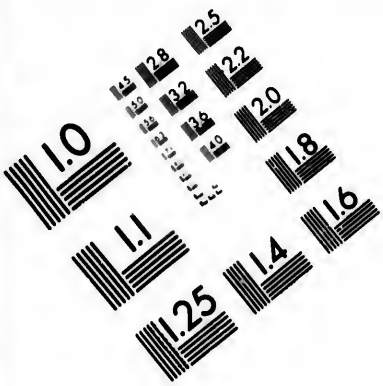

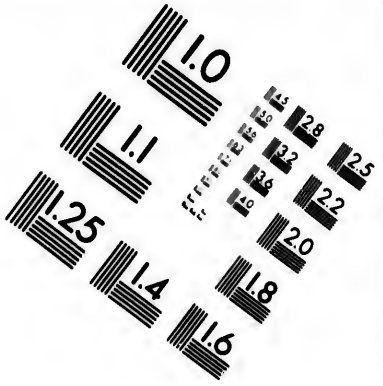

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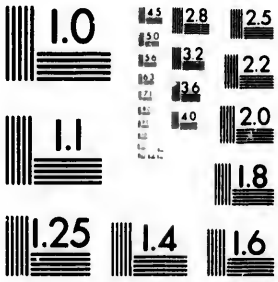

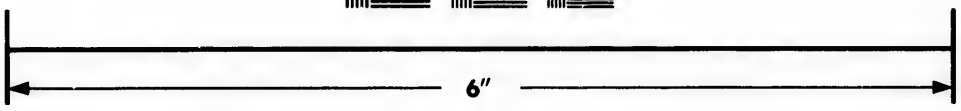

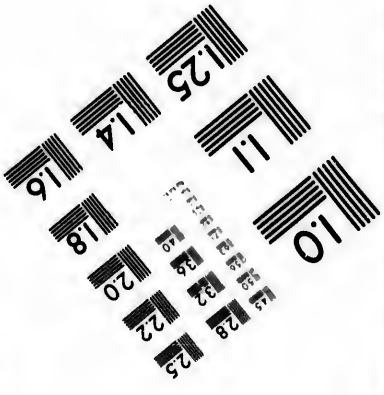

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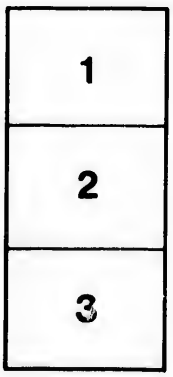

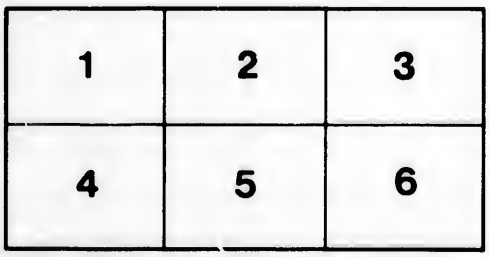

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APPENDIX No. 20 TO THE REPORT OF THE SURVEYOR GENERAL

REPORT OF ARTHUR SAINT CYR, D.L.S.

EXPLORATION OF THE COUNTRY EAST OF TESLIN LAKE.

OTTAWA, May 1, 1899.

E. DEVILLE, ESQ.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit my report on the exploration of the district allotted to me in your instructions dated April 13, 1898.

The district to be explored embraced that section of country which extends from Teslin lake to Pelly river Your instructions also suggested that, if time permitted, I should endeavour to reach Pelly river and ascend Ross river, which is believed to be the principal tributary of the Pelly river from the north. At the same time I was to make an examination of the country drained by it. I, however, found the water so low in all the streams leading up to the divide between the Nisutlin river and Pelly river basins that I had to abandon my canoes long before I could reach their sources. Under the circumstances the only thing left for us was to pack our supplies and outfit, in which case we could not take a sufficient quantity to successfully carry out the exploration. The mountainous character of the country to be examined and the lateness of the season, taken into consideration with the limited help at my disposal rendered our chances of safely returning from the trip very problematic. After giving due consideration to these difficulties, I decided to limit myself to the exploration of the Nisutlin and Big Salmon rivers. The former is the chief feeder of Teslin lake, and the latter an eastern tributary of the Lewes river.

The object of the exploration was to obtain a general knowledge of the district, its topography and its resources. In order to successfully complete the work during the short summer season, it was decided to connect by triangulation a number of the highest and most prominent points, and then fill in the gaps by means of photographs and sketches.

The general character of the country is mountainous, and specially so along the upper reaches of the Nisutlin and Big Salmon rivers, which of course is very advantageous for photographic surveying. The ascent of twenty peaks was made which ranged in altitude from 6,000 to 7,000 feet above the level of the sea. Whenever these were located too far apart to furnish the detailed topography of the country, I established intermediate camera stations. One hundred photographs were taken from these points for use at some future time in mapping the chief features of this district.

