIN HOUSE.



Drift. *Coarse Sand, Shingle &c with Boulders, consisting of large angular and rounded fragments of Magnesian Limestone and Azoic rocks.*

Beds of Clay, Shale Sandstone and Limestone with seams of Coal. Upper Sandstones, greenish-grey: Lower Sandstones, red.

Chalk. *of Nicollet. Calcareous and sandy Clays with Septaria which contain Fossils, viz: Baculites, Inoceramus, Cucullea., Lucina &c.*

These beds vary from Ash-Grey to a purple-brown.

J. Richardson. 1858.

John Arrowsmith, Lithr. 1859.

EXPLORATION—BRITISH NORTH AMERICA.

FURTHER PAPERS

RELATIVE TO THE

EXPLORATION

BY THE EXPEDITION UNDER CAPTAIN PALLISER

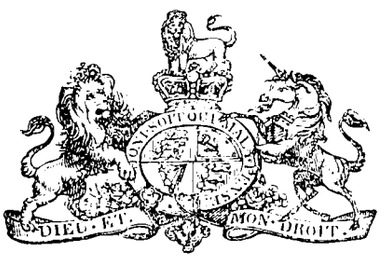
OF THAT PORTION OF

BRITISH NORTH AMERICA

WHICH LIES BETWEEN

THE NORTHERN BRANCH OF THE RIVER SASKATCHEWAN AND THE FRONTIER OF THE UNITED STATES; AND BETWEEN THE RED RIVER AND THE ROCKY MOUNTAINS, AND THENCE TO THE PACIFIC OCEAN.

Presented to both Houses of Parliament by Command of Her Majesty.
1860.



LONDON:
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PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1860.

SCHEDULE.

*** The details of Captain Palliser's Explorations are in preparation, No. 1. to No. 4. being merely preliminary letters.

FURTHER PAPERS

RELATIVE TO THE

EXPLORATION OF BRITISH NORTH AMERICA.

No. 1.

Copy of a LETTER from Captain Palliser to the Under-Secretary of State for the Colonies.

Fort Edmonton, Saskatchewan,
May 20th, 1859.
(Received September 5, 1859.)

My Lord,

I am in receipt of your Letter to me dated July 3rd, 1858, and in compliance with your directions I transmit my opinions on the four points therein contained for the information of Secretary Sir E. B. Lytton.

First, as to whether the Red River Settlement possess qualifications which would adapt it for an English Colony.

The advantages that would accrue to Great Britain from the possession of this Colony would consist in enabling the British Government to support troops in case their presence were required in that portion of the empire; without that Colony all supplies for their maintenance would be necessarily cut off; but if that Colony were adopted by Her Majesty's Government, it might in a short period become very important head quarters, situated as it is near the boundary of the United States, and almost in the centre of the continent.

I shall now endeavour to state its capabilities as an agricultural settlement, from the information I have received, as well as from my own observations during three different visits, (viz., in July and in November of 1857 and in April 1858.)

The average winter commences in the middle of November; shortly after this the lakes and rivers set fast, and the ground acquires its permanent clothing of snow.

The winter lasts till about the second week in April, although during the month of March there are many warm genial days, but with hard frosts during the nights; but in addition to this period of five months there is a previous frost of two or three weeks, which precedes the taking of the rivers; this frost is severe enough to stop agricultural operations, so that the winter may be estimated at six months' duration. The extreme cold is in the month of February, when the thermometer falls to about 45° below zero. The winter is the most favourable time for the transport of heavy materials, such as those required for building purposes. Thaws rarely occur before the month of March, and at this time the existence of horses and horned cattle becomes precarious, owing to the thaws by day being succeeded by frosts at nights, causing a crust on the snow, in many cases too hard for the animals to remove in order to feed. But if horses and horned cattle are properly provided with a sufficiency of hay to meet that emergency, they will not only survive, but continue useful and serviceable during the whole of the winter and spring. Spring progresses with great rapidity; in a few days snow disappears, and the new grass has already commenced to grow up by the beginning of May. At the end of that month agricultural operations might be commenced. During the month of June, however, severe night frosts frequently occur, rendering the wheat crops very precarious, but the climate is well suited to the growth of barley, oats, potatoes, and garden vegetables.

The heat during summer is very great, ripening all fruits rapidly with some curious exceptions, among which are apples, which will not grow either there or in the north of the State of Minesota. The harvest for hay, which is in great abundance, commences in the beginning of July, and that for the cereals about the 10th August. Great damage often occurs at this time to the crops from thunder storms and also from grasshoppers.

The soil is that of an ancient lake bottom, consisting of variously proportioned mixtures of clay, loam, and marl, with a remarkable deficiency of sand. It is overlaid by a great thickness of vegetable mould, varying from two to four or five feet in depth.

The settlement at present occupies an area of about 50 square miles in extent; its centre is at the forks of the Assineboine and Red River in lat. 49° 52′ N., long. 96° 53′ W., and at an elevation of 800 feet above the level of the sea.

The chief wealth of the agriculturist would be derived from the rearing of cattle; large quantities of very nutritious grasses abound everywhere. Hemp, flax, and hops grow admirably.

Query 2nd. "What should be the dimensions and the boundary line of such Colony, "and whether it would be advisable to include the Saskatchewan District in it so as to "establish one great border line from the new Colony of British Columbia up to the Red "River Settlement, under a sway and jurisdiction distinct from the Hudson's Bay "Company's authority?"

In answer to this question I can only state, that I cannot see any object in limiting a new Colony to such narrow bounds as the mere district of Red River, and feel decidedly in favour of annexing not only the Saskatchewan, but also the Swan River District in one Colony, and so establish one great border line from the new Colony of British Columbia up to the Red River Settlement.

The occupation of the territory will only be a work of time; in proportion to the increase of population at Red River, settlers will advance into the Swan River and Saskatchewan Districts.

The country drained by the Saskatchewan is very diverse in character, but although not presenting the same luxuriance of vegetation as the valley of Red River, there are many localities, both there and in the Swan River Districts, where fine arable tracts are to be found. The northern part of the Saskatchewan is a partially wooded country, having at one time been covered by an extension of the great pine forests of the north, which have been removed by successive fires.

The soil consequently abounds in vegetable mould, and is far superior to the prairie lands proper to the south, where there is in general but a very scanty growth of herbage. The northern portion of the Saskatchewan District is well adapted for the rearing of cattle, also for the raising of sheep, if housed and fed during the winter and spring.

Its climate is somewhat similar to that of Red River, but decidedly milder in the southern and western portions; the western portion of Swan River District is much the same as the northern parts of the Saskatchewan; while the northern and eastern parts, which consist chiefly of lakes, are valuable for their abundant supply of excellent fish.

To the north of the north branch of the Saskatchewan there is also a line of lake country crowning the watershed between that River and English and Athabasca Rivers, from which abundant supplies of fish can be obtained.

If then the united territories of Red River, Swan River, and Saskatchewan, were adopted by Her Majesty's Government, I would suggest the following boundaries:—

The southern boundary of the Colony should be the 49th parallel of north latitude, commencing on east shore of the Lake of the Woods, to where it meets the crest of the Rocky Mountains in long. 115° W. The eastern boundary of the Colony should be defined by a line commencing at the 49th parallel on the western shore of the Lake of the Woods, and following the western margin of that Lake to the watercourse which unites the Lake of the Woods with Lake Winipeg, from thence extending around the eastern shore of Lake Winipeg, and following the water course of that lake to the 54th parallel of N. lat. in long. 98° W. The northern boundary of the Colony might run from the above point of intersection along the parallel of 54° of N. lat. to the point where it intersects the crest of the Rocky Mountains in 118° of W. long.

The whole would thus include a territory of 240,000 square miles.

In reference to the concluding portion of the second query in your Lordship's letter, viz., whether such colony should be under a sway and jurisdiction distinct from the Hudson Bay Company's authority, I have no hesitation in expressing my conviction that it is impossible for the Hudson's Bay Company to provide a government to meet the exigencies of a growing colony. Indians they can govern well through the medium of the trading shop; but the interests of a commercial community, which at all events must be adverse to their own, would not be likely to prosper under their rule. But as this is only an opinion perhaps it will not be out of place here to state a case. On my return (last May twelve months, from Red River to Fort Carlton) I visited Manitoba Portage, a flourishing settlement, which though situated not more than 60 miles from Red River Settlement, the general cause of complaint was that when they brought cases of theft,

trespass, or any other such cause of complaint, before the tribunal at Red River, they were at once dismissed on the plea that the district was beyond their jurisdiction, and my informants went on to say, that if matters were allowed to go on thus they would be compelled to institute a lynch law of their own.

In answer to the third query contained in your Lordship's letter, viz., "What means "of access exist for British immigrants to reach this settlement," I think there are no means of access to be recommended save those viâ the United States.

The direct route from England viâ York Factory, and also that from Canada viâ Lake Superior, are too tedious, difficult, and expensive for the generality of settlers. The manner in which natural obstacles have isolated the country from all other British possessions in the East is a matter of considerable weight; indeed, it is *the* obstacle of the country, and one, I fear, almost beyond the remedies of art. The egress and ingress to the settlement from the east is obviously by the Red River Valley and through the States.

In answer to the fourth query contained in your Lordship's letter, viz., "Whether "judging from the explorations you have already made, the country presents such "facilities for the construction of a railway as would at some period, though possibly a "remote one, encourage Her Majesty's Government in the belief that such an under-"taking between the Atlantic and Pacific Oceans could ever be accomplished?" I have no hesitation in stating that no obstacles exist to the construction of a railway from Red River to the eastern base of the Rocky Mountains, and probably the best route would be found in the neighbourhood of the south branch of the Saskatchewan.

An amount of capital very small in proportion to the territory to be crossed would be sufficient to accomplish the undertaking so far, but the continuation of the railway across the Rocky Mountains would doubtless require a considerable outlay.

In my letter to Her Majesty's Government, dated 7th October 1858,* I have referred to the two Passes examined by myself and my Secretary, Mr. Sullivan, both of which I found practicable for horses right across the main chain of the Rocky Mountains to the Columbia River, and that a small outlay would render the more northern one practicable for carts, and even waggons.

On the return of Dr. Hector from his branch expedition, I found he had also crossed the mountains as far as the valley of the Columbia River by the Vermillion Pass which leaves the valley of Bow River nearer to its source than the pass I had myself traversed. In that pass he had observed a peculiarity which distinguishes it from the others we had examined, viz., the absence of any abrupt step at the commencement of the descent to the West, both ascent and descent being gradual. This, combined with the low altitude of the greatest elevation passed over, led him to report very favourably upon the facilities of this pass for the clearing of a waggon road, and even that the project of a railroad by this route across the Rocky Mountains might be reasonably entertained.

In conclusion I wish to draw your Lordship's attention to the fact, that, in accordance with my instructions, we did not continue our explorations westward beyond the valley of the Columbia, I am therefore unable to form an opinion on any facilities that may exist, or obstacles which may oppose the further continuance of a railway from the valley of the Columbia River to the shores of the Pacific, I am in hopes, however, of soon receiving an answer to my letter to Her Majesty's Government, dated 7th October 1858, which no doubt will contain further instructions as to my explorations in that direction.

In the event of Her Majesty's Government deciding on the adoption of a North American Colony, comprising Red River and the Saskatchewan Districts, I would recommend that the Swan River should also be included in that Colony, and I beg to submit a letter from W. I. Christie, Esq., an officer of the Hudson's Bay Company, for some years in charge of that district previous to his recent promotion to the Saskatchewan.

This enclosed letter will explain what are considered by the Hudson's Bay Company to be the bounds of the Swan River district.

The Hudson's Bay Company Territories, are divided into districts for the convenience of the Indian trade. The valley of the Swan River does not embrace the Swan River District, nor does the Saskatchewan District contain the whole valley of the Saskatchewan River (a part of whose waters run through the Cumberland District), and therefore I have suggested, in answer to query 2, boundaries for the Colony under consideration, irrespectively of the districts or parts of districts which they comprise.

I have, &c.

(Signed) JOHN PALLISER.
Commanding Exploring Expedition.

The Under Secretary of State for Colonies.

* *Vide* Papers presented June 1859, p. 29.

Enclosure in No. 1.

Edmonton House, Saskatchewan District,
17th May, 1859.

SIR,

AGREEABLY to your request, I beg leave to submit to you the following information regarding the extent and resources of the Swan River District of the Hudson's Bay territories.

The Swan River districts extend from the Manitobah post on the south, and of Manitobah lake, to within three days of Fort Carlton on the north branch of the Saskatchewan river. It embraces the country as far south as the boundary line from longitude 99° W. to 106° W. To the west it bounds with the Saskatchewan district, and on the north with the Cumberland district.

There are seven trading posts in the district, viz.:—

Fort Pelly.	Fort Ellice.
Egg Lake.	Touchwood Hills.
Shell River.	Q'Appelle Lakes.
Manitobah.	

Of these, the three latter are plain posts, the trade at them being mainly for provisions, the others lying within the thickwood country, are fur trading posts.

Fort Pelly is the head quarters of the district, the arable land round Fort Pelly is not of any great extent, owing to the prevalence of sandy soil and swampy land, covered with thick wood.

On the few patches which have been brought under cultivation in the neighbourhood of the Fort, barley, potatoes, and all vegetables are raised to perfection. Wheat has been tried, but invariably fails.

The pasture around Fort Pelly is excellent, and the cattle raised here have produced beef of very fine quality. The Hudson's Bay Company have a considerable stock of cattle at this post, and rear some fine horses, the breeds having been imported direct from England.

At all the thickwood posts in this district, there is abundance of timber for building and other purposes, consisting of spruce, pine, and poplar.

Fort Pelly and Egg Lake are entirely supplied with provisions from the plains, while Shell River and Manitobah posts are supported by fish.

The country around Fort Ellice and the Touchwood Hills is well adapted for cultivation, and the rearing of cattle; the soil is good, but there is a great scarcity of timber either for fuel or building purposes.

The Q'Appelle Lake post is far out in the plains, and the country around it is almost devoid of wood. There is an excellent fishery at the Q'Appelle lakes; white fish are speared here in great numbers in the autumn.

The thickwood population of the Swan River district is about 1000; but owing to the wandering habits of the prairie Indians it is difficult to form an estimate of their numbers.

The complement of officers, clerks, and men employed by the Hudson's Bay Company in this district, is as follows, viz.:—

One Commissioned officer, 6 Clerks, 7 Interpreters, and about 70 men, principally half-breeds.

The district is completely overrun by free traders from the Red River settlement, who come up in the fall and pass the winter along the frontier of the district, dependant entirely upon Buffalo for their support.

There is one settlement in this district at the south end of the Manitobah Lake, where there is a Missionary settlement, with a population of about 150 souls, who are entirely supported by fishing, raising a few potatoes only. Wheat however grows well there. There are besides this missionary settlement, two missionaries in the district, one stationed at Fort Pelly and the other at Q'Appelle Lakes, all belong to the Church Missionary Society.

Hoping the above information will be sufficient,

I have, &c.
(Signed) WM. J. CHRISTIE.

John Palliser, Esq.,
Commanding Exploring Expedition.

No. 2.

No. 2.

COPY of a LETTER from Captain PALLISER to HER MAJESTY'S SECRETARY OF STATE FOR THE COLONIES.

Fort Edmonton, Saskatchewan.
May 23, 1859.
(Received September 5, 1859.)

MY LORD,

I AVAIL myself of the opportunity afforded by the departure of the Hudson's Bay Company's boats for Norway House, to acquaint your Lordship of the return of Mons. Bourgeau (botanist of the expedition under my command) to England.

I have great pleasure in testifying to M. Bourgeau's zeal and activity in every way. In addition to his acquirements as a botanist, he possesses the most untiring energy, and in camp no fatigues deter him from immediate attention to the securing and preservation of his specimens.

He now leaves the expedition in order to return at the end of this his third season to England, and complete the botanical work (connected with the expedition) under the superintendance of Dr. Hooker at Kew.

I regret to say that in consequence of the total failure of provisions in this part of the district, I am compelled to start with the expedition immediately to the south in search of Buffalo, the delay of even one day in the present crisis might be of serious consequences, I therefore cannot wait for the arrival of further instructions in answer to my letter addressed to your Lordship, dated October 1858, but must hasten south, and meanwhile make the best arrangements in my power for receiving my letters on the plains, until which time I will take no decided step with respect to further explorations.

I regret to say that the war is just about to be renewed, but I shall endeavour to do all in my power to cement the peace again.

I have spent the greater part of the winter at the foot of the Rocky Mountains among the Blackfeet, and am personally acquainted with almost all the principal men, and also with many of the Piegan and Blood Indians. I have found them much easier to deal with in all questions of peace or war than their neighbours the Crees. Because the Blackfeet are richer in horses, war is the greater object to the Crees in order to steal the Blackfeet horses.

Doctor Hector also during the winter proceeded to the mountains, and the result of his exploration and observations will be reported in due course.

I am happy to state that almost all our horses have got through the winter fairly, with the exception of four deaths, and none have been stolen, and I have to thank Mr. Sullivan for his activity and zeal in looking after them during the protracted absence of Doctor Hector and myself while we were in the mountains.

I have, &c.

(Signed) JOHN PALLISER,
Commanding Exploring Expedition.

Her Majesty's Principal
Secretary of State for the Colonies.

No. 3.

No. 3.

COPY of a LETTER from Captain PALLISER to HER MAJESTY'S SECRETARY OF STATE FOR THE COLONIES.

Fort Colvile, October 22, 1859.

SIR, (Received December 27, 1859.)

I HAVE the honour to resume the account of the proceedings of the exploring expedition under my command, since our departure from Fort Edmonton, on the 27th of May 1859.

Owing to the great scarcity of provisions at Edmonton, and the total absence of buffalo from that part of the country, I was compelled to start with the expedition sooner than I would have wished, both on account of the condition of my horses, that had not yet sufficiently recovered from the severities of winter, also, because I had not yet received further instructions from the Colonial Office as to whether my expedition was to recross the Rocky Mountains. I therefore determined to endeavour to fall in with buffalo as speedily as possible, and there to await my instructions, and left Doctor Hector with directions to follow as soon as the mail from England had arrived.

Our party consisted of 16 men, including my secretary, Mr. Sullivan, and myself, two friends of mine, Captain Brisco, of the 11th Hussars, and Mr. Mitchell, who joined me in the commencement of last winter, and who were anxious to avail themselves of this opportunity of traversing the Blackfoot country. The accession of these two gentlemen and their men to my party enabled me to save some expence by hiring fewer men chargeable to the expedition, and I have had ever since cause to feel most thankful to them for the zeal and kindness, with which they have followed my directions, the patience and cheerfulness with which they endured many privations, and the steadiness and alacrity with which they undertook the guarding of the horses by night.

On 2nd of June we reached Buffalo Lake, where our provisions were exhausted; we however managed to support ourselves on ducks and beaver until the 11th, when we fell in with buffalo on the Oochischis Wachee or Hand Hills, in the Blackfoot country (Lat. 51° 32′ N., Long. 111° 20′ W.) Here I established my camp, and determined to await the arrival of Doctor Hector from Edmonton, with the letters from England. On the 14th of June we were visited by a war party of 45 Blackfeet, on their return from an unsuccessful invasion against the Crows. Having now plenty of meat, I received them hospitably, and dissuaded them from turning their arms against the Crees, from whom the Blackfeet had recently received great provocation, and persuaded them to

return to their camp. We were subsequently visited by several war parties, which, on the whole, were not very troublesome, but, unfortunately, succeeded in frightening one of my half-breed hunters and most of the men so much that I had no small amount of trouble to prevent my men from deserting and abandoning the expedition altogether, particularly when I informed them of my determination (in pursuance of my instructions of April 1857) to penetrate in a south-easterly direction to the forks of the Red Deer and Bow rivers, thence to the Cypreés mountains, and along the boundary line to the Rocky mountains. I was finally obliged to compromise the matter by consenting to send back to Edmonton and engage five more men from Lake St. Ann's.

June 19.—Doctor Hector arrived with instructions from the Colonial Office, and I determined (without sacrificing any of the objects of the expedition in the country eastward of the Rocky mountains) to pursue my route to the westward over the passes discovered last year, as far towards the sea as the season would permit.

On 20th of June I despatched Felix Monroe, one of my hunters, to Edmonton, with directions to engage five additional effective men; I took the precaution of sending provisions with him for the use of himself and these men on their return journey back to my camp, directing Felix to make a câche of the provisions when he came within two days of the Fort, in order to preserve them from the hungry population at Edmonton, for the use of the men on their return, but the fearful state to which the Edmonton population were driven was such that the men sent back to the câche, and gave up the provisions to the women and children, and reached my camp on the 4th of July, having had nothing to eat for three and a half days, an account which their fearfully haggard features fully confirmed.

The Blackfeet complain very bitterly of the Hudson Bay Company, and certainly not without reason, for the injustice of the tariff and the enormous difference between the price paid by a Cree and by a Blackfoot at the same Fort, for the same article. Also, they complain of the utter insufficiency of the goods that remain at the Fort during the summer months. "Therefore," said their chiefs to me, "let them see how well they can do without us now!" However, I persuaded them to go into Edmonton, and bring them provisions, and have since heard that these Indians fulfilled their promise to me.

Owing to my having been so much in the Blackfoot country, both in the summer of 1858 and the winter of 1858–9 all the chiefs and principal men know me, and frequently said to me "Desire us to do anything you please and we will do it." Doctor Hector also has acquired a great influence among them by removing some trifling complaints from the men, and a great success in his profession among the women and children. Neither is this friendly feeling confined to the Blackfeet alone, for both Piegans and Blood Indians, whenever they came in any numbers to visit me, always rode unarmed into my camp, which is the greatest compliment that these Indians can possibly pay.

We have now travelled through the whole of their territories, a portion of country hitherto considered so dangerous as to be almost inaccessible, and we have neither had a horse stolen or a gun pointed at us by any of these tribes. However, I do not wish to infer that a total stranger would be equally safe, nor that any one accompanied by a military force (unless that force were a very large one) would also be safe; I think in either case they would run very great risk of having all their horses stolen. These Indians tent in very large camps, from 400 to 600 tents together.

The Oochischis Wachee or Hand Hills in Lat. 51° 32′ N., Long. 111° 20′ W., are a plateau, elevated about 450 feet above the level of the surrounding prairies. The grass and land were very good, but the timber not of any value, being chiefly willow and poplar. With the exception of very few similar spots, the whole prairie over which we passed to our crossing place on Red Deer River (about 40 miles above the forks of Red Deer and Bow rivers) is a sandy country, the grass very scanty, and no wood.

On July 15th we crossed Red Deer River, and followed along its south bank until we arrived opposite the site of where the old Fort called Chesterfield House once stood; with the exception of the bed of Red Deer River the whole of that region is valueless, the grass being very scanty and timber very scarce.

Having now reached the 110th degree of longitude, I considered the whole of that region sufficiently explored, being now within 30 miles to the westward of that point of the Bow River which we had reached from the eastward, at the end of September 1857.

The general barrenness and absence of valuable timber along this whole region of country, has been the cause of great disappointment to us, as all the previous accounts we had heard of the south branch of the Saskatchewan or Bow River, had led us to

believe, that it would have been a most desirable place for settlers, but having now examined all that river, we find the whole region from the elbow in longitude 107° 37′ W. up to the point where the meridian of 112° W. intersects the "line of the woods," by no means a desirable district for settlement.

There is throughout the whole of this region a great scarcity of rain; but in a few places, here and there, where the land rises above the plain to the height of three or four hundred feet, good grass and some timber, as rough bark, poplar, and willow appear.

We were now not far from the Blood Indian Camp, pitched to the southward of us. July 19th we were visited by a great number of the Indians, headed by their two chiefs, all rode unarmed into our camp; they spent the day with us, and insisted on our riding with them the following day to their camp, where they received Capt. Brisco, Dr. Hector, and myself most hospitably. Their tents are the largest I have ever seen, some of them 30 feet in diameter and of a proportionate height, well supplied with kettles, dishes and spoons, and frequently with American luxuries, such as coffee and sugar. They trade at Fort Benton on the Missouri.

Our Blackfeet guides deserted us here, from fear of these Indians, which I did not regret, as I found them expensive and useless.

On 22nd July, we crossed to the south bank of the lower Saskatchewan or Bow River, by wrapping up our baggage in leather tents, so as to form them into circular boats, and swimming our horses across. From thence we proceeded in a S.W. direction to the Cyprées Mountains in longitude 111° W. Here I had great difficulty in inducing my men to travel any further, they were literally terrified, but we forced them onwards. I told them they would have no pay nor any assistance back to their country from me unless the journey were performed, a threat they knew I would execute. I had already made an example of one of them when at the Hand Hills where I lost my old hunter, a Blackfoot half breed, who had faithfully followed me across the mountains and back to Edmonton last year.

He being an old man, I allowed him to return when all my persuasions and promises to induce him to advance had failed. I paid him up to the time he had remained with me, but the first man that proclaimed his intention to follow his example, I collared, kicked out of the camp, and refused his pay, as well as permission to return.

I am happy to say I was not obliged to adopt this course on any other occasion, but succeeded ever after in keeping my men together principally by ridicule and partly by persuasion.

The Cypreés Mountains in lat. 49° 38′ N., long. 110° W. are a range elevated 1,600 feet above the level of the plains, covered in fine timber, abounding in excellent grass, well watered, and fairly though not abundantly stocked with game. They run nearly east and west, and are connected with the Côteau des Prairies about 40 miles to S.W. of the elbow of the south branch of the Saskatchewan which we reached previous to our return to the northward, in order to winter at Carlton in October 1857.

We remained some days in the Cypreés Mountains to hunt and make provisions. Here our bread and tea, which we had hitherto only enjoyed twice a week, was at length exhausted, save one bag of flour, which I carefully kept for the doctor's use on the west side of the Rocky Mountains, where I knew all other resources would fail.

From this point I deemed it advisable that Dr. Hector should start on a branch expedition, in conformity to my instructions from the Colonial Office dated 8th February 1859. I accordingly fitted him out with 16 horses, four men, and an Indian hunter, with instructions to proceed and enter the mountains by the "pass" he explored last year, and endeavour to discover and explore a route practicable for horses to the westward, by the valleys of Frazer and Thompson's Rivers, and to avoid the valley of the Columbia River. Also, that if he failed, he was to join me at Colvile, but if he succeeded he was to go on to Fort Langley.

On 3rd August, having converted the red deer and buffalo we had killed into pemican, we broke up camp. Dr. Hector started for the headwaters of the south branch of the Saskatchewan, and my two friends Captain Brisco and Mr. Mitchell proceeded southward to Fort Benton. Mr. Sullivan and I proceeded due west, nearly along the 49th parallel to the Chief's Mountain situated on the boundary line. It would be needless to occupy your time with a minute description of the country traversed by the 49th parallel of latitude, between longitudes 109° W. and 113° 50′ W. It is a level, sandy, arid plain, the very insignificant tributaries to the south Saskatchewan were nearly dried up, appearing here and there in pools of water. The few swamps on which we were almost wholly dependent for water, with a few exceptions, were brackish and impregnated with sulphates, and the grass barely sufficed to feed the horses.

We crossed the mountains easily in 2½ days from the place where we abandoned the carts.

On the 18th of August we arrived at two Kootanie tents. These people possessed cows as well as oxen and horses, and had milk in abundance. We exchanged some tired horses with them, and traded a very lean young bullock, as our provisions were nearly exhausted.

My intention had been from this place to have turned to the northward, followed up the Kootanie River to the entrance of the new "pass" which I established last year, and thence to have endeavoured to cross the country, keeping north of the 49th parallel, as far as the Columbia River; but we learnt that there were no Indians then fishing on or near the source of the Columbia, nor to the northward of us on the Kootanie River, as they had gone to the Columbia Lakes; so not having sufficient provisions, nor seeing any probability of getting a supply, I determined on taking the Hudson's Bay Company's trail through the United States territory to Colvile, there to change horses, lay in a stock of provisions, flour and pork, and renew the explorations from thence.

We found the Hudson Bay Company's trail from the Kootanies to Fort Colvile far worse than we expected. It follows closely the river valley as far as the Lake of the Paddlers, in latitude 48° 42′ north, longitude 116° 30′ west, also, after leaving the river it runs altogether in American territory. We reached Paddler's Lake on 29th August, we found the Indians very badly off for provisions, and the fishing unusually bad.

In order to obtain a more extended knowledge of the country, I bought an Indian canoe at this place, and engaged two Indians to take me down the Kootanie River to the Flat Bow Lake, thence into the Columbia River to Fort Colvile, leaving the men and horses in charge of Mr. Sullivan, to proceed by land to Fort Colvile.

As the general course of the river now ran in a north-westerly direction, I was soon in British territory again, and arrived late in the evening of August 29th, at a camp of Flat Bow Indians.

These Indians, like the Paddlers, live by fishing, seldom hunt, nor indeed, is there much to shoot in their country, save at a short period in the fall of the year, when they are sometimes visited by wild fowl in abundance. I killed a few ducks and geese which, together with dry fish and fresh salmon, enabled my party to fare very well. On 4th September, I arrived, early in the morning, at Fort Shepherd, on the Columbia, a day's journey to the south of the Columbia Lakes.

This post of the Hudson's Bay Company on the right bank of the river, has been recently built in expectation of the time when the American Government will exclude them from trading at Colvile. At present, there are no goods, nor is any trade carried on there. The fort is about a mile north of the 49th parallel, and about half a mile north of the mouth of the Pendoreilles river, a tributary from the opposite side.

Here I first learned of the gold discoveries upon that river, the Columbia river and the Similkameen, where harvests as rich as those of Frazer and Thompson's rivers are confidently expected.

On Monday the 6th September, I reached Colvile. Mr. Sullivan and the land party had already arrived the day before. They had suffered severely from want of provisions; the berries which made into cakes, and which are the principal food of these Indians, had disagreed with them very much, and caused an attack of cramps in the stomach, which gave them great uneasiness. The whole party were most hospitably received by Mr. McDougall, a settler in Colvile valley; a little laudanum and brandy, with good wholesome food soon restored them all.

I found the United States mail, viâ California about to start, time did not permit me a fuller report of myself and my companions than my letter to the Colonial Office, bearing date 6th September, 1859, which was confined altogether to the monetary matters of the expedition.

On my arrival at Fort Colvile, a letter from Sir George Simpson, Governor of the Hudson Bay Company's territories, purporting to be a circular, and addressed to George Blenkinsop, Esq. (officer in charge of Fort Colvile) was read to me, by which I learnt with surprise, that all the engagements of the Hudson Bay Company, to furnish provisions and necessaries to the expedition, as well as their undertaking to honour my drafts on them for wages of men, &c. had been retracted.

With respect to the monetary matters of the expedition, I understand that the Hudson Bay Company are pressing at the Colonial Office for payment of an account amounting to 3012*l.*, but I cannot understand why the Hudson Bay Company have not submitted that account to my inspection, previous to their demand for payment. I have as yet, received only two priced accounts of the Hudson Bay Company, each of which I promptly paid by bills on the Paymaster General.

The inconvenience of delay at present experienced by the Hudson Bay Company in the payment of their accounts, is entirely owing to an arrangement made by Sir George Simpson, viz. :—at each of the forts, where supplies are furnished to the expedition, I am also furnished with blank or unpriced bills for my signature. These unpriced bills are then forwarded to Sir George Simpson, to be priced, and I claim on the part of Her Majesty's Government, the right of seeing those bills after they have been priced, and previous to their being paid; for this reason I have more than once reminded Her Majesty's Government, not to pay or allow to be paid, any sums of money for the purposes of the expedition under my command, save those drawn by myself on the Paymaster General.

In addition to this obvious reason, there is another to be urged, viz.—The Company have agreed to take back all the goods remaining over and above those that have been sent up the country for the use of the expedition, which will considerably reduce the sum due to them, and enable me (when the Cr. as well as Dr. side of the account is made out) to draw Bills on the Paymaster General for the balance.

I am happy to say that I have not met any inconvenience in the prosecution of my searches from this point (Fort Colvile) in consequence of Sir George Simpson's prohibition to render us further assistance.

Mr. Blenkinsop, the officer in charge of the fort is himself a merchant, and has most kindly undertaken to furnish us in every way on his own private account, and accepts my bills on the Paymaster General, to defray the expences of the expedition.

It gives me great pleasure to be able to inform Her Majesty's Government, that my Secretary, Mr. Sullivan's, and my own endeavours to find a route practicable for horses from Edmonton westward across the Rocky Mountains, as far as the longitude of Fort Colvile, and entirely within British territory, have been perfectly successful. In addition to this, I pursued my way for more than 50 miles to the westward, still north of the 49th parallel, until I arrived and terminated my explorations on the 11th of October, by reaching the camp of the United States Boundary Commissioners in longitude 119° 30′ west.

I shall now endeavour to submit a detailed account of these explorations as briefly as possible, also Mr. Sullivan's description of that portion of them which was entrusted to him.

On 11th September I despatched Mr. Sullivan with orders to recommence on the 49th parallel at Fort Shepherd, there to "cross the Columbia River, and proceed from "the mouth of the Pendoreilles River in an easterly direction to that point on the "Kootanie River where our explorations terminated in the season of 1858, so com-"pleting the route across the country from the western base of the Rocky Mountains to "the valley of the Columbia."

On 14th September I started myself for Fort Shepherd there to recommence on the 49th parallel, and endeavour to make my way to the westward until I fell on the trail of the Hudson's Bay Company, which bears to the northward, passing over the Cascade Range at Mansen's Mountain.

I secured the services of an old Blackfoot half bred hunter together with two of his own horses, which were in much better condition for the severe journey I was undertaking than mine, and was accompanied also by an Indian; we three started on horseback and carried our provisions on two pack horses.

On the 17th September we left Fort Shepherd, crossing a country of wooded hills, the first three ranges of which we crossed without much difficulty. I could not ascertain their exact height having no barometer, but they probably averaged between 800 and 1,100 feet. We then camped on the edge of a small lake of an insignificant size, and where we had a sufficiency of water. To reach this lake I had to cross the 49° N. about half a mile to the south. Distance made seven miles.

September 18th.—Started at 7 A.M. After breakfast returned a little to the northward and pursued a western course through the hills. Latitude at noon 49° 0′ 15″ N. After this we had to cut our way with axes through a country which, although not impassable to horses, presented great difficulties in the accomplishment of a road. We worked till 6 P.M., when we camped, having found water but no grass for the horses. Made three miles.

September 19th.—Breakfast early; started at 7 A.M.; the chopping and climbing very severe; day cloudy, could not take the latitude which from our course was to the northward of last night's camp. We continued alternately chopping through 20 or 30 yards, then jumping and driving up the horses, but before we arrived to where there was grass the Indian's horse failed and could proceed no farther; but soon after this we came to a small swamp, where by great exertion we brought and left him. In the afternoon one of the mares rolled down a precipice, pack and all; we climbed down and carried up her

load, and by taking a circuitous route brought her up again. Here the Indian declared he could not stand the work longer; took off his coat and shirt (payment made in advance for the trip), threw them back to me and departed. We allowed the horses to feed for a short time, then descended a deep ravine, where we found no grass for the horses. Here we camped having made four miles.

September 20th.—We breakfasted before sunrise, commenced to chop through the fallen timber, which was terrible; we had to ascend a mountain about 1,200 feet high, which was both steep, rocky, and densely piled with fallen timber; we reached the summit a little after five; came down an easy descent and along a valley, and camped about 8 P.M. Made five miles, finding both grass and water. Here our Indian returned to us; I received him kindly, restored his property, and he continued faithful to me throughout.

September 21st.—Rained hard all night. The horses suffered so much from want of food that I determined to remain there a day to recruit them. Lat. 49° 3′ 10″ N.

September 22nd.—Our labours not so severe; the mountains not so steep, and the fallen timber not so heavy as heretofore. Passed the horses over one very bad place, across a face of rock. This place at first appeared impassable for horses, but by availing ourselves of the slate shingle, which we levelled with our hands, building it up in some parts and rolling it over the precipice in others, we made a causeway and passed triumphantly. Camped on a little tributary to the Columbia, called Sheep River. Made seven miles.

September 23rd.—We had some difficulty in crossing Sheep River, after which very heavy timber to cut through. Found grass at noon. Camped; made one mile, but proceeded to chop for to-morrow's journey. Lat. 49° 2′ 44″ N.

September 24th.—Crossed the second fork of Sheep River; ascended about 1,100 feet of mountain, very grassy in many places; rode along the crest of the hill in a north-westerly direction, afterwards in a westerly. Made nine miles, and camped at half-past four p.m. Here there was grass but no water. Lat. 49° 5′ 19″ N.

September 25th.—A good deal of chopping and climbing in the latter part of the day, but evidently the worst of the journey was then over. Made about nine miles.

September 26th.—Started very early. It had rained all night; made more than three miles before breakfast. Our course continued to wind through a valley considerably to the north of west, and then to ascend a grassy hill to the height of about 900 feet. Proceeding along the crest of this hill for several miles, we at length came in sight of a lake called by the Indians Lake Nichelaam, to which they repair to fish late in the autumn from the south, and to which an Indian trail forks off from the Colvile road. My companions were greatly rejoiced to find themselves once more within a mile or two of a known piece of country. My two mares here broke down for want of food, want of water, and the constant jumping over the fallen timber. One of them from the first start was not previously in sufficiently good condition for the trip, the other, unfortunately, owing to the constant jumping, slung her foal; we were obliged to abandon them. We had now but Pichena's two horses remaining, and we endeavoured to descend the mountain to the lake that evening. Not being able to accomplish this, we were obliged to camp in the cliffs without water, and consequently without anything to eat; having nothing but flour we could not cook it. Made 11 miles.

September 27th.—Since yesterday at 4 P.M. our course has been S.W., reached the southern extremity of the lake at half-past 8 A.M. Could not obtain the latitude at noon. It rained hard last night, snow fell in the mountains. This lake (Nichelaam) is about 7 or 8 miles long, and from 2 to 3¼ wide, surrounded by mountains rising above its surface from 700 to 1,100 feet in height. After breakfast, struck on an Indian trail, leading south, which we rightly guessed would take us out on the road to Colvile, distant about 50 miles. I determined to go to Colvile, obtain more horses, and return again to the lake, from thence to renew my exploration to the westward, we camped at the Colvile Road, which follows the Ne-hoi-al-pit-kwu or Colvile River. About 8 miles S.E. from the lake where we found good grass we encamped, cleared up at night, took observation lat. 48° 57′ 58″ N., therefore southern extremity of lake is somewhat about 4 or 5 miles north of the line.

September 28th.—Started early, camped not far from Colvile.

September 29th.—Crossed the Columbia River, reached Colvile at 8 A.M.

On the 5th October I again started from Colvile for Lake Nichelaam, accompanied by two half-breeds and an Indian.

* * *

October 7th.—Reached the southern portion of Lake Nichelaam, where I had left off on September 27th ultimo. Took observation for latitude 49° 4′ 30″ N.

October 8th.—Started on foot to ascend the hills, on the hills on the west of the lake, carrying a couple of days provisions with us, and sending the horses round by the road to meet us, a little on the west side of north fork of the river.

My reasons in sending the horses round, were not because I deemed the section of country with which I was engaged impracticable for horses, but the fallen timber was very dense, and required more time to chop it through than I at that time thought I could spare. We had a great deal of scrambling through this timber, and passed along a valley in direction W.N.W., and 4 P.M. reached a height of land commanding a fine view of prairie country, affording a choice for continuing a road in several directions. We commenced our descent to the S.W., came out on the Ne-hoi-al-pit-kwu, a little below the N. fork at 9 A.M. The horses arrived with my sextant at 11 A.M., and at noon I determined the lat. 49° 2′ 20″ N.

October 11th.—Started early, pursuing our western course again along the Ne-hoi-al-pit-kwu, and shortly caught sight of a soldier in American uniform in pursuit of some wild ducks on the river; he informed me that the surveying party were camped a little further to S.W. Following his directions, I soon came in sight of their observatory, and rode into their camp. I was most hospitably received, pressed to remain and pass the day with them, an invitation which I gladly availed myself of.

I was greatly pleased with the instrument with which they carried on their observations for latitude. I am not aware that the instrument is known or used in England. It is an American invention called the zenith telescope, used in observing pairs of stars (one north the other south of the zenith) of nearly the same declination. A far greater number of results can be obtained in a given period than by means of the transit instrument, which I believe (but I speak under correction) is the instrument generally used in our service.

I understand there are three parties on the American Boundary Survey, each party is supplied with an observer, computer, and topographer. The party I had the pleasure of visiting were civilians, and Mr. Harris, the gentleman in charge, was an able and experienced man. The following day Mr. Campbell, the Chief Commissioner, accompanied by his Secretary, Mr. Warren, with Lieutenant Parke of the United States, Topographical Engineers, and Mr. Gibbs arrived in Mr. Harris's camp. I returned with them by the Colvile road to the fort, and enjoyed their frank hospitality and most agreeable society. I could not learn much respecting Colonel Hawkins, except that he had started for England on a question concerning the Island of San Juan. The party of our engineers under his command have had a great many difficulties to contend with.

Having now terminated my account of the explorations effected by myself from the Columbia river westward to where the 49th parallel intersects the Cascade Range road, I beg leave to submit the report of my Secretary, Mr. Sullivan's explorations from the same starting point on the Columbia River to the point where we returned to recross the Rocky Mountains in September 1858.

Fort Colvile, October 1859.

SIR,

YOUR instructions of 8th September, 1859, directing me to start from Fort Shepherd, and explore the region of country to the northward of the 49th parallel of north latitude, and to the eastward of the fort, have been carried out, and I am rejoiced to say, with a result far more satisfactory than at first sight I was led to anticipate.

I beg to submit for your information, the following detailed account of my branch expedition, also a sketch map, showing the route we pursued.

On September 11, I started from Fort Colvile, lat. 48° 37′ 46″ north, and arrived at Fort Shepherd on the evening of the 13th. At this place I engaged three Sanihk Indians, and despatched two more of the same tribe in search of the only Indian who was said to know the country that I was about to explore. Previous to starting also, I obtained observations for latitude, and found the fort to be three quarters of a mile to the north of the frontier line; consequently the point at which the Pendoreilles joins the Columbia River, is in British territory. Having crossed the Columbia on the 15th, we then proceeded up the valley of the Pendoreilles for twelve miles, and encamped to await the arrival of our Indian guide. An observation at this place gave latitude 49° 0′ 36″ north. Six miles still further up the valley, and we struck the mouth of Salmon River, a small tributary of the Pendoreilles. Up to this point the whole of the river valley is in British dominion, but beyond, the Pendoreilles is in American soil.

The gold mines on this river are at present confined to this small portion of the valley, and the miners are engaged in mining the flats and bars of the river only; they realize from 15 to 20 shillings per day with the rocker, and from 35 to 40 shillings with sluices.

They are prevented from reaping rich harvests owing to the quantity of water in the stream, as well as the absence of capital for the purposes of ditching and carrying water to advantageous places in the neighbouring mountains.

Every prospect is in favour of the country being auriferous; the gold becomes coarser the further the miners advance into the bed of the stream, and the adjacent mountains possess every indication of containing gold.

Speculating companies, such as those that obtained large dividends from working the mountains of California, have not as yet commenced operations in the mountains of this part of the country, but from all accounts they would be amply repaid, were they to turn their attention to the mines on the Pendoreilles river.

From the isolation of the mines, provisions and every other necessary bring enormously high prices, and the consequence is, that the miners here, who are not in possession of more extensive means for mining than by the common rocker and sluice, find great difficulty in doing more than just to provide for the passing day.

The gold found in this part of the country is, to use a miner's expression, "lighter" than Californian gold, that is, a much larger bulk of Pendoreille gold is requisite to weigh an ounce than that of California. Indeed, I have heard that Californian gold is one-eighth heavier.

The bed rock on the Pendoreilles, as well as that on the Columbia, between Colvile and Fort Shepherd, is a blue slate with a large admixture of quartz veins. The immediately overlying rock is a very hard grey granite. In many places, mica is in great abundance, and up the Salmon River especially, mica is largely distributed.

On our arrival at this river, I "prospected" myself in the stream and washed out 2½*d.* in one pan of dirt, and 2*d.* in another. One of my Indians, more fortunate than I, picked up in the crevice of the rock, a piece of gold which valued 15*s.* 6*d.*

Here our party experienced great difficulty in pushing through the masses of fallen timber, and dense undergrowth, which latter was so tightly interlaced as almost to defy the power of the axe altogether. My Indians were in favour of returning to the fort, I told them that it was my determination to advance, and at once packed the horses with all the articles that were not absolutely necessary for the journey, including about half the provisions with which we had left Fort Colvile, and sent them back to Fort Shepherd under the charge of a half-breed, who was mining at the mouth of the Salmon River. Then, dividing the remainder of our provisions and baggage into as many parcels as there were people in the party, I told the Indians that both Mr. Margary and I, intended to carry the same weight as they, so that the sooner we started the sooner the journey would be done.

Mr. Margary, the gentleman belonging to the Hudson Bay Company's service, whom Mr. Blenkinsop had desired should accompany me, was of great assistance on this as well as on many subsequent occasions; he explained to the Indians my determination, and took to his pack as cheerfully as he would have done to a more pleasant occupation.

It was with reluctance at very best, that the Indians followed our examples; at length, all our loads strapped, we forced our way through the woods, and enjoyed a good supper and a most comfortable night's rest at the forks of Salmon river.

It would be needless to journal the account of each day's march here, and it will suffice to inform you, that in five days from this point, by following the more easterly branch of the Salmon River we had attained the summit of the dividing ridge between the Columbia and the Kootanie, or Flat Bow River, at an elevation of 1500 feet above Fort Shepherd. An observation for latitude here, assured us that we were still in British territory, it being 49° 5′ 24″ north, and judging from our course, I consider, that we did not dip to the south of the 49th parallel throughout the whole of the distance from Fort Shepherd to the height of land.

The ascent to reach this highest point of the dividing ridge is very gentle, and there is not the slightest obstacle to prevent the accomplishment of an excellent road. The descent, on the contrary, to the stream which is tributary to the Kootanie or Flat Bow River, is rather abrupt, but fortunately it is only for about 300 feet, when the river valley is reached.

At the height of land I was in hopes that we had struck an Indian trail, when suddenly our guide informed me that we had been travelling for the last half-hour, not upon an Indian, but a carriboeuf road, and that now we were forced to leave it. Carriboeufs frequent this part of the country in large numbers, as the woods are traversed by their beaten paths. They are induced to visit this tract of country in order to feed upon a very large leaf which grows in great abundance on the moist lands high up in the mountains.

From this place a most extensive view of the country was obtained; the rugged mountains to the south-eastward, which border the right bank of the Pendoreilles in the American territory, rising to an elevation of about 2500 feet, and clothed to their summits by dense pine forests, seemed to bid no hopes to strangers passing there; while the gentler undulations from the Columbia valley up to this point, offered no impediments but those resulting from decaying masses of vegetation, the young scrub pines which had risen on their ruins, and the stunted undergrowth; obstacles which disappear entirely before the woodman's axe.

On September 24th, we made a very long and tedious journey in our descent towards the Flat Bow Lake, crossing and re-crossing the stream to avoid fallen timber, and such obstacles as could be avoided at the expence of a little wetting, which, considering the quantity of rain that fell for a few days previous, was productive of little inconvenience. At nightfall of this date, the rain commenced in earnest, we were very comfortable however, having constructed an excellent shelter with the branches of the Cedar, and being provided with as much wood as we were disposed to burn.

On the 26th September we arrived at the Flat Bow Lake, and an observation showed us to be in lat. 49° 13′ 7″ N., or 15 miles to the north of the boundary line. We were all glad to have come to the end of our journey, (as far as walking was concerned,) for we were all more or less fatigued, and needed mocassins.

I should remark here, that that piece of country extending from the summit of the dividing ridge to the shores of the Flat Bow Lake, presents much greater difficulties than the slope towards the west; but at the same time I consider that with a sufficient number of men for the purpose of clearing, and the time necessary for such an undertaking, I might have succeeded in making a very practicable trail for my horses. The greatest obstacles throughout the road from Ft. Shepherd, eastward to the Flat

Bow Lake, is fallen timber; and great advantages for a road exist, *since the traverse of this piece of country was effected, by the valleys of two rivers, the whole of the way.*

The land to the southward of the Flat Bow Lake is flat and swampy, and preserves this character to the distance of 25 miles to the south-eastward of its southern extremity, where a range of mountains extend along the course of the Kootanie River, and prevents its continuation. The river itself has no current in this part of its course, and on either bank there are numerous sloughs and swamps teeming with wild ducks, geese, and other aquatic birds, that make these marshy lands a special rendezvous in the fall of the year, when they desert the less genial climate of the north.

From these swamps also, the Kootanie Indians obtain the klu-quis or thick reed, which is the only article that serves them in the construction of their lodges, and the klusquis is an article of barter with them to other tribes whose lands do not produce this necessary.

As soon as we arrived at the lake we were met by the Kootanies, and treated very hospitably. They inquired as to the object of our visit, and furnished me with a large amount of information relative to the country to the eastward.

By referring to the sketch map accompanying my letter, you will observe that I have laid down a road as "Kootanie Trail to the Columbia Lakes (abandoned)." This road has been for many years out of use, it is altogether in British territory, but according to the accounts of the Indians, two very precipitous mountains have to be crossed before arriving at the origin of the Columbia river. I expressed a desire to travel this road, and was assured that at present it is entirely impracticable for horses. The Kootanie chief said, "if you take all the young men of my tribe and furnish them with axes, they will "cut through but a very small piece in a day, your camp fire of one night will be in sight of your "camp fire the night following: the fallen timber is too bad, the trail that once was clear is now "blocked up by reason of the fires."

The next road laid down, and which I have called "Mr. Sullivan's Trail," is the one which the Indians described as very practicable, and which, for many reasons, was the one adopted.

I made a few presents to the chiefs and principal men, and obtained from them the loan of four horses, and the services of two young men as guides. Our Sanihk Indians we left at the Flat Bow Lake, and supplied them with ammunition with which to support themselves during our absence. Our provisions were very small, consisting of 30lbs. of flour, (all my meat had been consumed,) 15lbs. of which I turned over to the two Kootanies, and retained 15lbs. for Mr. Margary and myself.

At noon of September 30th, we left Flat Bow Lake, and keeping a south-easterly course for a few miles, crossed the Kootanie River in lat. 49° 3′ 6″ N. by observation, and encamped here for a whole day, having lost one of the horses.

Pursuing our south-easternly course for about nine miles, we struck the road laid down in the sketch map as "Mr. Sullivan's trail," and after making an ascent of 500 feet, we descended and encamped at nightfall in a small prairie affording excellent water and grass for our horses.

The following morning our horses had strayed backwards on the track towards the Kootanie camp. we were accordingly delayed from starting till 2 p.m. The day was cloudy, so that I was prevented from obtaining the latitude, but from my dead reckoning I consider that our encampment was about one or two miles to the north of the 49th parallel.

By reference again to the sketch map, you will observe that there is a tract of country indicated by "Practicable Trail." I wish to remark that this trail is not really in existence, but from the nature of the country I am inclined to believe that a road may be made in that direction with no degree of trouble, and which would have the material advantage of throwing the whole road altogether into British dominion, as well as the secondary advantage of escaping the ascent of 500 feet alluded to above. Indeed, the mountains here may be penetrated in many directions; they do not assume impracticable shapes, the highest does not exceed 2000 feet, many do not attain the altitude deserving the appellation mountain, and their gently sloping sides with wide valleys between, seem to offer facilities for roads in many ways.

On the evening of the 4th of October, we struck a tributary to the Kootanie River, going off to the south, and proceeding a little distance up the stream, we encamped on a fine prairie close to its right bank.

October 5th we were off before sunrise, and followed up the stream through a most beautiful valley, offering no obstacles whatever to our progress, water and fine grass everywhere, and we passed the best camping places that I have seen to the west of the Rocky Mountains. The Kootanie Indians resort to this part in search of beaver and carribœufs, and from the indications at their old camps, a large party of them had preceded us by about four or five days. An observation for latitude showed us that we were keeping to the north of the frontier line, being lat. 49° 6′ 48″ N.

October 6th we reached the highest point since leaving the Flat Bow Lake. At noon an observation for latitude was 49° 15′ 14″ N., and at our night camp of this date we were at least 10 miles still further to the northward, for we made a very long journey from our dinner camp. Here we had arrived at the most easternly of the two small lakes from which the tributary stream issues to join the Kootanie or Flat Bow River. I estimate the elevation to be 3300 feet above Fort Shepherd.

Our Kootanie guides now gave us the welcome intelligence that we were only one day's journey from the crossing place on the Kootanie River, where the Indians traverse the stream on their road to trade at the small Kootanie post situated near the western base of the Rocky Mountains, and at the distance of five miles to the south of the 49th parallel. I ascended a mountain and saw the heights which border the right bank of the Kootanie River, and I estimated the distance at 12 miles, to which point a broad open valley extends without any obstruction.

Up to this point, since leaving the Flat Bow Lake, we had travelled a most practicable piece of country; a good horse trail exists, and with the greatest ease a waggon road may be accomplished. Indeed, in the event of the requirements of commerce, as far as my experience of the mountains is concerned, I could not point out so extensive tract of country where a railway may be brought with comparatively so small expense. There is no one place on the whole of the trail between the Flat Bow Lake and the borders of the Kootanie or Flat Bow River, where a sudden ascent of 150 feet is requisite.

The whole ascent to the two lakes is small and very gradual, and the valley of the tributary river is wide open and flat.

Our provisions were entirely exhausted on our arrival at these two lakes, and the Indians told us that for the next day's journey on to the Kootanie River, a large quantity of burnt timber was lying across the road, and there was a possibility on this account that we should require two days to cut our way through, but they assured me at the same time that it was only timber that would be troublesome to us, nothing beside lay in our way.

Great dependence, as you are aware, can be placed on the word of an Indian of this tribe: the Kootanies never steal, rarely lie, and are decidedly the best converts to Christianity of all the Indian tribes among whom our travels have led us.

I was very reluctant to abandon this 12 miles of country, but under the circumstances there remained but one alternative, viz., to retrace our steps.

We had been living on two meals a day on the upward journey, and as our Indians were certainly gifted with most extraordinary appetites, their small supply of flour was soon consumed, and they made demands on our own little store, which we could have easily managed without their assistance. So now we were entirely dependent on the few small pine pheasants which chance might throw in our way.

I should certainly not have returned were it not that I was thoroughly convinced of the entire practicability of a road from that point on the Kootanie River, where the expedition penetrated in September 1858, right up to Fort Shepherd in the valley of the Columbia, more than three-fourths of which might be rendered available for a railway, and considering the stupendous triumphs of engineering art in modern times, I should be sorry to add that the remaining fourth is beyond the bounds of practicability.

We returned to the Flat Bow Lake on the 10th of October very hungry, having fasted two days, and found our Saniik Indians anxiously awaiting us. The following day I hired two bark canoes, crossed the Flat Bow Lake, descended the Kootanie River, from thence into the Columbia, and arrived at Fort Colvile on 15th October.

In conclusion, I beg to express my sincere thanks to Mr. Margary for his most friendly society and cheerful assistance throughout a trip which I shall ever remember with unspeakable pleasure, and I trust that hereafter I may hear of him occupying a high position in the service of the Hudson Bay Company, for which both by his intelligence, energy, and management of Indians, he is eminently fitted.

I have, &c.
(Signed) JOHN W. SULLIVAN,
Secretary.

Capt. J. Palliser,
Commanding Expl. Exp.,
&c. &c. &c.

The whole of the country which I have travelled from the Columbia to the westward is auriferous; there was hardly a creek of any importance in which more or less gold cannot be washed. This has rendered the prices for all articles of clothing, food, &c: enormous, as you will see by glancing over the accounts for the articles furnished to the expedition on this side of the mountains. Flour is now 2*l.* 17*s.* a bag of 100 lbs. and Pork 2*s.* 11*d.* per lb. Articles of clothing and food are the only pay with which you can engage Indians for a journey. Money cannot circulate in the country owing in a great measure to the absence of coin.

Horses which I had been led to suppose would have fetched a high price in this part of the country, change hands at exactly one third of their value east of the mountain. The American soldiers brought up a large number here (having been especially allowed to do so); after their arrival, being compelled to sell, horse, saddle, and bridle went together for 5*l.*, the price of a new Spanish saddle!

Under such circumstances, it was utterly impossible to form even an approximate estimate of the expenses that I have since been obliged to incur. But I can only say, that I have always endeavoured and will always continue to confine the expenditure of public money within the smallest limits.

Gold commences to be found abundantly on the Similkameen; all those that come from thence seem impressed with the idea that it exists in great abundance somewhere in the mountains surrounding its source. A man who arrived here only yesterday informed me that he had washed out 2 ounces of gold dust in one forenoon. I regret that I have neither time nor funds to make a tour through the valley of the Similkameen. I am credibly informed that it abounds in fine timber, and a most fertile soil, and is a far more eligible place for settlers than the valley of the Columbia.

If I may venture an opinion concerning a piece of country, over which I have not myself travelled, also concerning which I can only speak from collected information, I would suggest that the easiest way to open a road in the west of this country from the sea would be from Fort Hope to follow up the valley of the Fraser River, thence a little south of Shooshewap Lake to the Great Okanagan, passing on either side of that lake, and thence to the western shore of the more northern of the Columbia lakes, probably in latitude 50° 20′ N. about. A steamer down the Columbia lakes would connect this road with the south extremity of the lakes, only a very short distance, say 15 miles, from the line of country already explored and described in Mr. Sullivan's report.

One objection to this line of route would be that it would not afford as many advantages to agricultural settlers as one passing the Cascade Range over or near Mansen's mountain down into the Similkameen valley.

Should such a very arduous undertaking be attempted, the best course from Fort Hope would be to ascend the valley of the Kleh-Kwunnum till you fall on the Whatcomb Trail, which you follow up for a short distance, leaving this to pursue the valley of the Skagit River, cross the mountains there to the head waters of the Similkameen, and down the valley along the Hudson's Bay Company Trail to the western extremity of our explorations.

I hope, however, to obtain additional information from Doctor Hector, whom I expect by this time to have arrived at Vancouver, after having traversed the country in question.

Snow has commenced to fall, the season of 1859 is terminated, and in conformity with the directions of Her Majesty's Government, I am drawing the affairs of the expedition to a close. I shall start, accompanied by Mr. Sullivan, next week for the Dalles; we travel on horseback a journey of about 16 days, thence we shall take the steamer for Vancouver, where I hope to meet Dr. Hector. I shall then have the honour of again communicating with Her Majesty's Government, and shall draw on the Paymaster General for balance of salaries, homeward expenses, &c.

I have, &c.

Her Majesty's Secretary of State for the Colonies.

(Signed) JOHN PALLISER,
Commanding Exploring Expedition.

No. 4.

No. 4.

COPY of a LETTER from Captain PALLISER to Her Majesty's PRINCIPAL SECRETARY OF STATE FOR THE COLONIES.

London, July 8, 1860.
(Received July 10, 1860.)

MY LORD DUKE,

IN reference to my letter of 22d October 1859, I beg leave to draw your Grace's attention to this fact, as one of the results of the expedition under my command, viz., that we have succeeded in finding a way from Red River Settlement across the Rocky Mountains to the mouth of Fraser River, entirely within British territory.

I did not deem it necessary to prosecute the exploration further than 119° of west longitude, because in that neighbourhood I fell upon the Hudson's Bay Company's track, bearing away over Mansen's Mount, altogether north of the boundary line; in other words, Mr. Sullivan and I explored and discovered a route connecting the Kananaskis's Pass of the Rocky Mountains with that point on the Hudson's Bay Company's trail over the cascade range, from which that trail passes, altogether through British territory.

This Hudson Bay trail, which is used for bringing in supplies from Fort Langley (on the west coast) to Colvile, crosses the boundary line for the first time in the neighbourhood of the Lesser Okanagan Lakes, in long. 119° 10′ W. Being already aware of this fact, and being subsequently confirmed in this opinion by Lieutenant Palmer, R.E., who made a reconnaissance of the Hudson's Bay Company's trail all the way from Fraser River to Fort Colvile, I did not think it necessary or justifiable to cross the Cascade Range so late in the season; such a course would have been attended most probably with the loss of all the horses, and no further increase of knowledge, with regard to this old established trail, than that already known to the Hudson's Bay Company, and already supplied to Her Majesty's Government by Lieutenant Palmer.

Although I consider this fact established, viz., that a line for a route has been discovered from Red River Settlement to the west coast of the continent, and that line moreover entirely within British territory, yet I wish distinctly to be understood that I think it far from being the best that could be discovered. Time did not admit of a series of attempts in a more northernly direction.

Dr. Hector's explorations, when within 60 miles of his exit on Thompson's River, was prematurely closed by the advance of winter and the absence of provisions, while forcing his way through timber so thick that he could not penetrate faster than from three to four miles a day, and for a more detailed account of which I refer you to his report accompanying this letter.

The quantity of territory east of the Rocky Mountains explored by the expedition in the season of 1859 was so large that very little time remained for the further prosecution of our searches to the westward of the Columbia River, in a country where winter advances very rapidly.

I very much regretted that time did not enable me to recommence at the forks of the Columbia and McGillivray's River, and in a canoe to ascend the Columbia, *said* to be navigable for steamers all the way up to the great Columbia Lakes, to a large table land, along which it is *said* that horses may travel, passing either north or south of the Great Okanagan Lake to the forks of the Fraser and Thompson's Rivers. I only speak of the natural advantages of this line of route from hearsay, but my informants were an intelligent officer of the Hudson's Bay Company, Mr. McDonnell, who was for many years in that country, also several half-breeds who have travelled there with horses and mules. I have already alluded to this proposed route at the termination of my letter dated 22d October 1859.

The connexion of the Saskatchewan Plains east of the Rocky Mountains with a known route to British Columbia may be considered as the last of the results of the expedition.

I shall now give but a slight sketch of our journey to Vancouver's Island, as it was through American territory. We started from Fort Colvile on 2d November 1859 with horses. Although the road is quite as good and better than many in civilized countries, yet the country beyond the immediate valley of the Columbia at Fort Colvile is quite unsettled, and we had to carry our provisions along with us, and continued, as we had hitherto done, to camp out at night.

We assembled at Colvile (after the termination of our several branch expeditions), in lat. 48° 37′ N., long. 118° W. Fort Colvile is situated on, perhaps, the only spot favourable to agriculture for many miles of country through which that river flows, being an alluvial tongue of land formed by a bend of the river. Many emigrants came over some years ago from Red River under the erroneous impression that there was much land in that country available for the purposes of agriculture ; they were, however, disappointed, and wandered in search of land southernly, a few only settling on a tributary of the Columbia, the valley of which affords a narrow strip of arable land for about 30 miles south-east of Colvile. The rest finally settled at Walla Walla on the Wilhamet valley.

The discoveries of gold on the Similkameen has raised the price of provisions very considerably ; and that, with a large camp of American troops, render the supply very inadequate to the large demand upon its produce. Consequently large trains of American waggons ply up and down between the Colvile camp and the nearest points on the Columbia accessible for steamers, which vary according to the state of the water. Since the discovery of gold on the Similkameen, the mines on Clark's Fork, discovered in 1852, have been comparatively deserted; some few miners still remain there, however. The mines on Clark's Fork have this disadvantage, from the steep and rocky nature of the banks it is difficult to gain access to the bed of the river from which the gold is procured. A project therefore has been for some time in contemplation, viz., to cut off all the water from the river, and send it into the Spokan by means of a canal running in a southernly direction to a point on the Spokan, where these two rivers are only 35 miles apart. This is a project on a scale worthy of California, but at present far beyond the means of settlers and miners in the country.

On 2d November we commenced our journey homeward, our party quite assuming the dimensions of a caravan, as we were accompanied by the family of Mr. Blenkinsop, under the charge of his second in command, Mr. Margary. We followed the waggon road, which has been constructed at great expense for the use of the American army. It leaves the Columbia at first following the course of Mill Creek ; the first 60 miles lay through magnificent forest, composed of the "pinus ponderosa," a tree which stands free of underwood, until crossing the Spokan, when we entered the Great Columbian Desert. This district of country, extending for about 160 miles, is composed of tabular flows of basalt, covered with loose sandy soil, supporting a scanty growth of bunch grass. So little feed is there, that in crossing this plain corn is always carried for the use of the animals. Water is only to be found at long intervals, and there is hardly any wood, a want which is severely felt by the traveller, as there is no "bois de vaches" to supply its place.

After crossing Snake River, the southern branch of the Columbia, a swift and magnificent river a half a mile wide, and flowing through a wonderful rent in the basaltic rocks, which form these plains, we arrived at Walla Walla, where there is a large garrison of American troops. Here we were kindly entertained by Capt. Dent, the officer commanding, and the other officers attached to the division. It is necessary to keep this

large corps at Walla Walla, in order to protect the settlers from the incursions of the Indian tribes on the border, who in this part of the country are hostile towards the Americans. Only a few years ago a party of American troops experienced a severe repulse in the neighbourhood of the Spokan River, which, however, was amply avenged during a campaign of the ensuing summer. We had experienced very severe weather in travelling to this place, bitter cold, accompanied with heavy falls of snow; this, together with the want of food, had so reduced our horses, that we were strongly advised not to attempt to proceed any farther with them, as there was much high ground to be crossed, where we might be delayed by deep snow.

We accordingly left them in the hands of an agent for sale, dismissing the only man whom we had brought down from Colvile, and proceeding to old Walla Walla on the Columbia River, distant 30 miles. We had hoped to avail ourselves of the American steamer, which plying between this point and the Des Chutes, but unfortunately on our arrival the agent informed us that she had blown up.

We were now very much perplexed to know how to proceed with all our luggage, books, instruments, &c., down the Columbia; there were no boats, nor any Indians in the neighbourhood. At length some Indians arrived with the intelligence that a schooner was making its way up the river, and the American agent, who had become one of our party, calculated that the schooner would not arrive for some time, owing to the prevalence of a contrary wind and disadvantage of course up stream.

It was now about the middle of November, and I feared being caught in the ice, I determined therefore to purchase two canoes from the Indians, and descend to the Des Chutes.

In order to carry out this plan we were obliged to leave our luggage, such as books, maps, instruments, &c., with the agent, to be forwarded by the schooner whenever she should return. We preferred incurring this delay to running the risk of taking our baggage in the canoes, which on this part of the Columbia are very small and of the most wretched description. The whole of this district is devoid of timber, therefore the Indians depend solely on the logs of drift-wood which float down from the Columbia's upper waters from time to time.

Of these they take the best suited for the purpose, burning and hollowing them out, and at best they are always small, misshapen, rotten, and dangerous. We ran down to the Des Chutes, 140 miles, in 2½ days, arriving there at 10 o'clock at night on the third day, after running the rapids by moonlight. We had engaged one Indian who knew the river to steer the foremost canoe. On this our last day in the canoes we found no timber on the banks of the river to light a fire and camp, consequently were obliged to push on far into the night. The ice actually formed around us we arrived.

At the Des Chutes the Columbia falls in a succession of rapids as far as the Dalles, and the communication is open between those places by an excellent waggon road. The distance between the Des Chutes and the Dalles is about 12 miles. At the Dalles is an American steamer, plying between that place and the Cascades, where the Columbia falls into rapids for only a very short distance, not exceeding two miles. On leaving the steamer at the Cascades, the passengers walk along a boarded platform, on which also is constructed a train to convey the luggage to the other steamer in waiting at the lower end of the portage, from which point the navigation is open to the Pacific.

It may not be out of place here to diverge for a little from the account of our homeward journey, and give a description of the capability of the Columbia for steamer navigation, commencing from the mouth at the Pacific Ocean. From Astoria at this river's mouth it is navigable by steamers as far as the Cascades, a distance of 135 miles. Here a boarded portage and tramway not two miles in length enables the traveller to reach a second steamer, which runs up to the Dalles, distant about 48 miles. At this place a steep waggon road, which is kept in good order, takes the traveller to the Des Chutes, a distance of 12 miles, where a third steamer runs up as far as Old Walla Walla, this steamer however, when the occupation of the upper country by troops rendered it worth her while to take freight further up the river than usual, ran up to Priest's Rapids above the mouth of Snake River, and actually ran up Snake River itself, and found it navigable for a considerable way. Again, the Columbia River is said to be navigable from the Priest's Rapids to the mouth of the Okanagan River; and I have heard since my return that a steamer will be placed there by a private American Company. Above the Okanagan is a 10 mile rapid, and above this the river is said to have but one rapid to impede the navigation all the way to Fort Colvile. From the upper part of the Kettle Falls at Colvile there are but two portages interrupting the steam navigation to the mouth of the Pendoreilles River in British territory, and from this point I am credibly informed the

river is available for steam navigation to beyond the upper of the two great lakes of the Columbia to a point where a road might be made across a level plain (as I have mentioned above) either north or south of the Great Okanagan Lakes to the forks of the Fraser and Thompson's River (see above, also letter dated 22d October 1859).

On 30th November we arrived at Vancouver, and were most hospitably received by Mr. Graham, the officer in charge of the Hudson's Bay Company's fort there. Vancouver is the head-quarters of the American troops stationed in Oregon, under the command of General Harney, whom we found shortly after his return from San Juan, and who received us most hospitably.

The Hudson's Bay Company's establishment at Vancouver is considerably reduced at present, and their American neighbours offer them great annoyances, even so far as seizing their landed property, by a process termed in American parlance, "jumping their claims." A good deal of correspondence was being carried on while I was there upon the subject.

The Wilhamet River flows into the Columbia at a short distance below Vancouver; on it is situated Portland, one of the most flourishing towns in Oregon. From this town there is regular steam communication twice a month to San Francisco. These ocean steamers also call at Victoria, taking passengers, and delivering British letters for Vancouver's Island.

The American steamers start from San Francisco, pass down the straits of Juan de Fuca, carrying the letters past Victoria, up Admiralty Inlet and Puget Sound, to Olympia, then on their return call at Victoria, Vancouver's Island, deliver the mail and land the passengers.

Embarking on board one of these steamers, Mr. Sullivan and I started for Vancouver's Island, leaving Dr. Hector at Fort Vancouver, with directions to wait one fortnight for the luggage, &c., and then to join us at Victoria.

At Victoria we found great commercial industry, and much promise of progress. The inhabitants are English, Scotch, Americans, Chinese, and Indians, who rove about the streets, the former seeking and commencing to find employment, the latter begging, drinking, and not likely ever to become useful to the community. A handsome serviceable wooden bridge, James's Bay, connects the Government buildings with the town. The Hudson's Bay Company have one of their forts or picketed enclosures in the centre of the town, splendidly supplied with almost every kind of merchandise. Besides this, warehouses, stores, and shops carry on a good business; money is worth about 2½ per per cent. a month, on good security; good tradesmen can find abundance of employment. As there is a great scarcity of women on the island, female servants are in universal demand, and obtain very high wages from 30 dollars to 50 dollars a month.

The markets are abundantly supplied with the best beef, mutton, fish, poultry, eggs, and vegetables.

The town when I left is not yet lighted by gas, but I have no doubt that will shortly be accomplished.

Esquimault Harbour is about three miles from Victoria, where the "Ganges" (Admiral Baynes) and several other steamers are lying. Esquimault is also the head-quarters of the Boundary Commission, under Col. Hawkins, and then under Capt. Haig.

We were most kindly and hospitably entertained by Governor Douglas, Admiral Baynes, and all the officers of the fleet; also by Captain Haig and his brother officers.

On the 5th January I despatched Mr. Sullivan to England, with directions to join me again as soon as I arrived in London; and waited myself for Dr. Hector's arrival in Victoria from the Columbia River.

Dr. Hector joined me at Victoria on the 16th January 1860, with news of the luggage being as yet safe, but frozen in on the Columbia, about 30 miles below old Walla Walla. I then despatched Dr. Hector at his own request, and in conformity with the wishes of Sir R. I. Murchison, to examine the coal structures at Nanaimo, and make a short tour in the vicinity of that portion of the island. He accordingly started with my servant, James Beads, in a canoe, with bedding and provisions for a week's trip. Although the time which I allowed Dr. Hector was but short, nevertheless he acquired much valuable information, and received every assistance from Mr. Nicol, the Hudson's Bay Company's officer in charge of the coal mines, in effecting his object.

Shortly after this I went myself to visit a part of British Columbia, and was most kindly and hospitably entertained by Capt. Parsons, Col. Moody, and the officers of the Royal Engineers quartered at New Westminster. This place is situated on the right bank of Fraser's River, about 12 miles above its bar. The bank chosen for the site of the town is very disadvantageous; first, on account of its steepness, and again by the

size and density of the timber, causing the clearance of it to become a matter of such an enormous expense as far to exceed the fee simple value of any land in a still unoccupied country. This advantage would be possessed, however, by New Westminster, should it ever become a British town, that Burrard's Inlet, which is a most excellent harbour, would be easily accessible from the town, seven miles over land. The site, distant on the river about 1½ miles above the town, chosen by Col. Moody and the engineers as the site for the barracks and officers' houses, is preferable to that chosen for the site of the town. But it is worth serious consideration, whether it would not be more advisable to proceed about 18 miles up the river and choose the site where Fort Langley now stands, where there is a good deal of naturally cleared land, and the timber not formidable. The site of Fort Langley for a British town would have this disadvantage, it is on the same side of the river as the American boundary line.

On 14th March our baggage arrived in Victoria, and almost at the same time with the American steamer for San Francisco. By some exertion we managed to get our baggage and ourselves on board in time, and started from Esquimault for San Francisco. Dr. Hector and I arrived at the latter place on 20th March 1860, and found it impossible to get room on board the steamer about to start for Panama and Aspinwall, being obliged therefore to wait for a fortnight, we employed our time in the interior of California visiting the gold mines of Grass Valley and Nevada, and also the giant trees in the Sierra Nevada range. Returning for the steamer on the 5th of April, we travelled together as far as Panama, when I proceeded, viâ the Havannah, New York, and Montreal, to England, leaving Dr. Hector to await for the British steamer viâ Southampton, and by which he anticipated my arrival in England.

The territory which has now been examined and mapped by this expedition ranges from Lake Superior to the eastern shore of the lesser Okanagan Lake, and from the boundary line to the watershed of the Arctic Ocean. This large belt of the continent was explored in three seasons.

The first season was devoted to the examination of its south-eastern portion from Lake Superior to the elbow of the south branch of the Saskatchewan, and from the British boundary line or 49th parallel to Fort Carlton, in lat. 52° 52′ N., long. 106° 18′ W.

The second season was devoted to the examination of the territory between the two Saskatchewans, to the exploration of the Rocky Mountains, and to the discovery of the passes available for horses in the British territory.

The third season commenced with a long journey from our winter quarters at Edmonton in lat. 53° 34′ N., long. 113° 20′ W., through the Blackfoot country to the most western point in the neighbourhood of the boundary line, previously reached by the expedition from the eastward in 1857. A westward course was then resumed along the country between the South Saskatchewan and the British boundary line, thence once more across the Rocky Mountains. Finally, the connexion of a route practicable for horses was effected the whole way from Red River Settlement across the continent to the Gulf of Georgia, entirely within British dominions.

This large belt of country embraces districts, some of which are valuable for the purposes of the agriculturist, while others will for ever be comparatively useless.

The extent of surface drained by the Saskatchewan, and other tributaries to Lake Winipeg, which we had an opportunity of examining, amounts in round numbers to 150,000 square miles. This region is bounded to the north by what is known as the "strong woods," or the southern limit of the great circum-arctic zone of forest, which occupies these latitudes in the northern hemisphere. This line, which is indicated in the map, sweeps to the north-west from the shore of Lake Winipeg, and reaches its most northernly limit about 54° 30′ N., and long. 109° W., from where it again passes to south-west, meeting the Rocky Mountains in lat. 51° N., long. 115° W. Between this line of the "strong woods" and the northern limit of the true prairie country there is a belt of land varying in width, which at one period must have been covered by an extension of the northern forests, but which has been gradually cleared by successive fires.

It is now a partially wooded country, abounding in lakes and rich natural pasturage, in some parts rivalling the finest park scenery of our own country. Throughout this region of country the climate seems to preserve the same character, although it passes through very different latitudes, its form being doubtless determined by the curves of the isothermal line. Its superficial extent embraces about 65,000 square miles, of which more than one-third may be considered as at once available for the purposes of the agriculturist. Its elevation increases from 700 to 4,000 feet as we approach the Rocky Mountains, consequently it is not equally adapted throughout to the cultivation of any one

crop, nevertheless at Fort Edmonton, which has an altitude of 3,000 feet, even wheat is sometimes cultivated with success.

The least valuable portion of the prairie country has an extent of about 80,000 square miles, and is that lying along the southern branch of the Saskatchewan, and southward from thence to the boundary line, while its northern limit is known in the Indian languages as "the edge of the woods," the original line of the woods before invaded by fire.

On the western side of the Rocky Mountains, in the country which we examined, there were but few spots at all fitted for the agriculturist, and these form isolated patches in valleys separated by mountain ranges.

As the next result of our explorations, I shall briefly mention the different passes through the Rocky Mountains which we explored, alluding to the chief advantages and disadvantages of each.

The Kananaskis Pass and the British Kootanie Pass were examined by myself. Of these I consider the Kananaskis Pass the preferable one, both on account of its direct course through the mountains and its easier ascent.

The ascent to the height of land from the east is through a wide gently sloping valley, and the immediate watershed is formed by a narrow ridge, which, if pierced by a short tunnel, would reduce the summit level to about 4,600 feet above the sea. The descent to the west, into which Kananaskis Pass opens, is comparatively easy.

The British Kootanie Pass also opens out into the Kootanie River valley, but the altitude here to be overcome is much greater, amounting to 6,000 feet. There are likewise two ridges to be passed, which fact would form a very strong objection to this pass.

The Vermillion Pass, which was traversed by Dr. Hector, presents on a whole the greatest natural facilities for crossing the mountains without the aid of engineering work, as the rise to the height of land is gradual from both sides, a feature which seems to be peculiar to this pass. It would thus be impossible to diminish its summit level (which is less than 5,000 feet), as is proposed in the case of Kananaskis Pass, but on the other hand it would be the most suitable for the construction of an *easy waggon road*.

This, like the other two passes I have mentioned, also strikes the Kootanie River close to its source; but last summer Dr. Hector crossed the mountains by another pass from the head of the north branch of the Saskatchewan, directly to the Columbia River, in the vicinity of the boat encampment.

Leaving this latter pass out of consideration for the present, as all of the others open to the Kootanie River, it becomes necessary to consider the course by which it may be practicable to the coast of the Pacific without crossing to the south or American side of the boundary line. It was with great difficulty for this purpose even a partial examination of the country could be effected, owing to the rugged valleys which intersect it in a direction parallel to the mountains, and which, though not formidable themselves, are covered with such dense forest as to present obstacles to the traveller. Notwithstanding these difficulties, Mr. Sullivan succeeded in making his way on the north side of the boundary line, and at the same time following a system of transverse valleys, which might allow of the construction of a road without much trouble from the mouth of Kananaskis Pass to the Columbia, above Fort Colvile. From this point westward I myself ascertained that it would be possible to reach the valley of the Okanagan, by which I believe the Americans have already commenced to connect the waggon road of the Columbia with the upper country of the Fraser River. While pointing out the circumstances that seem to favour the possibility of carrying a road through British territory, from the Saskatchewan to the Pacific, I wish to refrain from expressing any opinion as to the expediency of undertaking at the present time a work which would involve a vast amount of labour and a corresponding heavy expenditure. For how long a time in the year such a road would remain open, is a question as yet unanswered, and which has a most important bearing on the subject. In addition, the difficulty of direct communication between Canada and the Saskatchewan country, as compared with the comparatively easy route through the United States by St. Paul's, renders it very unlikely that the great work of constructing a road across the continent can be solely the result of British enterprise.

Not the least important results of the expedition are the meteorological observations which have been carefully conducted during the whole period of the explorations, both in the winters and summers, whether we were stationary or travelling. I lay stress upon this fact, as it affords materials for ascertaining the exact nature of the climate and means for a correct comparison between its nature and that of Canada.

The hourly magnetic observations were conducted by Lieutenant Blakiston, R.A., assisted by the other members of the expedition, during the winter of 1857–8. These were not, however, all carried on during the winter 1858–9, owing to the return of Lieutenant Blakiston with the instruments, the magnetic declinations however were attended to.

The astronomical observations and computations were placed in the hands of Mr. Sullivan, and the geographical position of the several salient points of the map are determined principally by his lunars, the rates of chronometers being, of course, too unsteady to be depended on while travelling through so rough a country.

The large botanical collection of our botanist, M. Bourgeau, has already been sent to Kew Gardens, where the specimens have been carefully arranged by himself under the inspection of Dr. Hooker, who highly values them.

Dr. Hector's specimens of fossils, &c. were from time to time transmitted to Sir Roderick Murchison at the Jermyn Street Museum, but from the nature of the subject much time must elapse before his results can be laid before Her Majesty's Government.

In conclusion, I have great pleasure in bearing testimony to the unceasing zeal and energy of my companions, whose valuable assistance has been instrumental in bringing the expedition to so successful a termination.

I have, &c.
(Signed) JOHN PALLISER, Capt.,
Commanding North British American Exploring Expedition.

Her Majesty's Principal Secretary of State.

Enclosure 1 in No. 4. Encl. 1. in No. 4.

RECORD of ASTRONOMICAL OBSERVATIONS during 1859.

Date.	Place.	Obser. Mer. Alt. Cor. for I. E.			Longitude by Account or Observation.		Latitude.		
1859.		°	⊙ ′	″	°	W. ′	°	N. ′	″
March 25 -	α Rocky Mt Ho. - - -	39	13	0	115	4	52	22	6
June 12 -	Hand Hills - - -	61	21	35	111	30	51	33	13
„ 30 -	„ Lake* - - -	61	34	32	111	27	51	21	41
July 7 - -	Prairie near Red Deer River - -	61	6	40	111	12	51	14	19
„ 13 -	Elekesohp Creek - - -	60	42	25	110	58	50	53	7
„ 15 -	Red Deer River - - -	60	23	30	110	36	50	53	52
„ 17 -	Prairie - - - -	60	4	10	110	20	50	53	47
„ 19 -	16 miles to north of Bow River -	59	56	30	109	54	50	40	22
„ 20 -	8 miles to north of Bow River -	59	51	20	-	-	50	34	25
„ 21 -	Crossing Place, Bow River - -	59	46	11	110	28	50	27	42
„ 26 -	α Cypree's Mount, west flank -	59	24	30	110	42	49	47	27
„ 27 -	„ „ - -	59	12	55	110	36	49	45	38
„ -	α „ „ - -	59	0	5	110	35	49	44	38
„ 29 -	n oll, south of Cypree's Mounts -	58	59	22	110	35	49	31	22
„ 30 -	Milk River - - -	59	19	0	111	0	48	58	40
August 1 -	Cypree's Mounts - - -	58	8	10	110	35	49	38	32

* Longitude very accurately determined here by means of a set of lunar distances.

Record of Astronomical Observations during 1859—*continued.*

Date.	Place.	Obser. Mer. Alt. Cor. for I. E. ⊙			Longitude by Account or Observation. W.		Latitude. N.		
		°	′	″	°	′	°	′	″
1859. August 1 -	Cypree's Mounts, west flank, Small stream.	57	24	45	111	0	49	35	21
„ 8 -	Belly River - - - -	56	6	30	112	52	49	47	4
„ 9 -	One mile south-west of tributary to Belly River.	55	52	5	-	-	49	44	35
„ 10 -	Hills near tributary to Belly River -	55	42	30	113	50	49	36	44
„ 18 -	*Kootanie Valley - - -	53	51	10	115	12	49	0	3
„ 22 -	Kootanie River - - -	53	0	17	115	0	48	32	0
„ 24 -	Kootanie River (R. B.) - -	52	27	5	115	10	48	23	51
„ 26 -	„ „ - - -	51	43	0	115	30	48	26	29
„ 27 -	„ „ - - -	51	9	17	115	45	48	38	33
„ 28 -	„ „ (Paddler's Lake) -	50	45	40	116	0	48	41	41
„ 30 -	Kootanie River - - -	49	47	22	-	-	48	57	20
„ 31 -	„ 20 miles from Paddler's Ware.	49	7	32	116	36	49	15	33
September 1 -	Large Lake, north shore, 5 miles east of west extremity.	48	24	57	-	-	49	36	25
„ 2	Portage, west extremity of second lake -	48	9	40	-	-	49	29	50
„ 3 -	Kootanie River - - -	47	58	37	-	-	49	18	48
„ 4 -	Mouth of Pendereille's River - -	47	54	47	118	0	49	0	31
„ 8 -	Fort Colvile - - - -	46	48	2	118	12	48	37	48
„ 17 -	Fort Shepherd - - -	42	58	17	118	0	49	1	7
„ 18 -	Observation Mount - - -	42	35	47	-	-	49	0	15
„ 22 -	West of Fort Shepherd - - -	40	59	43	-	-	49	3	10
„ 23 -	„ „ - - -	40	36	33	-	-	49	2	44
„ 24 -	„ „ - - -	40	10	45	-	-	49	5	19

N.B. ∝ indicates lunar distances observed.

April 23rd, 1859, at 6 h. 20 m. A.M. Mean Time, at Place nearly (Rocky Mount Ho.) in Latitude 52° 22′ 6″ North, the following Mean of Lunar Distances were observed :—

T. Mean Time at Place, 22 d. 18 h. 21 m. 42 s. observed distance ∝ - - 107° 8′ 5″

I. E. + 4 40

Computed longitude - - 115° 10′ 45″ W.

March 29th, 1859, at Rocky Mount Ho. the following variation of Compass was determined :—

26° 30′ E.

Also on the same date - - - - - - - 26° 10′ E.

40′

Variation of compass, Mean - 26° 20′ E.

(Signed) J. W. Sullivan,
Secretary.

* Longitude obtained at this point by a series of lunar distances, the mean of which is here tabulated.

Enclosure 2 in No. 4.

SIR, London, July 8, 1860. Encl. 2 in No. 4.