To successfully carry on photographic surveys, it is necessary that the atmosphere should be free from smoke, a condition seldom obtained in a country where there are so many prospectors. Therefore the moment the smoke made its appearance, this work had to be discontinued and other methods substituted, such as instrumental traverses of the navigable rivers and track surveys of the paths following the most important of the mountain streams. I managed in every instance to connect these partial surveys with my triangulation.

In a mountainous country the magnetic needle is not solely to be relied upon. I therefore took solar observations for azimuth from the tops of almost every peak occupied, and thus obtained the astronomical bearings of the other peaks used as triangulation stations, and in this way did not depend altogether on the compass. The

observations were the means of detecting considerable abnormal deviations of the needle in certain localities. For instance in the vicinity of the headwaters of the Rose river the deviation is to the east of the meridian and amounts to 60°. Similar observations carried on in connection with the traverse of the streams failed to show any abnormal deviation of the needle in the valleys, thus tending to prove that these extraordinary deviations are a feature peculiar to the high peaks which form the crest of the mountain ranges.

The instruments furnished me for the work were a three inch transit-theodolite and a surveying camera. I was also given an improved surveying aneroid made by Keuffel and Esser. This was a new instrument, and it proved to be a reliable one, a very uncommon thing for an aneroid.

The recommendation made in the instructions that I should observe frequently for latitude was adhered to during the whole season.

It had been arranged that I should go by way of Skagway and the White pass to the district in which I was to spend the summer, but at the last moment my route was changed and I went by way of the Stikine river. This change fortunately gave me the opportunity to complete some work which had been left unfinished in the autumn of the previous year.

On May 20 I took passage on the Canadian Pacific Railway company's steamer *Athenian*, which sailed from Vancouver, and on the 23rd landed me in Wrangel, which is the place of departure of all steamers navigating the Stikine. A day later the sternwheel steamer *Ogilvie*, one of the swiftest boats on the river, left Wrangel and arrived at Glenora on the 26th. We saw several large parties of prospectors camped at different points along the river, who were on their way to the Yukon gold-fields. They started on their journey the previous winter and had hoped to be able to utilize the ice on the Stikine and reach Glenora before the spring thaw. But as the winter had been unusually mild, the ice had not formed over the canyons, and before they could get their outfits around the open water spaces a general breaking up of the ice had occurred, and they were obliged to seek safety for themselves and outfits on the higher banks of the river. At the time we passed they were anxiously waiting a chance to be taken on board of a passing steamer. Glenora, which was six months before composed of a few old dilapidated log houses surrounded by some small cultivated patches of land, now presented a lively appearance. Hotels, stores and large warehouses had been erected in that short space of time along the street facing the river. Back of the business part of the town miners had pitched their tents, and these covered the ground as far as the foot of a high cliff which limits the town site towards the west. This portion is low and some parts are liable to be flooded in the spring. Better ground is to be found towards the south of the town; this had been judiciously chosen and was at the time occupied by the Yukon military force, under the command of Lieut.-Col. Evans. The tents were pitched on the top of a bench which is several feet above the river and dotted here and there with poplar bluffs. A cool breeze constantly blowing across the terrace had the good effect of tempering, at midday, the scorching rays of the sun; all this coupled with fine springs of cold water spouting from the face of a hill close by, rendered the spot an ideal one for a military camp. The daily arrival of small river steamers loaded to their utmost capacity also tended to make Glenora a centre of great activity during the early part of the season.

On my arrival in Glenora I was informed by some returning packers that the trail to Teslin lake was in a very bad condition, and for that reason the pack animals could not carry a heavier load than 150 pounds each. In my outfit, which included three acme folding boats, I had also some packages of stationery addressed to Gold Commissioner Fawcett. I therefore made arrangements to have these carried by a pack train which was advertised to start at once for the lake. I then left with the rest of my outfit for Teslin lake, where I arrived on July 16, having been twenty-six days covering the distance. The report as to the bad condition of some parts of the trail had not been exaggerated, but on the other hand improvements in the shape of good substantial bridges over the largest streams, such as the Tahltan and Nahlin rivers, where in former days delays caused by freshets were a common occurrence, compensated to a certain extent for the slow travelling over the bad sections of the trail.