BEFORE entering on an account of my explorations in the Rocky Mountains last summer, it is necessary that I should briefly notice four different journeys I made while the expedition was in winter quarters at Fort Edmonton, from October 1858 to May 1859. The first was before the setting in of the snow, when I made a trip of ten days along the Saskatchewan to the Snake Portage, for the purpose of ascertaining the nature of the district included by the great bend of this river and north of my track of the previous winter from Fort Pitt to Edmonton.

Again in the following spring circumstances obliged me to travel to Fort Pitt, on the crust snow, in the end of March and to return in April, immediately on the opening of spring, giving me an opportunity of observing this very interesting district at the most unfavourable season, and thus forming a more accurate estimate of its capabilities.

In the months of November and December I examined the country in the neighbourhood of Red Deer River, and along the base of the Rocky Mountains, from thence to the old Bow Fort, thus connecting my work of the preceding winter with that of the main party of the expedition during the intervening summer. The fourth trip I have to notice was in January, February, and a part of March, when, by passing to the north from Edmonton, I struck the Athabasca, the most southernly branch of the Mackenzie River at the site of Fort Assineboine, and following it up, entered the mountains at Jasper's House, as shall be described.

The three first-mentioned trips embrace country of much the same character, partially wooded, but the timber being of the usual inferior quality, common to the whole Saskatchewan. The most valuable feature of this belt of country, which also stretches from Touchwood Hills, Carlton, and Fort Pitt south of Fort Edmonton to the old Bow Fort at the Rocky Mountains, is the immense extent it affords of what I shall term winter pasturage.

This winter pasturage consists of tracts of country partially wooded with poplar and willow clumps and bearing a most luxuriant growth of vetches and nutritious grasses. The clumps of wood afford shelter to animals, while the scrubby brush keeps the snow in such a loose state that they find no difficulty in feeding; the large tracts of swampy country, when frozen, also form admirable feeding grounds; and it is only towards spring, in very severe winters, that cattle and horses cannot be left to feed in well chosen localities throughout this region of country.

The proportion of arable land is also very considerable, and even late in autumn, which is the driest period of the year, and when the Saskatchewan for some weeks is fordable at Edmonton, there seems to be no want of water in the form of small streams and lakes. In spring I find the snow deeper in the neighbourhood of Fort Pitt than at Edmonton.

The winter of 1858–9 had been unusually severe, as far as the quantity of snow is concerned, and yet the average depth of snow, when undisturbed, as in the woods, was only about eight to twelve inches throughout a large district between Battle River and the North Saskatchewan at Edmonton. Towards the mountains, in a south-west direction, the quantity is still less; but during the early part of April, after the snow had nearly disappeared from Edmonton, a series of storms from the north visited the neighbourhood of Fort Pitt, so that in the middle of April there were from three to four feet of snow on the ground.

On the 12th January I started for Jasper House by way of Fort Assineboine and the Athabasca River, travelling of course with dogs. The track to Fort Assineboine passes through very densely timbered country to the north-west. On our second day we crossed a low height of land which separates the valley of the Saskatchewan from the waters which flow into the Arctic Ocean, and on the fourth reached the deserted fort of the Hudson's Bay Company.

The Athabasca is here a larger river than the North Saskatchewan at Edmonton, being about 300 yards, and flowing through a valley 250 feet deep, and from one to two miles wide.

For fourteen days I followed up this river on the ice, the great depth of the snow rendering our progress tedious, until within forty miles of the Rocky Mountains, where we arrived on 31st January.

Along the banks of this river were observed sections of the same coal-bearing strata that are exhibited on the Saskatchewan and the Red Deer River. There does not, however, seem to be the same quantity of coal.

Jasper House is in lat. 53° 12′ N., and stands in a wide valley within the second range of the mountains, which present a magnificent appearance here. The Roche à Miette rises just opposite the fort to about 5,400 feet above the river. Although it was the depth of winter, I was able to ascend to the height of 3,300 feet, or 7,300 feet above the sea, so singular is the climate along the eastern flank of the mountains, as thaws alternate with severe cold, preventing the snow from accumulating to any great depth. The winds are either from the north or the south, following the course of the Athabasca valley, which traverses the mountains in that direction. Although ice forms to a great thickness on the lakes, there are but few places where the river freezes within the mountains, as even a slight rapidity of current serves to free the ice during a partial thaw. The night we reached Jasper House we had to ford a rapid on the Athabasca breast deep, carrying our dog sledges on our shoulders, although the thermometer was 11° below zero. Finding a difficulty in obtaining food for my 3 men and 16 dogs at this little outpost, where their sole trust is on the hunting of the big horn sheep, I despatched them back to Edmonton by the route we came, remaining behind myself to make a further examination of the mountains.

Accompanied by Mr. Mowberly, the gentleman in charge of the place, and a half-breed Iriquois, I followed up the Athabasca for four or five days, taking horses with us as far as the point where the pass branches off to New Caledonia. We turned from where the Athabasca is but a small rivulet, closely hemmed by precipitous mountains. Want of food compelled us to return to Jasper House sooner than I would have wished.

Besides his kindness in accompanying me on this hard trip, I am also indebted to Mr. Mowberly for a valuable meteorological register, kept until the month of April, the observations being made with instruments I left at Jasper House for that purpose.

Having thus travelled in the Rocky Mountains at the most unfavourable period of an unusually severe winter, I am enabled to state, that whatever may be the amount of snow on the heights of land and their western flank, the valleys of the eastern ranges are actually less encumbered by snow than much of the prairie country.

On 19th February I started on my return to Edmonton, keeping a direct course through the woods for that place. I was accompanied by an Iriquois and a young half-breed lad; we carried our blankets and a small quantity of provisions on our backs, trusting to our killing rabbits or other game on the route. In this, however, we were disappointed, and we were forced to make three days' provisions last for 10 days, when the Iriquois killed a moose deer. On 5th March I reached Lake St. Ann's, and was hospitably entertained for a day by the Roman Catholic Missionaries at that place. A single night's run on a well-beaten track brought me to Edmonton, which is 50 miles from the Mission. The country passed over on this route is very irregular and densely wooded. Our course lay for a considerable distance along McLeod's River, a tributary of the Athabasca from the south. At the place where I crossed Pembina River, another tributary of the Athabasca, a bed of coal is exposed on its banks, which is about eight feet thick, and at one point has previously been on fire.

Having now given a brief sketch of the manner in which I employed my time during the winter, I will pass at once to the more especial object of this report, which is to describe the continuation of the exploration of the Rocky Mountains made during the succeeding summer.

After spending the early part of the summer with the main body of the expedition, in examining the country of the South Saskatchewan, as has already been detailed in your letter to Her Majesty's Government, dated September 1859, I left you at the Cypree's Mountains on 3rd of August.

My party consisted of myself, four men, and my Stoney hunter, Nimrod, with 17 horses, eight of which were packed with my supplies, consisting of 240 lbs. of pemmican, 80 lbs. of flour, and 50 lbs. of sugar, along with a good supply of ammunition.

Keeping on the whole nearly to the north-west, and crossing Belly River where it joins the South Saskatchewan, in lat. 49° 47′ N., I reached the mountains at the old Bow Fort in ten days; besides meeting with a large band of Piegan Indians, who alone of all the tribes we have met showed a disposition to be more than importunate, I spent a day in a camp of the mountain Assineboines, at the mouth of the Ispasquehon River. They had been obliged to leave the Thickwoods, owing to the scarcity of game, and were here killing a considerable quantity of elk and grisly bears. They are almost the best disposed Indians we have seen, and have been converted to Christianity through the influence of the Wesleyan missionaries. Some of them cultivate little plots of ground in the neighbourhood of the Wesleyan Missionary Station at Pigeon Lake, and also at the old Bow Fort. Their principal crops are turnips and potatoes, which they grow more as curiosities than practically supplying them with food.

From the site of the Bow Fort I followed up my track of the preceding summer, along the valley of Bow River, until I reached Castle Mount opposite the Vermillion Pass. Instead of crossing the watershed at this place, the hope of procuring game and adding to my stock of provisions, to which up to this time we had avoided having recourse, induced me to get to the N.W. as far as possible, keeping on the eastern slope of the mountains. I accordingly passed from the South to the North Saskatchawan by the Pipe Stone Pass, which is further to the east than the Little Fork Pass, by which I crossed this transverse divide in the preceding summer. This pass follows up a small tributary to Bow River from the north, and after having traversed a height of land at an altitude of about 7,000 feet, descends what I name the Siffleur River to the north branch of the Saskatchewan at the Kootanie ptain. Here I left my Indians, as they had by their hunting added 70 lbs. to my store of pemmican, and they were now likely, from the nature of the country I was about to traverse, to consume more than they would kill.

Altering my course to the S.W., I followed up the Saskatchewan to its source, and searched for a pass to the Columbia, of the existence of which I had been informed by the Indians.

Choosing the middle fork, I found it to rise in three branches, two of which are derived from immense glaciers, while the third is merely a small stream, issuing from a wide valley, the bottom of which is level and heavily wooded, and without any perceptible dividing ridge gives rise also to a branch of the Columbia flowing to the south.

This height of land is at an altitude of about 4,800 feet, and is in lat. 51° 46′ N., long. 117° 30′ W In reaching it the ascent is imperceptible, but the valley of the great fork is closely hemmed by lofty precipices, its whole width of about half a mile being occupied by shingle deposits, showing that during the floods the channel of the river must be of great breadth, and the valley almost impassable.

One of the glaciers in which this river rises is of magnificent dimensions, even exceeding those of the one at the Glacier Lake which was examined the preceding snmmer. It must be at least nine miles long and three wide, and descends from the same "mer de glace" that envelopes the higher portions of the mountains for a considerable way to the north.

On 7th September I commenced the descent to the Columbia by Blaeberry River, a stream which rapidly increases in size, and descends about 2,000 feet through a very contracted valley in its course of about 35 miles. At various points we found traces of an old trail, which had evidently been out of use for many years, so that I have no doubt that this was the pass traversed by Howse in August 1810 as laid down in Mr. Arrowsmith's most recent map. It was at that time used as a portage route from the east to the west side of the mountains, but was abandoned in favour of the more northernly route by the boat encampment.

The difficulties of descending this valley are very great, arising from the density of the forest growth, and the contraction of the valley at various points by rocky barriers. We were occupied nine days in descending a distance of 35 miles to its mouth, which is in lat. 51° 26′ N., long. about 117° 50′ W. Where it enters the valley of the Columbia River, Blaeberry River winds over immense flats of rounded shingle, testifying to the amount of material brought down from the mountains by the spring floods.

The Columbia at the point where we struck it is flowing to N.W. about 210 yards wide, and very sluggish and deep. Its valley is from three to four miles wide, and bounded by mountains, which to its right rise from 3,000 to 4,000 feet above its level, but on the left are about 1,000 feet lower.

A range of low hills occupy the centre of the valley, through which Blaeberry River passes in a deep rocky cañon before joining the main stream. It was now my wish to follow the Columbia River down to its great bend at the boat encampment, and thence following up the valley of Canoe River, endeavour to pass to the head waters of the Thompson's River, and so reach British Columbia. The valley of the river appears to be wide, and the mountains seem so open with rolling outline, that I did not anticipate any great difficulty in following such a course, if it had not been for the density of the forest. I spent some time in searching for any trace of a trail leading in the direction I desired to follow, but failed, as the Shooshewap Indians who inhabit this region of country travel solely by canoes, and keep the very few horses which they possess in the neighbourhood of the Upper Columbia Lakes.

I had only now provisions for 10 or 12 days, and many of my horses were much enfeebled by the long fast they had undergone in descending Blaeberry River, where there is little or nothing for them to eat, and having only one axe, I did not feel myself justified in attempting to follow a course by which, if I failed to penetrate, I should have to retrace my steps, probably with the loss of all my horses. We had also encountered several snow storms, warning us of the coming of winter; accordingly with great reluctance I turned to the south on the 18th of September and commenced following up the Columbia to its source, where I arrived on 3rd October.

This great valley through which the Columbia flows is one of the most singular features observed on the west slope of the Rocky Mountains. It is continued to the south from the Columbia Lakes by the valley through which the Kootanie River flows, and the famous wintering grounds in the Bitter Root Valley, to which the settlers flock from Colvile and other places, is, without doubt, the continuation of the same great natural feature. It is the belief that this valley is continued to the north, following the course of Canoe River, that makes me so sanguine that by this route a passage could be effected into the valleys of either Thompson or Fraser's River. However, we know so little of the head waters of those rivers, that I think it would be premature to offer an opinion on this point.

As far south as lat. 51° N. I found great difficulty in traversing this valley, from the nature of the woods with which it is clothed, consisting of a forest growth of northern character. After passing a bend which occurs in that latitude however, the forest assumes almost suddenly a Californian aspect, free from underwood, and stretches of open prairie clothed with bunch grass, the prevailing tree being the pinus ponderosa; wher cafarther down the Columbia and to the north spruce firs predominate.

The Columbia River continues to be of large size to its source, as from the small inclination of the valley through which it flows, it preserves more the character of a sluggish canal than of a mountain stream. It winds through its valley bounded by a natural level, and including large swampy lakes in its bends.

From about the 51st parallel southward, however, the river becomes hemmed in by high banks, formed of beds of sand and shingle, which fill the valley, forming terraces of different levels, a phenomenon common to all the valleys further to the south which are contiguous to the Rocky Mount axis.

A narrow belt of open timbered land, only slightly elevated above the upper Columbia Lake, separates the source of the Columbia from the Kootanie River, a swift stream of large size flowing to the south. Before reaching this point the Kootanie River breaks through a rocky cañon, as was observed by Captain Palliser in his exploration of the preceding year, and it is at this point that it enters the great longitudinal valley, through which it flows to the south, forming the camping grounds of the Kootanie Indians.

Following down this river, which flows to the E.S.E., I reached the Kootanie Post on 7th October. From this place I followed the Hudson's Bay Company's trail along the Kootanie River, which dips as far south as 48° 25′ N., before it bends again to the north to meet the Columbia. Before reaching the Paddlers' Lake, where we left this river, we were obliged to swim it twice, a very severe trial to the horses so late in the season. From the Kootanie River we crossed to the Kullespelm Lake, and thence followed down Clark's Fork for about 20 miles. Here I happened to meet a Colvile half-breed, who told me that the snow was lying so deep on the Kullespelm mountains that we should find a difficulty in crossing them. Accordingly I travelled to the south until I came to the Spokan River, by following down which I came on the Columbian waggon road, about 80 miles south of Colvile. I arrived at this place on the 26th October, and joined you as you were preparing to start for Vancouver.

You have already informed Her Majesty's Government of my movements from that time until my arrival in Vancouver's Island on January 16th, 1860.

In the end of January I started for Nanaimo, travelling in a canoe with four Indians, and accompanied by Mr. Nind, of the local Colonial Office.

Nanaimo is situated about 70 miles up the coast, north-west of Victoria. It is from this place that the coal is procured which is already rendering Vancouver's Island of considerable mercantile importance in the San Francisco market. I had only a few days to spend in the examination of this very interesting district, but I saw enough to convince me of the value and considerable extent of this

coal deposit. This coal, which, however, is more properly speaking a lignite, is about 10 per cent. less valuable than the true coal of the carboniferous epoch. It is worked at Nanaimo by the Hudson's Bay Company, the miners being principally Staffordshire men, but the under hands chiefly Indians. The coal is worked from two seams, the lowermost of which is six feet thick, while the upper is from 3½ to 4 feet. It is associated with grits and shales, and the whole group is probably of cretaceous age. The fossils which I have collected have not yet arrived in England, but they will be sufficient to determine this point with great exactitude. Mr. Nichol, the gentleman in charge, with the approval of Mr. Dallas, on behalf of the Hudson's Bay Company, afforded me every facility in the examination of the mines and the surrounding country, allowing me to have access to the different maps and documents connected with the mines under his charge. In the course of another trip from Victoria up Fraser's River, I learned some further details concerning this interesting group of coal-bearing strata of the Pacific coast, and which information, together with observations made in California, will be combined in the general report of the geology of the expedition to be submitted through you to Her Majesty's Government as soon as it is prepared.

I have, &c.

Captain Palliser,
Exploring Expedition.

(Signed) JAMES HECTOR, M.D., Edin.

ASTRONOMICAL OBSERVATIONS, 1858-9.—Dr. HECTOR.

Longitude, approximate. Latitude, diurnal only.

Date.	Place.	Longitude. W.		Latitude. N.		
		°	′	°	′	″
1858.						
November 29 -	North side of Battle River - - - -	113	35	52	46	26
December 1 -	Red Deer River - - - - -	113	40	52	18	13
„ 2 -	„ „ opposite Antler - - -	113	50	52	12	36
„ 4 -	„ „ above Forks - - -	114	30	52	1	26
„ 6 -	„ „ - - - - -	115	0	51	50	28
„ 9 -	Little Red Deer River - - - - -	114	53	51	29	28
„ 10 -	Source of Little Red Deer River - - -	115	3	51	21	40
„ 11 -	Dead Man's River - - - - -	115	16	51	14	3
„ 15 -	Indian Camp Edge Co. - - - -	114	36	51	25	24
1859.						
January 15 -	Thickwoods, between Pembina River and Paddle River	114	18	54	12	1
„ 17 -	Fort Assineboine - - - - -	114	48	54	31	4
„ 23 -	Athabasca River - - - - -	115	40	54	19	36
„ 25 -	„ - - - - - -	116	49	54	12	24
„ 29 -	Below Dead Man's Rapid - - - -	117	18	53	50	51
February 2 -	Jasper House - - - - - -	118	10	53	12	21
„ 8 -	„ - - - - - - -	118	10	53	12	5
„ 12 -	Maligne River - - - - - -	118	12	52	55	50
„ 13 -	Forks of Athabasca and Whirlpool River, trail to Boat Encampment - - - - -	118	6	52	46	54
August 8 -	South of Bow River - - - - -	112	46	50	13	5
„ 9 -	Small Lake - - - - - -	113	6	50	23	39
„ 12 -	Mouth, Ispasquehon River - - - -	113	58	50	43	8
„ 16 -	South of Bow River - - - -	115	7	51	8	20
„ 23 -	Ten miles above Vermillion - - -	116	16	51	19	0
„ 24 -	Opposite Observation Point - - -	116	20	51	22	29
„ 26 -	Height of land, Pipe River - - -	116	24	51	38	1
„ 30 -	R. bank of North Branch - - -	116	50	51	58	3
September 6 -	Great Glacier - - - - -	117	30	51	46	33
„ 8 -	Blaeberry River - - - - -	117	25	51	40	49
„ 10 -	Right side valley, Blaeberry River - -	117	30	51	36	39
„ 11 -	Blaeberry River - - - - -	117	35	51	34	3
„ 15 -	„ - - - - - -	117	35	51	30	3
„ 17 -	Mouth, Blaeberry River - - - -	117	50	51	25	50
„ 22 -	Columbia River - - - - - -	117	30	51	14	49
„ 23 -	„ - - - - - -	117	20	51	9	5
„ 25 -	„ - - - - - -	117	0	51	3	55
„ 30 -	„ - - - - - -	116	40	50	47	3
October 1 -	Lower Columbia Lake - - - - -	116	26	50	29	33
„ 2 -	Source of Columbia - - - - -	116	16	50	7	41
„ 3 -	Kootanie River - - - - -	115	50	49	50	24
„ 5 -	„ - - - - - -	115	35	49	36	18
„ 6 -	„ - - - - - -	115	20	49	23	42
„ 8 -	Kootanie Post - - - - -	115	10	48	54	48
„ 10 -	Kootanie River - - - - -	115	5	48	40	28
„ 12 -	„ - - - - - -	115	10		—	
	Second transverse valley - - -	115	20	48	30	34
„ 13 -	Kootanie River, third transverse valley - - -	115	30	48	25	23

The longitudes given are those used in calculating the latitudes merely.—J. H.

JAMES HECTOR, M. D., Edin.

No. 5. No 5.

EXTRACT of a LETTER from Captain BLAKISTON, R.A., to C. FORTESCUE, Esq., M.P.

SIR, Woolwich October 24, 1859.

IN accordance with the directions of his Grace the Duke of Newcastle, contained in your letter dated Downing Street, 22d July 1859, I have the honour herewith to enclose a report, drawn up from information collected whilst attached to Captain Palliser's expedition as Magnetic Observer, and also, after separating from that expedition, in carrying out my original instructions.

I have, &c.

C. Fortescue, Esq., M.P. (Signed) THOMAS BLAKISTON,
&c. &c. Captain, Royal Artillery.

REPORT.

Enclosure 1 in No. 5. Encl. 1 in No. 5.

INTRODUCTION.

British North America.—The prevailing ignorance in the United Kingdom of North America generally, but more especially of the British possessions on that continent, is such, that all the different provinces and territories are usually included in the term "Canada." Now, on looking at a map it will be seen that Canada is but a comparatively small portion of British North America, which extensive region, stretching from the Atlantic to the Pacific, and touching the United States in the great lakes and forty-ninth parallel, is limited to the north only by the Frozen Ocean, and rivals in size the remainder of this northern continent. Included in this are several thriving provinces, all under regular governments, and more or less peopled, but there is still the greater portion remaining as "Indian territory."

The Interior.—This, then, which until lately has excited little attention, except to those interested in the fur trade or Arctic exploration, is the country to which this report specially refers, and for want of a name must for the present be called "the Interior." And when we take into consideration that the extent in latitude of this tract is as great as from the almost tropical Gulf of Mexico to the most northern confines of the American Union, where the winters are nearly Arctic, we must expect to find it likewise varying very greatly in respect to climate, soil, and natural productions. Hence the greater part of the apparently contradictory evidence produced before the Select Committee of the House of Commons on the Hudson's Bay question in 1857 is to be attributed to the fact that the country over which that Company had control is of so great an extent, that a statement concerning the natural productions, fitness for agriculture, or anything which climate or physical nature would influence, can only be taken as referring to that particular part and not to the whole country. For example: a statement that good wheat grows in Rupert's Land does not prove that this grain can be produced over the whole country, of which the waters find their way into Hudson's Bay; nor can the fact that domestic cattle thrive in the Hudson's Bay Company's territories induce us to believe that stock farming (notwithstanding that we have evidence that on the banks of Back's Great Fish River there is some of "the finest grazing country in the world") would be a profitable undertaking on the shores of the Arctic Ocean, so that in the following "Report on the Interior of British North America," it has been my endeavour to bring each part forward in its true light as far as possible from reliable information and my own observations. I will therefore enumerate the different sources from which a knowledge of the interior has been gained.

Sources of Information.—During two centuries the fur trade has been gradually extending itself into the interior from three principal points—Hudson's Bay, Canada, and the Pacific; and so lucrative has the trade been, and such competition was there for some years between rival Companies, that the country has been traversed in almost every direction, and the routes taken being usually water (in most countries the primitive means of communication), the mapping of it in a geographical point of view has been generally very thoroughly carried out. Since the times of Hearne and Mackenzie, the Companies engaged in the fur trade have at different times employed men of considerable qualifications as astronomical surveyors, among whom may be mentioned the late Mr. David Thompson, Fidler, and Taylor, besides which the Hudson's Bay Company has itself fitted out Arctic expeditions, which have been ably carried out by Dease and Simpson, Dr. Rae, Messrs. Anderson and Stewart; and, moreover, Howse, known as the author of the Cree Grammar, made considerable explorations in the

Rocky Mountains in 1809–10–11, while in that service. Other travellers have passed through the country entirely by the means provided by the fur trade, among whom may be mentioned Sir George Simpson, Governor of the territories of the Hudson's Bay Company, Colonel Lefroy, Royal Artillery, David Douglas, and Mr. Drummond, both botanists, Captain Warre, and Mr. Paul Kane, whose interesting work, "The Wanderings of an Artist," has served to throw much light on the mode of life in the interior. Again, Arctic America and the regions of Lakes Superior, Winipeg, and the Lower Saskatchewan have been surveyed by the several Government expeditions under Franklin, Back, and Richardson; besides which the International Commissioners ran the line of boundary in 1825 along the old canoe route as far as the Lake of the Woods.

Lake Explorations.—All this had been done, and several sportsmen and others had penetrated into the country of the Saskatchewan previous to 1857, when, at the recommendation of the Royal Geographical Society, an expedition was decided upon by Her Majesty's Government for the purpose of exploring the country between Lake Superior and the Rocky Mountains, together with the passes to the west side. This expedition, under the direction of Captain Palliser, left England in the spring of 1857, and the several reports of its progress, up to the winter of 1858 and 1859, will be found in the Parliamentary papers dated June 1859.

During the same season (1857), the Canadian Government having granted a sum of money for the purpose, an expedition was despatched from Canada for the purpose of surveying the canoe route between Lake Superior and Red River Settlement, with a staff of scientific gentlemen and their assistants, the whole under the superintendence of Mr. Gladman. The work, I believe, was accomplished satisfactorily, the results of which, together with explorations of Maintoba and Winipegosis Lakes, the Assiniboine River, part of the south branch and Lower Saskatchewan, as well as a careful survey of the settlement on Red River, were carried out by Messrs. Dawson and Hind during that and the following year. An account of these expeditions is to be found in another blue book, ("Explorations of the Country between Lake Superior and Red River Settlement,") also dated June 1859. Moreover, during the summer of 1857, a company of Royal Canadian Rifles proceeded from Montreal by ship to Hudson's Bay, and thence by the usual inland navigation to Red River Settlement, and reports having been called for from each officer of that detachment, the Commander of the Forces in British North America is doubtless in possession of some valuable information concerning that route.

Captain Blakiston's Proceedings.

This being the first opportunity I have had of making any report direct to Her Majesty's Government, I shall now give as brief a statement of my proceedings as is consistent with clearness, omitting all observations of places or things the results of which have been embodied in the following report, and equally those matters of personal interest or slight importance which would only be introduced to enliven the dull monotony of a narrative.

Appointment.—Having been attached at the recommendation of the Royal Society to the exploring expedition under Captain Palliser for the purpose of prosecuting the required magnetic researches and assisting in the geographical objects of the expedition, I received instructions, drawn up by a Committee of that Society and sanctioned by the Colonial Department, concerning the magnetic desiderata which it might be in my power to supply. On the 21st of June 1857, I sailed out of the Thames on board the Hudson's Bay Company's ship "Prince of Wales," and after a seven weeks' voyage, the latter part of which, namely in Hudson's Straits and Bay, was mostly through ice, we reached York Factory, the seaport of Rupert's Land, at the mouth of Hayes River.

On landing I was engaged every day for upwards of a week in magnetic observations, the results of which have been discussed by Major-General Sabine, Royal Artillery (see "Remarks on the Magnetic Observations transmitted from York Fort on Hudson's Bay in August 1857."—Proceedings of Royal Society, 7th of January 1858). The Hudson's Bay Company fort containing the only dwellings at this desolate place, I, in common with some missionaries and other passengers, shared the hospitality so readily afforded, and it is but justice to say that while living at any of this Company's establishments no charge was ever made, and the gentlemen of the service seemed anxious to rival one another in good offices towards a stranger.

Start for the Interior.—Having been supplied with the necessary equipments and provisions, on the 31st August I left York Factory, having a passage provided in one of a brigade of six boats which was proceeding to the interior. An account of this voyage (Appendix I.) having appeared in the Parliamentary papers on Captain Palliser's expedition, I need say no more than that after travelling 400 miles, in which distance 35 portages were made and one house only seen, on the 20th September we arrived at Norway House, a post of the Hudson's Bay Company, situated near the north end of Lake Winipeg. Here, the brigade with which I was travelling being bound for Red River, my traps were turned over to another boat, which being manned by "green hands," was to proceed up the Saskatchewan as the "fall boat" in charge of an experienced steersman. I remained on shore for two nights, and the day intervening being taken up in magnetic determinations from sunrise to sunset, I was unable to visit the Indian settlement of Rossville, under the auspices of the Wesleyan Missionary Society, situated on Play Green Lake at a short distance.

Lake Winipeg.—Starting with our single boat on the 22d, we camped a few miles short of the

entrance to Lake Winipeg. The following day, getting a fair wind, we ran across the greater part of the north end of the lake, but were forced to put ashore at the "Three Islands" on account of the heaviness of the sea. We were, moreover, disturbed during the night by the rising of the water, caused, no doubt, by the strong southerly wind heaping it up to this end of the lake, which obliged the men to divest the boat of her cargo and haul her up in the dark, a feat accomplished rather roughly. Luckily none of my magnetic instruments, which before leaving England I had taken particular care to secure in the boxes by strips of india-rubber, suffered any damage; but the breakage of two mountain barometers, which could only be carried loose in the stern sheets, I attribute to this shaking. Managing to get under weigh about noon the day following, we crossed the remainder of the lake, and camped near the foot of the "Grand Rapid," just inside the mouth of the Saskatchewan.

Grand Rapid.—By the evening of the next day we had succeeded in getting boat and cargo to the upper end of the Rapid, which was accomplished in the usual way by hauling the boat by a line up the lower part to the "carrying place," thence transporting the "pieces" (cargo) over the mile portage and towing the boat by a rope up the Rapid under the cliffs along the south side.

Saskatchewan River.—Some rapids which are shoal at this season of the year occur at either end of Cross Lake; after which Cedar Lake is reached. From this we continued up the Saskatchewan, the country on either side of which is so little elevated above the river that it is possible to pass in almost in any direction in canoe.

Having passed "the Pas" Mission we arrived at Cumberland House, situated on Pine Island Lake, on the 4th of October, where, after enjoying a Sunday of the most lovely "Indian summer" weather, I was comfortably put up for the night, and we proceeded on our upward voyage the following day. The country becoming gradually of greater elevation and the river banks consequently higher, we arrived at "Fort à la Corne," 15 miles below "the Forks," on the 15th October, where finding another boat on the point of starting for up river, we made our way in company until the 23d of October, when we reached Fort Carlton, the winter quarters of the expedition. Ice was already forming along the shore, and it being thought that the boat would not reach the next fort above before the closing of the river, the men with whom I had travelled, mostly Norwegians, who were bound for the upper posts, were despatched overland. I was received by Mr. Hardisty, the gentleman in charge, and was installed into comfortable quarters, after a fifty-three days' boat voyage.

Arrival at Winter Quarters.—Here I found M. Bourgeau, the amiable and hard working botanist of the expedition, the other gentleman being off on excursions into the country. Captain Palliser had left sometime previous on his return to Red River, en route for the United States; and I was somewhat surprised at finding neither letter nor even message from him. My position on the expedition was not defined; I had work to be done in which assistance was required, and yet no authority to procure it.

I need hardly say that my position was by no means enviable, but I at once decided to carry out my special instructions and interfere in no matters concerning the expedition. This course I followed without deviation, and although in doing so I may have caused myself to be looked upon by some as an unwelcome addition to the expedition, yet I have the satisfaction of knowing that in making all private feeling succumb to the requirements of duty, I have carried out that which possibly others more yielding might have failed to accomplish.

Hourly Observations.—On the arrival of Dr. Hector and Mr. Sullivan I showed them and M. Bourgeau my instructions, in which, referring to hourly observations made on the Arctic coast in 1853 and 1854, this clause occurs: "It is hoped that, with the aid of some of his colleagues on the "expedition, Lieutenant Blakiston may be able to accomplish similar observations at the winter "station of at least three or four months' continuance." They immediately expressed their desire to aid in the work; I therefore applied to the gentleman in charge, and the construction of a rough observatory was commenced without delay.

Until the completion of this the greater part of my time was occupied in making the out-door observations, to which the approaching cold weather would put a stop; when, having fixed the instruments, gone through the necessary adjustments, and everything being ready, on the 12th November was commenced a series of hourly observations of the changes of the magnetic declination, the temperature of the air, and state of the weather, together with six-hourly readings of the barometer and hygrometer; besides the daily self-registering thermometers; M. Bourgeau at the same time taking the temperature of the ground at the depths of two and three feet daily, which he conducted with uninterrupted regularity.

The hourly series was carried on by a system of watches, each relief during the day being six and at night four hours, the observations being made at the exact minute of time according to a chronometer, which I kept regulated by astronomical observations. For the first month the work was by no means pressing, as four observers took their regular turns; but Dr. Hector leaving at this time, the duty was carried on for the next two months by three of us. Unluckily it was a winter of rather "hard times" at Carlton, and in February the fort becoming much reduced in provisions, nearly all the families were sent off to the plains to shift for themselves near the buffalo, and at the same time Mr. Sullivan, accompanied by the expedition cook, left for another post of the Hudson's Bay Company. Thus reduced to two, I consulted with M. Bourgeau, who immediately expressed his willingness to devote himself to the work as long as I thought proper for the good of science. For

two months, consequently, were the observations carried on by M. Bourgeau and myself, the instruments being registered every hour, day and night, and it was not until five months were completed, and the spring botanical collecting commenced, that I brought the series to a close.

Credit due to the Observers.—Considering that the use of the magnetic instrument employed was entirely new to the observers, I cannot but say that the greater part of the observations were made in a manner most creditable to themselves, and on the completion I addressed a letter to Captain Palliser, which was delivered to him on his arrival from the United States, but which not appearing in the Parliamentary papers, I here insert a copy.

"Sir, "Fort Carlton, Saskatchewan River, April 16, 1858.

"A series of hourly magnetic and meteorological observations continued uninterruptedly "night and day for five months, having been this day brought to successful termination, I have the "honour to express my thanks for the co-oporation of the members of the expedition under your "command, who, on my arrival here in your absence, voluntarily undertook the work which I had "no power to command. I would more particularly mention, for the information of Her Majesty's "Government, the untiring zeal manifested by M. Bourgeau during the whole period, but especially "for the last two months, when he devoted himself to the somewhat arduous undertaking of sharing "the watches with only myself, so as to carry on the series without omitting any of the hours of the "day or night.

"I have, &c.
(Signed) "Thomas Blakiston,
"Lieutenant, Royal Artillery.

"John Palliser, Esq.,
"Commanding Exploring Expedition, &c."

I also wrote to Major-General Sabine, especially mentioning M. Bourgeau, to whom science is so greatly indebted, that had it not been for him this important series of observations could never have been accomplished; and I do hope, that taking into consideration the most complete botanical collection which has been made by that gentleman, Her Majesty's Government will be induced to add a bonus to the scanty allowance which he has received for each season's work.

Magnetic Observations.—The five months' hourly magnetic observations above mentioned have been discussed by General Sabine in the volume concerning magnetic observations and surveys now in the press; but having at the same time made determinations of the magnetic elements at regular intervals during the course of the winter and spring, I should here observe that the results of all my magnetic observations, from Hudson's Bay to the Rocky Mountains, will appear in a comple account which I have been requested to draw up for the Royal Society, after the arrival of the instruments and their verification at the original base station "Kew."

Meteorological Observations.—I have before said the meteorological observations were included in the hourly series; but that terminating on 16th April, they were afterwards kept up three times a day until the expedition left its winter quarters in the middle of June; I, however, left a thermometer, which was registered by the gentleman in charge and those under him, during summer and autumn while I was absent; and on my leaving Carlton for good in December 1858, I still left it there, and have now received another six months' observations. The climate, therefore, of this station is likely to be well determined.

Astronomical Observations.—Astronomical observations were made by Mr. Sullivan and myself during the winter and spring for the correct determination of the geographical position of Fort Carlton, and their agreements are as near as can be expected, the latitude being the same, namely, 52° 52 5 north, and the longitude, deduced from lunar distances,—

Sullivan	- -	106° 15 3 west (mean of three).
Blakiston	- -	106° 23 8 „ „ seven).

Proceedings, Summer of 1858.—I need say little concerning the proceedings of the expedition during the summer of 1858, which have been described by Captain Palliser (see Parliamentary papers), it is sufficient for me to mention that while carrying out his orders, I made magnetic determinations at required stations, and carefully mapped the country through which I passed, and having rejoined the expedition near "Cache Camp" to the south of the Red Deer River, we proceeded to the south-east over prairie until buffalo were found at what I called "Slaughter Camp." Here a council was held, and Captain Palliser decided on what part of the explorations of the mountains was to be undertaken by each individual, and which he has detailed in his report, but with the error that he has stated, "Lieutenant Blakiston to proceed through the mountains by the two known Kootanie "passes, returning by the southern one;" whereas the fact is, the information of the half-breed who was consulted on this part of the mounains was, in his own words, "Ils y en a plusieurs des places on "les Kootonaies sont accoutumes de faire le travers." At the same he said that he had only crossed by one of these, which was that generally used, and among the natives known by the name of "the "Kootmay pass." This known pass, therefore, Captain Palliser desired me to survey, and determine whether it was wholly in British territory; if it proved not to be so, he left it to myself to endeavour or not, as I chose, to search for another north of it.

Proposition to explore rejected.—At this council, which was held on the 2d August, I proposed that two men should be left at the site of Bow Fort on Bow River (at which point the parties were to separate), for the purpose of constructing a canoe, in which, after returning from the mountains (having calculated the time required), I proposed to descend Bow River and the south branch to

the Forks of the Saskatchewan, thereby getting a knowledge of the whole length of the river and the country through which it flows. This proposition seemed to be favourably entertained at the time, but on the following morning I was informed that it was an unknown river; I need only further say that it is still equally unknown.

Separation from Exploring Expedition.—I was, moreover, told (after having at last demanded to know my position in the expedition), that I was to consider myself under the order of another member; immediately after making which declaration, Captain Palliser rode off on an exploration to the southward, and I accompanied the remainder of the expedition to the "site of Bow Fort," where, after mature deliberation, I wrote a letter (see Parliamentary Paper, June 1859) which I left for Captain Palliser, wherein I threw off his command; but in order that the objects of the expedition should not be frustrated, I proceeded with the exploration which I had previously undertaken, which will be found detailed in a "Report on the Exploration of the Kootonay and Boundary Passes of the "Rocky Mountains in 1858." This, although in the possession of the Colonial Department, I have attached as an appendix (Appendix II.) for the sake of reference. As to the statement of Captain Palliser with respect to the Kootonay Pass in his report (see Parliamentary Papers, June 1859) of which the words are "Lieutenant Blakiston's exploration may, perhaps, have a value hereafter as a "corroboration of my own," I have only to say that unfortunately in his map or description I am unable to recognize, except in its general position, the "Kootonay Pass," which I had previously taken so much pains accurately to lay down; and the tone of that statement leaves me under the impression that it was, perhaps, made but half-intentionally in the haste of writing. It may possibly be some explanation of the course taken by Captain Palliser, that previous to my separation from him, on 11th August 1858, I had been altogether but fourteen days in his company since the expedition left England in May 1857; and before that we had met so few times that whatever Captain Palliser knows of me must be from report.

Return to England.—The appendix above referred to and a letter which reached the Colonial Office contain my proceedings till arriving at Carlton at the end of October 1858. Subsequently I travelled during the winter, walking in snow shoes driving a train of dogs, a distance of 800 miles, arriving at Red River Settlement on the 1st of March 1859. Here I remained until I received Sir E. B. Lytton's reply to my offer to prosecute further exploration or magnetic survey, after which I took the earliest opportunity on the breaking up of the winter of proceeding by the overland route to Saint Paul on the upper Mississippi, distant 530 miles from Red River Settlement; after this my travelling was through civilized parts.

Contents of Report.

It is not without some degree of hesitation that I now offer this Report, which notwithstanding the labour bestowed upon it, must necessarily be very imperfect. It will, moreover, I feel sure fail to give that correct conception of the state of things that actually exists, which it has been my endeavour to pourtray; but such as it is, I have arranged as follows:—

Report.—Section A. Physical features.
„ Natural productions and climate.
„ B. Inhabitants, present state, missions, &c.
„ C. Development of resources.
„ D. Future government and colonization.

Appendix.—Appendix I. "Report on the route between Hudson's Bay and Lake Winipeg."
„ II. "Report on the exploration of the Kootonay and Boundary Passes of the Rocky Mountains in 1858."

Section A.—I.

Physical Features.

General Features, North America.—The continent of North America is divided into several great basins, determined by the general slopes of the surface and consequent direction of the flow of its waters, of which the British or northern portion comprises almost the whole of that drained to the north and north-east, as well as a part of the western or Pacific slope. Besides these water systems, the great features which influence the climate and the progress of civilization are, first, a continuous chain of mountains running through the whole length of the continent, dividing it laterally into two distinct portions,—the warm chaldron of the Gulf of Mexico to the south, with a counter-balancing reservoir of ice penetrating deeply into the northern part of the continent; and lastly, those extensive inland sheets of fresh water commonly called "The Great Lakes." In an extra-tropical continent thus formed, it would be natural to expect a very varied climate, and such being actually the case, we find consequently in a comparatively short distance great diversity in the habits and occupations of the inhabitants.

The Interior.—As this report purports to treat only of the interior of British North America, I shall confine myself to a general sketch of the physical features of that country, which, to speak generally, may be thus divided:—

1. The northern or Arctic basin. 2. Hudson's Bay. 3. The Central Plains. 4. The Rocky Mountains. 5. The Pacific slope; and if Canada were included it would be a sixth, the St. Lawrence basin. They are all so distinctly marked that their names at once almost define them. Again, looking at the country from a geological point of view, the first point that must strike the attention is that at an average distance of 100 or 150 geographical miles from the south and west shores of Hudson's Bay commences a district of primitive formation, and which, when defined on a map, appears as a great belt or band of from 150 to 200 miles in width, coming from the northern part of Canada east, skirting the upper Great Lakes, curving round to Lake Winipeg, and thence taking a north-easterly direction, reaching the Arctic Sea in the region between the Coppermine and Back's Great Fish River. In this granite axis, as it should perhaps be called, but mostly on its western edge, lie the principal lakes of the interior, commencing with Winipeg, whose eastern and western shores, approaching within two miles of one another, exhibit on the one hand secondary, and on the other primary rock. Deer Lake, Athabasca, Slave, and Great Bear Lakes carry on the connexion to the Arctic Sea, where Coronation Gulf occurs. It is a peculiarity of this belt that no rivers run interruptedly through it, and the water is so dammed up that the whole country is intersected with numberless lakes. It is almost needless to say that this tract is extremely rocky. The geological nature of the country intervening between this barrier and Hudson's Bay is favourable, but the influence of that icy sea on the climate is such that we must class the whole of that region as most inhospitable.

Central Plains.—Beyond this primary belt, and limited on the west by the chain of the Rocky Mountains, is an extensive region of secondary formation, through the northern part of which flows the Mackenzie, the greater part of the valley of which river, from its Arctic situation, being unfit for pasturage and worthless for agricultural purposes, there only remains the country between Lake Winipeg, the Rocky Mountains, and forty-ninth parallel, to which we can look as affording soil and climate adapted for settlement by a civilized community; and it is to this area, including also that portion between the western boundary of Canada and Lake Winipeg, to which in this Report I would most particularly draw attention. It is this district, I may observe, which fills the gap between Canada and British Columbia, and may before long be required to complete the chain of dependencies of the British Crown, stretching from the Atlantic to the Pacific.

Many would divide the central plains which occupy the greater part of the country just mentioned, and are but the northward extension of the high plateau in the territory of the United States west of the Mississippi, between the Arctic basin and that of Hudson's Bay, because of the rivers which flow through them ultimately find their way to the north and north-east. I cannot, however, do this; but must consider the great central plains as a distinct district, having the general form of a triangle, of which the 49th parallel (international boundary), from the Rocky Mountains to the Lake of the Woods, forms the base, while the apex is to the north of Peace River, near latitude 60°. This is also in accordance with the views of Sir Alexander Mackenzie, the greatest North American traveller at the end of the last century, and who, in speaking of the tract usually called the "barren "grounds" gives as its southern limit a line "from Churchill (Hudson's Bay) along the "north border of Deer Lake to the north of the Lake of the Hills (Lake Athabasca) "and Slave Lake, and along the north side of the latter to the Rocky Mountains, which terminate in "the North Sea, latitude 70° north, and longitude 135° west, in the whole extent of which no trees "are visible, except a few stunted ones scattered along its rivers, and with scarce anything of surface "which can be called earth; yet this inhospitable region is inhabited by a people who are accus-"tomed to the life it requires," and which has been so distinctly confirmed by later travellers. In connexion with this subject is the "limit of perpetually frozen ground," north of which the subsoil never thaws; its general direction is much the same as that of the "barren grounds," but considerably to the southward, namely, from the southern extremity of Hudson's Bay, touching the north end of Lake Winipeg, and thence taking a north-westerly direction. These climatic lines have been marked on the map No. 1.

Climatic Divisions.

Arctic Regions.—To despatch in a few words the north and north-eastern portion, properly called the Arctic Regions, we see that the greater part is included in the "barren grounds," and besides the Mackenzie is drained by Back's Great Fish River and the Coppermine, both flowing into the Arctic Sea; the more southern and western part of the country is however wooded, as is, I believe, the whole length of that noble stream, the Mackenzie, except at its most northern parts. The climate is cold in the extreme, and a considerable portion of the country is within the Arctic Circle. The inhabitants are Esquimaux, Chipweyans, and some Crees in the south. The trading establishments are kept up on deer, meat, and fish, with potatoes and barley, which are grown at some posts. The supplies and returns of the fur trade are annually transported in boats, but there not being time for those belonging to Mackenzie's River to go to and return from Lake Winipeg, cargoes are exchanged at "Portage la Loche," between the English and Athabasca rivers, in latitude 56° north, with a brigade sent from the depôt.

Hudson's Bay.—Again, the region around Hudson's Bay is generally of much the same character as the wooded portion of the Arctic regions, but owing to the formation of the country, causing so many rocky obstructions in the rivers, the extent to which the country is in many parts submerged is almost incredible, except to one who has witnessed it. Few of the rivers, of which there are many, are navigable for anything larger than boats, and it is with the greatest difficulty that even these are got through many parts (see Appendix I.)

The timber is small and stunted, particularly in the vicinity of the bay.

Of course, James' Bay being the most southern, is the most salubrious portion of this great inland sea, but as I have no personal knowledge of that part, I take the information gained from persons who have lived there.

In this district, on the shore of Hudson's Bay at the mouth of Hayes and Nelson rivers, is York Factory, the great depôt of the Hudson's Bay Company for the inland trade.

There is a road outside, which is, however, much exposed, but a safe anchorage exists inside the mouth of the former river for a limited number of vessels, not drawing more than 15 feet (the depth of water in the bar), and I have little doubt that a harbour for vessels of large size would be found in the mouth of Nelson River, which being the outlet of the Saskatchewan and other rivers of the interior, is of large size. There is also another post on the west side of the bay, but more to the north, at the mouth of English River. This is Fort Churchill, a place of importance in the early days of the fur trade.

The depôt for the southern department, which a vessel of about 500 tons annually visits, is Moose Factory, at the southern extremity of James' Bay, of the country around which I am ignorant, but being directly north of and not far removed from the confines of Canada, matters little with regard to the interior.

Numerous trading posts are scattered throughout this thickly wooded region, but with no other object than the prosecution of the fur trade.

Winipeg.

Winipeg.—In referring to this remaining district, I have as yet only spoken of it as the Central Plains, without reference to its rivers, lakes, or mountains.

This district contains about 380,000 square miles, or extending in latitude 7°, with a general width of 750 miles, is as large as France and Spain together, and is the portion of country which, unnamed at present, I have preferred to call after its principal lake "Winipeg." The word is Cree Indian, and as with most of their names, is descriptive of the lake "Muddy water." This being the part of the interior likely to be of use for civilization, and being that with which I am most acquainted, I propose to treat of it somewhat in detail.

Between the valley of the Mississippi and the Rocky Mountains is a large extent of elevated and level country which is now generally called the "High Central Plains." These plains extending into British territory, constitute the country of which we have now to speak. Leaving the primary formation on the east shore of Lake Winipeg, a secondary limestone is visible along the entire western shore, and on the Red River, and this must extend westward, but very little is seen of it owing to the mass of "drift" which covers the country as far as the mountains, which consequently is the geological nature of these plains, which extend without break from Lake Winipeg and the Red River to the Rocky Mountains, being at their eastern extremity a little over 600, and rising by successive steps until at the base of the mountains they have an altitude of 4,000 feet above the sea.

Speaking generally, the nature of the soil of these plains is sandy, and almost the entire southern portion is prairie, trees only occurring in the river bottoms. But north of a line from the south end of Manitoba Lake, running towards the forks of the Saskatchewan, and following the north branch to longitude 111° west, and after this sweeping south-west to the Rocky Mountains, the country is generally partially and in parts thickly wooded, small aspen being the common tree, but in the more southern portion the oak and elm flourish, while the spruce and pine are only found in patches except towards the north. There is usually a good depth of soil in the wooded portions and on those prairies which have originally been forest land.

The extent of this kind of country northward I am unable exactly to define, but the region to the north of the Saskatchewan is not, as has been stated, altogether thick forests, for there are prairies on Peace River in latitude 56° north, so that we may presume that the partially wooded country, except at the base of the Rocky Mountains, has considerable range in a north-westerly direction.

The prairies are of two kinds, the "arable" and the "dry," the former having a good depth of black mould, while the soil of the latter is usually limited to two or three inches. The arable prairie in the United States is found to extend throughout the valley of the Mississippi, but west of that the dry arid prairie extends without interruption to the Rocky Mountains. On the British side of the line the same difference exists, the arable prairie being confined to the basin of Red River, while the dry prairie extends west to the mountains. But besides these two there is another kind of prairie, which, for sake of distinction, I call "Willow Prairie," it was probably originally wood land, which being by the continual prairie fires cleared of trees, there now remains a fine vegetable soil, on which vetches and plants of that kind flourish, besides the grass, while some willows are generally found, often very small, but after the absence of fire for some years, they grow to considerable size. Along the edge of the line of woods is usually a belt of this willow land of greater or less width, but often separating the true prairies from the woods by some miles.

Crossing this generally level district there are what are called "Coteaus," which, in my opinion, are the rises of the successive steps of the plains as they gain altitude, and in travelling westward, on mounting one of these coteaus, you do not again descend but continue at a higher level. They may have been coast lines of the sea at different periods of submersion, the effects of which are so clearly shown in the "river levels" which have been described in Appendix II.

Rocky Mountains.—The Rocky Mountains, forming the western boundary of the plains described, have a general direction N.N.W. and S.S.E., and are characterized by a great absence of prominent peaks, being in fact generally a number of parallel ridges with intervening valleys. They appear to reach their greatest height, 15,000 to 16,000 feet, about latitude 52° north, which also seems to be their broadest part north of 49°.

The line of watershed, as far as latitude 51° north, is near the eastern edge, but from thence north it seems to tend more to the westward, and at the several places where it has been crossed is nearly of the same altitude, viz., from 5,000 to 6,000 feet above the sea level. To the south of 51°, but particularly near the international boundary, the range is very narrow, not over 40 miles in width. It is remarkable that no primitive rock has been found in these mountains between 52° north and the boundary, while it exists in the cascade range of British Columbia, hence we may infer that it is not probable that gold will be found on their eastern side.

Owing to the great altitude of the plains the mountains do not appear of any considerable elevation when seen from the east side, and it is a fact that most of the western are much more precipitous than the eastern slopes.

These mountains, in the part of which I speak, are generally, except at their summits, well wooded; but owing to the climate the growth of the trees is inferior on the eastern declivity, while from some other cause the flora of the two sides is quite distinct. Perpetual snow only rests on some of the higher peaks; but during the summer falls of snow occur, but the snow does not lie long; a small glacier or two have been seen.

Rivers.—Of the rivers of the district, besides the Athabasca, a tributary of the Mackenzie, up which boats can be pushed to Jasper's House in the Rocky Mountains and the Assiniboine and its tributaries, which can hardly be said to be fit for anything but canoes, there remain Red River of the north, rising near the Mississippi, 280 miles south of the boundary, and running into Lake Winipeg and the Saskatchewan, discharging into the north end of the same lake the waters of the Rocky Mountains. These two differ considerably, the former being sluggish and deep, while the latter is swift and shallow.

Red River.—Red River cannot in length be compared with the Saskatchewan, but for the present interests of the interior it is of more importance than the other. It is somewhat tortuous, but is navigable for small steamers from Lake Winipeg a considerable distance into the territory of the United States, and I have just heard that a steam-boat, which was built by some Americans last winter, arrived at Red River Settlement on its first trip on the 10th of June last.

This river rises with the breaking up of the ice, which occurs from the beginning to the end of April, and on two occasions during the memory of the settlers has risen so high as to flood the whole country, destroying houses, cattle, and human life. It gradually begins to fall in June, and is lowest in the autumn.

Saskatchewan River.—The Saskatchewan, unlike the river just described, obtains nearly the whole of its water from the mountains, and has consequently little or no spring flood, but begins to rise from the 10th to 15th of June, with the melting of the snow at those high elevations, continuing high for six weeks or so, and begins to subside again in August; as the cool weather comes it falls rapidly.

Navigation.—Taking either branch of this river, it is navigable for boats from Lake Winipeg to near the base of the Rocky Mountains, a distance of about 1,200 miles, but for steam navigation the river is but ill adapted, and I am glad to say that I was fortunate to travel on it from its mouth to Fort Edmonton, 1,000 miles up, at a time of year when I saw the water at its lowest, otherwise I might have formed most erroneous impressions. Commencing at its mouth, there is a good entrance from Lake Winipeg, and a safe and sheltered harbour inside; just above this, however, is the foot of a large and strong rapid above 2½ miles in length, caused by the breaking of the river through a belt of limestone, this is called the Grand Rapid, and is a barrier to the ascent of loaded boats, which the first mile and a half are hauled or "tracked" up in half cargo, and for the remainder or strong part of the rapid are entirely discharged, the cargoes being carried over the mile portage on the north side, and the boats themselves hauled up along the south shore under the limestone cliffs. In making the descent the boats are "run" with full cargo, but not without some risk of striking rocks or stones. For a description of the kind of boat, number of men, cargo, and other particulars, see "Report on the Route between York Factory and Lake Winipeg," Appendix I.

The worst part of the rapid for steamboat navigation is the lower half, in which the water is shoal the whole way across. As for the upper part, although very strong, a steamer might perhaps be warped up.

This is the greatest, and supposed by many to be the only rapid in this river, it having been stated in the House of Commons, on apparently good authority, that "with this one exception you "could take a vessel of considerable size up to the foot of the Rocky Mountains." This is, however, far from being the case.

About five miles above the Grand Rapid, during which distance the river is nearly half a mile wide, Cross Lake is entered, between some islands where there is a considerable current; at the western end of Cross Lake, and between that and Cedar Lake, there are some small rapids, which, during high water, may perhaps be passed, but in the fall of the year boats have to discharge the greater part of their cargoes. Cedar Lake (as will be seen by the map) is one of considerable size, containing numerous islands, and about it is timber available for building purposes, which may also be said of the country east to lake Winipeg. The south side of this lake is only separated from Winipegosis

Lake by a little over four miles of land, and where my winter track is shown as passing across is the "Mossy Portage," formerly used by the boats of the Swan River district of the fur trade in going to and from Hudson's Bay.

Lake Winipegosis has been determined to be four feet above Cedar Lake in the spring, but in passing over as I did, without time to measure it, I was under the impression that Cedar Lake was much the higher.

To continue the Saskatchewan River for the next 180 miles or so, to the foot of Thobon's Rapid, just above the "Mosquito Point," owing to the very level and low country through which it flows, is tortuous, and for about 70 miles west of Cedar Lake the waters are divided into two channels, one passing near Moose Lake, while the other runs through Muddy Lake, in the centre of which there is at low water a small rapid. The northern channel is somewhat longer, and after they unite the river continues of considerable depth, passing south of Pine Island or Cumberland Lake, with which it is connected by streams navigable for boats, and into or out of which the waters flow according to the height of the main river. Through this lake is the route to English River and the north.

Thobon's Rapid is certainly not navigable for steamers at low water, and I should much doubt if it were even at high, but the difference caused by the state of the water in a rapid is so great that it is hardly safe to give an opinion. From this the elevation of the country begins, and there is no rapid until the Nepowewin, about 80 miles below "the Forks;" but I should think that at high water this would be capable of being surmounted.

Thus, in summing up the Lower Saskatchewan River, or Saskatchewan below the Forks, we may say that at high water a steamer could run from Cedar Lake to Thobon's Rapid, and from thence to the Forks. There are, however, a good many shoals, sand bars, or "batteurs," as they are called by the voyagers, below "Pemmican Point." Of the south branch I know little, except by report. It is of a strong current and stony bottom near its mouth, and after that "batteurs" are numerous to within a short distance of the junction of Red Deer's River, the former site of Chesterfield House, and it is said by the few persons who have ascended it in boats to be navigable for steamboats during high summer water.

For some miles above the Forks the north branch is obstructed by a succession of small rapids, usually called the "Col Rapids," this part is certainly impassable for large craft during low water, but those who have seen these rapids in high water think there would be no obstruction to a steamboat. From the head of these rapids the bed of the river is filled with batteurs or sand bars as far as the mouth of Vermillion Creek, about 25 miles above Fort Pitt, after which the bottom is usually of a strong nature, which continues to Fort Edmonton, some distance below which there are small rapids and shoal places in the fall of the year. Of the distance to which a steamer would ascend in high water I can give no positive information, but I should suppose that one adapted for that kind of navigation might possibly reach Fort Edmonton, but in low water little could be accomplished in most parts.

This river is usually closed with ice for five months from the second week of November to the second week of April, but of course becomes navigable much sooner than the lakes, which are never clear of ice until June. On the whole it can hardly be considered as a river offering much advantage to steam navigation, on account of its small size in comparison to its length, which need not appear so extraordinary when we consider that it runs through a great extent of level plains, from which it receives no waters, there being a remarkable absence of tributaries. In fact the Saskatchewan does not drain the plains, but traverses the country as a canal fed from the Rocky Mountains, it may therefore be said to have no basin, and consequently "the fertile valley of the "Great Saskatchewan, containing an unlimited extent of arable land," really does not exist. The water of the Saskatchewan, except near the mountains, is very earthy, especially during flood, and helps to give to Lake Winipeg its expressive name. Many of those persons who "summer inland," as it is called, that is remain at the forts during the voyaging season, are affected more or less with the goitre, which is attributed to the water. From the Forks upwards the river is generally in a deep narrow valley about 200 feet below the level of the surrounding country, and in many parts having precipitous banks. I ascertained the current at Fort Pitt during high water to be two and a half knots per hour, but during spring and fall it would in most parts probably not exceed two miles.

The fall of the north branch, as determined by barometric observations, is from Edmonton to Lake Winipeg, including the Grand Rapid, at an average of 1·4 feet per statute mile, but the rise above Fort Edmonton is probably much greater. Of the south branch there are no observations between its mouth and the site of Bow Fort, which, taking the whole, would give a fall of 4 feet per mile, but of course it would be greater than that in the upper and much less in the lower parts; however, taking its tributary, the Red Deer River at its forks, would give from thence to the forks of the Saskatchewan an average of nearly three feet per mile. We may therefore safely suppose that the fall of the south branch from the site of Chesterfield or its forks to its junction with the north is not over 2 feet per mile, and this is what my observations give on the fall of the north branch from Fort Pitt in the same longitude as the site of Chesterfield House to the junction. After a few days of warm weather during summer the river is sure to rise, owing to the increased melting of the snow in the mountains, and in spring, should the ice choke in any part when running, it causes considerable rise above that point. The thickness of ice in mid-winter is from three to four feet.

Boats and Steamboats.—With regard to the navigation of any part of a river, it is not to be thought that because boats have considerable difficulty it would be impassable for steamers, for boats are, when "tracking," limited to a certain distance from the bank by the length of the line, while steamers can, if required, keep mid-channel. Cord wood for the use of steamboats would be procurable at almost

any part of the Lower Saskatchewan and north branch, but there will probably be found to be a scarcity on the south; it however could be rafted down from near the mountains.

Lakes.—The lakes are a great feature in the eastern part of this district, and from their comparative shallowness may be considered the lowest of the great steps of which this country is made up. The principal ones, and which are connected with each other, are Winipeg, Manitoba, and Winipegosis or Little Winipeg. Owing to the level of the country to the west of the first and surrounding the others, they are of very irregular forms, and this is so much the case to the north of those enumerated that the whole country about Cumberland and "the Pas" is nothing but connected lakes and swamps, very convenient for canoe travelling in summer, as well as being a great resort for multitudes of waterfowl. In the upper parts of the country the lakes are detached, although in some parts pretty numerous, and are mostly valuable as fishing places.

The altitude of Lake Winipeg is found to be but a few feet above Lake Superior, having been determined by the Canadian surveyors to be 630 feet above the sea. Manitoba is somewhat above it, and there is said to be a difference of five feet in favour of Winipegosis over the latter.

The greatest depth of Lake Winipeg as far as yet ascertained is 60, while Manitoba is merely 15 to 18 feet, and with a generally level bottom, the remaining one differing very little, except at its upper end, where it is said to be deep.

A.—II.

Natural Productions.

The natural productions of a tract of country of such extent as the interior of British North America may readily be supposed to be very varied, but various as they are, they may be all classed under the three heads—Mineral, Vegetable, and Animal.

Minerals.—From our imperfect knowledge of the greater portion of the country in a geological way, little can be said in relation to its minerals; but to commence with the metals. The province of Columbia and her gold fields not coming under the appellation of "the interior," I cannot record the existence of gold in any part of the country, and the geological structure of the western portion is far from holding out any prospects in that way. Of course there have been here as elsewhere reports of the discovery of gold in certain places, but, as is often unfortunately true, all glittering substances are not gold.

Sir John Richardson's "Journal of a Boat Voyage" contains the greater part of the reliable information concerning the mineral resources of the north, and from that and other statements from actual observation we gain the following information:—that both copper and malachite exist in the region of the Copper Mine River in sufficient quantities to pay the working in time to come when the southern portion of the country becomes peopled, providing that dependence can be placed on an uninterrupted summer of sufficient length; that plumbago is found on Lake Athabasca, as well as iron and mineral pitch, which latter is in abundance, and will probably be for many years of more use than any of the others.

Again, with respect to salt, besides that stated to be found in "a very pure state near Great Slave Lake," there are numerous salt springs on the borders of Lakes Manitoba and Winipegosis, some of which are now worked to advantage and used at "the settlement" on Red River. Even with the primitive mode in use salt of a very fair quality is manufactured, and from the report of Professor Hind, who geologically examined that district, there is every reason to suppose that salt could be produced in sufficient quantity for the whole consumption of the country. The native salt sells at Red River Settlement for 10s. per bushel, all the remaining salt coming from England or the United States, by either of which routes the freight is necessarily high.

Limestone occurs at Red River and the west side of Lake Winipeg, suitable for building purposes or the manufacture of lime, and there is an inexhaustible supply of granite on the east side of that lake and the country through to Lake Superior and Hudson's Bay. On the Saskatchewan, where there is but little limestone to be found, and where there are no means of burning it, a kind of clay, known by the name of "white mud," is used for white washing and other purposes, and in such a dry climate makes a good substitute for lime.

Of coal, I believe that none of secondary formation has yet been found, except in the Arctic Sea; but what is considered to be a tertiary coal or lignite has been discovered in several places, and, curiously enough, the district in which it exists is that in which wood being rather scarce, it will in time to come (should it prove suitable for domestic and steam purposes) be in large demand.

A small seam of nine inches in thickness was discovered by Dr. Hector on the Assouri River, near the international boundary, in longitude 104° W. It also exists in beds from 2 to 2½ feet in thickness on the banks of the north branch of the Saskatchewan, at Fort Edmonton, and it is said, with little interruption, to Rocky Mountain House, 200 miles above, and as the formation containing this deposit extends considerably to the south (lignite being found on the upper waters of the Missouri), the same substance will probably be found in most of the tributaries of the south branch. It has already been discovered on Red Deer River, in beds so close that out of 20 feet of strata 12 were of coal. This coal of the Upper Saskatchewan is considered to be of a different age to that first found, but no report has yet appeared of its quality. I have seen it in use at Fort Edmonton for the forge, where it is there preferred to charcoal, but is said to require rather a strong draught.

Vegetable Productions.—The vegetable productions of the country, although numerous, are not such as are likely to cause any great traffic with other parts, but will be found of considerable domestic value.

From all accounts the best timbered country is between Red River and Lake Superior, many of the trees flourishing there which do not exist in other parts, while the size of the timber is greater. There can, therefore, be no want of wood for building purposes in that district.

Trees.—The oak is not found to the north or north-west of Red River and Lake Manitoba. The ash extends to the lower part of the Saskatchewan only. One species of maple (ash-leaved) exists on the Saskatchewan and throughout the southern country, which is much used by the natives for the manufacture of sugar. Elm reaches only to the Lower Saskatchewan. Both balsam, poplar, and aspen are the common trees of the plain country, the former being generally confined to the sandy and moist intervale land along the rivers, while the latter, which never attains large size, is to be found everywhere, and is the only tree existing on the edges of the dry western prairies. Possibly, the considerable rise in the elevation of these plains may limit some of the species.

The usual members of the pine family are the white spruce (*a. alba*), the American larch or juniper, the fir (*a. balsamea*), and Bank's pine, the last never attaining large size, and the fir being of little value as timber. Building and boat timber is usually cut from the spruce (called "pine" in the country), except when required of particular durability or for some special purpose. This wood has the advantage of being light, easily worked, and of sufficient strength for ordinary purposes, but unless of good size it is by no means free from knots.

White or bass wood is used for some purposes at Red River Settlement, but is confined to the most southern parts of the territory. I should have said that birch exists to a considerable distance north, and is used for carts and sleds when oak is not attainable, as balsam poplar is also sometimes used for building purposes.

The sides of the Rocky Mountains are well wooded, and I doubt not that they will be resorted to to supply the prairie country with timber by means of the rivers. As you proceed northwards, particularly approaching Hudson's Bay, the trees become more and more stunted until you reach the region called "the Barren Grounds."

Grass.—Of other vegetable productions existing in a state of nature, grass for hay is to be found in abundance on the numerous swamps, and in such a region, where the summer is so dry and hot, requires little or no trouble in making.

Grass for pasture is abundant all throughout the plain country, that on the dry prairie being short, but at the same time nutritious, while on the tracts of the former woodlands it is often thickly interspersed with different sorts of vetch, excellent food for cattle and horses.

Berries and Roots.—Berries of different kinds are abundant in most parts of the country, including cranberry, sasketoom, pembina, currant (the black being very fine), gooseberry (small), raspberries, and strawberries, and these are found of great use and much sought after by the natives, where farinaceous food is so scarce. Wild rice is plentiful in the region of Rainy Lake. A root which grows on the prairie is dug up by the Indians and greatly used by them; it is called the prairie "turnip," but assimilates to that root only, I think, in growing under ground, being more the shape of a carrot or rather Jerusalem artichoke, and by no means of the most tender nature. Other roots and barks are used for medicinal and dyeing purposes.

Animals.—I now come to what may be called the staple natural produce of the interior, the animals, for it is on these, their flesh, their skins, their furs, their tallow, and their oil, that the whole of the natives exist, besides being a great source of wealth to those Europeans and others engaged in the Indian trade.

It will be needless here to enumerate the different fur-bearing animals, and out of place to enter into the details of the fur trade, which will be touched upon when I come to speak of the development of the resources of the country; I shall, therefore, refer simply to those animals on which the natives depend for their support.

The use to which the Indians put the larger mammalia, such as the deer and buffalo, is in the manufacture of their skins into untanned leather for wearing apparel, tents, horse and dog harness, and for the purpose of cords or lines of all sorts, canoes, &c., besides curing the meat and tallow which they get from the carcase for food.

Those tribes inhabiting the north, Hudson's Bay, and other wooded portions of the country exist chiefly on the two kinds of reindeer or caribou and the moose, besides which the black bear, musk rat, porcupine, beaver, and that most useful of all animals in times of scarcity, the never failing rabbit or rather hare, together with fish and fowl. The musk ox is confined to the north.

Buffalo.—Those Indians belonging to the prairie and semi-prairie parts of the great plains depend for their support almost entirely on the buffalo, or, as it should, perhaps, be called, strictly speaking, the bison; and as the Indians of this district outnumber all the others, while at the same time the greater portion of the voyagers and others engaged in the fur trade are fed on provisions manufactured from this animal, together with the half-breeds of Red River, and also, considering the numbers which are wantonly slaughtered, it cannot but appear evident that this animal must exist in immense numbers. Having taken some trouble to obtain the most reliable data in respect of the numbers annually killed, in which I have been aided by gentlemen in the fur trade, I consider since 1842, when the Hudson's Bay Company first commenced to trade to any great extent in robes, there have been no less than 145,000 buffalo annually killed in British territory; while on the great prairies on the American side, where the trade in buffalo robes has been carried on to a far greater extent, the amount annually slaughtered at the early part of the period mentioned was upwards of 1,000,000, but this trade is now said to have decreased on the Missouri one-half. In 1855, on the British side alone, there were 20,000 robes and skins received at York Factory on Hudson's Bay, which, making all allowances, would give about 230,000 slaughtered the previous year. This in a civilized country, allowing 2lbs. per head per diem, a very liberal allowance, would have served to sustain a population of a quarter of a million, while, probably, 30,000 only benefited by this slaughter.

From these statements it is but reasonable to suppose, that although the buffalo still exist in immense numbers, they must be on the decrease, and it is well known that on the southern prairies

they are becoming very scarce, and on the west side of the mountains are extinct; while in the country of the Saskatchewan, notwithstanding that the contrary opinion is held by many, they are also decreasing, being now unknown in places where they were formerly abundant. This the Indians know well, and may yet know to their cost, for if some decided measures be not taken, Indians and buffalo will disappear simultaneously. We may, nevertheless, look for their existence yet for many years, for the decrease in the buffalo on the Saskatchewan does not seem to be proportionate to the numbers killed, and it is a prevailing idea with some people, that the animals are being driven north from the Missouri on to British ground; this may to some extent be the case.

Other Large Game.—As I before stated, the prairie Indians depend almost entirely on buffalo for their support, and the only mode of curing the meat is by drying or "jerking," which may or may not be by pounding and mixing with grease, formed into "pemmican." But those Indians inhabiting the slopes of the mountains and semi-wooded country around the edge of the prairies also kill for the sake of their skins and meat, the wapiti, two smaller kinds of deer, the prong-horned antelope, black and grisly bears, big-horn and mountain goat, besides the fur-bearing animals, and as is the case with all Indians, resort to rabbits in case of necessity.

Birds.—As to birds, many Indians (but more particularly those called "Swampies") exist for a considerable time both in spring and fall entirely on ducks, geese, and other water-fowl, at the killing of which with the least possible expenditure of ammunition they are very expert; and from the nature of the lower parts of the country, water-fowl are in so great demand for food that they are killed for the purpose of salting. As I hope soon to be in possession of returns of the numbers annually killed for that purpose in Hudson's Bay, I shall probably insert some particulars concerning this in a paper on the "Birds of the Interior of British North America," which it is my intention to draw up for the Zoological Society.

The white partridges (grouse and ptarmigan) are also in use as provisions in the north.

Having given this necessarily cursory view of the land animals, I come to the inhabitants of the waters.

Aquatic Animals.—The Esquimaux of the coasts make use of the seal as an article of food and for other purposes, and this, together with the waburs and white bear, is found amongst the Arctic Islands to Hudson's Straits and in the Bay.

Then there is the large white porpoise, commonly called by the residents the "white whale," which is abundant in Hudson's Bay, usually during summer keeping about the mouths of the rivers. This animal has been made a source of some profit to the Hudson's Bay Company by the import into England of the oil extracted from it; and they have of late years established a regular fishery for the same at Little Whale River on the east main. Of the quality of the oil I can only say, that I have heard it is found to answer the same purposes as that of the sperm whale.

Fish.—The fish, par excellence, of the interior is the white fish (coreyonus albus), which may be said to be universally distributed through the numerous lakes. It is in the opinion of all who have had opportunities of judging, the only fish of the country which one can live on continually without tiring of it. The average weight may be taken, perhaps, at from 2 to 3 lbs., but in some lakes they grow to large size, and I have myself seen them weighing upwards of 11 lbs., and the average of 200 from 5 to 7 lbs. A smaller species of white fish is found near the mouths of rivers emptying into Hudson's Bay. The fish next in request is the sturgeon, of which there are two or more species inhabiting the lakes and rivers; and although they do not in these inland waters reach the size of the Columbia River fish, yet they are met with in the Winipeg and Lower Saskatchewan districts to 160 lbs. To give some idea of the rations required to feed the inmates of a trading post, including the dogs, I may mention that at Cumberland House, there are yearly taken 500 to 700 sturgeon and 10,000 white fish, while at the same time potatoes, barley, and a little wheat are grown. There are many other kinds of fish, pike, gold-eyes, trout (some of which attain immense size), cat-fish, suckers, &c., which all serve to keep the pot boiling during hard times.

The general mode of fishing throughout the country (sturgeon included) is with the net, summer and winter; during the latter time the nets are set under the ice. A great advantage of the severe weather of winter is that fish as well as all meat requires no curing of any sort, but is kept frozen; and in the buffalo country it is usual to construct ice cellars on the approach of spring, when a large supply of meat may be kept during the ensuing warm weather.

A.—III.

Climate.

Climate.—Having giving a general description of the natural productions as well as the physical features of the interior, it is necessary, before speaking of the development of its resources, to give some idea of the climate, and in so doing I shall omit the scientific and unnecessary details, which would rather confuse than elucidate.

There have been and possibly still exist, more particularly in Canada, most erroneous opinions concerning the country and climate of the Red River and the west; I have seen it described as superior even to the south-western peninsula of Canada, which to any observant person must appear absurd; and those who have been led away by such statements need only have looked at any map of the continent to have been convinced that, in the face of 5° difference of latitude between even the central part of that peninsula and the most southern limits of the interior, notwithstanding the westing, this was most improbable.

Materials.—The materials from which a knowledge of the climate of the country under consideration has been drawn are the results of regular meteorological observations carried on simultaneously

at Red River Settlement and Fort Carlton on the Saskatchewan River; two points which could hardly have been more happily situated had they been selected purposely. At Red River two distinct sets of observations were kept up, one at the Hospital of the Royal Canadian Rifles under the direction of Dr. Stranaghan of the Medical Staff, while the other was the continuation of a register kept by Mr. Donald Gunn, of St. Andrews; to both of these gentlemen I am greatly indebted for full copies of their observations. That at Fort Carlton was of observations made during the stay of Captain Palliser's expedition, and afterwards kept up by Mr. Richard Hardisty, the gentleman in charge, and those under him. All the above observations have been discussed for 18 months, commencing November 1857. But besides these simultaneous observations, others have been made on former occasions, among which I may mention those of Lieutenant now Colonel Lefroy, R.A., at Lake Athabasca and Fort Simpson in 1843–4; those of Sir John Richardson and Dr. Rae at Great Bear Lake in 1848–9; those of Franklin's two journeys; besides a number of registers and detached observations collected in Sir John Richardson's "Journal of a Boat Voyage." Also, with a view to assist me in drawing a comparison with the climate of Canada, Professor Kingston, in charge of the "Provincial Observatory" at Toronto, has kindly furnished me with numerous records of meteorological observations.

From these several sources then has the information been drawn, of which, although the results appear small, yet the labour required in carrying out, as well as discussing the observations, is very considerable.

Climate of Interior.—From the maxima, minima, and means deduced from these observations it appears, taking the climate of Toronto as a base, that while the mean summer temperature at Red River differs but little, that of winter falls far below it; and speaking generally, the climate of the interior may be said to be one of extremes. I have drawn the annexed plate in order to show at a glance the corresponding temperatures at the different places selected; which, although not giving the details which would appear in a more scientific paper, yet may be sufficient for the present purpose.

Division of the Seasons.—I have not followed the general mode of dividing the seasons, which, although adapted to temperate regions, fails to give a good idea of a climate where the transition from an Arctic to an almost tropical temperature is so sudden, I have therefore considered the winter season as embracing five months, which leaves summer as usually taken, but cuts off the coldest month from both spring and autumn.

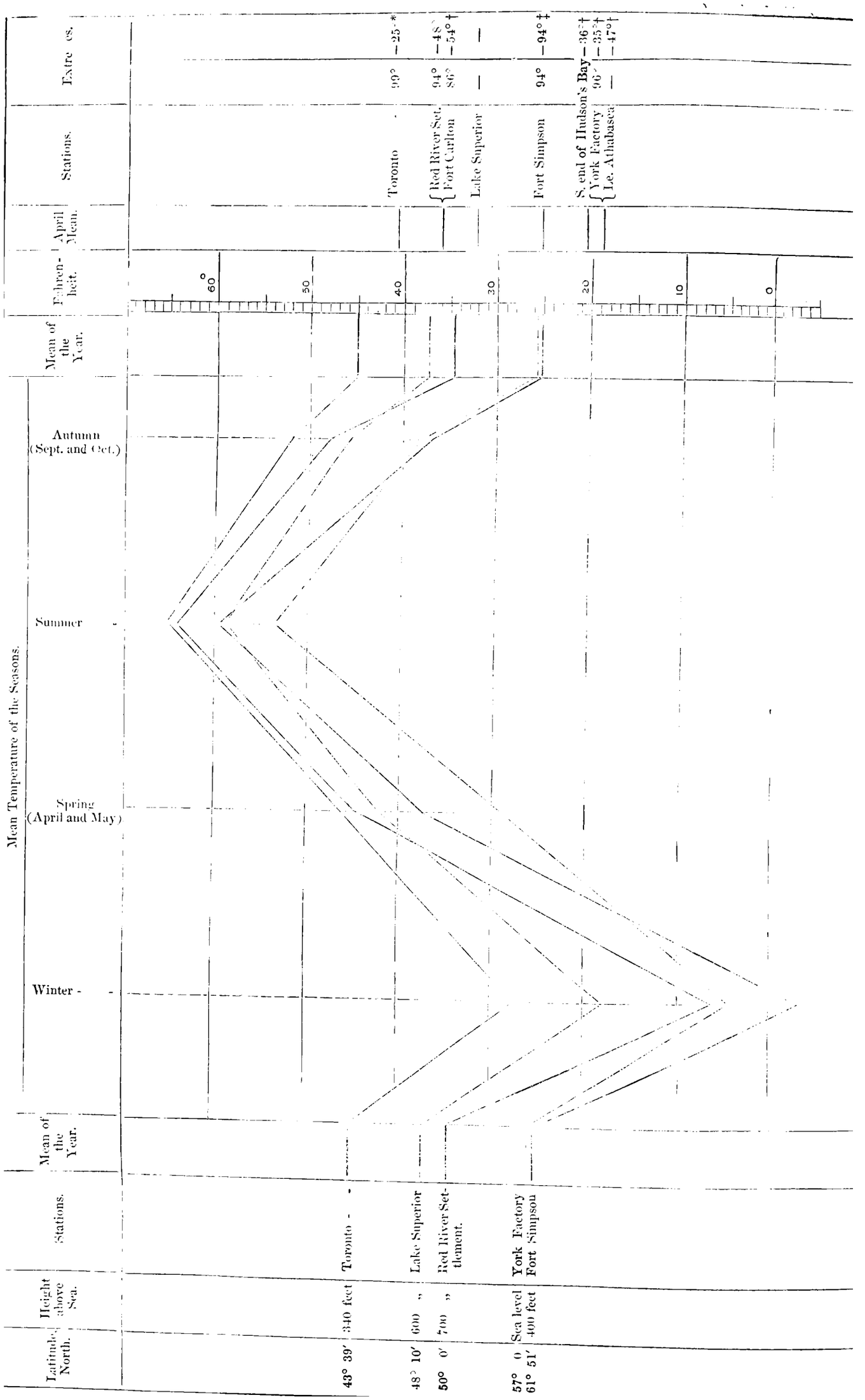
Stations.—The different stations have been selected as those which, from their positions and the number of meteorological observations made at them, would afford the best general information of the climate of the whole country. There are, of course, certain situations where influences of a local nature seem to modify the climate, but these are only exceptions, and do not enter into the general view.

Facts relating to the Climate.—Before attempting to draw any general conclusions, I will direct attention to a few facts which ought to be kept in view. First, the mean annual temperature of the whole interior is lower than Canada; second, that while the mean summer temperature in the southern part is nearly equal to that of Toronto, the winter climate is much more severe; and lastly, the spring temperature of the western plains in latitude 53° N., notwithstanding their elevation nearly equals Toronto, 8° further south.

Influence of Lakes.—Then with respect to the country itself, it must be apparent to any one that Hudson's Bay and the Lakes have very great influence on the climate, particularly with respect to the spring and summer temperature. Hence the wide discrepancy between Fort Simpson and York Factory or the south of Hudson's Bay, which having annual temperatures equal to and above the first, fall so much short of it in the spring; again the backward spring season of Lake Superior results from the ice it contains, while the coldness of the deep water during summer aids in tempering that season; the same holds good for Lake Athabasca. And lastly, the comparatively low spring (particularly April) temperature of Red River compared with the Saskatchewan at so much greater elevation is no doubt due to its proximity to Lake Winipeg.

In a report contained in the Parliamentary Papers (dated June 1859), concerning the explorations of the country between Lake Superior and Red River Settlement, carried on under the Canadian Government, there is a comparison given of the climates of Red River Settlement and Toronto, and which from its authority might be liable to lead many into error. But it appears that only one year's observations having been taken, and the means deduced from certain hours of the day without correction, it has made the summer temperature of Red River 4° higher than that of Toronto; and again, owing to the estimated amount of rain at the former having been compared with the actual amount at Toronto, has given no less than 21 inches in favour of Red River for the summer season alone. Now, although this may be the case, it is hardly probable; and although the inhabitants of Red River Settlement should take into account the good as well as the harm done by the frequent thunder storms which pass over that region during the hot summer weather, yet I must hold to the opinion that the fall of rain has been somewhat exaggerated. I need only refer to the plate on the following page for the results of carefully corrected registrations of the temperature of the whole year and several seasons, which will, I think, be found not very wide of the truth.

Cold Nights.—It should here be observed, with respect to the climate of the Red River and Saskatchewan country, that although the summer temperature is high, yet the thermometer generally falls to the freezing point at the end of May and August, and occasionally frosts occur in


Mean Temperature of the Seasons.
Autumn (Sept. and Oct.)
Summer
Spring (April and May)
Winter
Stations.
Mean of the Year.
Height above Sea.
Latitude North.
Toronto
Lake Superior
Red River Settlement.
York Factory
Fort Simpson
340 feet
600 „
700 „
Sea level
400 feet
43° 39′
48° 10′
50° 0′
57° 0
61° 51′
Fahrenheit.
60°
50
40
30
20
10
0
April Mean.
Stations.
Extremes.
Toronto
Red River Set.
Fort Carlton
Lake Superior
Fort Simpson
S. end of Hudson's Bay
York Factory
Le. Athabasca
99°
94°
86°
94°
96°
— 25° *
— 48°
— 54° †
—
— 94° ‡
— 36° †
— 35° †
— 47° †

every month in the year. I have myself, at 2,000 feet above the sea, registered the thermometer at 86° on the 17th July in latitude 53°, and but nine days after, not having changed my altitude more than 1,000 feet, and to the south of the former position, seen it at 31° at sunrise.

Winter.—Winter may be said to set in with November and last till the end of March or middle of April; but the first snow falls sometimes in the commencement of October and lasts until May. The thermometer ranges over 140° of Fahrenheit.

There sometimes occur most exceptional phenomena; thus, in March 1858, after two days of magnificent auroral displays and intense magnetic disturbance, a cyclone or revolving storm, which at Red River on the 14th was accompanied by thunder, passed over the country, bringing rain and a rapid thaw; a few days after the thermometer was at 2°, and had been 25° below zero on the 1st of the month.

Rivers and Lakes ice-bound.—Although Lake Winipeg is seldom navigable before June, yet the Red River and Saskatchewan having been closed for the previous five months usually break up about the middle of April; however this also varies, for on the 1st of May of the present year I crossed the Red River at 49° parallel on the ice with horses; while on the same day, the snow being on the ground, the thermometer rose to 74°.

Wind and Rain.—The prevailing winds at Red River Settlement are north and south, the former being about one-fourth and the latter one-third of the whole from the eight principal points of the compass; the remainder being mostly on the west side. At Red River and on the Saskatchewan, when a north-east or easterly wind springs up, thick weather is certain to follow, which in summer is usually attended with rain and in winter snow; this is, no doubt, entirely owing to the presence of ice at the former and open sea during the latter season in Hudson's Bay; and it should be recollected that the bay has a greater influence on the climate of the more northern part than any other feature of the continent. Were it not for the bay the British territory would be no better than the sterile waste on the eastern flank of the chain of the Rocky Mountains, which is already being felt as such a formidable barrier to the progress of western enterprise beyond the Mississippi valley; and moreover, when we consider that Lake Baikal and Winipeg are very similarly situated in their respective continents, and that while their mid-winter temperatures differ but little, the isothermal of July for Red River passes considerably to the south of the Siberian Lake through Central France and the Azores, we cannot but feel thankful that the Anglo-Saxon race was guided towards the New World.

Climates of Old and New Worlds.—Many inquire, why the climate of North America differs so much from that of Europe? But the converse should rather be asked; why does Europe differ in climate so greatly from North America? which could be answered in the few words,—on account of the gulf stream. And in comparing the climate of the two continents, we should rather contrast Europe with the Pacific side of North America and the eastern or greater portion with Asia; thus we bring together two regions having for the amelioration of their climate similar causes, namely, the gulf stream of the North Atlantic, and if we may so call it, the Pacific gulf stream, while the two other masses of land are under much the same conditions, with the exception, perhaps, of Siberia containing no equivalent to Hudson's Bay.

B.

The Inhabitants.

The inhabitants of the vast but thinly populated interior of Northern America are separable into four divisions; namely, North American Indians, Esquimaux, whites, and half-breeds; the aborigines being the most numerous, and the whites considerably in the minority.

I.

Aborigines.

Esquimaux.—First, in speaking of the Esquimaux or Arctic natives, I will give in a few words such information as I have gained from the works of explorers and by intercourse with gentlemen of the fur trade.

The Esquimaux, as one person remarked to me, "are not Indians, we never call them Indians," said he; "they are as distinct from the real Indians as the negro from the white man; they are "more like Europeans in appearance, traditions, and mode of life." Little doubt exists but that the Esquimaux of the Arctic regions of Europe, Asia, and America are the same race; but I shall leave to ethnologists to determine where was their original habitat, or how and for what purpose they were distributed as we now find them, as well as the origin of the Indians of this new world. Besides assimilating to the whites in appearance, the Esquimaux possess a quality in common with them, which I may say is almost unknown among Indians, namely, providence; thus, in the season when the animals are plentiful on the shores of the Arctic Sea, they make "caches" of large quantities of meat for winter use.