On the trip to Teslin lake I was able, with the instruments I had with me, and the favourable weather, to determine the latitude of the following points:—Egnell post, the Nahlin river where it is crossed by the trail, the eastern outlet of Disella lake, and the mouth of Whiteswan river. The latitude of the southern extremity of Teslin lake was also determined. I had not been able to obtain this on a previous trip because of unfavourable weather and pressure of time due to the lateness of the season. I could not help noticing, on my arrival at the lake, the changes which a dry spring season had made on its surroundings. At the mouth of Whiteswan river, which enters the lake at its southern extremity, are alluvial flats where a great quantity of wild hay grows; at a much later date in the previous year these were covered with water and inaccessible for horses. The meadows were not only dry, but the deep channel of the river which separates them from the mainland was perfectly dry. As a consequence of the drought the level of the lake was considerably lower.

When travelling on the trail to the lake, we passed droves of sheep and cattle which were being taken to the Yukon. This I believe is the first time that the trail has been utilized for the purpose. On July 5 a drove of forty head of cattle, which had been brought from the United States as a speculative venture, was met in the vicinity of Hatin lake, sixty-five miles distant from Teslin lake. They had, therefore, at the time covered more than half of the distance between Glenora and the lake. They appeared as fat and fit for market as any cattle I have ever seen. The drovers informed me that they had experienced no difficulty in finding an abundance of good feed in close proximity to the trail. Their intention after reaching the lake was to take the cattle on rafts to Dawson, where they expected to obtain a good price for them. I was informed later on that they had succeeded beyond their expectations, and that another party had, by the same means, taken several hundred sheep down the river.

The moment I reached the lake, preparations were commenced for the exploration, which was to begin by the survey of the Nisutlin river.

Our three acme canvas boats, when taken out of their crates, were found none the worse for being packed over the trail; all the parts were in perfect order. With the aid of the concise directions accompanying each, all the pieces were soon fitted together and put in their proper places. The boats were sixteen feet long and four feet beam; being flat-bottomed, their carrying capacity is remarkable. They easily carry 1,500 pounds and two men, with five inches to spare above the water line.

The Nisutlin river had been reported to me as being so swift over the greatest part of its course that polling would have to be resorted to in order to ascend it if any kind of progress was to be made against its current. To counteract the great strain to which the boats would be subjected and to give them the additional strength necessary for the better performance of the special work which would be required of them in polling or tracking against strong currents, two extra pieces of wood a little longer than the boat, three inches wide in the middle and tapering to one and a half inches at the ends, were added to each side of the boat. These pieces were placed longitudinally outside the boats, and pressed tightly against them when fastened at their extremities. Both pieces were well fastened together, but the end which carried the tow line was depressed to the indicated water line when the boat was loaded to its full capacity. The reason for tying the line low is that in coming to a ripple or in trying to avoid dangerous places we had a better control over the boat which would otherwise, the instant it struck swift water, be carried into midstream by the action of the current. When the rope is tied higher the tension caused by the united efforts of the crew in their endeavour to bring the boat back towards the shore tends only to hasten the overturning of the boat, entailing not only the loss of its contents but generally that of the boat also. Thus improved, we had at all times complete control over our boats, and the worst sections of the river were passed without accident.

As soon as the improvements to the first boat were completed and found satisfactory, I set the men to improve the other ones in the same manner. Knowing that this would occupy some time, I started with one man for the foot of Teslin lake, where I intended to observe for latitude; on the way I made the survey of the eastern shore, thus completing the work commenced in the autumn of 1897.

SESSIONAL PAPER No. 13

SURVEY OF THE EASTERN SHORE OF TESLIN LAKE.

Teslin lake lies in a north-westerly direction. From the mouth of Whiteswan river (which enters the lake at its southern extremity) the distance to the outlet of the lake or Teslin river is eighty miles. In this stretch there is at its southern end a narrow section, eight miles long, with occasional shallow places. This river-like extension is soon followed by an expanse two miles in length and width, and terminating in a neck called Moose narrows. Beyond the narrows the lake is shallow for some distance, but its depth soon increases. Moose narrows may be considered as the commencement of the lake proper. There is another shallow spot at the foot of the lake, just before entering Teslin river. Teslin lake is four miles in width at its widest part, which occurs sixteen miles north of Moose narrows. The shores of the lake differ in a marked degree; the western is very regular and for that reason is the one generally followed by travellers, whilst the eastern shore is indented with several deep bays, which invariably receive streams draining the adjoining country. The first bay is thirteen miles north of Moose narrows, and is nearly two miles deep. Near its southern entrance we sailed between several small islands. Twenty-one miles farther there is a second deep bay. Seven miles still farther is another bay known as Nisutlin bay, which receives the river of the same name. It is the largest bay in the lake, and will be described more fully later on

Between Moose narrows and Nisutlin bay the country east of the lake is very much broken by hills extending a long way into the interior. They rise to an altitude of 1,700 feet above the level of the lake, and slope gently towards the shore. In a few places they end abruptly at the water's edge, forming cliffs in places, and at other points high and precipitous clay escarpments. The country is thickly wooded. Of the many streams draining it and running into Teslin lake, I will only mention, besides the Nisutlin, the Williams river, as it is the next in importance to the Nisutlin. The current is so swift at its mouth that it forces its way for a considerable distance through the placid waters of the lake without mixing its turbid stream with the dark waters of the lake.