Speaking generally, this nation is confined to the shores of the Arctic Sea, the northern and eastern parts of Hudson's Bay, and Labrador; and missionaries have only come in contact with them on the east main and last-mentioned place. Parties of them, inhabiting certain districts, are spoken of as being treacherous, and others again as quite the reverse.

The art of dog and sledge driving is known almost to perfection among them.

Localities of Indian Nations.—In enumerating the different nations and tribes of Indians inhabiting the interior, I shall not include those of Canada, for whom provision is made in that province, nor can I speak of the numerous inhabitants of the Pacific coast.

According to ethnologists, the different tribes inhabiting the country are ranged under five great nations—the Alsonquin, Dacotah, Chipweyan, the Kutchin, and those of the Pacific slope, which severally include the tribes as here enumerated:—

1. Aborigines.—1. Crees of the coast.
   2. Swampy Crees.
   3. Thickwood Crees.
   4. Prairie Crees.
   5. Mountain Crees.
   6. Saulteau or Chippeway.
2. Dacotah. — 1. Sioux.
   2. Assiniboine or Stone Indians (prairie and wood).
   3. Blackfeet (including Blood and Piegan.)
3. Chipweyans.—1. Chipweyan (proper).
   2. Hare Indians.
   3. Dog Ribs.
   4. Beaver Indians.
   4. Lucree (Circees.)
4. Kutchin or Loucheaux.
5. — 1. Kootonays.
   2. Flathead.
   3. Shoushwaps.

To begin with the north, the different tribes of Chipweyans extend from the north-western part of Hudson's Bay across the continent to the Pacific, bordering the Esquimaux on the north, except westward of Mackenzie's River, where the Kutchin interpose, who extend into the Russian dominions, and are said to be a people of large stature and warlike nature.

To the south of the Chipweyan barrier comes the Algurquin nation, whose representatives in the interior are the different Crees and the Chippeways or Soulteaux; the latter are almost exclusively confined to the south part of Lake Winipeg and the country thence to and around Lake Superior. But the Crees are distributed over the whole country around Hudson's Bay, and west to the Rocky Mountains; they are numerous, and from the fact of their having always been favourable to the traders and the first to obtain fire-arms, are a powerful people. There can be little doubt but that they were in former times Indians of the woods and confined to the east of Lake Winipeg; and I think that Sir Alexander Mackenzie's theory of the progress of the different nations is not far from the truth when he says that the Algongains have progressed westerly, the Chipweyans easterly, and the Dacotahs northerly.

The Dacotahs, of which the Sioux tribe form the greater part, being of themselves 30,000, are mostly confined to the territory of the United States; but the Assiniboine or Stone Indians of the plains of the Saskatchewan are of the Surix tribe, although they have been for many years separate from it, and the Blackfeet, three divisions of which tribe extend to the Saskatchewan near the Rocky Mountains, are all said to belong to the same nation.

Shoushwaps.—On the Pacific side, but near the Rocky Mountains, are the Shoushwaps, who, inhabiting the upper part of Frazer's River and the north fork of the Columbia, have always behaved peaceably towards the whites; but in search after the precious metal, unthinking persons may yet make formidable enemies out of beings heretofore considered harmless.

Kootonays.—To the south of these are the Kootonays, who it would appear are not a numerous tribe; they live in peace with their southern neighbours, the Flatheads, who, as they seldom come north of 49°, do not properly come under observation here. These two tribes have in times gone by joined for the purpose of carrying on war with their mutual enemies, the Blackfeet, who have usually commenced the quarrel by stealing horses, in which these western slope Indians are rich. Although a quiet, peaceful, and honest tribe, the Kootonays are said to be remarkably brave, and have on different occasions made such a display of strength that their former enemies are now glad enough to keep on terms of friendship with them. Some of the Blackfeet, therefore, usually meet them yearly when they come to the east side of the mountains (which they do regularly in the spring and fall for the purpose of killing buffalo, and curing the meat for their own subsistence and trade) for the purpose of traffic and exchange of horses, guns, blankets, and other indispensables of savage life.

Some years ago they went so far as to exchange two lads for the purpose of learning each other's languages, one of whom (a Kootonay) became useful to me as an interpreter when amongst his people. Another one, who acted as guide and interpreter in my second passage of the mountains, had when young lived a considerable time with both the Crees and Blackfeet, and boasted that he could count ten in as many languages as he had fingers on his hand, namely, Kootonay, Flathead, Blackfoot, Cree, and French, he having learned the last from the half-breed French Canadian traders.

From these circumstances, the care they bestow on their horses and cattle, and from not being addicted to begging or stealing, the Kootonays contrast favourably with the Indians of the east side, and as I have already mentioned (see Appendix II.), I am at a loss to know to what to attribute this marked difference. If, as I have premised, it can be attributed to their partial Christianization, still it remains a contrast to the effects produced elsewhere. It appears to me that they are in a state highly favourable to further civilization; and I would select the tobacco plains (the centre of their country) as a point well adapted for one of the Indian agricultural settlements, which I should propose to be established by this country for the benefit of the natives of the interior. When, indeed,

we look on the state of the aborigines throughout the world, but more particularly in North America, where the march of civilization has been so rapid, we cannot but feel that we owe something to those poor uncivilized people whom we deprive both of their lands and means of existence. This has been so ably pointed out by Mr. Hopkinson in a speech on the Seminole war on the floor of Congress, that I make no apology for giving his precise words:—

Duty towards the Indians.—"I may say, however, that I presume the origin of this war is the same "with all our Indian wars. It lies deep, beyond the power of eradication, in the mighty wrongs we "have heaped upon the miserable nations of these lands. I cannot refuse them my heartfelt sympathy; "reflect upon what they were, and look upon them as they are. Great nations dwindled down into "wandering tribes, and powerful kings degraded to beggarly chiefs. Once the sole possessors of "unmeasureable wilds, it could not have entered into their imagination that there was a force on "earth to disturb their possession and overthrow their power. It entered not into their imagination "that from beyond that great water, which to them was an unpassable limit, would come a race of "beings to despoil them of their inheritance, and sweep them from the earth. Three hundred years "have rolled into the bosom of eternity since the white man put his foot on these silent shores, and "every day and hour and every moment has been marked with some act of cruelty and oppression. "Imposing on the credulity and ignorance of the aborigines, and overawing their fears by the use of "instruments of death or inconceivable terror, the strangers gradually established themselves, in- "creasing the work of destruction with the increase of their strength. The tide of civilization, for "so we call it, fled from the inexhaustible sources in Europe, as well by its own means of aug "mentation, swells rapidly and presses on the savage. He retreats from forest to forest, from moun- "tain to mountain, hoping at every remove he has left enough for his invaders, and may enjoy in "peace his new abode; but in vain, it is only in the grave, the last retreat of man, that he will find "repose. He recedes before the swelling waters; the cry of his complaint becomes more distant "and feeble, and soon will be heard no more. I hear, sir, of benificent plans for civilizing the "Indians and securing their possessions to them. The great men who make these efforts will have the "approbation of God and their own conscience, but this will be all their success. I consider the fate "of the Indian as inevitably fixed. He must perish. The decree of extermination has long since "gone forth, and the execution of it is in rapid progress. Avarice, sir, has counted their acres and "power, their force and avarice and power march on together to their destruction. You talk of the "scalping knife, what is it to the liquid poison you pour down the throats of these wretched beings? "You declaim against the murderous tomahawk, what is it in comparison with your arms, your "discipline, your numbers? The contest is in vain, and equally vain are the efforts of a handfull of "benevolent men against a combination of force stimulated by avarice and the temptations of "wealth. When in the documents on your table I see in the triumphal march of General Jackson "he meets from time to time (the only enemy he saw) groups of old men and women and children "gathering on the edge of a morass, their villages destroyed, their corn and provisions carried off, "houseless in the depth of winter, looking for death alternately to famine and the sword, my heart "sickens at a scene so charged with wretchedness. To rouse us from a sympathy so deep, so "irresistible, we are told of the scalping knife and the tomahawk of our slaughtered women and "children. We speak of these things as if women and children were unknown to the Indians, as if "they had no such being among them, no such near and dear relation, as if they belong only to us. "It is not so. The poor Indian mother, crouching in her miserable wigwam or resting under the "broad canopy of heaven, presses her naked infant to her bosom with as true and fond emotion as "the fairest in our land, and her heart is torn with as keen anguish if it perish in her sight."

Management of Indian Affairs, United States.—The people of the United States have so far taken this subject into consideration, that a large sum is annually granted for the benefit of the aborigines, a portion of which has of late years been expended in a manner likely to be of more permanent benefit to them than the former system of Indian (so called) "presents" still carried on in Canada. In the central governments of the United States the office of Indian affairs is a branch of the department of the Interior, the business connected with which is under the control of the "Commissioner of Indian Affairs," who annually makes his report, which accompanies that of the Secretary of the Interior, and is published by the country and distributed among the members of Congress; and I have now before me the report for 1858, by which it appears that scattered throughout the Union are about 350,000 Indians, among whom are located near a hundred superintendents, agents, teachers, and farmers, whose reports are all annually published.

With respect to the manner of treating the Indians, the words of the Commissioner are "Experience "has demonstrated that at least three serious, and to the Indians fatal, errors have hitherto marked" the United States policy towards them, "viz., their removal from place to place as white population "advanced, the assignment to them of too great an extent of country to be held in common, and the "allowance of large sums of money as annuities for the lands ceded by them. These errors, far "more than the want of capacity on the part of the Indian, have been the cause of the very limited "success of constant efforts to domesticate and civilize him."

But each year more attention is now being directed to the establishment of schools for farming and useful arts, and in some places the Indians seem to have already derived much benefit.

The Indians on the East Side.—Before making this digression, I submitted some general statements concerning the different nations of Indians, and having in a former report (see Appendix H.) described more particularly those Indians which I came in contact with on the west side, I shall now proceed to notice the tribes whose hunting grounds lie to the east of the Rocky Mountains, and who are more properly the aborigines of the country treated of in this report.

Chipweyan.—Of the northern tribes I have no personal knowledge, but the Chipweyans, with the exception of one band originally Beaver Indians, who now live on the Saskatchewan prairies under the name of Circees or Surcees, are purely Wood Indians, and are said, when the language is acquired, to be by no means difficult to deal with; and their country being mostly thick woods, and intersected by numerous rivers connecting the different lakes, their mode of life differs little from other inhabitants of similar districts, where the horse being unknown, the facilities for transport are confined to the canoe and snow shoe. Traders having been among them for many years, they are now, in common with others, dependent on the whites for articles of every-day use.

Coast and Swampy Crees.—The country around Hudson's Bay, and including its southern extremity, called James Bay, is thinly inhabited by Coast and Swampy Crees; and the latter extend as far inland as English River, Lake Winipeg, and the lower part of the Saskatchewan; there are also many at the Indian settlement near the mouth of Red River, but they have only been drawn there by the advantages afforded by civilization, and of these there are few that can be called pure Indians. This is much the case throughout the whole swampy portion of the Crees, owing to their having been longer associated with whites than any other tribe. In fact, the Crees generally may thank the traders for the greater part of the interior they now have in their hands, for it is not a great many years since the Blackfeet held the whole Saskatchewan plains, at which time the Stone Indians or Assiniboines inhabited the country lying along the river of that name, and the Crees were confined mostly to the thickly-wooded country to the north of Lake Winipeg, and between that lake and Hudson's Bay. On the fur trade, however, being pushed up the Saskatchewan and the Crees obtaining fire-arms of the traders, they drove the Blackfeet and Fall Indians, or Gros Ventres, west, at the same time taking to horses, they gradually became Prairie Indians, and forming a league with the Stone Indians, who, as late as 1819, could not obtain guns in trade at the forts, succeeded in confining Blackfeet to the limits they now rarely overstep, namely, from the upper waters of the Saskatchewan in a line towards Fort Union on the Missouri, as shown on the map. Crees also inhabit the country to the north of the Saskatchewan, where they are mostly what are called thick or strong-wood Indians, there being only a few horses among them.

Treatment of Horses.—The Crees of the prairies, or as they are usually called by the English speaking portion of the inhabitants, "Plain Crees," show a great want of knowledge and feeling in the treatment of their horses, which is also largely shared in by their "half brothers," who call themselves civilized. A horse by them is treated like a dog (and dogs certainly do not experience the kindest treatment at the hands of the Indian women), and they are so given to barter, that if any kind of brute having four legs and a head is offered, and some trifling article to boot, a Cree will close the bargain; there are, of course, exceptions.

There can be little doubt that the Crees originally had no horses, which their word for a horse "Mistatim" (big dog) clearly shows. We may, however, say that of all the Indians, if we are to believe that the animal did not exist in America before the invasion by the Spaniards.

The Stone Indians or Assiniboines show equal ignorance of the horse with the Crees.

The Blackfeet, being further west and south, treat their animals better, and have more of them; but the Kootonays before spoken of, living on the west side of the Rocky Mountains, have more knowledge, take more care of, and own many more horses in proportion to their numbers than any of the tribes on the east side, besides which they are adepts at the use of the lasso.

All Indians own large numbers of dogs, which are used in hauling lodge or tent poles and other loads. They live on what they can pick up or steal, and are managed by the women. They have mostly a very wolfish look, and often breed with those hyenas of the north.

Chippeways.—The Chippeways, or as they are also called Saulteaux and Ojibeways, are in language and habits nearly related to the Crees.

They are, I think, generally speaking a fine race, as I have seen many men of large stature among them, and on an average (although I have not data on which to give a decided opinion) are probably over the height of Anglo-Saxons, from whom the Indians generally differ little, although they are usually not so stoutly formed as the white man.

The Chippeway country is around Lake Superior and Red River, a few being to the west of Lake Winipeg. They are essentially Wood Indians, but some few, as is always the case, bordering on the prairie Indians, have fallen into their mode of life. They seem to be, if we may judge from the reports of travellers through their country, somewhat noted for their elocution, but to make a little too much out of Indian speeches is an error into which many persons fall.

However the Chippeways are a good deal mixed up with half-breeds and Swampy Crees at Red River Settlement, some going under the name of Christians, and are generally very favourable to the whites.

Sioux Nation.—I have last to speak of the Sioux or Dacotah Indians, the mention of whose name strikes terror into the mind of may a young half-breed, brought up to regard them as inveterate aud bloodthirsty enemies.

Stone Indians.—The Stone Indians or Assiniboines were of this people, but in times long past separated from the main tribe, and now live at peace with the Crees from the Missouri to the Saskatchewan, besides a few families along the Rocky Mountains. Within the memory of man they have been dreadfully reduced by that scourge of savage life, the small-pox. In habits they differ little from the Crees, but were formerly considered much greater thieves.

Sioux.—The Sioux proper do not live to the north of the international boundary, but as they are often encountered by the Red River half-breed hunters, who are their inveterate enemies, I considered that I was bound to introduce them here. They are numerous, and said to be brave,

and the Salteaux (Chippeways of Red River) are their perpetual enemies, and sometimes join the half-breeds for the purpose of chastising them.

Blackfeet.—The Blackfeet, who are said to be of the Dacotah nation, and of whom the different branches, Blackfeet proper, Piegans, Blood Indians, and Gros-Ventres or Fall Indians are still in large numbers, constitute a powerful tribe. This people is, perhaps, of all the Indians east of the Rocky Mountains the least dependent on the whites, and having in times past caused considerable annoyance to the traders by their depredations, and, moreover, being seldom at peace with the Indians around them, they received a bad name, which has clung to them. Since, however, I have had opportunities of judging of their character compared with that of the other tribes inhabiting the plains, I have formed a more favourable impression of them. They are, in common with their neighbours, the Crees and Stone Indians, great thieves, as also beggars, but on account of having been brought less in contact with the whites, they have a more independent manner. Their chiefs also have some command over their men, which is but very slightly the case among either Stone or Cree Indians. They are true Prairie Indians, and occupy the whole country from the Missouri on the south to the Saskatchewan on the north, near the Rocky Mountains. Their territory formerly, as has been said, extended far to the east. The buffalo is their main support. From conversations which I had with several of them, it would appear that they are favourably inclined towards the introduction of civilization among them, which has as yet hardly been attempted. They are aware that the buffalo are rapidly decreasing, and foresee that their descendants will have to take to some other way of living than the lazy yet not luxurious mode followed at present. The custom of polygamy is more prevalent among them than with the Crees, but the women are better looking and far cleaner than their neighbours. The men are also I think generally more robust. Owing to the laws of the United States prohibiting the sale of spirituous liquors to the Indians, they can obtain very little on the Missouri, and although they go there to get their goods at the cheaper rate, yet they often travel five or six hundred miles for the purpose of obtaining the much coveted commodity at the Hudson's Bay Company trading posts on the Saskatchewan River, where they are never refused if they pay in horses or dried provisions. The scenes which ensue on these visits of bands of Indians for the purpose of liquor trade are beyond description. It is not uncommon for wives to be offered in trade for rum. They are so fond of the liquor that, although they know that they become poorer by taking it in place of useful articles, yet they say that they hope it will not be prohibited. Certain it is that if there were a law enforced against it on the British side of the line, the trade in buffalo robes and provisions would decrease considerably on the Saskatchewan. However, let us hope that such a state of things will not much longer exist, but that a law being enacted, it will be the duty of an Indian Commissioner and his agents to put a stop to this demoralizing traffic. All missionaries agree on this point, that they can make nothing of the Indians where liquor is in use, and I have been repeatedly solicited to use my best endeavours for its suppression. Moreover, the gentlemen of the fur trade, who deal directly with the Indians, would only be too glad to see the system of liquor traffic or "presents" entirely abolished.

Mode of Life of Indians.—In speaking of the mode of living of the Indians, we must separate those inhabiting the thickly wooded country from their brethren of the prairies; and taking first of all the thick-wood Indians, including the different tribes that extend over the whole country, except the plains to the south of the Saskatchewan River, they may be said to live much in the following manner.

Thick-wood Indians.—During the summer they move about by means of canoes, usually a few families together, living on the fat of the land, namely, waterfowl, fish, berries, &c., while fur taken at this season being of little value they live a rather lazy life. Before the end of the autumn they find their way to their separate trading posts, and then take a number of supplies required for the coming winter "in debt," the amount of which depends on the trader's opinion as to their hunting powers. With this they make off to the region of their intended winter hunting grounds, sometimes prosecuting a fishery before the setting in of winter. During the winter they form their tents in a more permanent manner, in order to resist the cold, and do not often shift their camps, from whence they trap, hunt, and gradually accumulate fur. Some keep a fishery going the whole time for their subsistence, but occasionally, on the failure of this and the scarcity of game, they are reduced to great straits for existence; cannibalism is, however, rarely heard of.

Some of the men may visit the fort during the winter for the purpose of obtaining a few additional supplies. When the rivers open in the spring they depend largely on waterfowl for their support, and make their way to the forts, where, if they have been successful in hunting during the winter, they pay off their debts, and procure ammunition and other requisites with the balance of their furs. It is customary also in the country around Lake Winipeg and the Saskatchewan to give each Indian a present of rum on his paying off his debt, and moreover (although I believe it is against the regulations of the Hudson's Bay Company) to sell him more liquor if he wishes it for his extra furs. I must say, however, that the gentlemen of the fur trade are in many cases driven to this practice by the competition kept up in some parts of the country by the petty traders.

Prairie Indians.—The life of a Prairie Indian is of a more free and independent nature. During the summer he roams about the plains following the buffalo, and living on them, and in the winter, camped usually in the shelter of woods, he still lives on buffalo, of which he often catches numbers at a time by means of the "pound." These Indians, although inhabiting the comparatively small portion of prairie country, outnumber all the other Indians scattered over the interior east of the Rocky Mountains. They live usually in large bands, seldom less than 40 tents, 120 fighting men, or 400 souls together. They exist entirely by the buffalo, the skins of which are dressed for shoes and other clothing, and also for their tents. They seldom eat anything but buffalo beef, and

accumulate the dried meat and grease of the animal, as well as the skins, for trade. They own numbers of ponies and dogs. When short of ammunition, tobacco, knives, or other necessaries, they visit one of the trading forts, which, on account of the numbers of Indians who come in to trade at the same time, are surrounded by high stockades for defence in case of disturbance. Spirituous liquors are traded *ad libitum*, and the scenes of drunkenness and riot witnessed on the arrival of a band of prairie Indians are almost beyond description, suffice it in this place to say that the amount of well-watered rum which is given in exchange is of but slight value when compared with the provisions, skins, and horses obtained from the Indians. So well is the knack of dealing with Indians known by those engaged in the trade, that it is rare to hear of any serious disturbance. Guns, blankets, cloth, tobacco, ammunition, knives, &c. are obtained by these Indians at the forts, but they are not nearly so much dependent on the whites as the wood Indians before described.

Numbers of Indians.—According to the most reliable estimates, the number of wood Indians of all tribes east of the Rock Mountains, excluding Canada, is 20,000, while the prairie Indians trading on the Saskatchewan, Assiniboine, and Quappelle Rivers have been estimated at 26,000. This includes those who also trade on the Missouri, and live as much on one side of the line as the other; but deducting them, I think this estimate is considerably beyond the mark, and I regret that the returns of a census made by the orders of the Hudson's Bay Company during the winter of 1857 and 1858 have not yet reached this country, which would have allowed me to have given accurate returns of the different tribes. The Esquimaux, who are not included in the above numbers, are supposed to be about 4,000. Thus there are about 40,000 souls, whose welfare it would be but right to consider when making provision for the government of the country they inhabit.

There is but one treaty in existence with any Indians on the British side of 49°, and this was a bargain made by Lord Selkirk with the Chief of the Red River Chippeways, for the land on either side of Red River above what is known as the "Sugar Point," extending as far back from the river as "on a clear day a man can be distinguished from a horse;" while the Americans have made treaties and bought land to the very foot of the Rocky Mountains. But this system of treaty making with aborigines may be abused, and without doubt the payment of an annual sum and his removal to a distant locality can hardly be called a recompence to the Indian, who, if he goes not willingly, is forced to give way to the white man. If he could still live in the way in which he has been brought up, then the payment of beads, blankets, and other articles of Indian use would be a fair recompence; but with civilization closing in upon him these things only serve to help him to drag out a miserable existence in a (to him) miserable country. No, the permanent benefit which ought to be conferred on the Indian is, that as he cannot live much longer by the chase he should be taught to live by the soil. The Indians, although they are often called "wild "untutored beings," when they do speak usually speak to the point; and as when travelling in the interior I took every opportunity of conversing with them on the subject of which they could give me the best information, namely, themselves, I shall here give some of their ideas on their present state and their wishes as to the future.

Real Benefit.

Indian Talks.—I may premise by saying, that in holding a "talk" with Indians, I always first plainly stated that I had been sent out by Her Majesty for the purpose of examining and mapping the country, and for inquiring into the state of the Indians of the different tribes; that the Queen had sent them no presents because she did not know whether they were good or bad people; and I usually stated that the reason of my travelling with so small a party was because I trusted to their honesty and good faith; at the same time explaining to them that in our country we had very large guns which would kill at a long distance, and that in one battle there were as often as many killed as their whole tribe numbered. I would add that I was sure Her Majesty would be glad to hear a good report of them, and if they had any messages for Her that I would take it down in writing, in which they have great faith. I made no promises of rewards for good conduct, or anything of that sort, but said that I should report what I had seen. I refused all presents of horses, robes, or other things, telling them that I could not take as I could not repay, for they always expect payment.

After the speeches were over we used to carry on a good deal of talk in questions and answers, which elicited much valuable information.

State of Indians.—There were very few who on commencing to speak did not mention that they were very poor, that they were very thankful to Her Majesty for thinking about them in the manner detailed in a portion of a speech given in Appendix II.

The Indians of the Saskatchewan have generally the idea that the British have a right to the country in which the Hudson's Bay Company trade, and they do not wish that it should come into the hands of others, although they are aware that the Indians on the American side receive payments for these lands, and in fact many of the Blackfeet, whose hunting ground is divided by the boundary line, and who actually receive the yearly payments, have told me that they do not wish payment for their lands, for they have the idea that the payments bring sickness amongst them. The Indians of the prairie are, however, opposed to the country becoming settled up like the Red River, which many have seen and all heard of. They would wish there to be plenty of wild animals, and that the traders (whom they consider to be under the immediate control of Her Majesty) should be made to pay them good prices for the produce of the chase. This, however, they know cannot last long, for year by year they see the animals decrease, and although they consider that they will last their time, and that by them they will be able to keep themselves in tobacco, ammunition, and other requisites, and have an occasional drinking bout, yet they know too well, as one man expressed himself to me, "If this "continues our children cannot live;" and whereon I have said that in our country we were able to live independently of the chase by keeping domestic cattle, growing crops, making cloth, &c., I have

always been asked to use my best influence to have people sent out to bring up their children to this way of living.

Missions.—Many of them have seen missionaries, and some have, perhaps, derived Spiritual benefit from them, but as they say of them, "these praying chiefs tell us what we ought to do and sometimes "give us tobacco when we attend their church gatherings, but we cannot always live in one place "as they do, because we must hunt for our subsistence: but they can do so because they have goods "sent over the sea with which they buy the provisions which we furnish. If it were not for us they "could not remain here."

This is true enough, and as these remarks have led to the subject, I will here notice the progress of missionary enterprise in the interior.

B.—II.

Indian Missions and Settlements.

Missionaries.—The first missionary who entered Rupert's Land, Mr. West, was sent out by the Church Missionary Society in 1820. He established a mission at Red River Settlement for the benefit of Scotch settlers, half-breeds, and Indians. Since that time there have been many missionaries sent out by this and other societies, and they number at present—

Church of England - - -	20
Wesleyans - - - -	5
Presbyterian - - - -	1
Roman Catholic, about - - -	15

besides many native and other schoolmasters.

Out of the 40 clergymen one-half are at the Red River Settlement, where the greater part of their work is among the half-breeds and white residents, who, if left to themselves, would be well able, and, in most cases, willing to support their own clergy and schools. At Red River, however, the necessaries and many of the luxuries of civilized life are to be had, besides which a regular postal communication being kept up with the United States, it serves as a sort of transition chamber in which the missionary, fresh from the refinements of home, may be somewhat prepared for life in the wilds. The remainder are scattered throughout the Indian country, from Hudson's Bay to near the Rocky Mountains, and from Red River to Fort Simpson on Mackenzie River, the established stations being marked on the map.

Effects produced.—The effects produced by the missions are not so apparent as from the missionary reports charitable subscribers would be led to suppose, when they see a gain of so many hundred Christians or a certain number of extra communicants over the year previous. For how many of these so-called Christians are even in outward form worthy of the name? I am sorry to say (but were I not to do so I should be courting approbation at the expense of truth) that there are but very few "Christian Indians" who do not still repose implicit faith in the conjuring tent and medicine man. Few, indeed, there are in civilized life who can or ought to be called real Christians. I will not comment on the merits or demerits of missionaries or of the system, but as the "light of "Christianity" is so favourite an expression, I would ask how can it be expected that this light can be disseminated without the atmosphere of civilization.

At two places only has the domestication of the Indians been in the least effected, namely, Rossville near Norway House, by the Wesleyan Missionary Society, and at the "Indian Settlement" on Red River by the Church Missionary Society. At these the improvement is apparent; although the missionaries have neither the power nor the means of carrying out all their objects.

The fact of missionaries being by their position forced to trade and bargain with the Indians has a bad effect, for the Indians come to look upon them as traders working for their own benefit. And another evil which unfortunately cannot so easily be remedied is, when the Indians see a missionary of one persuasion working against one of another, they begin to think which of the two is to be believed, for each says the other is doing wrong.

Indian Commissioner and Settlements.—Taking into consideration all that has been urged, I would propose the appointment of an Indian Commissioner for the interior of British North America, whose first duty should be to travel through the country, visiting the different tribes of Indians, and selecting certain locations in the more habitable portion for Indian agricultural settlements; although, with some knowledge of Indian character, he should be at the same time in no way connected with the Indian by blood, but agents whom he would employ might be half-breeds or others used to the ways of the country. A certain sum being placed at his disposal, he would proceed to establish agencies at the different points selected, and in carrying them out he should select at first (according to the means at his disposal) one or two places where the buildings and other requisites of the agency should be completed, and the agricultural implements and stock be supplied as soon as possible; after which the staff for the agency should be located. This would probably consist of a superintendent who understood farming; a school teacher, a carpenter, and perhaps a blacksmith, with two or more men used to farming and general work. Missionary societies should be invited to establish missions at these settlements, a certain portion of land being allotted for that purpose. I would, however, strongly recommend no favour being shown to any particular sect.

The Indians of a certain district would be encouraged to settle on lands which would be regularly laid out on the reserves, and they would receive help from the agency in putting up buildings, &c. The domestication of old persons, who all their lives have been accustomed to roam at large, must seldom be looked for; but the great point is to get them to live about or frequently to visit the agency, so that the children (whom they have great objection to part with) may be instructed, both in the school and farm or workshops. Sunday should be given up for religious instruction and

recreation, and the superintendent should be allowed in no way to interfere with the missionaries of whatever denomination. A regular scale of payments should be adopted, and every Indian should receive remuneration for any work done on the agency.

Every exertion should be used to gather a large amount of stock as early as possible, because many of the more aged individuals might take to such work as cattle keeping, and thereby living about the place allow their children to be instructed. A medical man should be under the orders of the Commissioner, who could travel about, visiting the Indians for the purpose of vaccinating them and giving medical advice.

Indian Reserves.—I would recommend that the different portions of country to be kept as Indian reserves be at once defined, and due notice given that any persons besides Indians settling on these tracts would, when required, have to give up possession without remuneration. Moreover, in order to prevent Indians being dispossessed of their lands, a law should be enacted preventing the transfer of land from the Indian to the white man or half-breed.

Treatment of Indians.—I have previously mentioned (Appendix II.) that although I travelled among large numbers of Indians, I had never any difficulty with them. This I attribute mainly to having always appeared to repose entire confidence in them, and never attempting to pass through any part of the country unseen, for the Indians are such adepts at stealing, deceiving, and other underhand practices, that if recourse be had to these measures, they are only too ready to follow up to your disadvantage; but on the contrary, deal with an Indian openly, and trust to his honour, ("there is "honour among thieves,") and you may usually rely upon his acting fairly.

Missionary System.—In the early pages of this section I have endeavoured to give a faithful picture of the present state of the aborigines, while in the latter part I have set forth (but necessarily omitting numerous details) my own views of the manner in which they may be most benefited, for I am inclined to the opinion that the wild man is not altogether incapable of civilization; but at the same time, from the numerous examples of the objects of the present missionary system which have come under my notice, I am convinced that scattering abroad the seeds of Christianity without simultaneously preparing the unbroken land for its reception is of little avail. Some seeds of course falling in favoured spots, spring up and bear fruit, but these are only exceptions, which do good only so far as to show us what the soil is capable of producing. Many of the industrious and self-denying missionaries would repeat these words, but the fault does not rest with them, they carry out all that their means will allow, and can only look to a change in the system for the advancement of the cause.

I feel sure that, owing to the prevailing opinion of missionaries and missionary work, some of my statements will not be received without hesitation, but I must simply say, that in the case where the interests of many are at stake in opposition to the prejudices of a few, I have only endeavoured to present the picture in an impartial light. I might have entered into details and produced examples in order to substantiate these statements, but this, while serving to increase the volume of an imperfect yet laborious compilation, would only have "convinced against their will" those who would "remain "of the same opinion still." I therefore close the remarks with the expression of a wish that some may be induced to look into this matter, so intimately connected with the calls of humanity, religion, and justice.

B.—III.

Whites and Half-breds.

White and Half-breed Inhabitants.—I have thus far spoken only of the aboriginal inhabitants. There are yet two other classes, the whites and the half-breeds; the former mostly Orkney and Scotch settlers, and their descendants at the Red River Settlement, and officers and men who have been or are at present in the fur trade; while the latter are the offspring of the former and Indians, as well as their descendants, and being of all shades, from the almost pure red man to the white, are a motley population. Altogether the white and half-breed population of the interior numbers about 12,000, of which one-half are at Red River. The half-breeds, who constitute by far the greater proportion, being about five to one, are divided into two classes, generally called in the country French and English, the former being descended from French Canadians, and the latter from Scotch and English. Cree is the mother tongue, but almost the whole also speak either Canadian French or English. The occupation of most of these people is hunting and voyaging, the first on their own account, and the latter in the pay of the Hudson's Bay Company or Red River merchants. They are remarkably adapted for either of these employments, but there are very few who make good farmers. The old Scotch settlers and their descendants are the real farmers at the Red River, where the soil being excellent, the only drawback to agriculture is the short and sometimes interrupted duration of hot weather. The half-breeds are naturally intelligent, and are mostly very apt at picking up any handicraft, their principal failing being instability of character.

Military Force.—Should there be occasion for a military force to be kept up in the interior, an efficient corps of mounted troops could be raised at Red River, which, for rapid movements and reconnoitring or outpost duty in a country where the means of subsistence for man and horse have to be drawn from the wilderness, it would be particularly adapted, while it would be difficult to find a class of people more suited to this kind of service than the half-breeds. The raising of such a force on an emergency would be a task of very short duration, as the general fire-arms in use in the country are all of one calibre, and a large store of ammunition, including ready-made bullets, is always on hand.

C.—I.

Development of Resources.—Means of Communication with the Interior.

Routes to the Interior.—The several lines of internal communication with the more northern parts of the continent of North America being intimately connected with the development of the resources of the country under consideration, I will here enumerate them, commencing with the north. We find a river of the first class, the Mackenzie, flowing into the Arctic Sea; on the west the Columbia's branches carrying the western waters from eleven degrees of latitude of the Rocky Mountains to the Pacific. Again, from the Gulf of Mexico, the navigable waters of the Mississippi and Missouri reach the latitudes of 45° and 48° north, in the very centre of the continent, and the connected chain of the Great Lakes extending one thousand miles west of the Atlantic sea-board, while the north-east is penetrated deeply by the great inland sea of Hudson's Bay. But setting aside the Mackenzie on account of its Arctic situation, and the Columbia, which, although serviceable to the North Pacific States of the American Union, can have but little influence on British territory, there remain four points to which the communication from the civilized world is by water, and which we may call bases of approach to the interior of British North America. They are Hudson's Bay, Lake Superior, the head of the navigation of the Mississippi, and the most northern part of the Missouri. From the first three of these connexion with the interior has been hitherto maintained, and although a large Indian trade has been prosecuted on the Upper Missouri, yet, owing to the absence of any settlements in that region, it has not extended into the British possessions. It is almost needless to say, that external communication by steamboats can be kept up during the entire summer season with the three southern-most of these bases, while the impediments offered by ice to the navigation of Hudson's Straits and Bay precludes the use of that base for more than from six to ten weeks of the latter part of summer and autumn. Thus, although it is principally by means of that route that the fur trade has been pushed to its present extent, yet we can hardly look forward to its being used to a much greater extent in future. We have, therefore, three bases left, which, with their internal and external connexions, are of the greatest importance to the future of the country under consideration. I shall at present, however, only describe the routes as hitherto in use, leaving the considerations with respect to the encouragement of any particular channel for the next section of this report.

Hudson's Bay and Lake Superior Routes.—The ordinary boat route between Hudson's Bay and Lake Winipeg, and the boats in use on it, has been described (see Appendix I.), and in its present state has been used for many years as the principal outlet of the interior. The other water connexion, usually called the "Canoe Route," has been fully reported on by the the Canadian expedition in 1857 and 1858 (see Parliamentary Paper, dated June 1859). This was in frequent use at the time of the competition between the Hudson's Bay and North-west Fur Companies, but from the numerous obstructions precluding the use of any craft but bark canoes over a great portion of it, it has latterly fallen into disuse, except for personal conveyance. The distance from Lake Superior to Lake Winipeg is 560 miles. I shall have to speak of a modification of this route proposed by the Canadian expedition in its proper place.

Red River and St. Paul Route.—The third means of communication with the civilized world, although not through British territory, yet having been for some years extensively used by British subjects, who carry on by its means a yearly augmenting trade, is entitled to a description here. This is the overland route between Red River and Saint Paul on the Mississippi, and may be said to consist of two regularly frequented trails, although much of the country being of an open charocter, it is not necessary always to follow these trails. The one by the east is usually called the "wood road," and the other, keeping more on the open prairie to the west of Red River, is called the "Prairie" or "Plain Road." Small parties have usually followed the former, on account of the hostility of the Sioux Indians, who frequent the country more particularly to the west of Red River. Both these trails will be seen marked on map.

The mode of transport employed for merchandise is by means of light oak carts drawn by single horses or oxen (see "Means of Transport," c. iv.), and the country being in a state of nature, the travelling is so rough that the roads are not heavy nor is the progress rapid. The distance, which differs little by either trail, is from Fort Garry to Saint Paul about 530 miles, which distance is accomplished in from three to four weeks, according to the loads and state of the country. It has been usual for a large caravan of traders to leave Red River Settlement from the 1st to the 10th of June annually, and another trip is usually made in the fall of the year.

Besides this land route there is a way of getting by canoe up the Red River, and by a portage out of Otter-tale Lake on to Craw-wing River flowing into the Mississippi. And in bringing the machinery and boiler for a steam mill from the United States in 1856, a "skow" or flat-bottomed boat was constructed on the upper part of Red River, by which it was transported to the settlement. There was, however, this season, a small steamer plying on Red River, which will facilitate the means of transport at the northern end of the route, by providing water carriage for nearly half the entire distance.

I will now pass on to give a sketch of what has been achieved with the means of communication just described, and in commencing I would draw attention to the fur trade.

C.—II.

The Fur Trade.

The fur trade commenced on the shores of Hudson's Bay nearly two centuries since, and gradually extended inland; but when the North-west Company pushed their way from Canada into the interior, it gave an impulse to the efforts of the Hudson's Bay Company, and during the competition which lasted till 1821, the country was explored and the trade pushed to great extent. Since the union of

the two Companies, the trade has been successfully, although more quietly pursued, and notwithstanding that within the last few years the proximity of an American market has induced a number of the inhabitants of the most southern portion of the interior to traffic in furs, thereby raising the prices in that part; yet the trade carried on by the Hudson's Bay Company in other districts has altered but little, save in its extension northward; and as but little is known of the conduct of this peculiar trade, I will give some description of it.

Hudson's Bay Company.—The fur trade as carried on by the Hudson's Bay Company over the whole northern part of the continent, from the Atlantic to the Pacific, is on a most uniform and comprehensive system. The whole territory is divided into five departments, in each of which there is a certain number of established posts. One of these is the depôt where the goods for the trade are received from England by ships, and thence distributed among the whole.

Departments.	Depôt.	No. of Posts.
1. Northern	York Factory, Hudson's Bay	69
2. Southern	Moose Factory	42
3. Montreal	Lachine	22
4. Oregon	Fort Vancouver, W.T.	16
5. Western	Victoria, V.I.	15

Making altogether, exclusive of flying posts, 164 regular establishments, of which 16 are on American ground, 37 in Canada, and 14 in the province of Columbia and Vancouver Island. The Indians trading at three places are about 150,000, including young and old.

Pacific Departments.—The two departments in the Pacific are now kept quite distinct from the remainder, there not having been for several years any regular communication kept up across the Rocky Mountains.

Eastern Departments.—Lachine, near Montreal, the residence of the Governor of the territories, forms the head-quarters of all the trade on the east side of the Rocky Mountains, and thither the accounts of the separate departments are transmitted yearly. Of the Montreal department, which carries on the trade in Canada, I know nothing; while of the southern department, having its depôt at the southern extremity of Hudson's Bay, I know simply that a vessel of about 500 tons sails annually from England to this point, with men, goods, and provisions for the prosecution of the trade, carrying back to England the fur returns. The country in which the trade is prosecuted from thence is generally thickly wooded, and the larger animals not being abundant, many skins are applied for the use of the servants from the northern department, while salt meat and flour are used in place of pemmican.

Northern Department.—The northern part, in which it has been my duty to travel, and which is the country more particularly included in this report, is by far the largest in extent as well as the richest in peltries; and as a knowledge of the internal economy of this will give a general idea of the whole, I shall proceed to describe it.

Supply of the Depôt.—A ship annually leaves the Thames in the month of June, having a very mixed cargo, including blankets, materials for and articles of wearing apparel of woollen and cotton manufacture, hardware and earthenware, beads, ribbons, pipes, fire-steels and other miscellaneous articles; also tea, coffee, sugar, rice, raisins, wine, tobacco, salt, flour, gunpowder, shot, ball, fire-arms, &c. While another is usually chartered by the Company for the conveyance of extra supplies, and the property of Red River merchants and the missions. These two vessels, depending on the state of the ice in Hudson's Straits and the Bay, generally arrive at York Factory towards the middle of August. Here the discharging of the cargo by means of schooners (as the ship cannot come within five miles of the fort) is carried on as rapidly as possible, and ballast of stones having been taken in, one ship only is loaded with the packs of furs, skins, and robes, and they usually, if possible, get away by the middle of September, in order to have light nights for the navigation of Hudson's Straits.

Thus is the depôt for the interior supplied yearly with necessaries for and relieved of the returns of the Indian trade; but to provide against the consequences of any unforeseen accident preventing the arrival of the ships, there is always a twelvemonth's extra supply on hand there.

Economy of the Interior.—The economy of the interior is really nothing more than the general system carried out in particulars.

This department is divided into ten districts, each of which is under the superintendence of a chief factor or chief trader, as the case may be, who, as in any military system, is responsible for his whole district, taking care that the work is carried on properly by clerks or postmasters in charge of the several establishments. He has, if the district be large, one clerk employed as an accountant, whose duty it is to collect and arrange the returns and accounts of the different forts.

The persons in the employment of the Hudson's Bay Company are a mixture of Europeans and half-breeds, those for the higher grades entering the former as apprentice clerks, and the latter usually as apprentice postmasters, but each have the chance of rising to the office of chief clerk, which is the highest grade to which a regular salary is attached, and from thence obtaining a commission, on which he becomes a partner in the fur trade, first as chief trader, on a certain percentage, and afterwards as chief factor with a higher share, and after serving a certain number of years, a retiring pension is allowed him.

All promotions and appointments, as well as the general arrangement for the prosecution of the trade, are under the control of a council of commissioned gentlemen collected from different districts, who meet every summer at Norway House, at the north end of Lake Winipeg, headed by the Governor of the territories, who makes a long voyage annually from Montreal for that purpose. A standing account is kept up between the "fur trade" and the "shareholders" of the Hudson's

Bay Company, and a regular yearly balance struck, out of which the several proportions are allotted.

Summer Voyaging.—The brigades belonging to the several districts being on their way to the depôt at the time of the council just described, the officers in charge proceed with them, and discharge their boats of packs of furs, the proceeds of the previous year's trade. Here the voyagers are paid their wages in supplies of any kind which the depôt affords, taking advances on account of the next year's wages.

According to a demand (so far as allowed by council) made out the preceeding winter, the supplies for the different districts are given to those in charge, who as soon as everything is prepared start with their boats on the return voyage to the interior, arriving at their winter quarters at different times in the fall of the year, according to the distance, which in most cases amounts to many hundred miles. The return of the voyagers to their wives and families, and the initiation of the "green hands" into the realities of Indian life, afford an opportunity for a slight festivity, and each man is served with a "regale" of liquor.

Wintering.—The work of preparation for winter now goes on; "fall fisheries" are established, each party is despatched to its wintering post with a supply of goods for the trade, the fort is put in repair, houses "mudded" (pointed), and other work got through; while the Indians, who have collected in expectation of the arrival of the boats, are furnished with numerous supplies for the coming winter, on account of the furs they will probably bring in in the spring. By the time all this is over winter sets in rapidly, the lakes and rivers close with ice, snow covers the ground, and the ordinary winter occupations of the inmates of the forts, such as boat-building, hauling fire and building wood, fetching provisions with dog trains. Making pemmican, sorting furs, and occasional trading with Indians are taken up and continued with little intermission, save a dinner at Christmas, a dance on the coming-in of the new year, and the passing of the ordinary "winter packet," or express, bringing letters perhaps a year old, and taking away others which have been in course of concoction for two or three months, and again all is quiet until the welcome arrival of the "first goose."

Spring.—All is now activity, and successful hunters make the returns of the chase pay well for the expenditure of ammunition. Then the river opens, the furs are pressed and bound in packs properly marked, and on the arrival of the boats from "up river," their numbers are augmented, and bidding adieu to their wives and families, the voyagers and gentlemen, with the exception of a few who remain "inland," start on their summer voyage of perhaps half a year's duration.

Hudson's Bay Company Service.—Such is the ordinary yearly life of those engaged in this peculiar trade, and when it is considered that the trading establishments scattered over their extensive region are in the same relative proportion as if in Great Britain, there was one at London, another at Plymouth, another at Liverpool, and the fourth at Edinburgh, with no roads connecting them, and that many of these so-called forts consist of one or two log houses, where a single European is located with two or three half-breeds only, on whom he has to depend for assistance in case of the natives becoming troublesome, I shall be believed when I say that in this service are to be found men of the greatest self-reliance, who are at any time ready to face almost insurmountable difficulties; many there are who have been reduced to the greatest straits for means of subsistence; others again have been exposed to numerous dangers by land and water, and yet there are few who when they return to civilized life do not wish themselves back in the dreary north.

The North.—There are some exceptions to the general statement which I made with regard to the boats of each district going to the depôt.

This is not the case with either the Athabasca or Mackenzie River brigades, the former of which only comes to Norway House, where they find their supplies, while that from Mackenzie River and the far north is met at "Portage la Loche" by a brigade specially employed, with whom they exchange cargoes at this nine mile portage.

Traffic.—At Red River the trade is carried on by money, paper and coin; an Indian or half-breed bringing in fur is paid in cash for it, and he uses this cash in the purchase of goods. In other parts it is direct barter, article for article, or, as is much the same thing, the furs and goods are reckoned at so many "made beaver" or "skins," and the goods are priced by the same unit of value, which exists only in imagination. Spirit is kept up in the trade, first, by the officers being partners, and secondly, by a system of competition fostered by the returns of the several districts, priced according to a fixed tariff (not necessarily the home prices), being annually laid before the council, and from which the members often judge of the capabilities of a man by seeing whether or not he has made a "good trade."

Furs.—I need not here enter into the details of the fur trade, suffice it to say, that the goods allowed the Indians for the furs are in proportion to the European prices, and it is not a fact, as has been stated, that higher payment is given for those less valuable, in order to preserve others. The Indians being very indolent, are, I think, generally fairly paid for their produce. The furs in greatest demand are the marten or sable, fisher, mink, otter, beaver, musk-rat, bear, lynx, badger, ermine, wolf, and fox, of which the variety called black or silver fox will sell sometimes in this country for 50*l.* per skin. There is, moreover, a considerable trade now carried on in buffalo robes, besides which goose quills, isinglass, castorum, and oil are imported into England. Most of the "robes" go to the American market, but there is annually a sale of furs in London, in which the greater part are brought up by continual dealers.

Competition.—I have mentioned before that although the Hudson's Bay Company have nominally the exclusive trade of all the country drained by the rivers running into Hudson's Bay, yet there is a certain amount of opposition in that part bordering on the state of Minnesota, caused by American traders having pushed up there from the Mississippi. This is carried further into the country by

half-breeds, who, from being natives, claim the right of trade, and during winter make trips to or live in certain parts of the country near Lake Winipeg and the Saskatchewan, and there trade with the Indians, using a great deal of bad spirits obtained from the United States. These people take their furs to Red River Settlement; but owing to the Hudson's Bay Company allowing as much as the American and other merchants, and within a little of the prices at Saint Paul, distant over 500 miles, the greater part fall into their hands, although, of course, there is not so much profit on them as if obtained direct from the Indians.

This competition, although it obtains higher prices for the Indians, does not benefit them, for it introduces spirits, the temptation of which they cannot withstand. But were the Indian liquor traffic prohibited, as it ought to be, then competition would be a present benefit to the Indians by allowing them higher prices, and a future benefit by destroying the fur trade of the southern portion of the country; as until this is accomplished little progress will be made in agriculture by them, or by the large majority of the half-breeds.

Provisions.—The supply of provisions required for the greater part of the voyaging by summer and winter travelling in connexion with the fur trade is mostly drawn from the buffalo; pemmican or dried meat being the usual food on such occasions for all the southern part of the country. But in the district of Mackenzie's River the numerous deer and other animals furnish their contributions towards the support of man, so that it is erroneous to suppose that the trade could not be carried on in the north without buffalo.

In the buffalo country fish is little used, but in the woody districts it constitutes, together with potatoes, grown at some posts, the staple article of food. Flour, which is supplied from England and Red River Settlement, is not much used in the upper parts of the country, on account of its cost of transport. At many forts the inmates would live far better than they now do, did they cultivate the soil to a greater extent, but they are usually of so indolent a nature that rather than employ spare time in that way they go without those things which are looked upon as necessaries in a civilized country. Thus, with the exception of Red River, where many live by it, agriculture is almost unknown. In the more northern and eastern parts of the country of course it is impossible.

In describing the fur trade, I think I may say that I have included all the resources of the country that have as yet been developed, with the exception of what has been done at Red River in the way of farming; so that I will endeavour to give some idea of the state of that settlement as it now is, omitting the numerous struggles of the early settlers in contending with the many natural and other obstacles.

C.—III.

Red River Settlement.

Origin.—Those interested in the rise and progress of this distant colony have but to peruse a most complete history of it by the late Alexander Ross, entitled "Red River Settlement." I shall here simply state that the idea originated with the Earl of Selkirk, who, obtaining a tract of territory from the Hudson's Bay Company in 1811, sent out the original Scotch settlers, and entered into treaty with the Indians of Red River.

Among the difficulties with which the settlers have had to contend, I may mention the visitation of grasshoppers in certain years, inundations caused by the rise of the river, the difficulty of procuring stock and implements, and the want of a market. But notwithstanding these and other disadvantages, including climate, under which the inhabitants have laboured, there at present exists at Red River a thriving British community of whites and half-breeds, numbering about 6,500 souls, separated from the most advanced point of civilization by 400 miles of wilderness.

Present State.—Red River Settlement is neither a city, town, or even a village, but, as the name indicates, a settlement consisting of a straggling chain of small farm establishments, extending for a distance of forty miles along the banks, but mostly on the west bank of the Red River of the north, the dwellings being from fifty yards to a mile apart, while at intervals along this line are a few churches and windmills, besides two establishments of the Hudson's Bay Company, built in the form of forts, one at the junction of the Assiniboine with the main river, and the other twenty miles below. On the north bank of the Assiniboine also, which has a general east course, the settlement extends about 25 miles up, and about 50 miles further is another small collection of homesteads, usually called "the Portage."

Population.—From the latest census (1856) it appears that there were then 1,082 families, of which 816 were natives of the country, the remainder belonging to the United Kingdom and Canada. The French Canadians and their offspring, usually called "French half-breeds," who number about one-half of the whole population, are confined mostly to the Assiniboine and Red River above "the Forks;" the Europeans and their descendants, pure and mixed, being located between the two forts, and a couple of miles below the lower one; while the so-called Christian Indians, numbering about 400 or 500 souls, are confined to the lower part of the river, usually designated the "Indian Settlement."

Religion and Occupations.—The settlement is divided into parishes, and there are nine churches and seventeen schools; the French part of the population being generally Roman Catholics, while the English and Indians are Episcopalians and Presbyterian. Not one-half of the population are farmers, for there are but 400 barns for the 900 houses, accommodating above 1,000 families, the remainder being hunters, who may be said to live entirely on the buffalo and the fur trade. These are, for the most part, French Canadian half-breeds, whose occupations are well exemplified in the small number of farms existing in the parishes which they inhabit, for while the population is equal, here are but ninety barns compared to the 230 in the remaining parishes.

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Land and Productions.—The country is very level, and on the west generally open. There is a considerable amount of swamp, but in the dry parts the soil is well adapted for the growth of cereal and other crops, and naturally supports a rich growth of the different grasses. The trees are generally small, but there is fine oak and elm along the borders of the river, and timber suitable for building purposes to the north-east of the settlement. Firewood, of which large quantities are required during the severe and lengthened winter, has now to be "hauled" a considerable distance, or "rafted" down the rivers. Good limestone for building exists. Wild land is sold by the Hudson's Bay Company, in lots with from two to four chains' river frontage, at seven shillings and sixpence per acre.

Government.—There is a Governor of the Settlement, styled "Governor of Assiniboya," appointed by the Hudson's Bay Company, who is assisted by a council composed of influential inhabitants, holding their commissions also from the Hudson's Bay Company. Quarterly, general, and petty local courts are held, in which trial by jury is recognized. Public works, such as bridges, and what little road manufacture is done, are paid out of the revenue arising from duties levied on certain imports, fines, &c.

Trade and Occupation of Inhabitants.—There can be said to be no distinct trades practised at Red River, every man being his own carpenter, smith, mason, &c., and the women taking the clothing department. There are a number of wind flour mills, but all the millers have other occupations; but there is one steam mill imported from the United States, which is kept pretty continually in operation, at any rate during winter.

Whiskey is manufactured; leather is roughly tanned, but, as with the making of beer, simply for home use. Sugar is made from the maple, and salt, as has been before mentioned, is manufactured on Manitoba Lake, but not at present in sufficient quantity for the supply of the country. The buffalo hunters and voyagers are absent from the Settlement most of the summer, and owing to their improvidence, are often reduced to great straits from the want of provisions during winter.

Agriculture.—Farming cannot be said to be carried on to a great extent, when the whole number of stock is only, cattle 9,600, sheep 2,200, and pigs 5,000, and the amount of land under cultivation is 8,800 acres. The agricultural implements not constructed at the settlement are mostly obtained from Saint Paul on the Mississippi, and a few reaping machines have been already introduced.

Farming operations comprehend the growth of wheat, barley, oats, Indian corn, and potatoes, the manufacture of cheese and butter, and the keeping of cows, horses, pigs, and sheep, besides gardening operations for the culture of turnips, onions, peas, cabbage, rhubarb, radishes, mangle carrots, hops, pumpkins, and melons, which all appear to thrive in ordinary seasons. The periodical visits of immense swarms of grasshoppers, who eat down every green thing, is a source of great annoyance to the farmers of Red River, as well as in some parts of the state of Minnesota.

Growth of Crops.—First, in respect to the growth of wheat, the soil seems particularly well adapted, but owing to the climate it is occasionally caught by the early frosts. Large returns are obtained from new land, sometimes up to 40 bushels per acre, and the soil will bear cropping for many years in succession. Barley and oats do well, and are never damaged by the frost; but Indian corn is sometimes destroyed. The green crops flourish: potatoes, turnips, and onions attaining very large size. Melons are said to come to maturity in the open air.

Stock Farming.—In regard to stock farming, the greatest drawback is the length of winter, owing to which so much hay is required for the subsistence of the animals; the usual allowance being five loads per ox and 10 per horse for the winter months, but the former feeds also on straw. The hay is cut off the swamps, where it is met with of tolerable quality, in great abundance; but for this as for other farming operations there is always a great scarcity of labourers, on account of the absence of the hunters and voyagers from the settlement during summer, as well as from the natural dislike of the natives to any steady employment.

Sheep thrive well at Red River, where there are but few wolves, owing to there being a head money. Pigs do remarkably well, and if turned out where there are oak woods require no looking after.

The cattle during summer roam at large at the back of the cultivated land, where they find plenty of excellent pasturage, but owing to the annoyance caused by the "bull dogs," mosquitoes, and other flies, they generally during summer collect in the smoke of smouldering fires which are made for their protection, but in the fall wander off and are often not seen for weeks. The cows are milked regularly twice a day.

It is usual at Red River to keep the cattle housed and fed during winter, but as cattle sometimes on the Saskatchawan remain out all the winter in the same way as horses, I think, in the event of stock farming being carried on to any extent, herds of cattle might be wintered out in sheltered situations, with the assistance of a little hay, which would be cut in the previous summer off the swamps in the tract of country where it was proposed to winter the cattle; and the animals would be kept grazing in other parts until the severe part of the winter: and whilst speaking of stock farming, my opinion is, that the country to which I am now calling attention is not ill adapted for it, while the natives would be more inclined to take to a pastoral than an agricultural life. As it is as present at Red River, many cattle and horses are lost every winter from the people not laying in a sufficient stock of hay.

The Hudson's Bay Company now farm to a considerable extent, and since the arrival of a Company of Rifles in 1857 have imported a number of oxen from Minnesota.

Farming Operations.—The commencement of farming operations depends altogether on the progress of the season, but it is seldom that wheat sowing is commenced before May, and it is usually cut before the end of August. The cutting of hay on public land is not allowed by law to be commenced before the 20th July, so that every one may have an equal chance.

Growth of Vegetables in other Parts.—So much for agriculture at Red River, but as a little farming and gardening is done at some of the forts and mission stations, I insert the following information,

which may be of use in comparing one part of the country with another; I will premise that the potatoe disease is unknown.

Barley and wheat thrive on any part of the Saskatchewan, but the latter sometimes does not ripen if grown in low situations. All the ordinary vegetables of a temperate climate come to perfection on the Saskatchewan, potatoes and turnips growing to a very large size.

At the north end of Lake Winipeg, barley, potatoes, onions, carrots, turnips, peas, and pumpkins flourish in the open air, and melons can be forced. At York Factory white turnips grow, but not of large size.

At Churchill on Hudson's Bay potatoes have been tried, but they grew no larger than musket balls.

On Holy Lake, latitude 55° N., long. 95°, potatoes do not always attain full size. Much, however, depends on the situation, for at Norway House those planted near the woods have been frost-bitten, while others in open ground were not.

Barley is grown as far north as Fort Simpson on Mackenzie River, latitude 62°, but this is owing to its westerly situation giving it such a high summer temperature. (See Climate, Section A.)

It is Sir John Richardson's opinion that the cultivation of grain could be carried out sufficiently to support settlement as far north as Peace River.

Exports.—With the exception of furs, the exports from Red River amount to very little.

A small amount of beef, pork, flour, butter, and cheese being supplied to the Hudson's Bay Company, cattle and horses have been exported to the United States, but latterly the former have been imported.

Imports.—Besides the large quantity of merchandise annually imported from England by way of Hudson's Bay, a considerable traffic has during the last few years sprung up with Saint Paul on the Mississippi, and besides dry goods, hardware, agricultural implements, groceries, ammunition, &c., a large quantity of whiskey is annually brought into the settlement, both for the Indians' trade and home consumption; and I have not yet heard that any steps have been to require all engaged in selling spirituous liquors to be provided with a licence. Horses and cattle for the improvement of the breed have been imported from England as well as from the United States, whence the first stock was procured by the early settlers.

Mail Service.—A bi-monthly postal service is kept up the whole year by the United States, between the Mississippi and a small settlement of fur traders and half-breeds near the 49th parallel, with which a connexion is kept up from the Red River Settlement, so that letters can be received from England within the month, but the usual term is six weeks. Another mail route was opened during the summer of 1858, between Canada and Red River Settlement, and was kept up during most of the following winter, and is, I believe, again in operation; but owing to the very great distance through unsettled country, the delay to letters going by this route is so great that few are sent by it.

There is no regular internal mail, but the Hudson's Bay Company forward letters and small parcels by their brigades of boats and winter express to their different ports and the mission stations free of charge.

American Settlements near the Boundary.—It is supposed by many that there is a considerable American settlement and military post near the international boundary on Red River; this, however, is not the case, there being only about a dozen loghouses where Red River crosses the boundary, occupied by traders and half-breeds, while the settlement of Saint Joseph, commonly called "Pembina Mountain," about thirty miles to the west, contains about one thousand half-breeds and Indians, the chief occupations of whom is the chase.

C.—IV.

Means of Transport.

Water Transport.—The craft in general use throughout the country are canoes and boats, the latter as described (Appendix I.), while the former are made of birch bark from 12 to 28 feet in length, the largest carrying 2,300 lbs. of cargo, worked by eight men, and capable of being carried when empty by two. Canoes of larger size are, however, used on Lake Superior, but are not adapted for the more intricate navigation of the interior.

With the exception of the route between Lake Superior and Rainy Lake, the 30 feet keel boats are in general used for the transport of merchandise, and have many advantages over canoes, where the portages are not over long or the navigation very intricate. Canoes made out of solid timber, usually called "dug outs," are in use at Red River, being very handy as crossing boats, for they require no care. Canoes formed of the hides of buffalo are also used on the Saskatchewan for descending the stream loaded with provisions or robes, and being easily constructed of the materials always at hand, are often used in crossing rivers when travelling. A canoe of this sort, made from buffalo skins and managed by two men, will contain about 2,100 lbs. or one-fourth of the cargo put in a boat when going down the stream. Flat-bottomed "skows," made of rough plank and caulked with Indian leather and grease, are also used for descending rivers with large canoes.

The cost of boat transport, including portages, is on an average one halfpenny per 100 lbs. per mile, or one shilling per diem.

Land Transport—Carts.—The land transport throughout the whole of the Red River and Saskatchewan country is performed during the summer season by light carts of home manufacture, drawn by single horses or oxen, the load drawn by the former being usually 600 lbs. for a long trip, and the latter, which is harnessed by means of a collar (something like a horse collar put on upside down), hauls about 900 lbs. The rate of travelling with loaded carts, including stoppages, is from 20 to 25

miles a day, and when following a beaten trail there is usually but one man to every three carts. The animals are without shoes, and live entirely on the pasture found by the way. The Red River carts, in the manufacture of which no iron is used, are certainly well-adapted for the mode of travelling in use, being easily "man-handled" at creeks, bogs, or other difficult places, and being constructed entirely of wood and with little extra boarding about them, they float well and offer little resistance to the current in crossing rivers; besides which, the wheels are useful for the formation of "skows" in which to ferry over the baggage; but at the same time carts are in rough travelling very severe on the animals, as every jolt of the wheels is communicated to them, and there is in addition always a weight on the backs, frequently the source of sore backs. The cost of this travelling is, perhaps, a little more than by water.

Waggons.—The Red River people have a great objection to waggons, owing, I fancy, to a dislike of the American waggons in use in Minnesota, which are of that narrow wheeled and neatly finished kind in very general use in the North-western States, which is ill-adapted to travelling in a rough country, where swamps are numerous and iron and smiths unknown; but, perhaps, more particularly because they have always used carts.

It being generally admitted that two oxen hauling by the yoke will do twice as much work than if working separately, I would recommend the construction at Red River of waggons made on the same principle as the carts, having perhaps but one or two pins of iron in their construction, the wheels of which should be high and rather broad in the fellies, which would enable them to surmount obstacles and pass over soft places with tolerable ease. The only drawback that I can see to the use of waggons, causing a considerable diminution in the expenditure of horse and ox flesh, is, that more men would be required to extricate a waggon than a cart in difficulty; but then it must be borne in mind that in a train of waggons the drivers would not be so far separated as at present, and the help applied to one waggon would be equivalent to that applied to four carts.

Travails.—The use of "travails," both horse and dog, is general among the Prairie Indians, and consists in the animal having to drag a load, supported on two poles, the larger ends of which trail on the ground behind, while the others cross over the back, and are made fast to a rough pad and breast strap.

Sleds.—In winter sleds are used; those for beaten tracks with horses or oxen being formed with runners, while those for dog travelling and single horses away from civilization are what are termed "flat sleds." The loads are about the same as for carts.

D.—I.

Future Government and Colonization.

The Interior.—Having in the foregoing pages attempted a general description of the nature of the country, inhabitants, natural productions, climate, and state of civilization of the interior of British North America, I shall now proceed to offer a few suggestions having reference to the future government of that territory, founded on some knowledge of the wishes of the present inhabitants, as well as with a view to the strengthening of British power and the advancement of Christianity and civilization.

Present State.—The whole interior, which has been before defined, is virtually under the government of the Honourable Hudson's Bay Company. But since the expiration of the licence in May 1859, the part now in their hands (and for anything yet proved to the contrary, the property of this Company by Royal Charter) is that portion of which the waters run into Hudson's Bay, known as "Rupert's Land."

I have previously shown that there exists in the heart of this territory a community who, mostly British and their descendants, claim to be called by the name of the mother country; and that, moreover, scattered through the length and breadth of this extensive track is a race of human beings, the rightful owners of the soil, who, though changed in many respects since white men went among them, are still uncivilized; these, although they cannot claim to be called by the name of Englishmen, yet having been so long associated with us may reasonably expect our sympathy if not support. These inhabitants of a portion of the British dominions are entitled to be placed by the British nation on an equality with their neighbours inhabiting the territory of the United States; and although perhaps the destiny of the aboriginal race "may be seen in the setting sun," yet it is against the laws of humanity to offer any obstacle to the progress of civilization.

Union of British North American Provinces.—Much has been talked about, but perhaps less really thought of, the union of the British North American Provinces, a scheme which, although in the present age, might be thought somewhat speculative, may yet not only be projected but accomplished. But it must be a work of time, and such time as many may become impatient, even in contemplating. Before a union can take place a connexion must be made, and in making this connexion each link has to be bound to its adjoining one, and new links supplied where required.

Connexion with the United States.—I have before pointed out that the means of communication between the country under consideration and the civilized world are of very indifferent descriptions, and that in the present state of those communications it is more nearly connected with the United States than either England or her provinces. This connexion, which is year by year increasing, will, if some steps are not taken for the opening of a practicable route with Canada, monopolize the whole traffic of the interior, and thus drawing those strong ties of commerce and mutual interests gradually tighter, may yet cost England a province, and offer an impassable barrier to the contemplated connexion of her Atlantic and Pacific Colonies.

I would not at present undertake to say, that if the offer were made by a neighbouring power of protection, the inhabitants of Red River Settlement would cease to own allegiance to England; but

I do believe that in a few years' time, should the present form of government continue, which, although by no means oppressive, yet it must be owned is not exactly devoted to the interests of civilization, such a demonstration would be by no means improbable; and as to the possibility, there is at present no power to prevent it.

First Step required.—The first great step required towards opening up the interior and connecting it with the eastern provinces is the formation of a mode of communication between Lake Superior and Red River Settlement, which, in giving facilities to a trade with Canada in British manufactures, would create a place of importance on Lake Superior, and the formation of small settlements along the route, besides guiding the set of western emigration through British soil. The water routes connecting Lakes Superior and Winipeg have been examined and fully reported upon by competent persons, who have given it as their opinion that no continuous water communication can be established, but have proposed a scheme of a partly water and partly land route from Fort William on Thunder Bay to Red River Settlement, which to my mind, taking into consideration the very large expenditure required to carry out this, at best, interrupted communication, appears far from being one suited to the requirements of the case. The details of this scheme are to be found in the Parliamentary papers which I have on several occasions referred to, dated June 1859. On this a Company was formed in Canada, under the name of the "North-west Transportation and Land Company," the object of which was to open this route and trade with the interior; but the stock failing to be taken up in England, little has been heard of it of late. Such an undertaking is one of the few which are rather the work of Government than private companies, who could not expect remuneration for the outlay in any reasonable time.

Proposed Land Route.—At present we know little or nothing of the district of country between Lake Superior and the Lake of the Woods, except just along the "canoe route;" but my opinion long since expressed (see Appendix I.) is, that a land route is required from a harbour on the north shore of Lake Superior passing the north end of the Lake of the Woods to Red River Settlement. And the reason I say north shore is, because if any port could there be found, such as Nipigon Bay (if it should prove available), it would, besides being as near the north end of the Lake of the Woods (the southern part of which lake is in American territory), as Fort William, be on the line of an ultimate land route to the present settled parts of Canada. This would necessitate the formation of about five hundred miles of road, through probably a difficult country. But in using the word road, I do not wish it to be understood that a regular stage road is required to be constructed, for it would in the first instance be little more than cutting away the trees wide enough for a track, the partial levelling of some of the roughest places, the formation of causeways over impassable swamps, and the rough bridging or forming slopes into the smaller creeks; while the larger rivers would be left for crossing by means of boats or flying bridges, which would be established by settlers, who might be encouraged to settle along the road by the restriction of free grants of land to that portion of the country.

The general direction of this road could most easily be laid out by one accustomed to travelling during winter, while its cutting out might be commenced the following spring. The winter trail would naturally deviate from the summer road, for the purpose of keeping on the lakes and swamps where the travelling is level, but still it would in most parts follow the cut road; and if settlers, as has been before observed, were induced to locate along the line, they would, by cutting hay off the numerous swamps during summer, be able to supply the wants of passing travellers during winter; this would, I doubt not, cause the route to be much used during that season, when the bogs, rivers, and lakes are frozen. Another reason in favour of this route is that it would be on the line of, and consequently aid considerably, in the construction of a railroad, besides being well removed from the international boundary.

This then is the first great step required, and when we see with what rapid strides settlement, and consequently civilization, is extending to the west and north-west from the upper waters of the Mississippi, whence a navigable river flows into British territory.

I cannot but think that the above proposed undertaking is of national importance, and would, therefore, press it on the attention of Her Majesty's Government.

Indian Policy.—With respect to the government of the interior it is hardly my place to offer suggestions; but in the event of any change being made in the present state of things, the interests of all the parties concerned should be kept in remembrance; and while in regard to the colonist there is previous experience for a guide, we have no precedent as to the Indian. I have for that reason paid particular attention to the policy of the United States in regard to the aborigines, and after having well weighed and considered both sides of the question, I have been led to the conclusion that they should be taken under the special care of the Government; and that while provision is made for them by the reservation of a certain proportion of the proceeds resulting from the sale of Crown or rather Indian lands, that also in the framing of the laws and statutes of a new colony particular attention should be paid to the appropriation of Indian reserves, the prevention of whites "buying out" Indians, and the prohibition of the liquor traffic.

Out of the "Indian fund" above proposed an Indian Commissioner and staff would be paid, who in attending to the interests of the Indians would have the management of the "Indian agricultural settlements" and schools mentioned in a former part of this report, the expenses of which, as well as everything connected with the Indians, would be defrayed by the fund. I should not, however, advocate the system of licences for the Indian trade, for the half-breeds being natives, could not be compelled to have licences, and the expense would only ultimately fall on the Indian, who would not get his goods so cheaply as if there were free trade.

Military Police.—It would, moreover, be necessary for the maintenance of law and order, the suppression of the liquor traffic, and the preservation of peace with and among the Indian tribes, to establish a provincial military police, somewhat on the system of the Irish constabulary; such a body would, moreover, serve as the nucleus on which to build should circumstances require, and it might be easily raised from among the present population.

International Boundary.—It would be advisable that at an early date the boundary should be run westward from the Lake of the Woods, where the Commissioners under the treaty of Utrecht terminated their labours in 1825; and from the nature of the country, this might readily be done by a small party, American and British, in a short time, and at little expense. The marking of it on the prairie far away from all settlements, or the chance of any for some time to come, could be easily accomplished by the erection of mounds or cairns at certain intervals in prominent positions. This is at present rather important in the region of Red River, for the position of the boundary having only been determined by passing travellers with the aid of ordinary sextants, is not known within a quarter of a mile; and this being only 75 miles from the centre of the British settlement on Red River, while Americans are pushing down this valley, should any revenue or other establishment be located on the wrong side of the line by either country, it might hereafter prove the source of some difficulty. Again, in the country of the Blackfoot Indians, towards the Rocky Mountains, some of the waters of the Missouri certainly come from British ground; and as treaties are now being formed with these Indians by the United States for the sale of their lands the boundary should be known in that part. The locality of the boundary has been determined in the mountains, and at their bases on either side (see Appendix II.), where I have drawn attention to the peculiar configuration of the mountains at that part, but the forty-ninth parallel is in no way marked. At any rate the determination of the boundary in the immediate neighbourhood of Red River should be attended to without delay.

Future Settlement.—Concerning the capabilities of the soil and climate for the purpose of agriculture, I have refrained from making general statements which might lead to erroneous conclusions, but have confined myself to speaking of those portions of which I have personal knowledge, or concerning which reliable evidence is to be obtained. From the information I have gleaned, I think that the first fresh settlement formed will be in the region of Manitoba and Winipegosis Lakes and the Upper Assiniboine River; and that as immigration increases, settlements will reach the Saskatchewan about its forks, and thence up the north branch, Battle and Red Deer Rivers, where timber is comparatively not so scarce as in the more southern part of the country; and doubtless, in time to come, a considerable business will be carried on in bringing timber down the Saskatchewan from the Rocky Mountains. My reason for mentioning the country about the lakes and Upper Assiniboine is, because all those who have visited this district report that the greater portion is well adapted for settlement, the soil very fertile, and the climate probably differs little from that of Red River; and in regard to the means of communication, the bordering lakes would offer considerable facilities, as it appears that steamers of light draught might run from Red River Settlement to Lake Winipeg through the Little Saskatchewan to Lake Manitoba, and thence to the Water-hen River into Winipegosis Lake.

This is one route which has been proposed to the Saskatchewan, the distance across the Mossy Portage, marked on map between the last named lake and Cedar Lake, through which the Saskatchewan flows, being only four miles; but I should much doubt whether this circuitous line of communication with the Upper Saskatchewan would hold its own against the direct land transport through the plain country.

I have said that agricultural settlements are likely to flourish about the forks of the Saskatchewan, and thence to extend westward rather than south-west. My reason for this statement is, that the original prairie land, wherever I have seen it, is, as well as being destitute of wood, also wanting in good soil. For whether of a sandy, clayey, or gravelly subsoil, there is seldom more than a couple of inches of vegetable mould, and the southern part of the Saskatchewan country is generally speaking of this nature, which tract stretching southward beyond the Missouri, has in parts not inaptly been termed "desert." It must not, however, be inferred from this that all prairie land is sterile, for there are immense prairies in the valley of the Mississippi, which extend up to Lake Winipeg, and account for the great fertility of the Red River Valley, which are quite of a different character, and are now called "arable prairie," in contra-distinction to the "dry upland, or rolling prairie;" while around the northern limit of the original prairie, and between it and the wooded district, is a belt of greater or lesser width, which having once been woods, has been cleared by the extension of the frequent prairie fires, and is now a comparatively open country, having a fine black vegetable soil; such is the region about the forks of the Saskatchewan, and much of the country to the north and west, while that bordering on the lower part of the Saskatchewan is so little elevated above the lakes and rivers, that although a great resort for waterfowl, it must for ages remain in its present state.

Benefit to the Interior from a Communication with the Civilized World.—But to speak of the interior generally, and the benefit it would derive from the improvement of the means of communication with the civilized world, it cannot but be supposed that many of those enterprising individuals in Canada and the Lower Provinces so impressed with the idea of "going west" would, if the means were at hand, rather make for the somewhat rigorous though healthy climate of the northern prairies, where they would still be under the government to which they have been accustomed, than, as they now do, migrate to the Mississippi States. Thus would a class of hardy and striving people be introduced among the somewhat indolent yet most capable population of the interior, while others, tempted by the offer of free grants along the line of land road between Lake Superior and Red River, in settling would supply some of the required links in the chain of civilization. Again, the half-breeds being a class brought up from their youth to voyaging by land and water, would abundantly supply that, in a country of such extent, much needed element, while many unsuited

to the steady work of an agricultural life would find employment as stock-keepers, lumberers, and such like.

The Passes of the Rocky Mountains.—In anticipation of the establishment of a continuous route through British North America, it is proper here to refer to the passes of the Rocky Mountains north of latitude 49°, or, in other words, in British territory. There are many points at which the chain of these mountains can be traversed, but omitting for the present that known as "Peel's River Pass" within the Arctic circle; that from Fraser's Lake to Pelly Banks, at the head waters of the Yonkon in latitude 62°, as well as one from Dease's House to Stickeen, and others only known to the hardy fur traders of the far north, we come to three, one of which crosses from the Findlay branch of Peace River to Babine River, the northern boundary of the province of Columbia; while the other two, at the very head waters of Peace River in latitude 55° north, connect with Fraser's River at its most northern bend, one of which was described as long ago as 1793 by that intrepid traveller Sir Alexander Mackenzie.

Northern Passes.

Passes to British Columbia.—The connexion with these being, however, by water, and rather far north on the east side, I shall pass on to enumerate the known passes more to the southward, and which may be called the Passes to British Columbia. In commencing with the north they stand thus:—

1.	Cow Dung Lake Portage, or "Leather Pass,"	latutude	54° 0′
2.	Boat Encampment on original Athabasca Portage	„	53° 0′
3.	Howse's Pass	„	51° 45′
4.	Kicking Horse Pass	„	51° 25′
5.	Vermillion Pass	„	51° 10′
6.	Kananaski or Emigrant Pass	„	50° 40′
7.	Crow Nest Pass	„	49° 40′
8.	Kootonay Pass	„	49° 25′

1. The first of these connects the head waters of the Athabasca River with the great fork of the Fraser, and has never been used except as a "portage" between these two rivers.

2. The second is that which until the last few years was used regularly by the Hudson's Bay Company for the conveyance of a few furs, as well as despatches and servants, from the east side to the Pacific by way of the Columbia River, and from the "Boat Encampment" is navigable for small craft; but this pass, like the first, has not been used in connexion with any land route on the west side.

3. The third was probably first used by either Thompson or Howse (author of the "Cree Grammar"), who, following up the north branch of the Saskatchewan crossed the watershed of the mountains to the north fork of the Columbia, and thence to its source, the Columbia Lakes, where striking the Kootonay River, he followed it down to the south of 49° north.

4. The "Kicking Horse Pass," so named by Dr. Hector, crosses the watershed from near the head waters of Bow River to those of the Kootonay, and may be reached by following up either the north or south branches of the Saskatchewan by land.

5. While another (see Parliamentary Papers, June 1859), the "Vermillion Pass," also traversed and laid down by Dr. Hector during the summer of 1858, occurs also on Bow River, so near the last named one that it is unfortunate that the western edge of the mountains was not reached, as it would then have been proved whether these passes can be of value in connexion with a continuous route across the country.

6. The next pass which enters the mountains in common with the fifth on Bow River has been named the "Kananaski Pass" (see Parliamentary Papers, June 1859), and was laid down by latitude and longitude observations during the summer of 1858 by Captain Palliser. This also leads to the Kootonay River, passing near the Columbia Lakes. It is generally supposed that this pass was only discovered last year, but a description of it is to be found in "An Overland Journey round the World," by Sir George Simpson, who, together with a party of emigrants about 50 in number, under the late Mr. James Sinclair, passed through, but not with carts as has been stated (see Evidence before the Select Committee, Hudson's Bay Question), to the lower part of the Columbia in 1841, besides which it has been used by other travellers. If we are to consider its western extremity to the south of the Columbia Lakes, it is a long and indirect pass, but as yet it has only been used for following the valley of the Kootonay, and thence into American territory. In the event of the country west of the Columbia Lakes proving suitable to a land road, this as well as the previous three would prove available for crossing from the Saskatchewan north of latitude 51°.

For one hundred geographical miles of the mountains south of Bow River no pass is at present known to exist until we come to Mocowans or Belly River, a tributary of the South Saskatchewan, on the branches of which four passes enter the mountains, the "Crow Nest," the "Kootonay," the "Boundary," and the "Flathead."

7. Of the first of these we know only (see Appendix II.) that its eastern entrance is on the river of the same name, while it emerges in the vicinity of the "Steeples" or Mount Deception, while neither of the two last are entirely in British territory, hence the name of "Boundary Pass" for that one which has its culminating point north of 49° and which has been described (Appendix II.)

8. The "Kootonay Pass," the most southern, and, of those yet known, by far the shortest in British territory, having been already described in detail, as well as a plan and section having appeared (see Appendix II.), requires no further notice, but I will here observe that there is one point on which I may have been mistaken, namely, that the river at its western extremity, into which the Wigwam River falls, is perhaps not the main Kootonay River which I fell upon near the 49th parallel, but may be the Stag or Elk River, a branch of it. On reference to my map, however, it will be seen that seven miles of the course of this river is only dotted (signifying that I had not actually seen it there), so that the junction of these two rivers may take place in that interval. I have consequently

made the alteration in red on the original map (see Appendix II.) but in *dotted lines as uncertain*, and I take this opportunity of stating that whatever appears on any map of my own in *continued lines is from actual observation*, nothing obtained by report, however reliable, being accepted as certain. If this practice were more generally followed by travellers, the greater part of those mistakes and inconsistencies which cause such trouble to the mapper would be prevented. Whatever course the river above alluded to takes, the extremity of Kootonay Pass remains unchanged, for in proceeding westward out of it the direction would not be along but across the river, on to the tobacco plains, as shown in the section 1, Appendix II.

The passes of which the altitudes are known do not differ greatly, and I refrain from commenting on their relative merits, because, before any particular one can be selected for the construction of a road, the easiest land route from Hope, at the western bend of Fraser's River, should be ascertained, which, considering the distance, would be no very great undertaking. In conclusion, I would only remark that *at present no pass in British territory is practicable for wheeled carriages.*

Country South of the Saskatchewan River.—On reference to the maps it will be observed that the late exploring expedition has left a large portion of the country in the neighbourhood of the south branch of the Saskatchawan, and the tract between that river and the international boundary, totally unexplored, but in order to remedy this defect I have collected all the reliable information in my power, and I should here mention that the greater part of this I obtained from Mr. Harriott, a retired chief factor of the Hudson's Bay Company service, now living at Red River Settlement, who has travelled over the greater part of that country as far as the Missouri.

It appears that the south branch of the Saskatchewan is almost entirely destitute of wood up to the vicinity of the junction of Red Deer and Bow Rivers, the whole country being prairie, but about seventy miles south of that point there is a range of low wooded hills, having an extension east and west about eighty miles. These hills are usually called the "Cypress Mountain," from the fact of a species of pine, known by the name of "Cypré" to the French half-breeds, growing there in abundance, and appear to be the watershed between the Saskatchewan and Missouri, for there are streams described as running towards both rivers. There, moreover, seems to be a good supply of building timber, which may yet prove of much value. Being about seventy miles north of the boundary, it is well within British territory.

Route through the Interior.—As to a route from Red River Settlement to any of the more southern passes, it would follow the trail now in use to Fort Ellice, thence along the Quappelle River and Lakes, striking the south branch near its elbow, and then following the general direction of that river towards the mountains, taking whichever branch led to the selected pass. This would doubtless be entirely a land route, for the Assiniboine being very tortuous, and only fit for canoes, and the Quappelle being in places not even navigable for these frail craft, no water transport would be available except on the Saskatchewan, and if the country were examined, probably good halting places would be found which would allow of a direct course being made from the "Elbow" to "Harriott's Cypress Mountain," which would materially shorten the distance to the three forks of the Belly River, near the most southern passes. The distance from Red River to the western extremity of one of the passes would be probably 900 miles by the windings of a trail.

I have previously mentioned that to the west of the Rocky Mountains no land route to the Pacific in British territory is at present known, but we are aware that from Hope on Fraser's River the country has been traversed with pack animals, keeping north of 49° as far east as Fort Shepherd on the north fork of the Columbia, so that there remains from the base of the mountains but 140 miles in a direct line to be crossed in order to establish the fact of a land route from Red River Settlement to the Pacific. This would, however, be after arriving at the mountains unavailable for wheeled carriages. It remains, therefore, to be considered by the proper authorities whether the state of the Atlantic and Pacific provinces demand the opening of a waggon road.

D.—II.

Telegraph and Mail Route.

I have now to propose the establishment of an uninterrupted communication by electric telegraph between the Atlantic and Pacific through British North America.

Shortest Distance from Atlantic to Pacific.—It is worthy of notice that the "great circle" (shortest line on the globe) passing through Montreal, the seaport of Canada, and New Westminster, the capital and seaport of British Columbia, follows the valley of the Ottawa, thence to the north shore of Lake Superior through Red River Settlement, touching the South Saskatchewan, and so across the Rocky Mountains; and this is the only direct continuous line for a land route through the more northern part of the continent, clearing as it does both Lakes Superior and Winipeg, and it will be this route that the continuous line of railway through the British provinces, whenever that shall be made, must follow.

Telegraph and Railroad.—Again, telegraph communication is at present complete from St. John, Newfoundland, and Halifax, Nova Scotia, to the most western settled parts of Canada; while in a few years the line of railroad will be complete between Ottawa, the future seat of Government of Canada, and Halifax, Nova Scotia, the nearest port to Europe in the mainland of North America, which is continually open during winter.

Distances.—The distance across the entire continent, not allowing for the small curves, are as follows:—

	Miles.
Halifax, N.S. to Montreal	650
Montreal to Ottawa	100
Ottawa to Nipigon Bay, Lake Superior	650
Nipigon Bay to Red River Settlement	400
Red River Settlement to Rocky Mountains	800

	Miles.
Rocky Mountains to the Gulf of Georgia - - - -	400
Halifax, N.S., to Gulf of Georgia - - - -	3,000
Atlantic summer port of Montreal to Gulf of Georgia - -	2,350
Western extremity of Canadian inland navigation to Gulf of Georgia	1,600

Of the total distance, 750 miles of telegraphic communication is at present established, leaving the remaining three-fourths yet to be accomplished.

Proposed Telegraph.—It would be ridiculous to expect for many years to come a continuous railway communication throughout this immense distance, but from the fact of over one-fourth of the distance being now complete, and considering the incalculable benefit the United Kingdom and her distant colonies would derive from connexion by telegraph, I am encouraged to advocate warmly the carrying out of this enterprise. Were the entire line in working order, and supposing the "Atlantic Telegraph" not in existence, British Columbia on the Pacific would be within ten days of England, whilst at present four times that period does not suffice for the conveyance of news, even through a foreign state.

It would consequently appear advisable to have this line at once marked out. All that portion through the wooded district from Ottawa to Nipigon Bay, and thence to Red River Settlement, could be accomplished with the least expense during winter, while the remaining portion, a considerable part of which is well known (namely, from Red River Settlement across the Rocky Mountains to the mouth of Fraser's River might be performed during the following summer.

A mail route might be established without much difficulty, but the objection which I see to it at present is, that on account of no continuous railway being in existence from Halifax, N.S., to Quebec, the forwarding of letters entirely through British territory could only be accomplished with anything like despatch while the port of Quebec was open during the summer season. However, this objection in no way applies to the telegraphic communication, which is of course open during the whole year, from Newfoundland and Nova Scotia to the west of Montreal, being one-fourth of the whole distance.