The distance from the entrance of Nisutlin bay to the outlet of Teslin lake is 30 miles. Between these two points the shore of the lake trends north-west, and is very uniform. The shore line at the entrance of the bay is formed of precipitous cliffs, which, however, soon give place to a sandy beach. Back of the beach is a strip of low and swampy country of varying width, which extends close to the foot of the neighbouring range of mountains. Adjoining this strip of low land there is towards the north a series of terraces, low at first, but increasing gradually in altitude, and by the time the foot of the lake is almost reached their crest looms up several hundred feet above its level. The unceasing beat of the waves against their base has caused land slides which have left bare the slope of these elevations. These slopes are deeply furrowed by the action of the torrents which rush down from the high lands in the spring of the year, when the snow begins to melt under the fierce action of the sun.

Two large creeks, which rise in the high range of mountains east of the lower half of the lake, are the only streams which enter the lake between Nisutlin bay and its northern extremity.

On July 23, having completed my observations at the foot of the lake, I returned to the entrance of Nisutlin bay, where I had been preceded by the rest of my party, and began its survey. On entering the bay one cannot fail to notice the difference in the colour of the water, which is turbid in the bay, whilst that of the lake is brown. The bay opens in a north-easterly direction, and its length to the delta of the river is 5½ miles. Up to the 5th mile its average width is not over half a mile. Its southern shore then takes a sharp turn to the south-east, and continues in that direction for 2½ miles, and forms, with the delta of the Nisutlin river, which is its opposite shore, another but smaller bay, three-quarters of a mile at its widest part. In the southern extremity of this small bay there are numerous islands; a small stream also enters it.

The quantity of sediment scoured, at high water, from the banks of such a stream as the Nisutlin river is necessarily great, and is the cause of the extensive delta formed at its mouth. This land is low, and subject each year to inundations, which occur in the month of June. A narrow fringe of willows grows along the edge of the banks of the

river, but back of it natural prairies cover the greatest part of the land, which at the time of the survey was partially dry and producing good hay. I see no reason why this hay could not be utilized in the future to feed cattle on their way to the Yukon markets. I mention this because cattle were driven this year, for the first time, over the Teslin lake trail, and as the experiment has turned out well it may reasonably be expected that the route will be used again for the same purpose, and should there happen to be at any time a scarcity of feed along the trail the cattle could be brought here. The animals could not only have rest, but recuperate as well before being fowarded to market. This land would then become valuable, as it is situated at the head of the navigable waters of the Yukon.

EXPLORATION OF NISUTLIN RIVER.

On our arrival in Nisutlin bay the smoke, which had been thickening every day, became so dense that it precluded all photographic work for the time being. The season being already so far advanced, I was loath to lose any time waiting for a more suitable condition of the atmosphere, and I decided, as the next best thing under the circumstances, to make a traverse of the river, and if later the atmosphere cleared up, to begin a triangulation of the country. Such an opportunity, however, did not present itself for several days afterwards, and by that time I had completed the survey of 80 miles of the river.

The Nisutlin river empties into Nisutlin bay by three estuaries, the middle one being the principal. The southern one diverges from the main stream at a point two miles above the bay, and flows toward the foothills which limit the valley to the south. On its way it branches off into several channels, which send their ramifications through the meadows mentioned above. The other branch (north of the main stream), though narrow, is deep. The current is slack except at its bifurcation from the river proper, where it is quite swift.

On July 30 we entered the river by its middle branch. A short distance above its mouth it is 200 feet wide, with a depth of 8 feet of water. The channel follows close along the northern bank, which, like the opposite bank, is low and thickly covered with willows. A large sand bar has formed along the southern bank and spread a considerable distance into the bay. It is strewn with a great number of trees, which have been detached from the banks during the season of high water and become imbedded in the sand. Two miles above its mouth the river, which now runs through a single channel, increases its width to 700 feet, with a depth of 10 feet of water, but one mile and a half further up it suddenly contracts again. At this point the channel is obstructed by sharp pointed rocks, the remains of a rocky ledge through which the river has cut its channel. There is deep water close to the right bank. The river soon widens again, and a distance of half a mile more brings us to a large tributary which enters the river from the right. Its width, a short distance above its confluence, is 100 feet between the banks, which are low and well timbered. It has a swift current, and at the time of survey had a depth of 8 feet of water. Its waters are bluish. The volume discharged by it into the Nisutlin river is equal to about one-third of that of the main river. The valley of the stream is wide, and opens towards the east. A large gravel bar, which has formed in the Nisutlin river a short distance below the point where it receives this eastern tributary, had been staked as a mining claim. At the time of the survey it was not being worked, but there were unmistakable signs of its having been at some period. A few pans of gravel taken from the surface and washed showed fine gold. Half a mile below the junction of this tributary the right bank of the Nisutlin is formed by cliffs which rise almost perpendicularly from the water's edge. They are part of the ledge encountered a short distance below and which obstructs the passage of the river. The opposite shore, on the other hand, is formed of low banks, on which is a vigorous growth of spruce, poplar and cottonwood, intermixed with thick willows, whose branches trail into the stream and give a fine appearance to its banks.