The construction of an Atlantic and Pacific railroad, which has so long engrossed the minds of Americans, is now in that country beginning to be considered a most formidable undertaking, and the citizens of the United States are very much divided as to the line of route. No less than five different lines have been surveyed by the Government: that near the boundary of Mexico appearing to be the most feasible. But in all of them there is a very great amount of sterile land to be gone through; and it would appear that a considerable portion of the line from St. Paul at the head of the navigation of the Mississippi, usually known as the "North Pacific route," which has been laid out so close to the international boundary, could be most easily carried over British ground. It seems therefore worthy of consideration whether this could not be made a joint international undertaking.

Conclusion.

In the introduction to this report, a general summary only has been given of my own proceedings, the details of exploration and scientific inquiry which would enter into a personal narrative having been purposely omitted; but in order that others may be able to judge of the degree of dependence to be placed on the geographical and other information herein given, I will enumerate the principal instrumental and other aids employed.

Instruments.—The instruments used for geographical determinations and exploratory surveying were:—

Eight-inch sextant,	the property of	May, Observatory Department.
Artificial horizon,	,,	Exploring expedition.
Prismatic compass,	,,	Self.
Pocket ditto,	,,	Ditto.
Chronometer,	,,	Admiralty.
Watch,	,,	Self.
Aneroid barometer,	,,	Exploring expedition.
Boiling-point apparatus,	,,	Ditto.
Thermometers,	,,	Ditto.
Telescope,	,,	Self.
Magnetic instruments,	,,	Colonial Department.

Besides which I employed note "log," and astronomical computation books, in the planning of which I was much aided by others, as well as a blank map in pieces, for sake of convenience.

Mode of keeping Records.—The reliance which I am now able to place on the country mapped is on account of my having always kept a regular dead reckoning of the courses, time, and estimated rate of travelling, which, together with the sketch of each day's route, is preserved in my "log books," this reckoning being checked as often as possible by celestial observations, and the little difficulty I find in gaining an idea of the general features or details of any part of the country is from having at the time kept full notes, leaving little or nothing to memory.

Elevations.—The elevation above the sea, depths of valleys, and other measurements of heights were made by an aneroid barometer compared at intervals with the temperature of boiling water, determined by an instrument of the most improved construction, and have been, when necessary, inserted in the accompanying maps, or referred to in the course of this report.

Geographical Positions.—The following latitudes and longitudes are deduced from celestial observations, except those underlined, which are "by account" from careful dead reckoning. Those in the second column are what I have adopted when my positions have differed from those of other observers, or the rate of my chronometer was irregular:—

Place.	Observation and Account.		Adopted.		
	°	′	°	′	
York Factory	56	59·8 N.			
"	96	26·0 W.	96	26·0 W.	
Norway House	53	59·0 N.			
"	98	7·0 W.	98	7·0 W.	
Fort Carlton	52	52·5 N.			
"	106	23·8 W.	106	20·0 W.	by lunar observations.
Jack Fish Creek at Pike Lake	53	0·5 N.			
" "	109	33·0			
Fort Pitt	53	34·9 N.			
"	109	33·0 W.			
Vermillion Creek, bend from N. to E.	53	30·2 N.			
" "	110	17·0 W.			
Vermillion Creek, east end of chain of lakes	53	40·2 N.			
" "	111	11·0 W.			
Most Northern Point of Edmonton and Fort Pitt trail	53	52·2 N.			
" "	112	27·0 W.			
Fort Edmonton	53	32·4 N.			
"	113	35·0 W.	113	35·0 W.	
Twin Knolls	52	59·7 N.			
"	113	27·0 W.			
Wolf's Road, 10 miles N.N.E. of Elbow of Red Deer River	52	32·9 N.			
" "	113	50·0 W.			
Junction of Little and Great Red Deer Rivers	52	2·0 N.			
" "	114	20·0 W.			
Cache Camp			51	52·9 N.	
"			114	5·0 W.	
Slaughter Camp			51	20·8 N.	
"			113	50·0 W.	
Point of Wood's Valley	51	21·2 N.			
" "	114	46·0 W.			
Site of Bow Fort	51	9·4 N.			
"	115	20·0 W.	115	20·0 W.	
Dead Indian Creek	51	3·1 N.			
" "	114	59·0 W.			
Sunday Valley	50	44·4 N.			
"	114	43·0 W.			
Blood Creek	50	23·1 N.			
"	114	40·0 W.			
Belly River	49	51·9 N.			
"	114	31·0 W.			
Entrance of Kootonay Pass	49	34·0 N.			
" "	114	34·0 W.			
Watershed	49	27·0 N.			
"	114	30·0 W.			
Flat-head River	49	22·1 N.			
"	114	55·9 W.			
Wigwam River, North and South Bluffs-	49	17·0 N.			
" "	115	15·0 W.			
Kootonay Trading Post, H. B. C.	48	55·5 N.			
" "	115	31·0 W.			
Kootonay Camp	40	55·6 N.			
"	115	19·0 W.			Chronometer.
"	114	55·0 W.			Lunar.
"	115	30·0 W.			Account West.
"	115	22·0 W.			Account East.
"			115°	25·0′ W.	
Flat-head River	48	57·3 N.			
"	114	46·0 W.			
Redstone Creek	49	7·6 N.			
"	114	18·0 W.	114	27·0 W.	
"	114	27·0 W.			
North End of "Waterton" or "Chief's Mountain" Lakes	49	6·2 N.			
" "	114	9·0 W.	114	16·0 W.	
" "	114	16·0 W.			

N.B.—Degrees, minutes, and tenths of a minute are used; no seconds.

Names.—I am responsible for but few proper names, for whenever I was able to discover the Indian name of any place, I have (unless too long or unpronounceable) inserted it, and its interpretation in English. Where this has not been the case, I have generally given the names of travellers or naturalists, so that I am not responsible for such as "Belly River," "Devil's Head," and the like, which are translations from the Indian.

Sketches. My sketches of the passes of the Rocky Mountains, forts, and other objects of interest in the country I have not inserted here; but if it should be considered advisable for copies to be made of any of them, I shall be glad to place them at the service of Her Majesty's Government.

Aid of Hudson's Bay Company.—I cannot pass over the aid which has been afforded me by the Hudson's Bay Company, who, besides refusing remuneration for the hospitality afforded at their establishments, have rendered every assistance to the prosecution of my journeys through their territories, as well as supplying necessaries procurable only from their own stores.

Favours received at Washington.—The favours conferred upon me by the United States Government authorities at Washington, which I visited on my way to England for the purpose of obtaining the latest maps and other information concerning the natives and country near the international boundary, I shall not easily forget, for on my mentioning in what capacity I had been employed by Her Majesty's Government, I was presented with the Government maps drawn up under the War Department, the latest report on their well regulated "Indian affairs," and I, moreover, received from the Smithsonian Institution many scientific and other publications.

Conclusion. In drawing this report to a conclusion, I would wish it to be understood, with respect to the exploring expedition on which I at first served, that the course I pursued was the only one to my mind compatible with the position of an officer in Her Majesty's service, and the carrying out of the wishes of the Government.

THOMAS BLAKISTON,
Capt. Royal Artillery.

Woolwich, October 21, 1859.

APPENDIX I.

SIR, Fort Carlton, Saskatchewan River, January 3, 1858.

As the subject of a communication between Red River Settlement and some civilized portion of the British dominions is beginning to attract some amount of public attention, and as two indifferent routes are at present in use, one of which, namely, that from Canada, viâ Lake Superior, Rainy Lake, and the Lake of the Woods, you have this last season traversed, and will no doubt have made a report on the same, while during the same season I have passed the other, namely, from England, viâ York Factory, on Hudson's Bay, and Lake Winnipeg, I have the honour to lay before you my observations on the same for the information of Her Majesty's Government.

Description of Boat used in River Navigation.

In the first place, the mode of transporting passengers and goods between York Factory, Hudson's Bay, and Red River, which is at present and has been for many years in use, is by means of large wooden boats built in the country, and well adapted for this kind of navigation. Each boat is of the following construction:— Length of keel 30 feet, over all 42 feet, which gives considerable shear equally to both stem and stern-post; breadth of beam 9 feet, sharp at both ends, depth inside 3 feet, and when loaded with 70 "pieces" (about 56 cwt.), besides the crew, oars, sail, mast, &c. draws two feet of water; it is steered by means of a long sweep passing through a ring made fast to the stern-post, except under sail, when a rudder is shipped.

Voyages.

Each boat is manned by one steersman, one bowsman, and six or seven middlemen, who, mostly half-breeds of French-Canadian or British descent, labour in the service of the Hudson's Bay Company for very moderate wages; their food, however, which consists of "pemmican" and flour, being supplied by the Company, as much as they have need of; in fact, were it not that they have plenty of good working food, they certainly could not continue this laborious work.

Up-passage.—Description of the Route.

The spring floods having subsided, the upward journey is performed as follows:— Leaving York Factory, which is situated on the left bank of Hayes River, five miles above its mouth, it is possible with a fair wind to sail about six miles to the head of the tide, at which place poles and the tracking line are obliged to be used for the purpose of passing some shoal places; from this sailing or "tracking" (hauling the boat in the manner of a canal barge by a line with four men walking on shore), with occasional poling over shoal places, is continued for a couple of days, after which the continual bends of the river and the strength of the current prevent the use of the sail, the mast, a rough pole, is therefore thrown overboard, and tracking with occasional poling is continued until the Rock Portage is reached, 124 miles above York Factory.

Work of Men.

Tracking is hard work for the voyagers, they take it turn about, an hour and a half at a time, in fact this river work, to say nothing of the "carrying" at the portages where many are injured, is very laborious and trying, particularly considering the fact of their being almost continually in wet clothes, from the necessity of frequently jumping into the water for the purpose of lifting the boat over stones, and their having to "track" over all sorts of ground under the high alluvial banks, often where scarcely foothold can be obtained.

Time occupied.—Nature of the Country.

This 124 miles of river, in my case, travelling with a brigade of six boats, lightly loaded, namely, with 50 pieces, was accomplished in six days. The river runs in a deep channel through alluvial soil, where not a piece of rock is seen, save the boulders in the bed of the river; from this first impediment westward to Lake Winnipeg the geological formation is primitive, the rock, which is nearly always at the surface, being granite and schist, and the whole country being but little elevated above the water.

Description of the Route.

Portage after portage, with occasional intervening lakes, succeed one another in rapid succession, over some of which the boats have to be carried, but at others hauled up the rapids by ropes, and the cargoes carried over land; suffice to say, that in the next 40 miles 20 portages are made, taking five days. After this two lakes of considerable size, Knee and Holey Lakes, are passed with four portages between them, soon after which the River Wepinapanis narrows so much that the oars sometimes touch granite rock on each side, which rises vertically to a considerable height. Before emerging from this narrow gorge, which continues for some miles, some very bad rapids have to be surmounted, and again before arriving at White-water Lake a portage for cargoes and boats of two-thirds of a mile has to be made, in order to avoid the White Falls. The end of a narrow lake is within a few yards of the source of the Echiamamis, a small stream whose waters flow to the westward; when sufficient water is only kept for the passage of boats by two dams six miles apart, these were formerly the work of beavers, but are now kept up by the passing boats. At the passage of a boat a portion is pulled away, the boats run through, and it is again shut securely. This stream, which on account of dams has little or no current, is for the most part through marsh, and so narrow that the willows nearly meet over head, and the boat sometimes touches the bank on each side. At a distance of 358 miles from Hudson's Bay Sea River is entered, when, by making the last of the 35 portages, and pulling against stream, Norway House, a post of the Hudson's Bay Company is reached, from which to Lake Winnipeg is but 20 miles without rapids.

Up-passage, Distance, and Time.

Thus, from York Factory to Norway House, a distance of 400 miles, is accomplished only after laborious work for three weeks. The time for the passage across Lake Winnipeg to Red River, 300 miles, depending entirely on the wind, may be taken on an average at seven days; making the entire distance from York Factory, Hudson's Bay, to Red River Settlement, 700 miles, in four weeks on the upward passage.

Down Passage.

The passage down stream from Norway House to York Factory being accomplished in nine days, making about half a dozen portages, at three of which the boat is carried over, one being the two-thirds of a mile portage, all the other rapids being "run," not, however, without considerable risk, makes the passage from Red River to York Factory sixteen days.

Entire Passage.

Thus to go to and from Red River to Hudson's Bay without stoppages is about seven weeks.

Another Route.

The outlet of the waters which are collected in Lake Winnipeg from the Saskatchewan, Swan River, Red River, &c. is from the north end of the lake by Nelson River, which flows into Hudson's Bay at the mouth of Hayes River; but the falls and rapids are said to be so very heavy on this river, besides its being the longer route, that it is now never used.

Impossibility of Improvement for Steamers.

It has been proposed to improve the former route in order to allow of the passage of steamers, this however from the foregoing description will be seen to be impossible: for, if by cutting through solid granite and swamp, and the construction of locks, the portages could be avoided and the smaller rivers widened, yet in the lower rivers the want of water could only be overcome by dredging, which operation would be entirely destroyed by the spring floods; and I think that it would be the opinion of any observing person passing through this route, that it would be impossible so to improve it as to allow of the navigation of anything larger than the boats (previously described) at present in use; and certain it is, that the future produce of the vast western plains could never be transported in this manner.

Hudson's Bay.

But were a route practicable there exists a consideration, which is above all others; namely, that from the outlet of Hudson's Bay being so far north, and the amount of ice in the bay itself, vessels cannot remain more than six weeks out of the whole year at York Factory, with a chance of afterwards being able to make their way out again to the Atlantic.

Natural Outlet.—Land Route proposed.

No doubt the natural outlet of this great western district is across an easy country to the water of the Mississippi and Missouri, which if first established the west is lost to Britain. It behoves us, therefore, to establish a route through our own territory, for the encouragement of emigration to and the transport of the future produce from Red River and the great Western Plains to Canada. Now, as the water route from Lake Superior to Red River which you have traversed is of a still more

amphibious nature than the more northern one described in this report it seems natural that we should look for a land route; I would therefore suggest a search for such a one, considerably to the north of the eastern part of the canoe route, namely, from a port on the north shore of Lake Superior crossing to the north end of the Lake of the Woods, which, as well as being quite as convenient for the lake navigation by steamers, would be on the line of a continuous railway from other portions of Canada and the United States, besides being much more preferable in a military point of view than a route near the boundary line.

Means of Transport.

Steamers will no doubt navigate Lake Winnipeg and Red River, but the Saskatchewan being obstructed at its mouth by a large rapid, and at other places by minor ones, besides the upper part containing numerous shifting sand bars, will likely be little used for navigation, particularly on account of the very level nature of the country westward from Red River and Lake Winnipeg, so suitable to the formation of railways, which I doubt not will be the first means of transport on a large scale on these plains.

Postal Communication through United States.

At present there exists no postal communication between Canada and Red River except through the United States.

I have, &c.

John Palliser, Esq.,
&c. &c.

(Signed) THOMAS BLAKISTON,
Lieut. R. Artillery.

P.S.—By the arrival of the packet, I hear that the Canadian Government having granted a sum of 5,000*l.* for the establishment of a route between Lake Superior and Red River, an engineering party is at present employed in laying out a road from the Lake of the Woods to the settlement of Red River, to form the western section of the route.

January 29, 1858. T. B., Lieut. R.A.

APPENDIX II.

Report on the Exploration of the Kootanie and Boundary Passes of the Rocky Mountains in 1858. By Captain BLAKISTON, Royal Artillery.

On the 12th of August 1858, I left the camp of the main body of the exploring expedition at the site of Bow Fort, base of the Rocky Mountains, lat. 51° 9′ N., long. 115° 20′ W., and after crossing the Bow River by a ford about four miles above that point, I gained ground to the eastward, so as to get clear of the broken and wooded country on the edge of the mountains.

My party consisted of three Red River half-breed voyageurs, Thomas Sinclair, Amable Hogg, and Charles Racette, besides a Thick-wood Cree Indian "James," whom I had engaged as hunter to the party. I had ten horses, five of which were used for riding, and the rest carried the packs, containing a quantity of ball and powder, tobacco, a few knives, and other articles of small value for Indian trade; also some dried meat and pemmican, with tea, sugar, and salt, as well as two boxes containing my instruments, books, &c.

Soon after leaving Bow River we crossed one of its tributaries, the Kananaski or Lake River, a rapid stream coming out of the mountains from the south-west; here we saw the remains of many wooden carts which had been abandoned by a party of emigrants from Red River Settlement, under the late Mr. James Sinclair, on their way to the Columbia in 1854, who had found it impossible to drag them further into the mountains. This pass, I believe, follows the course of the river to its source, and is the one by which Sir George Simpson, governor of the territories of the Hudson's Bay Company, as well as another party of emigrants crossed in the Rocky Mountains in 1841. In the past season it was travelled by Mr. Palliser.

The forests consist of spruce (*abies alba*), a small pine (*p. banksiana*), and another rough-looking *abies* which grows to a large size, also a few balsam poplar, and aspen. In travelling through these mountain forests, the greatest obstruction is the fallen timber, which, lying about in all directions, causes much exertion to the horses, and confines them to a slow pace. It was during this first day's travel that I noticed the devastating effects of a tempest: numbers of trees had been blown down, and many broken short off. The work of destruction had evidently been of this year, but there were also signs of former work of the same character.

The following day, our course still tending a good deal to the eastward, carried us farther and farther from the mountains, but we passed within twelve miles of a marked outlier, which from its peculiar form, I called "The Family." After this as we travelled along through a partially wooded country, and receded from the near hills which obstructed the view, a sharp peak entirely covered with snow opened to us at about forty miles distance. The wind was from the westward, and to the east of the summit of the peak rested a mass of white cloud, which was very marked, for there were no other clouds to be seen, with the exception of a few light cirri over head. This attending cloud gave the mountain the appearance of an active volcano, and the effect against the clear sky was extremely beautiful. The phenomenon was caused by the aqueous vapour of the warm Pacific breeze being condensed by the coldness of the snow, and appearing as a cloud to the leeward of the peak. I took careful bearings of this mountain, to which I gave the name of "The Pyramid."

We camped at the forks of a creek, called by our hunter the "Strong Current." Here he was successful enough to procure a few fine mountain trout, which proved a very agreeable change to our ordinary fare, which consisted of dried buffalo meat, containing by no means too large a proportion of

fat, washed down by tea. Bread was not in our bill of fare, and I may here state, that during the whole summer while travelling, with the exception of two Sundays, I never tasted a morsel of farinaceous food. This may appear atonishing, but when continually travelling, with the appetite sharpened by a ride over the prairie in the cool breeze of the mountains, one becomes accustomed to do without flour, salt, sugar, &c., which under other circumstances would be considered indispensable.

The next day was Saturday; we rose early, packed the horses, and made a start as usual about sunrise, and travelled on through much the same sort of country, the up-lands being generally wooded, while the bottoms were partially covered by scrub willow and other bushes. We halted between 8 and 9 A.M. for breakfast, giving the horses a "spell" of a couple of hours or so: then started again, and gained a somewhat elevated position, from which we had an extensive view of a fine valley, watered by two clear mountain streams, which as they neared the edge of the great plains, stretching probably without break for 700 miles eastward, united, and with mingled waters, pursued their course towards Bow River, ultimately to pour themselves into the icy basin of Hudson's Bay. I continued on till we reached the southernmost of the two creeks, within ten yards of which, under the shade of some fine poplars, I pitched my small patrol tent. The valley bottom was a fine piece of prairie pasture for the horses, and presented a most suitable resting-place for a Sunday camp. I had (for it was only two o'clock) halted in sufficient time to allow me to obtain an observation of the sun during the afternoon for comparison with one I hoped to obtain on the morrow, and so rate my chronometer. This important instrument was carried each day, turn about, by one of the men, who for that day did nothing else but carry it as carefully as possible. I would recommend this plan to future explorers. In a large party, a few of the steadier hands should be selected for this service; but the same man should never be obliged to carry the instrument every day, lest he become careless.

My ordinary mode of travelling gave the horses six to seven hours' work per day, with the exception of Sundays. Frequently I halted from breakfast till noon, in order to obtain an observation for latitude, in which case I camped later. I never, however, gave up the plan which I adopted from the first, of making an early start, and getting the best part of the day's work over before noon. There are many reasons in favour of it. The horses were mostly Indian ponies, which are hardy and work well on grass. They grow somewhat lean while living out during the severe winter weather, but fatten rapidly with the appearance of the new grass in the spring. They are not accustomed to shoes, but I had some on three of them, whose feet I considered too much worn down for the rocky ground of the mountains. On camping, the horses after being watered, are left to themselves for the night, the fore legs of those likely to wander being hobbled with a piece of soft leather. They are very sagacious in following a trail. The 15th of August was a Sunday. While continually travelling, it will be found that rest one day in seven is required by man and horse, the former taking advantage of it to wash and mend clothes.

The weather continued fine, and this day the thermometer rose to 85° in the shade, with a clear sky, and fresh breeze off the mountains in the afternoon, the day closing with a calm evening. This mountain breeze appears to be a regular occurrence during the fine summer weather of this season. On each of three successive days of fine weather which we enjoyed at the site of Bow Fort, the morning was calm, at about 7½ A.M. the wind commenced lightly from about W.S.W. off the mountains, and gradually increasing: in the middle of the day and afternoon it blew a fresh breeze from the same point, with usually some *cumuli* over the mountains, which disappear before reaching the plains; in the evening the wind fell, and the night was calm. The explanation of this phenomenon is the same as that of the sea breeze so unvarying in tropical islands, namely, that as the sun gains altitude, the great plains which are entirely prairie become heated, and consequently the air in contact with them ascends and is replaced by the cooler air from the mountains.

Our general course for the next three days was a point east of south, for we were now as far out from the mountains as our Indian thought requisite. We were, however, within the outlying ridges, which are numerous, and all run parallel to the larger ranges of the great chain, namely S.S.E. Thus travelling the course we were on, we had very seldom to surmount any high land, but passed along the valleys between these ridges.

The country was less wooded than that previously passed, being for a considerable part fine prairie slopes. The main range or water shed, as I supposed it to be, was occasionally visible, through gaps in the nearer mountains, at a distance of about thirty miles.

On the 16th our hunter was lucky enough to procure us some fresh meat in the shape of wupiti or wa-waskasew (red deer) of the Crees. In order to lighten the burthen of the horses and preserve the meat, the bones were taken out, and it was cut into thin flakes and half dried over the night camp fire.

The same afternoon, as we arrived at Trap Creek, just above its junction with High Woods River, we found six tents of Thick-wood Stone Indians who were just preparing their encampment. We camped along with them, and as usual, when with or near any Indians, my flag, a St. George's Jack, was hoisted on a pole in front of the tent. I gave them a present of some tobacco and fresh meat. These Stone Indians, with whom are associated also a few Crees, and whose hunting ground is the wooded and semi-wooded country along the base of the mountains at the head waters of the Saskatchewan, are a harmless and well-disposed people towards the whites. Education has, thanks to the former Wesleyan missionary, the Rev. Mr. Rundle, and his successor, the Rev. Thomas Wolsey, made some little progress amongst them; a few being able to read and write the Cree syllabic characters, now in general use among the missions of the north-west.

During the afternoon I held a talk with these Indians. I told them plainly for what reason we had been sent to the country; that Her Majesty was always glad to hear of their welfare, and that any message which they might have for Her, I would take down in writing.

"We are glad," said an old man, "that the great woman Chief of the Whites takes compassion "upon us, we think she is ignorant of the way in which the traders treat us; they give us very little "goods and ammunition for our furs and skins, and if this continues our children cannot live. We "are poor, but we work well for the whites. The Indians of the plains treat us badly and steal our "horses, but we do nothing to them, for the minister tells us so." In answer to questions from myself, they said that they would wish white people to come and live among them, and teach them to farm, make clothes, &c., so that "their children might live," for the animals are getting every year more scarce. I may here state, that I have been fortunate enough this year to fall in with many camps of the different tribes of Indians inhabiting this country, from whom I always obtained as much information as possible on their present state, and their wishes as to the future; and I hope to draw up a report on the same for the information of Her Majesty's Government; for without doubt, when deciding on the future of this country, some provision should be made for the poor uncivilized beings to whom by right the soil belongs.

From these Indians I obtained a pair of saddle-bags, of which I was in want, and by giving in boot a little ammunition and tobacco, I changed a lame horse which I had brought with me for that purpose for a good strong Indian pony.

Crossing Spuchee or High Woods River on leaving the Indians in the morning, we travelled over undulating prairie all the forenoon, crossing another tributary of this river. During the latter part of the day we passed through a narrow wooded ravine between rugged hills, covered with burned forest, and camped on a small creek. Here I determined to make a cache. Therefore selecting a good thick spruce tree, we enclosed in a box some ammunition, tobacco, and a few other things, which with half the bag of pemmican which still remained intact, rolled up in a piece of buffalo robe, we suspended from a branch about fifteen feet from the ground.

We were delayed some time next morning by some of the horses having strayed a distance into the woods during the night; however, when found they were quickly unhobbled, saddled, and packed, and we started not very long after our usual hour. The Indian trail led between numerous wooded ridges, but the greater part of the wood was burned. The soil of the valleys was usually a deep dark mould, supporting a luxuriant vegetation of the smaller plants. This is the nature of most of these mountain valleys. Where the strata are upheaved to the surface, the ground is of course rocky; such is, however, not often the case in the valleys, but the lines of strata running along the ridges are distinctly visible even when the grass is growing, owing to the difference of colour of the grass on the almost bare rock. The strata run in the direction of the ridges, namely, a little east of south, and usually dip from, but in some few cases towards, the mountains, and at a considerable vertical angle.

In the afternoon we passed close on the left hand a very remarkable feature; it was a mass of rock projecting upwards from the top of a hill, and visible at a considerable distance; from its peculiar form I called it the "Chopping Block." Soon after we gained the height of land between the waters of the Speehee and Mocowans, or Belly River, and the wide prairie valley of the latter broke upon our view. We descended a short distance and camped at the first wood and water.

Before gaining Belly River in the morning, the quick and practised eye of the Indian caught sight of a herd of buffalo in the valley; he therefore went ahead, and by the time we had halted on the river, and I had obtained an observation, he had killed one animal. I remained here until noon, in order to obtain a meridian altitude, and so complete my observation for latitude and longitude, occupying a portion of the time in measuring the heights of the successive river levels with the aneroid barometer.

These "river levels" are a very general feature in this portion of the Western Continent; I have observed them on all parts of the Saskatchewan above the forks, and its tributaries issuing from the Rocky Mountains, as well as on the Kootanie fork of the Columbia on the west side, and the Flat-head River in the mountains, from an altitude of 1,000 to upwards of 4,200 feet above the sea. They are in some places very marked, and appear as a succession of steps from the bed of the river to the level of the plain above, often in sight for miles, and running horizontally along either side. The tread of the step is of greater or lesser width, the rise nearly always abrupt and well marked. They were very decided in the valley of Bow River at the base of the mountains, where they appeared cut with mathematical accuracy.

The levels measured at Belly River were:—

	Above the sea.
Present bed of the river - - -	- 4,024
1st river level - - -	- 4,085
2nd „ - - - -	- 4,176
3rd, the level of the valley - - -	- 4,226

These river levels are for the most part, on the lower portions of the branches of the Saskatchewan, on a somewhat larger scale in vertical height than near the sources.

I was now on Belly River at about the same altitude as on Bow River at the site of Bow Fort, namely 4,000 above the sea, although 87 miles (geographical) in a direct line S.S.E. from it. From this point the route of the party may be traced on the plan attached to this report. The plan does not include the country to the northward, which has no connexion with the passes reported upon. I have, however, the whole country mapped on a smaller scale.

The bed and sides of this river are rocky, the strata of hard grey sandstone, much inclined, and the current obstructed in places by immense granite boulders. We found no difficulty in crossing, the water, though running swiftly, being not deeper than three feet, and about 25 yards across.

Looking through the gap in the near range through which the river issues, I saw a very decided dome-shaped mountain. It afterwards proved to be, when seen from the plains, and also from the top of a mountain in the Kootanie pass, the highest and almost only peak rising above the others in this part of the mountains. After the distinguished British naturalist, I named it "Gould's Dome." The gap through which I had seen this mountain was in the eastern or near range, of very regular form, extending, with the exception of this gap, for a distance of five and twenty miles without break. The crest of the range was of so regular a form that no point could be selected as a peak, I therefore gave the whole the name of "Livingston's Range;" it is a very marked feature when seen from the forks of Belly River and the plain outside.

On leaving Belly River we rose considerably, and keeping along under Livingston's Range the sun had dropped behind this great curtain before we camped. The spot was 540 feet above Belly River, which we had left behind to the northward. Looking to the mountains ahead of us I picked out the most prominent, and took bearings of them before the Indian, who was in the rear hunting, came up. There were two near one another bearing 30 miles south, one of which, from the resemblance to a castle on its summit, I named "Castle Mountain;" to the east of these, but at a greater distance, a portion of the mountains stretched out to the eastward. From reports which I had previously heard, I took the most easterly one, standing by itself, to be the "Chief's Mountain," which the Indian on coming up confirmed, and pointed out the place where on the morrow we should turn into the mountains.

This offset range occurs, as I afterwards discovered, just at the 49th parallel or international boundary line.

The morning of the 20th of August was thick and hazy, with occasional showers of rain, which entirely prevented me from obtaining the good view of the country which I had hoped for, having seen but little in the uncertain light of the previous evening. I therefore travelled on, crossed Crow-nest River, and soon after noon gained the entrance of the Kootanie pass, where another of the branches of Belly River issues from the mountains. Here we struck a narrow but tolerably well-beaten track, which the Indian informed us was the Kootanie trail, by which these Indians had crossed the mountains the past spring. Making a turn therefore to the W.S.W., nearly at right angles to our former course, we followed this track, which led up a narrow valley along the left bank of the river, and between high wooded hills; the travelling was good, for we were on the even grassy river levels, and we camped at a spot where a small mountain stream entered the river from the north.

We were now fairly in the mountains, and had already overpassed the spot where our Indian guide knew anything of the road but by report; he knew that if all went right we should be some three or four days in crossing, and had been told that there was but one track, and that we were not likely to miss it. It may be asked, why was I without a guide? The fact was, that a guide had been allotted to me by Mr. Palliser, but on leaving the camp of the expedition on Bow River, I had started without him on account of the sickness of his wife. He promised to start the following morning and overtake the party; which he failed to do. It will be seen subsequently, however, that I did not suffer by his absence, and I am now glad that he was not of the party, for I have no great faith in the so-called "guides," and think they are seldom worth their pay.

The entrance of this pass is in latitude 49° 34′ N., and longitude 114° 34′ W., being (consequently) 40 English miles north of the boundary line. I have omitted to insert the latitude and longitude of points where I obtained observations, because by referring to the map the geographical position of any place may be seen.

We started at 5.40 in the morning, with the sky overcast and a drizzling rain, and soon entered thick woods and uneven ground, with a great many fallen trees, which caused the horses to travel slowly. We continued travelling in this way and gradually ascending along the course of a small creek running into Railway River, which we had left where the trail parted from it; this river was so named by me from the striking advantage offered by its "levels" for the entry of a railway into the mountains. Gradually the stream became less and less until after gaining considerable altitude it dwindled into a small quantity of water falling in a cascade. Here we passed Hero's Cliff, an enormous vertical escarpment, facing the east, of hard red sandstone or quartzite, with the strata dipping at least 45° to the west. We now rose rapidly as will be seen by reference to Section No. 1 (the Kootanie Pass); the trees became smaller, and we soon reached the region of rock and alpine plants; here were some large patches of snow and a couple of ponds of clear water; we passed over a quantity of débris of hard grey limestone, of which the peaks on our right hand, namely to the N.W., were composed. As we were now clear of all shelter, we felt the cold damp east wind, which blew a fresh breeze, and drove along scudding clouds which prevented any extensive view. We were now on the watershed of the mountains, the great axis of America; a few steps farther and I gave a loud shout as I caught the first glimpse in a deep valley, as it were at my feet, of a feeder of the Pacific Ocean. It was the Flathead River, a tributary of the Columbia. At the same moment the shots of my men's guns echoing among the rocks announced the passage of the first white man over the Kootanie Pass. I halted for the purpose of reading the barometer, which showed an altitude of 5,960 feet. It was just five hours since leaving our previous night's camp, at an altitude of 4,100 feet.

This is no place for a dissertation on the physical geography of North America, but I may simply state, that in that portion of the Rocky Mountains comprised between the parallels of 45° and 54° north latitude, rise the four great rivers of the continent, namely, the Mackenzie, running north to the Arctic Ocean, the Saskatchawan east to Hudson's Bay, the Columbia west to the Pacific, and the Missouri south to the Gulf of Mexico; thus we may say, that in a certain sense that portion of the mountains is the culminating point of North America, and I now, on the Kootanie Pass, stood as nearly as possible in the centre of it.

A rapid descent of two hours brought us to the Flathead River, a clear and quick running stream, dividing a beautiful partially wooded valley enclosed by mountains; here we halted soon after mid-day, having passed the great watershed, and descended again 1,400 feet without breakfast.

During Sunday I did not move from my pleasant camp, where was wood, good water, and good pasturage, everything to be desired by the traveller. I was engaged in obtaining observations for latitude and longitude, and computing them, writing up my notes, &c.; and I also made a sketch of the mountains over which we had passed the previous day. The men brought in some ducks, grouse, and trout, which made an agreeable change in our diet; two or three humming birds were seen about the camp.

The track now led up to the course of Flathead River, through thick forests with occasional openings, crossing several mountain streams, feeders of the river. We halted for breakfast on an open piece of swampy ground. On moving on again we plunged into thick forest, where the track was greatly obstructed by fallen timber. The Kootanies cut through a good many of the fallen sticks to allow of the passage of the horses, but still the greater number remain as they fall, and cause much twisting, turning, and branching of the track. We ascended gradually, passing a few fine pieces of open meadow, until we arrived near the head waters of the river, when the different streams composing it became mere mountain torrents. Here we commenced a steep ascent, the path ascending in a zig-zag up the hill; the trees, mostly spruce and fir, became smaller until we gained the summit of this knife-like ridge, from which an extensive view of the mountains was obtained. I halted to contemplate the scene, take bearings, and read the barometer, which showed an altitude of 6,100 feet. All appeared, however, utter confusion, such slight differences were there between the different mountains and ridges. One peak alone showed itself above the general surface. It lay to the northward about thirty miles distant, and I recognized it as "Gould's Dome," which I had previously remarked from the edge of the plains. I estimated it to be not more than 1,000 feet above my present position, which would give it an altitude of about 7,000 feet. The rest of the mountains appeared all about the same level, and but few of greater altitude than the ridge from which I surveyed them; there were visible the main range or watershed, then a number of ridges and mountains densely wooded, and of somewhat less elevation; after which, to the westward, higher mountains, the ranges generally taking a N.N.W. and S.S.E. direction. Such was the scene to the north of my position, but to the southward the mountains appeared to have no general direction, as many running crosswise as lengthwise. I was now on a height of land between two branches of the Columbia; the rock was the same hard grey sandstone as observed all along the base of the mountains on the east side, no granite showing anywhere.

Heavy dark clouds were gathering rapidly, and the louder and louder rumblings of thunder warned us of an approaching storm. We had descended but a few yards of the great western slope when the tempest broke with all its violence, and we were wet to the skin in a few moments; my own habiliments were far from waterproof, being simply a flannel shirt and pair of leather trowsers, with a striped cotton shirt over all. The descent was very steep, the horses having in some places difficulty in keeping their legs, although the path was zig-zag, and the continual descending on foot was very trying to the legs. After some distance, however, the descent became less steep, and we continued our course for a couple of hours before coming to any place fit for camping. Although camping in the woods is always to be avoided with horses, we were at length induced to halt from the appearance of some old skeletons of Indian lodges, not knowing how far we might have to travel before coming to any open place; and we camped, for the first time, in a Columbian forest.

The change in the vegetation was first made evident to me on descending the mountain, by the appearance of a beautiful and regularly formed cedar, which, for the sake of remembering the tree, I then called the "Columbian Cedar." It flourished at an altitude of about 5,000 feet, and I subsequently observed it as low as 3,000, but I feel doubtful as to whether it descends to the Tobacco Plains. Besides this I found, to me, a new *abies* something like the balsam fir of the Atlantic slope, but with a rough bark, and growing to a large size; the spruce and supposed Bank's pine remained with a few balsam poplar and birch, some of good size; also maple and alder as underwood. A new larch appeared, an elegant tree; and around our camp were the dead stems of many deprived of life, no doubt in years past by fire, rising to an immense height, and tapering upwards perfectly straight, without a limb, to a fine point.

The next day we travelled on through these forests, continually descending, and before noon arrived at Wigwam River, where it passes between two high rocky hills, which, from their imposing appearance from this spot, I called the North and South Bluffs. The bed of the river was deeply cut in the valley and exposed grand sand cliffs from two to three hundred feet in height, portions of these cliffs were broken, and pinnacles and blocks of different forms were left, having at a short distance a most fantastic appearance. The track leaving the river and ascending a steep bank, carried us for five miles over a very rocky piece of country, where the trees were of stunted growth from want of soil, to the junction of Wigwam River with the Kootanie Fork of the Columbia, or its tributary the Elk River. The former was forty yards wide and two to three feet deep, and the latter sixty yards across with a depth of four to six feet, both running with a swift current, their beds being rocky and stony. The Kootanie Fork could be seen coming down a valley from the N.N.W., from near a well-marked mountain about twenty-seven miles distant, which has been called "The Steeples." I believe that not far above the Wigwam tributary another, called the Elk River, comes in from the north, down a long narrow valley in the mountains. We descended about 300 feet, crossed the small river, and having lost the trail, camped for the night, the Indian's opinion being that we must also cross the main river, which would have occupied more time than the decreasing daylight would allow us. On going lower down the river in search of a better crossing place, I luckily struck on the proper

trail leading up the side of the river bank towards the south; so we turned in that night with the satisfaction that we were still to travel in the morning on dry land.

To the west of us, on the other side of the river, was a level partially wooded country, a portion of the Tobacco Plains, which, as will be seen by reference to the plan, is a tract of country of about 10 miles in width, stretching from near Mount Sabine on the north to the southward of the boundary line, bounded on the west by low wooded hills, and skirting the foot of Galton's Range on the east. The Kootanie Fork in its southern course traverses these plains.

Being now at the western extremity of the Kootanie Pass, I will pause to point out the capabilities it affords for a railway across the mountains within the British possessions. I should premise that I have not sufficient evidence to be able to state that the Kootanie Pass is absolutely the most advantageous place for the crossing of a railroad from the Saskatchewan Plains to the Pacific, because the mountains to the north have not yet been sufficiently explored; but I am able to say that it is the most southern line within the British territory, and, as yet, by far the shortest; moreover, I have every reason to believe that the most suitable portion of the mountains for the passage of a railroad will be found to the south of Bow River.

The Kootanie Pass crosses the Rocky Mountains from the Great Saskatchewan Plains on the east, to the Tobacco Plains on the west, its extremity on the former side being 40 and on the latter 18 English miles to the northward of the international boundary, the 49th parallel of north latitude. Its length is 40 geographical or nearly 47 English miles, extending from longitude 114° 34′ to 115° 24′ west. It leaves the Saskatchewan Plains where they have an altitude of about 4,000 feet above the sea, rises 2,000 feet to the watershed of the mountains, descends to Flathead River, again to an altitude of 4,000, follows up this river to its head waters, then crosses a precipitous ridge, reaching an altitude of 6,000 feet; it then descends the great western slope, falling 2,000 feet in two miles of horizontal distance, after which, by a nearly uniform grade of 100 feet per geographical mile, it gains the Tobacco Plains at the point where the Wigwam branch enters Kootanie or Elk River.

By reference to Section No. 1, it will be seen that there are three obstacles to the passage of a railroad; namely, two mountains and one steep slope. As to the mountains, they could, I consider, without difficulty be pierced by tunnels. The great western slope is a more serious obstacle; however, in the following details I hope to show that it also may be overcome.

From the forks of Belly River on the east side the line would traverse the gradually ascending prairie to the entrance of the pass where Railway River issues from the mountains. This river would be followed up with a grade of 1 in 180, or 34 feet per geographical mile for 7½ miles, the "river levels" affording considerable advantages; leaving this river it would follow the course of my track marked on the map. A cutting of about 3½ miles would lead to a tunnel of nearly 5 miles in length, which would pierce the Watershed mountain, and come out in the valley of Flathead River, the whole having a grade of 1 in 130, or 47 feet per geographical mile. On emerging into the valley, the line would skirt the base of the mountains to the north of the track, thereby avoiding a steep descent, then following up the river with a grade of 40 feet per geographical mile, it would reach the rise of the western ridge at a height of 5,100 feet above the sea. This would be the culminating point of the line, from which in a distance of 10 geographical miles it has to fall 1,900 feet to the North and South Bluff, and after that, by a slope of 54 feet per geographical mile for five miles, to reach the Tobacco Plains, crossing the Kootanie Fork by a bridge. This I propose to accomplish in the following manner:—From the culminating point, to pierce the ridge by a tunnel of three geographical miles, and continue the line along the side of the hills to the north of the track until reaching the North Bluff, the whole with a grade of 190 feet per geographical mile. This portion of the line of ten geographical miles would have to be worked by a wire rope and one or more stationary engines. Regarding the remaining five miles to the west of the North and South Bluffs, a careful survey is required to determine whether a grade not too steep for locomotives can be made. My measurements, taken with so uncertain an instrument as an aneroid barometer, must not be depended on to a few feet; they give a fall of 54 feet per geographical mile, or 1 in 112.

As regards the country to the west of the Kootanie Fork I can say nothing, but that no mountains were visible to the distance I could see, neither have I any personal knowledge of the Saskatchewan Plains to the eastward of the forks of Belly River; but it is probable that these great prairies stretch without break from this point to the Red River Settlement, and that in the construction of a railroad little more labour would be required than that of laying down the rails. The following statement of distances to be traversed by a railroad to the Pacific within the British territories may be of interest:—

	Geog. Miles.
Lake Superior to Red River Settlement - - - - -	320
Red River Settlement, *viâ* Elbow of South Branch of Saskatchewan to Rocky Mountains - - - - - -	700
Kootanie Pass - - - - - - - -	40
West End of Kootanie Pass to Mouth of Fraser's River, Gulf of Georgia	300
Total, Lake Superior to Pacific - -	1,360

Probable length of railroad, 2,300 miles English.

Thus it will be seen that out of the whole distance one-half is over level prairies, and but 40 miles through mountains.

To resume the narrative of my journey:—On the morning of the 25th of August at starting we were obliged to climb the face of a steep hillside for the purpose of keeping on the left bank of the Kootanie Fork or Elk River, which here sweeps in close under an outer range of the mountains, having a north and south direction, and which I have called "Galton's Range." We gained a considerable altitude above the river which ran at our feet, and of whose course I had a view for some distance. The banks were vertical and rocky, and the stream appeared to continue swift. Both horses and men had enough to do in climbing up, and then coming down again from the heights. I was well repaid for my climb by the remainder of the day's travel, which was through magnificent open forests with patches of prairie sometimes of considerable extent. These forests were the finest it had been my good fortune to see. A splendid species of pine and the larch previously spoken of, with their bright red barks, rose from the ground at ample distances; no brushwood encumbered their feet or offered impediment to the progress of waggons, which might move in every direction.