Owing to the thick smoke, which at the time spread over the country and appeared to originate from fires raging in the valley of this tributary, I did not care to spend any time on its exploration, but continued the survey of the Nisutlin river.

The general course of the Nisutlin is N. 20° E. from its mouth to a point two miles above the confluence, where a sudden change occurs in its direction to N. 25° W. which it maintains for fifty-five miles. Here the river divides into two branches. The principal one or main stream is diverted towards the east, whilst the secondary branch continues in a southerly direction for another mile. At that point it receives its principal tributary from the west. Thus increased in volume the secondary branch again alters its course and gradually approaches the main river, which it finally joins at two miles below the bifurcation.

The striking change from the clear bluish water of the Nisutlin to a turbid colour brought about by the mixing of the waters of Muddy river with those of the Nisutlin river is what led to the discovery of this tributary.

Up to August 12, the smoke had been an insuperable obstacle to any photographic work, but a strong wind blowing constantly from the north had cleared the atmosphere to a certain extent and permitted the taking of photographs. With this prospect in view, I established a main camp on the bank of the Nisutlin river, and left it in charge of the cook while with the rest of the party I entered Muddy river. Near its mouth the current is rapid, averaging probably three miles an hour. Its waters being very muddy are evidently in great part derived from melting snow. On August 13, I camped at the mouth of the first tributary of this river from the south-east. While the men were preparing for the night, I went along this creek and after following it for four miles, I was surprised to find that its size increased considerably. Its bed was both deeper and wider than nearer its mouth. This continued for a few miles more, where the creek changed to a turbulent stream, rushing by rocks and boulders, some of great size. The low and flat country here gives place to high hills, timbered with pine, around which the creek meanders. Its water is of a dark brown colour, and is undoubtedly from swamps near the foot of the mountain range.

The next day I continued the ascent of Muddy river and passed two other large creeks ; also rising from the south east. I continued up stream all that day and part of the next one, when finding myself close to the foot of a group of mountains which occupies the point formed by the Muddy river and the Nisutlin, I established my last camp. This stream is very tortuous and its width at our camp was not over one chain. Just above our camp its channel was blocked by great piles of drift wood. The valley is not more than two miles in width. While the country west of the stream is hilly and broken, that on the opposite side is low and marshy and considerably cut up by old channels which in the early part of the summer carry away the surplus waters. Beyond these marshes there are rough hills upon which the timber has been killed by fire ; they culminate in high mountains rising 3,000 feet above the river.

From the top of these mountains I obtained the first glimpse of the southern end of Quiet lake, but only for a few moments. Towards the west there looms up a high and serrated range of mountains, a continuation of the range which separates the valley of the Nisutlin from that of Teslin river. The valley of Muddy river is connected with the depression in which Quiet lake lies, by a low pass just north of the mountains which I had occupied as a station. Although I remained on the summit of these mountains for four days, I could not take any photographs, but was compelled to make sketches of different sections of country which came into view, when by the sudden shifting of the wind the smoke was driven in another direction. I was, however, enabled to trace the course of the stream eight miles beyond our camp, where it branches off into several streams heading from the mountains and is fed by the melting snow which caps the mountains in that district late in the summer. On the fifth day, seeing that no better results could be obtained by remaining there any longer, we retraced our steps towards the camp very much disgusted with the poor success which resulted from this, our first attempt in the mountains this season.

The mountains to the east of Nisutlin river do not form a continuous range, but are in groups separated from one another by deep and sometimes very wide valleys whose general trend is east and west. Near the mouth of the river they are better called hills

and though these increase in altitude as we ascend the river, their highest summits never reach over four thousand feet above the valley. In each of the valleys there flows a tributary of the Nisutlin. These are exceedingly tortuous, and navigable for boats only at high water.

From the summits of some mountains, which I had to climb in this vicinity, I could distinguish through the smoke the reflection of large sheets of water. These are located in the plains east of the mountains bounding the valley of the Nisutlin to the east. These lakes are the head waters of the numerous small eastern tributaries of the river.

On August 21, we broke camp and started down Muddy river. The absence of the sun had arrested the melting of the snow in the mountains, and consequently the volume of water in the river had been considerably reduced. Though we had frequently to drag our boats over shallow bars, we managed to reach our main camp that night.

The next day I continued the traverse of the Nisutlin river; its direction for the next forty miles is nearly north. It now meanders between high benches whose crests are within a mile of each other. From the top of these benches, terraces extend to the foot of the mountains. At the fourteenth mile on this stretch we come to Cary portage leading to Quiet lake, which lies west of the river. Here I left a man in charge of our stores, and with the rest of the party I proceeded up the river. There is also another portage to the same lake about three miles farther up, but the first one mentioned is preferable being considerably shorter and running across a more even country. Besides, there are two lakes on it, one of which is a mile in length; this stretch of water is convenient to portage boats from Nisutlin river to Quiet lake. Above the last portage the stream is very tortuous and impeded by a succession of rapids which, however, must be greatly improved at high water. These rapids are two and one-half miles long. One mile and a half above them a small river enters the Nisutlin from the east. Its right bank near its confluence is very high and precipitous. From the rapids there is a broad and straight expanse of river three miles in length with low banks wooded to the water's edge. The current for a long distance is almost imperceptible, the bed of the river is filled with quicksand, which rendered it dangerous to land at many places. Beyond this expansion the river resumes its usual appearance: swift current, high cut-banks, specially on the right bank, and tortuous course. These characteristics continue up to its confluence with the Rose river, its principal tributary from the north. There are other streams heading from the same direction but of less importance. Its valley was explored and the country which it drains will be described fully later on. It rises from some lakes at the summit of the range of mountains which divide the Pelly river basin from that of the Nisutlin.

From the mouth of the Rose river, the valley changes its hitherto northerly direction and stretches away almost due east, a distance of eight miles. Beyond this it inclines towards the north-east, and has cut through a high range of mountains, which bounds the valley towards the east, and whose snow covered tops could be seen glittering in the sun now that the smoke had partially disappeared. Here a branch valley opens towards the south-east and leads to a mountainous district. Beyond that point the chains of mountains on both sides of the river converge towards each other and at two and a half miles further up stream are so close to each other that they confine the river in a narrow and deep gorge whose sides are at some points formed by precipitous cliffs; at other points by high escarpments of sand and gravel into which large boulders are imbedded. These under the joint action of rain and frost, which disintegrate the softer material in which they are imbedded, are precipitated into the bed of the narrow stream and cause obstructions which are a serious drawback to anything but light boats. There are no large islands in this section of the river. The gorge is six and a half miles long. Above the rapids the valley widens again, there are numerous islands and the bed of the river being free from boulders becomes again navigable for boats, thus rendering access possible to the large lakes from which it rises.

I now discovered that there would be more exploratory work to do here than I had anticipated, and if I kept the whole party with me that our supplies would not last us long enough to satisfactorily complete it. I therefore sent back two of my men with instructions to transfer our stores and outfit from the Nisutlin river, by Cary portage,

to Quiet lake. In the meantime, accompanied by one man, I went on with the exploration. Four miles above the head of the rapids mentioned a second tributary, McConnell river, enters the Nisutlin from the north. Up to this point the general trend of the valley is to the north-east; but it now turns in a south-eastern direction for a distance of eighteen miles.

From the top of a mountain, north of the river, which overlooks extensive plains spreading towards the east, there appears to be a low country dotted with lakes of all sizes and intersected by numerous connecting streams which ultimately find their way towards the Nisutlin. From the same point of vantage the eye rests on the mighty mass of a well defined range of mountains which extends to the north. This range is separated from my station by a narrow pass lying at its base. A fine lake at the highest point of the pass is the source of a stream which meanders along the foot of this mountain, which I had chosen for an observation point, and after receiving another large creek (the outlet of a good sized lake) enters the plains and finally empties into Nisutlin river.

The distance from the confluence of Rose river with the main river to the point where the Nisutlin issues from the lake is eighteen miles. The average width of the river throughout this section of the country is rather less than in the previous section. The islands are not so numerous, and occur singly, not in groups as is the case in its lower reach. The current is very swift, there being an average fall of twenty-seven feet to the mile. Land slides have occurred wherever the current sweeps by the hills. Both sides of the valley are timbered from the water's edge to an altitude of two thousand feet on the slopes of the mountains.

Having located the eastern sources of the Nisutlin river and completed my photographic survey of the adjacent country, I now turned my attention to the exploration of some of its chief tributaries from the north.