As we advanced along the prairie the trail forked, and our Indian took the branch which led nearest the river, as from information he had received he believed it to be that which led to the trading post. Towards evening, according to my reckoning, we crossed the boundary line, and camped about two miles within the American territory, and not more than a mile from the river. In a few minutes a Kootanie Indian came to us on horseback. My Indian guide "James," knowing but a few words of his language and a little Blackfoot, and he not knowing one word of Cree, we had some difficulty in comprehending that he wished to inform us that there were no people at the trading post, which he described as being quite close. A small present of tobacco and something to eat were thankfully received by him, and he took his leave. Shortly after there came several more from the same camp, having a chief among them. They were mounted on good looking horses, and raced up to our camp as hard as they could gallop, no doubt with the idea of creating an impression. The evening was spent in a talk with them, one of them understanding Blackfoot. It was dark before they took their departure, having promised that they would meet us in the morning at the trading post, to guide us to their camp, where they wished us much to come, saying they had some provisions.

Following the track still S.S.W. the following morning in a thick fog, we came on the river, and within a few hundred yards found three diminutive log houses. Two of them, not over ten feet square, and to enter which it was necessary to crawl through a hole as an apology for a door, had evidently been used for dwellings; the other, somewhat larger, without a chimney, we were informed was the Kootanie chapel which had been erected the previous spring when a priest was there.

The Kootanies afterwards informed me that white people always come in the fall, remaining the winter trading with them, and returning to Colville, eight or ten days' journey, in the spring. These are the Hudson's Bay Company's people, and this post is what figures on maps in large letters as "Fort Kootanie." I remained here till noon, and obtained observations, which placed the post in latitude 48° 55′5 N., and longitude 115° 31′ W., thus a little over five English miles south of the boundary.

In the afternoon I rode four miles across prairie in an easterly direction with a chief, the pack animals following, and arrived at the Kootanie camp, where I was under the necessity of shaking hands with every man, woman, and child. The people had a rather dirty and wretched appearance, but their herds of horses, and some few horned cattle, showed that they were not poor.

Having pitched my tent at a short distance from the lodges of the Indians, which were in a pleasant situation near a small stream with some woods along it at the base of Galton's Range, I was soon inundated with presents of berries, dried and fresh, dried and pounded meat, and cow's milk. Of course, although no payment was asked, I paid these people for their food in tobacco, ammunition, &c.

Seeing that there was no chance of starving, I determined on remaining here some days for the sake of the horses; the next five days were therefore spent in trading, and exchanging horses, buying provisions, &c., and obtaining by actual observation and Indian report such knowledge of the country as I was enabled to do.

The weather was fine and generally calm, but rather warm, the thermometer ranging from 47° to 82° in the shade. I should have said, that in my passage over the mountains I had experienced no cold nights, the temperature at sunrise being usually about 50°, once only so low as 37°.

I made an excursion to the north of the boundary with my sextant, to obtain as near as possible the precise position of the line; I found no remarkable feature to mark it, but noted the place where it crossed the hills. I also obtained a sketch of the mountains to the northward, Mount Deception, or, as I had myself named it from its peculiar form, "The Steeples," standing out quite distinct from the rest. I may here say, that it was in the neighbourhood of this mountain that Mr. Palliser, following the old emigrant pass which he had entered at Bow River, emerged from the mountains after a six or eight days' journey; he then recrossed by the Kootanie Pass, which I had previously explored.

I found the Kootanies communicative, and from them gathered the following information:—

That Colville, an American settlement on the Columbia, was about eight or ten days' journey with pack horses, and that they could descend to it by the river in canoes, but there were too many falls and rapids to admit of its being ascended; that the Flathead River, which I followed up in the mountains, runs to the south and joins Clark's Fork of the Columbia, on which is the Flathead Mission, which they described as three days' riding south of this; that there are large lakes to the N.W. of the Kootanie Post, from one of which a small river flows and joins the Kootanie Fork before it falls into Clark's Fork.

They also told me that there was a pass entering the mountains a little to the southward of their camp, and which came out on the east side near the Chief's Mountain; that there were long hills, but

not so steep as to the Kootanie Pass, and that they used it sometimes when the horses were heavily loaded. This information of another pass in a portion of the mountains that I knew should be explored caused me at once to decide on recrossing the mountains by this pass, although I knew that it must be wholly or partially on American ground. I, therefore, prevailed upon a Kootanie to accompany the party across as guide.

There are some considerable tracts of the Tobacco Plains which are prairie. The grass, however, does not grow close and thick, but in small bunches with bare ground between, and the pasture is nothing to be compared in appearance to that at the base of the mountains on the east side. This is perhaps chiefly owing to the nature of the soil, which in the latter case is a black mould, while on the Tobacco Plains it is sandy, and in most parts stony. At this season the grass was quite dried up and yellow.

As to the Kootanie Indians, their language at once strikes one as being most guttural and unpronounceable by a European, every word appearing to be brought up from their lowest extremities with difficulty.

They are nearly all baptized Roman Catholics, and are most particular in their attendance at morning and evening prayers, to which they are summoned by a small hand-bell. They always pray before eating. On the Sunday that I spent with them their service, in which is a good deal of singing, lasted a considerable time. One of their number preached, and seemed to be well attended to.

Their food at this season appears to be almost entirely berries; namely, the "Sasketoom" of the Crees, a delicious fruit, and a small species of cherry, also a sweet root, which they obtain to the southward.

They grow some little wheat and a few peas; a patch of the former, about forty yards square, which I saw near their camp, although rather small-headed, looked well, a proof that this grain thrives in latitude 49° at an altitude of 2,500 feet above the sea.

They possess more horses than any Indians I have seen or heard of on the east side, a camp of only six tents having about 150 old and young. They also, in their treatment, are kind to and show some knowledge of the animal. They are adepts at throwing the lasso, being brought up from their youth to its use. They possess a certain amount of domestic cattle, six tents having twelve or sixteen head; and I heard of some individuals at a distant camp who owned as many as twenty or thirty each.

They are perfectly honest and do not beg, qualities which I have never yet met with in any Indians. I extract the following from my journal, written on the spot:—"On now taking leave of "the Kootanies, with whom I have been camped for nearly a week, it is but justice to say, that they "have behaved in a very civil and hospitable manner; and although our clothes and other articles "have been lying about in all directions, we have (with the exception of some hide lines, mocassins, "and other articles of leather, which the half-starved dogs have eaten) not lost a single article." Whether this honesty is to be attributed to the knowledge of Christianity spread among them by the ministers of the Roman Catholic church, or whether it is innate in them, I can only say that it is a great contrast to the effect produced by the missions in the Indian territory on the east side.

The Tobacco Plains form the country of the Kootanies, but every spring and fall they cross the mountains to the Saskatchewan Plains for the purpose of killing buffalo; they return with supplies of dried meat, &c., with which they trade for blankets, knives, tobacco, &c. with the Hudson's Bay Company's traders at the Kootanie Post. They also sometimes cross during the latter part of winter, when there is sufficient crust on the deep snow of the mountains, on snow shoes, also for the purpose of obtaining provisions, for there is little or no large game on the west side.

On the 2d of September I set out on my return journey across the mountains. The morning was clear and sharp, the thermometer being two degrees below freezing. After I had lost sight of the Kootanie camp, and was riding ahead of my party on a S.S.E. course over undulating prairie, I felt satisfied that I had done all that came under the spirit of my instructions, and was happy to be able to recross the mountains by another unexplored route; my only regret was, that this time it was not my fate to see the Pacific.

Leaving the Tobacco Plains at a point where they were pretty thickly wooded, we followed a narrow trail which, turning the south end of Galton's Range, followed up a small creek towards the north-east. We crossed a considerable mountain stream coming down a valley from the north, which, as it may be of use to the Boundary Commission, I have taken care to mark, and camped at an altitude of 4,070 feet. The following day we crossed soon after starting some high land, and then descended for the remainder of the day through thick woods till we arrived in the valley of Flathead River. The day after we descended by successive steps to the Flathead River, where it is joined by a creek from the N.W. Here I remained till noon for the purpose of fixing the position of this part of the river, which was just twenty-five miles south of where I had fallen upon it in my progress westward. Several peaks of the mountains showed well from this valley, and I did not lose the opportunity of sketching. A storm coming on drove me to camp earlier than I had intended. We halted on the creek spoken of, and only about half a mile south of the boundary, which, according to careful bearings, crosses just over a mountain, which itself has its length nearly in the exact direction of the line. Much rain fell in the afternoon, and by the next morning, Sunday, had changed for snow, which continued nearly all that day, giving the mountains a good white coat.

On Monday the 6th of September we regained British ground immediately on starting at 6 A.M.; we travelled up the creek till 10, when we halted for breakfast. It was cold, raw, and clouded. Here we found that the Kootanies, four men and two women, with whom we were travelling, and who had camped here on Saturday, had started this morning for the traverse of the mountains. Suspecting that we had a good day's work before us, I delayed as little as possible at breakfast, and

in less than an hour and a half we were again under weigh travelling up the course of the creek, which has some picturesque falls and cascades, caused by the inclined strata of red shale and sandstone. After two or three miles we began a steep ascent, and were soon on ground entirely covered with snow, in which the tracks of the Kootanies who had gone before us were visible. We passed along the edge of a very steep hill, and it was as much as the horses or ourselves could do in some places to keep footing. We now descended, crossed a thickly wooded gully, and then commenced the ascent to the water-shed through thick wood. The snow increased in depth as we ascended until, on arriving at the crest, it was two feet on the level, and in places heaped up to double that depth. It was cold work trudging through the snow in thin leather mocassins without socks; and, to make matters worse, it was blowing and snowing all the time. I, however, on arriving at the water-shed, with the assistance of the Indian "James," whom I always found most willing, unpacked the horse with the instrument boxes, and obtained a reading of the barometer, which gave an altitude of 6,030 feet. We ascended *along* the ridge about 100 feet more, and then by a zig-zag track commenced a steep descent. It was not, however, very bad, and we soon arrived at a small mountain torrent flowing eastward, thus regaining the waters of the Atlantic after an absence of sixteen days. The trail continued mostly through woods down the valley due east. The rocks on the tops of the mountains on either side were often of very curious shapes, and the strata in places much contorted; there were also some magnificent cliffs, and the cascades of snow water falling down the narrow gullies added motion to the grandeur of the scene. The snow gradually decreased as we descended. On arriving at the spot where the valley joined another I found the Indians camped on a patch of prairie, where I was glad enough to let my horse free, as we had travelled this day from six to six, with a halt of only 1½ hours.

The horses had the first half of the following day to rest, and I took the opportunity of testing my aneroid barometer by the boiling water apparatus, making the ordinary observations, and taking a sketch of a very peculiar peak just above our camp. After two hours' travelling on level ground along Red-stone Creek we emerged on the Saskatchewan Plains, just six geographical miles north of the 49th parallel, and camped at Waterton Lakes, two miles east of the mouth of the pass.

The position of the Waterton Lakes, as will be seen on the plan, is just where the offset range before spoken of strikes out to the eastward from the main chain, having the Chief's Mountain at its extremity. The uppermost and largest of these lakes lies in a gorge in the mountains, and is crossed by the boundary line. The scenery here is grand and picturesque, and I took care to make a sketch from the narrows between the upper or southernmost and second lake.

I was here fortunate enough to discover a stunted species of pine which M. Bourgeau, the botanist of the expedition, had not obtained. I gave him the specimen of this, as well as of some ferns and other plants which I had collected.

I was much struck by the comparative greenness of the prairies on this side, after the burned-up appearance of the Tobacco Plains, which we had left but a few days.

I remained camped at this pleasant spot two whole days for the sake of the horses, and in order to examine more carefully the nature of the country. Game was abundant, including grisly bears, and we obtained both fresh meat and fish. The trout and pike in the lakes were of large size.

The Chief's Mountain was not visible from the camp, but I obtained a good view of it from a knoll on the prairie about four miles distant, which with my previous bearings enabled me to lay it down, and curious enough, the boundary line passes just over this peculiar shaped mountain, which stands out in the plain like a landmark. I also made a sketch of it.

It will be seen that some of the waters of the Saskatchewan take their rise from the offset range at the boundary line, and from information gained from the Indians, I believe there is a tributary of the south branch, which rises to the southward of the Chief's Mountain, this may be the Bull-pound River of Arrowsmith; if so, this offset range has nothing to do with dividing the waters of the Missouri and Saskatchewan, and some of the waters of the latter must come from American ground.

We experienced a gale of wind from the south-west on the night of the 7th, which on the following morning ceased very suddenly, and an opposing wind from the north brought rain and snow, which gave another coating of white to the mountains. This corner of the mountains appeared to be a very windy spot, and when it was not blowing much on the plain, a strong breeze came from the south down the gorge in which is the Upper Waterton Lake.

On the 10th of September I turned my face towards Fort Edmonton, the previously appointed winter quarters of the expedition, which lay more than three hundred miles to the north, and as will be seen on the plan, passed several creeks, and over a country mostly prairie. I remained at the Forks of Belly River on Sunday the 12th. From this place I visited a camp of forty-five tents of Blackfoot Indians, accompanied by one of my men and "James," the Cree Indian. I was received with the usual hospitality, and having expressed a desire to change a horse or two, I had no trouble the following morning in exchanging one and buying another for ammunition, tobacco, blankets, old coat, &c. This tribe has the credit of being dangerous, but from what I have seen of them, I consider them far better behaved than their more civilized neighbours, the Crees. I made it a rule never to hide from Indians, and, although I had but a small party, to go to them as soon as I knew of their proximity. I also always told them for what reason the British Government had sent the expedition to the country: and I never failed to receive manifestations of goodwill, neither was there one attempt made to steal my horses, a practice only too prevalent among the Indians of these plains.

I need not describe my northward journey; suffice it to say that I kept to the east of my former track, along the base of the mountains, except when I turned in for the purpose of raising the cache. I rested at Bow River on Sunday the 19th, travelled over prairie till crossing Red Deer River, the

other fork of the south branch of the Saskatchewan, on the 23rd; then passing through a partially wooded country, which I had surveyed in the summer, arrived at Fort Edmonton on the north branch on the 29th September.

In this account of the return passage of the Rocky Mountains, by what I have called the Boundary Pass, I have not entered into such details as in the case of the Kootanie Pass, because, as will be seen by the accompanying plan and sections, more than one half of it lies in American ground; but I have given the same amount of attention to the mapping of it, as I considered a knowledge of that portion of the mountains would be of service to the International Boundary Commissioners at present engaged on the west side. Moreover, I do not consider the Boundary Pass so well suited for the passage of a railroad as the Kootanie Pass.

It will be perhaps noticed that I have said nothing concerning the fitness of the Kootanie Pass for a waggon road. My reason is simply that where a railroad can be constructed, a waggon road can also be made; without considerable expense a road could not be made to pass *over* the two high points (through which a railroad would tunnel) in the line of the pack-horse track followed by me: but I have no doubt by taking more circuitous routes, both of these heights might be passed by slopes adapted for wheel carriages. In other parts the road would follow the line proposed for the railroad.

I have not mentioned the existence of two other passes across this portion of the mountains, called the Crow-nest and Flathead Passes, the former in the British and the latter in American territory.

The Crow-nest Pass, of which I have marked the general direction on the plan, follows up Crow-nest River, a tributary of Belly River, into the mountains, and gains the west side near "The Steeples." By report of the natives it is a very bad road, and seldom used. I observed the old trail coming in from the plains on the left bank of Crow-nest River.

The Flathead Pass enters the mountains at the 49th parallel of latitude, follows the west shore of Lake Waterton, and gains Flathead River, which it follows to the Flathead Mission on Clark's Fork of the Columbia, about 80 miles south by east of the Kootanie Trading Post. It is used by the Flathead Indians when crossing to the Saskatchewan Plains for the purpose of obtaining buffalo meat.

Fort Carlton, Saskatchewan River,
December 15, 1858.


A GENERAL MAP
OF THE ROUTES IN
BRITISH NORTH AMERICA
EXPLORED BY THE EXPEDITION UNDER
CAPTAIN PALLISER,
DURING THE YEARS
1857, 1858, 1859, 1860.
Compiled from the Observations and Reports of Captain Palliser and his Officers, including the Maps constructed by Dr. Hector, and other authentic documents.
Scale of English Statute Miles.
Heights above the Sea in English Feet.
To accompany "The Journals, Detailed Reports, & Observations" presented to both Houses of Parliament, by Command of Her Majesty, 9th May, 1863.
LAKE WINNIPEG
LAKE WINNIPEGOSIS
LAKE MANITOBAH
LAKE SUPERIOR
641 ft. above the Sea
ISLE ROYALE
LAKE NIPIGON
LAKE ST JOSEPH
LAC SEUL
RAINY LAKE
L. of the Woods
Fort Carlton
Fort Ellice
Fort William
Upper Ft. Garry
Pembina
St. Joseph
Saskatchewan River
Assiniboine River
Red River
Rainy River
Touchwood Hills
Duck Mountain
Riding Mountain
Moose Mountain
Turtle Mount
Longitude West 91° of Greenwich.


CANADA
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
CARIBOO
Quesnelle Lake
Shoushwap Lake
Okanagan Lake
Flathead Lake
Kootanie Pass
Rocky Mountain Pass
Maria Pass
Boundary Line of Montana
Columbia Mountains
Rocky Mountains
Cypress Hills
Milk River
Red Deer River
Battle River
Blackfoot Camp
Stone Ind. Camp
Slaughter Camp
Old Bow Fort
Peigan Ind. Camp
Blood Ind.
Cree Ind. Camp
Fort Edmonton
Fort Assiniboine
Fort Chilcoten
Fort Alexandria
Fort Kamloops
Fort Colville
Fort Shepherd
Fort Walla Walla
Fort Langley
Fort Simpson
Fort Rupert
NEW WESTMINSTER
VICTORIA
Mt. Baker
Mt. Olympus
Mt. Robson
Mt. Brown
Mt. Hooker
Mt. Lyell
Mt. Sullivan
Mt. Head
Mt. Sabine
Mt. Nelson
Mt. Robinson
Mt. Wilson
Mt. Fox
Chief Mt.
Waterton of Chief Mountain L.
The Three Buttes
Site of Chesterfield Ho.
Thunder-breeding Hills
Moose Hills
Neutral Hills
Wolf Hills
Willow Hills
Hand Hills
Bad Hills
Rabbit Point
Redberry Lake
Jack Fish L.
Stinking Lake
Meadow L.
Pelican L.
Beaver R.
Milk River
Bow River
Elbow of the South Saskatchewan R.
Elbow of Battle River
Elbow of Red Deer River
Big Bend of Red Deer River
Big Bend of Bow River
Big Bend of Milk River
Big Bend of Saskatchewan
Big Bend of Columbia
Big Bend of Fraser
Big Bend of Thompson R.
Big Bend of Stikine R.
Big Bend of Liard R.
Big Bend of Peace R.
Big Bend of Athabasca R.
Big Bend of Mackenzie R.
Big Bend of Yukon R.
Big Bend of Porcupine R.
Big Bend of Pelly R.
Big Bend of Lewes R.
Big Bend of Stikine R.
Big Bend of Liard R.
Big Bend of Peace R.
Big Bend of Athabasca R.
Big Bend of Mackenzie R.
Big Bend of Yukon R.
Big Bend of Porcupine R.
Big Bend of Pelly R.
Big Bend of Lewes R.

Maximum fall of Snow is, at Fort Pitt, for East of the Rocky Mtns
Minimum — Do — is along East Base of the Rocky Mtns

Note — All the Rivers flow in narrow valleys depressed 100 to 300 ft below the general level.

Glaciers are coloured Blue

Trees of the Saskatchewan

Abies	alba	Michaux
—	nigra	Poiret
—	balsamea	Marshall
Larix	americana	Michaux
Pinus	banksiana	Lambert
Betula	alba	Spach
—	papyracea	Aiton
Populus	tremuloides	Michaux
—	balsamifera	Linne

Willows, Alders & a small variety of Shrubs.

Between the dotted lines is a belt of rich Country. Northwards is heavy timber & swamp — to the South Arid Plains.

At Walla Walla the Columbia with swift current & rocky banks is 1000 Yds wide.

SASKATCHEWAN RIVERS & ROCKY MOUNTAINS.

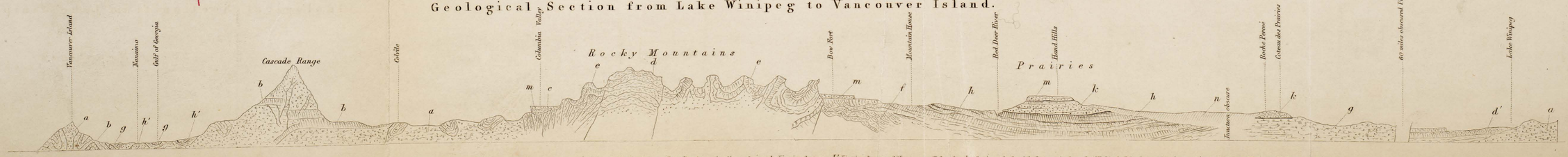
Routes of the
BRITISH NORTH AMERICAN EXPLORING EXPEDITION.
under the Command of
CAPTN JOHN PALLISER,
1858–1859.

James Hector, 1860.

Summer Tracks Coloured
Winter — Do

John Arrowsmith, 1860.

Geological Section from Lake Winipeg to Vancouver Island.



a. Granite & Metamorphic Rocks. — b. Basalts of Cascade Range. — c. Slates. — d. Silurian(?). — d'. Lower Silurian Limestone. — e. Carboniferous. — f. Grits & Shales (?). — g. Baculite Septaria Clays Cret. — h. Lignite Group. — k. Lignite Group of Vancouver Island. — l. Tertiary bed with brown Coal and Silicified Wood. — m. Tertiary Shingle beds of Highest Plains and Base of Mountains. — n. Tertiaries of Low Hollows.

Nº 5.

GEOLOGICAL SKETCH MAP of NANAIMO in VANCOUVER ISLAND.

Scale.- 1Inch to 1Mile.

Colours.

Green ..... Septaria Clays.
Brown ..... Coal bearing Sandstones & Shales.
Red ..... Trap.

See Dr Hector's Geological Report, page 235.

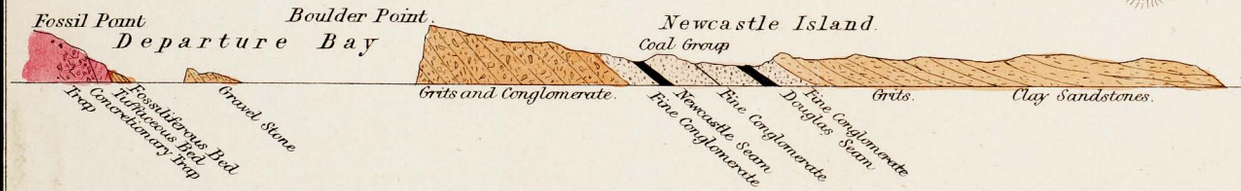
Fossil Point
Vertical
Section Nº 1
30°
15°
Var. 23°E.
Diver I.
Departure Bay
60°
25°
Gold Ck.
NEWCASTLE ISLAND
Exit Passage
DOUGLAS I.
Nanaimo Harbour
Mill
NANAIMO
MOUNTAIN DISTRICT
Mill Creek
10°
20°
5°
CALA DESCANSO
(OR GABRIOLA ISLAND)
Mt Benson
NANAIMO
Chase River
Section Nº 2
Rapids
15°
9 in. Seam Coal
Coal exposed at low water
DISTRICT
9 in. Seam Coal
Nanaimo River
10°
Fossil Bank
7°
Boat Creek
CEDAR DISTRICT
Fish hook L.
Trout L.
Section Nº 3
15°
Canon

Nº 4.

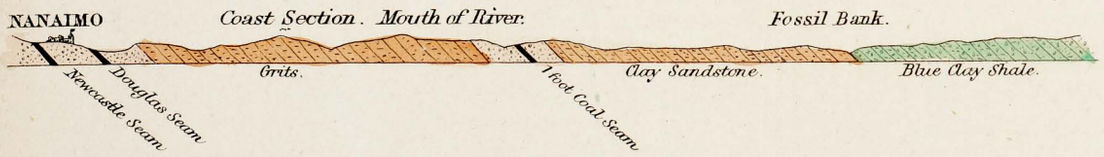
SECTIONS.

'Detached Sheet' See Dr Hector's Geological Report, page 235.

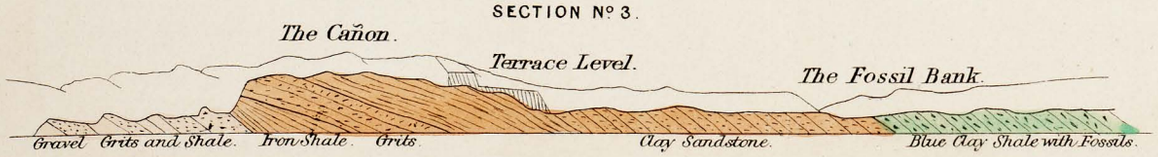
SECTION Nº 1.



SECTION Nº 2.



SECTION Nº 3.



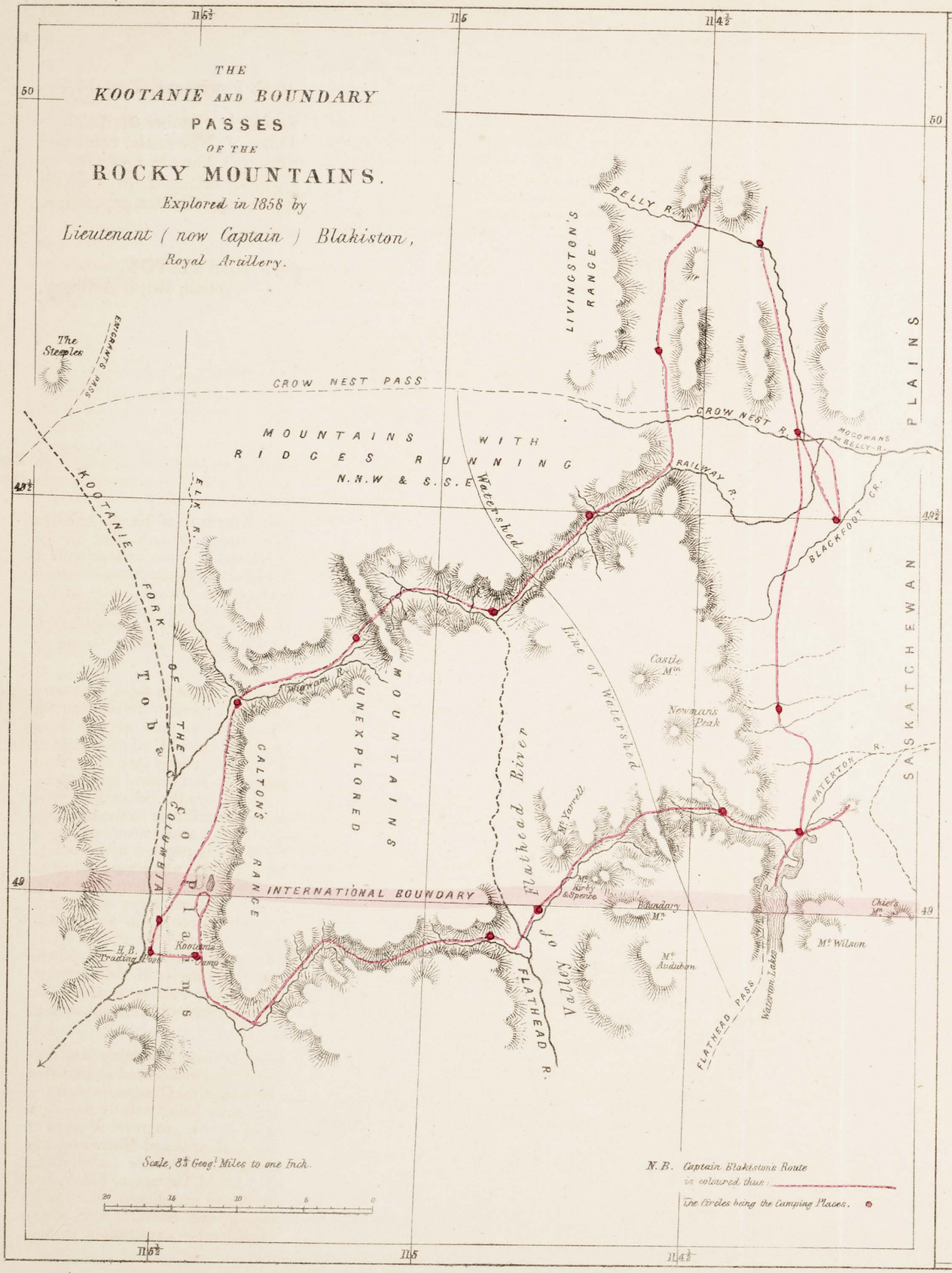
Stanfords Geographical Establishment, London.

THE KOOTANIE AND BOUNDARY PASSES OF THE ROCKY MOUNTAINS.

Explored in 1858 by

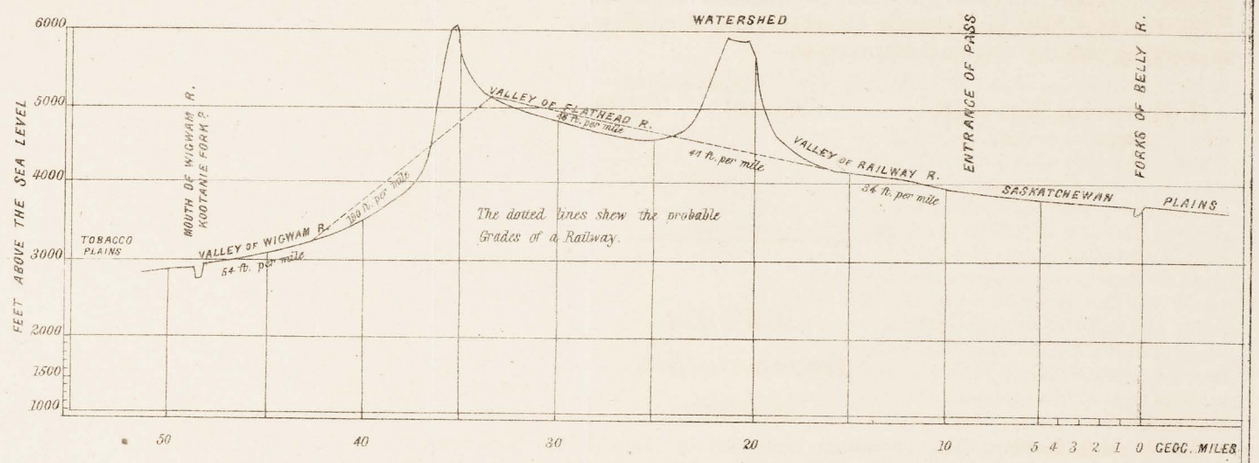
Lieutenant (now Captain) Blakiston,

Royal Artillery.



SECTIONS.

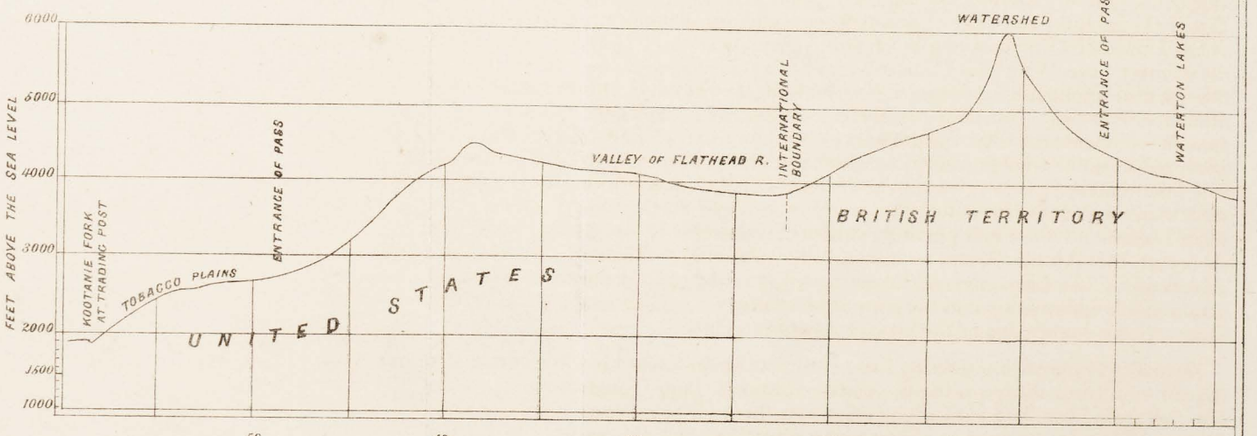
Nº 1 THE KOOTANIE PASS.



Horizontal Scale 8 Geog.l Miles to an Inch.

Vertical Scale 2000 feet to an Inch.

Nº 2 BOUNDARY PASS.



John Arrowsmith, Litho. 1860.

124° 123°

49

Burrard Inlet Coal as described by F.D Pemberton Esq. Surveyor Gen. of Vancouver Id
From this place Angiospermous Leaves have been sent home by H.M.S.Plumper.

Burrard Inlet
Coal
Coal
Coal Saw Creek
Point Grey
Lake
Cascade Range of Mountains
NEW WESTMINSTER
H.B.C. Fort Langley
Low Densely Wooded Country
BRITISH COLUMBIA
Fraser River
Roberts Bank
Boundary Line
Point Roberts
Variation 20° E. 1859
Semiahmoo Bay
Boundary Line

Fossil Point
NEWCASTLE Id
NANAIMO
Departure Bay
CALA DESCANSO Id
(GABRIOLA ISLd)
Conglomerate
Clay & Sand
Coal
Fossil Bank
Round Id
Inoceramus Clay Shales
The Cañon
D

From the Coal Strata at Nanaimo
H.M.S. Plumper has sent home
Conifereus but no Angiospermous leaves.

VALDES Id
GULF OF GEORGIA
GALIANO ISLAND
Trincomalee Channel
Salt Springs
Active or Plumper Pass.
Conglomerate & False bedded Sandstones
MAYNE I.
1529 ft.
SALT SPRING ISLAND
1972 ft.
2129 ft.
Stratified Rocks Cliffs face S.W.
PENDER I.
SATURNA Id
B
COAL Id
WALDRON Id
Saanych Bay
ORCAS ISLAND
SAN JUAN Id
Haro Strait
Rosario Strait
Middle Strait
LOPEZ ISLAND
Limestone
Esquimalt
Altered Rocks
VICTORIA
Royal Bay

Sections of Strata of Bellingham Bay
By F.D. Pemberton Esqre

	Sandstone	Clay	Coal 1ft	Coal 10ft	Clay	Sandstone
Sect 1						
Sect 2		Bad Coal 6 ft	Fire Clay			
Sect 3			Coal 3 ft	Fire Clay	Coal	
Sect 4	Clay	Sandstone	Coal 2 ft	Sandstone	Clay	

The Sandstone is pale drab color.
Unlike that with the Nanaimo Coal, it is full of small streaks of Coal.
The floor of the Coal is Fire Clay.
F.D.P.

Perhaps the Strike is parallel with the Coast. These Sections might all be of one series
J.H.
Sect 1 Sect 2 Sect 3 Sect 4
Bellingham Bay

Nº 8.

GEOLOGICAL SKETCH

of the South East of

VANCOUVER ISLAND

and part of the coast of

THE GULF OF GEORGIA

See Dr Hector's Geological Report, page 233.

Sect. A — B

Plications of Conglomerates observed when passing along the Coast

a b c d e f + g R h
Sect. C — D

Ideal Section of the Nanaimo strata from observed Sections. Report, page 235.
a. Trap of Departure Bay. b Green-sand stone (Trigonia) c. Gravel-stone. d. Grits
e. Newcastle and Douglas Coal seams. f. Clay sandstones + Thin Seam of Coal
g. Clay Shales with Cement stones (Inoceramus) h. Cala Descanso Island, Conglomerates and False bedded Sandstones. R. The rapids, probably a fault.

View of West Coast of Vancouver Island.

Nootka Sound (Cook)

124° 123°

Stanford's Geographical Establishment, London.

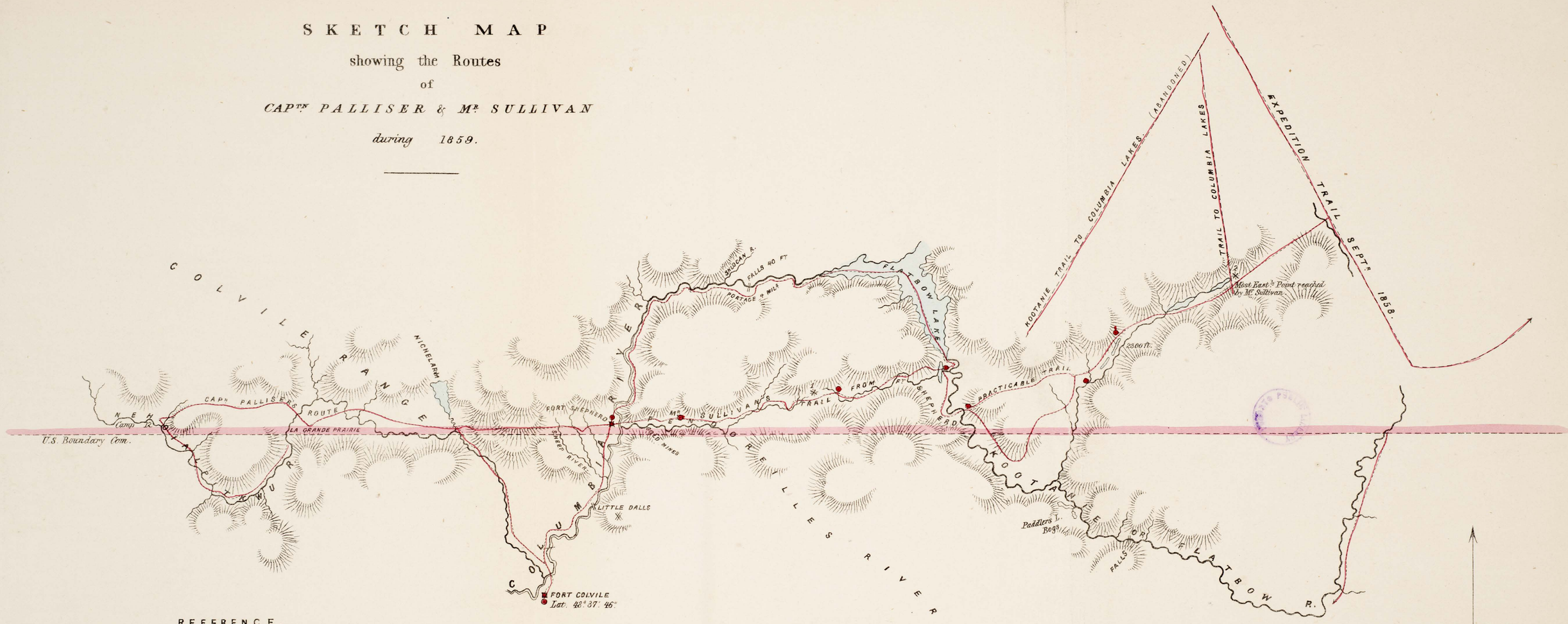
SKETCH MAP

showing the Routes

of

CAPTN PALLISER & MR SULLIVAN

during 1859.



REFERENCE.

1* ..... Height of Land 1500 ft. above FT SHEPHERD.

2* ..... 2300 ft. above FT SHEPHERD.

X ..... COLUMBIA is here a very wild Stream, flowing through a very contracted Channel, called as above, LITTLE DALLS.

N.B. ..... As far up as Salmon R. on the PENDOREILLES, not even a bark canoe can ascend, the River is a succession of falls and wild rapids.

The KOOTANIE R. also, presents numerous bad rapids from its mouth right up to the FLATBOW LAKE. Only experienced Indians navigate it.

Brit. Statute Miles.

5 10 15 20 25 30

J. Sullivan

John Arrowsmith. Litho. 1860

Nº 6.

DEPARTURE BAY

Boulder Pt

Grits

Outcrop of Newcastle Seam

Outcrop of Douglas Seam

Pt Mc Kay

Angle Pt

Newcastle Mine

Floor and roof of Coal Seam of Fine Conglomerate

Bore 8 fathoms to Douglas Seam

Gold Ck.

NEWCASTLE ISLAND

Clay Sandstones

Exit Passage

DOUGLAS (PROTECTION) ISLAND

Leaf Seam 2ft thick

Pt Mowatt

Nanaimo Harbour

Stuart Pt

Execution Pt

Mill Creek

Leaf Seam 6 inches

NANAIMO

Nº 3

Nº 1

Nº 2

Supposed fault

Bore 16½ fathoms No Coal

Bore 16 fathoms No Coal

Level free Workings

Bore 35 fathoms for Newcastle Seam

Var. 20° 30' E.

Outcrop of Newcastle Seam

Outcrop of Douglas Seam

Grits and Clay Sandstones

Chase R. Working

Flea Bay

Chase River

Nanaimo R.

First Working	In Newcastle Seam (Level free)	6 ft thick
Pit Nº 1	In Douglas Seam	3½ ft „
Pit Nº 2	Dead Workings	
Pit Nº 3	In Newcastle Seam. Shaft 15 faths from Floor of Douglas Seam	6 ft „
Level free Working	Douglas Seam	4 ft „
Newcastle Mine	In Newcastle Seam	6 ft „

Floor of Newcastle Seam is sometimes Fire Clay
Roof of Douglas Seam is sometimes Iron Clay Shale
Generally roof and floor of both seams is fine Conglomerate.

SCALE 0 1 2 3 4 5 6 7 8 Furlongs

PLAN OF NANAIMO
shewing the
COAL MINES
from records and Surveys of the
HONOURABLE HUDSON BAY COMPANY
and original observations by
C. S. NICOL, Manager,
and
Dr HECTOR
1860

James Hector M.D. 1860

See Dr Hectors Geological Report, page 233.

Nº 7.

DEPARTURE BAY

Outcrop of Newcastle Seam

Nº 7

Nº 5

Nº 4

Nº 3

Nº 2

Nº 1

Level of Slip

Line of Slip

20°

Magnetic

SCALE OF CHAINS
0 1 2 3 4 5 6 7 8

SCALE OF FEET
100 50 0 100 200 300

NEWCASTLE PIT
NEWCASTLE ISLAND
Seam 6 ft.

Bore 8 fathoms to Douglas Seam

Magnetic

Shaft 15 fathoms

PIT Nº 3.
NANAIMO
In the Newcastle Seam.
Seam 6 ft.

Bastion

Outcrop of Douglas Seam

Shaft

Magnetic

PIT Nº 1.
NANAIMO
Seam 3½ feet

Air way

Outcrop of Douglas Seam

Magnetic

Nº 10

Little Fault

Big Creep Fault

Air way Seam

Air way

Parkhead Level free

Air way

Dunsmuirs Level free

27°

Slope

LEVEL FREE WORKINGS
NANAIMO
Seam 4 feet