On September 7, I returned to the mouth of McConnell river, which I ascended for several miles. The next day I occupied a prominent peak to the east of the river. Its altitude is 3,270 feet above the valley. It is one of the points in the chain of triangles covering this section of country. The scenery of this region is very striking. Looking back over the river, it is seen that it may be divided into two principal divisions. The lower reach is one hundred miles long and with its sinuosities occupies a very wide valley. Forests of spruce cover the greater part of the bottom lands and terraces, and the slopes of the mountains are also clad with trees to an altitude of two thousand feet above the valley. The strips of low lands between the river and the foot of the mountains are often several miles wide. Along their foot we noticed lakes or ponds which act as reservoirs for the surplus water which rushes down these mountains in the early part of the summer. There are numerous gravel bars in the river, some extend from the banks of the stream, while at other places, where its width is great, they have been deposited in the centre of the stream.

The second division of the river, or its upper reach, embraces not only its main eastern branch but includes as well all its tributaries. These streams run in close proximity to each other through nearly parallel valleys and, by their numerous ramifications reach to the heart of the mountains which separate the basin of the Nisutlin from that of the Pelly.

The appearance of the country to the north is remarkably grand and imposing. We are here confronted by bold and serrated high ranges of mountains which stretch to the extreme limit of our horizon. These are cleft at intervals by defiles which converge towards the principal valleys leading to that of the Nisutlin. The general trend of these valleys is nearly in a north-east direction. As may be expected, the streams which drain this district are nothing more than torrents, and in high water their ascent is attended with the greatest exertion and risk. After the freshets have subsided they are too shallow for the use of boats.

On September 11, I descended the Nisutlin river, as far as the mouth of the Rose river. The next morning I began the ascent of that stream, which is one and a half chains wide at the mouth, with a depth of two feet of water, and for one and a half miles from its mouth is nearly straight. This swift stream follows the foot of wooded hills which separate its valley from the depression occupied by Quiet lake. The hills, however, recede towards the west, while the river continues its tortuous course in a north-

westerly direction. The river is frequently blocked by trees which have been detached from the banks and accumulated in the narrow parts of the river, thus backing up the water, which spreads over the banks and forces it to cut new channels through the bottom lands. On the opposite side of the river the bottom land begins at the Nisutlin and stretches towards the north, where it is bounded by a sandy ridge, a projection of the eastern range of mountains. This strip of land extends to the foot of the mountains on the east and is generally boggy. The river, after receiving a tributary from the west, skirts the extremity of a ridge which it afterwards closely follows for miles. We had now reached a section of the river which is narrow and full of boulders and was difficult to ascend. We were obliged to drag our boats through it; the water being swift, three feet deep and icy cold. Our progress was so slow that I decided to abandon the boats for the time being and to continue the exploration on foot. Taking with us the instruments and supplies for a few days we proceeded by the western side of the valley, which seemed to promise the best travelling. Where we left our boats the stream divides into three channels, formed by two islands timbered with spruce. One mile above the islands there is a gorge formed by spurs from the high ranges of mountains which rise on each side of the river. Above the gorge a turnulent stream enters the river from the east; after which the valley widens again and the velocity of the current is greatly reduced; in some sections it is less than two miles an hour. A cursory examination of the country ahead of us was made from the top of a hill rising three hundred feet above the river; it showed that the western side of the valley was the least broken and would afford the best route for our exp'oration. Beyond the gorge our path led at times through forests and over sandy ridges in order to avoid marshy lakes caused by the overflow of the river during the freshet; at other times it crossed prairies and stretches of brushy lands on the points formed by the bends of the river.

As we moved up the valley, the mountains to our left became very rugged, bold bluffs several hundred feet high face the river while further inland they break into sharp peaks rising to a great altitude. The mountains east of the river, on the other hand, slope gently towards the river. Their slopes are still to a certain extent forest clad, but near the river all the timber has been killed by fire and the trees are now thickly strewn over the ground. After crossing several creeks we came to a point where the main valley breaks into two smaller ones; the one to the right hand side continues in a northerly direction and is the valley of the Rose river, while the other one is from the north-west and contains a large tributary. The distance between the mouth of the river and the forks is twenty miles. I established my last camp on this river near the mouth of a large creek which comes from the east and enters the river at two and a half miles above the forks. I had now proceeded far enough inland to gain a complete knowledge of the sources of this stream, provided I could succeed in climbing some of the high neighbouring peaks which tower above the valley. From our camp the valley of the Rose river lies between two high ranges of mountains; the valley itself is probably more than three thousand feet above the level of the sea.

During our stay in this district heavy rains fell continuously, and hardly a day passed without severe hail storms. We now noticed with apprehension that the snow line on the mountains was getting lower after each storm and that very soon the valley itself would be covered with snow. The leaves were now lying thickly over the frozen ground, a sure sign that the winter season with its many discomforts was fast approaching.

On September 7, after a very laborious climb of seven hours, I reached the top of a peak forming the southern extremity of the range of mountains rising between both streams, but discovered that the view to the north, which I specially wanted to photograph, was intercepted by a row of higher peaks which, however owing to their great distance could not be reached the same day. I, however, did considerable work from the station now occupied, and the next day by daylight I was on my way to those peaks, from whose tops I expected to photograph the head waters of the Rose river. The day proved to be a very bright one though cold. By noon we had attained the highest point, 8,700 feet above the level of the sea.

The scenery is equal to, if not grander than, anything I have seen in the Rocky Mountains, there are such contrasts. At our feet lay the river, like a silver ribbon,

winding its way in a maze of loops. From its banks spread a forest of conifers whose dark foliage broken in spots by the golden hued foliage of poplar and birch, contrasted strikingly with the now snow covered slopes of the precipitous sides of the mountains. Just north of us the deep blue of the lakes from which the river issues added to the grandeur of the landscape. Beyond the lakes I could distinguish a transversal valley through which probably the waters take their course towards the Pelly river. We were now in the heart of the mountains limiting the basin of the Pelly river to the south. The erosion and denudation of these mountains are peculiar, the ridges are sharp and the gorges deep with very precipitous sides.

The work was successfully completed from this our farthest station in that region. Night had set in long before we reached the camp. The next morning we began our return journey, and two days later we arrived at the place where we had abandoned our boats. Here I observed from another peak. It was on its top that I noticed an abnormal local variation of the needle, amounting to 60° east of the meridian. From this peak I could see Quiet lake, eight miles due south, but only its southern half, as the other part was cut off from my view by the hills which rise along the northern shore. North of these hills the country is low, swampy and full of small lakes, some of which drain into the first lake, whilst the eastern one runs into the Rose river.

At different places along the stream I came across Indian camps, which leads me to believe that this valley may have been used by them as a route to the Pelly river. The valley of this river is also connected in its lower reach, by an Indian trail, with both the Big Salmon river basin, through its first lake, and the Nisutlin river proper by a trail which follows a pass opening towards the east and ending through the valley of Cañon creek to the river.

On September 24, we again reached Cary portage, having been twenty days exploring all the sources of the Nisutlin, besides making the ascent of seven peaks distributed at intervals of several miles and chosen in such localities as would provide the greatest amount of information.

GENERAL REMARKS.

The Nisutlin river is navigable for a distance of fifty miles, in which its current is not over three miles an hour; farther up gravel bars would interfere with its navigation.

Spruce of large size was frequently noticed along both banks of the river, but did not appear to extend to any great distance from the river. Besides spruce, poplar and cottonwood, which grow on the bottom lands, pine is found on the top of the benches, whilst birch and balsam fir prevail on the slopes of the mountains. Raspberries, blueberries, high bush cranberries, and currants of large size and excellent flavour are to be had everywhere.

Animal life along the river is well represented by flocks of wild geese, cranes, ducks and other aquatic birds. These, on the first appearance of ice upon the lakes and ponds, swarm on the bars of the river, previous to taking their departure for a milder climate. The animals of the forest are found in abundance and are by no means shy, which serves to show that they are very little hunted. Moose are very numerous and in the fall of the year they leave the uplands and resort to the lower valleys for protection from the wintry winds and in search of better feeding grounds; they are by this time of the year in prime condition. Of the fur-bearing animals I may mention the beaver, whose numerous tracks, strewn with freshly-cut willow and poplar twigs, leave unmistakable signs of their presence and activity. They do not attempt to dam the stream, but seem to prefer locating their lodges in the high-cut banks where, along the base, there is a great depth of water, and in almost every loop of the river there are such spots. In travelling over this district I came across only one beaver dam, which these industrious animals had thrown across a small stream draining the low lands west of the Rose river. Though no bears were seen, the bars and banks of the river were covered with their foot-prints. I never travelled through any district which showed them in

such numbers as in the one adjoining the Nisutlin river. The mountain goat inhabits the mountains and frequents the wildest and most inaccessible sections. The ptarmigan was the only bird we saw in these altitudes. The waters of the Nisutlin river and Teslin lake abound in fish, but to take full advantage of this one must be provided with a fishing net.

EXPLORATION OF BIG SALMON RIVER.

The region drained by Big Salmon river and its numerous tributaries may be divided into two sections, each one having distinctive features of its own. A line drawn in the direction of the valley of the south branch, and produced across that of Big Salmon river in a northerly direction, would fairly indicate where the change in the topography of the country occurs. To the east of this line are massive mountains crowned with high, rugged and fantastically shaped peaks, frequently difficult of access, as we found to our cost on several occasions. The slopes of these mountains are generally devoid of vegetation and are furrowed by deep gorges and ravines leading to valleys, of which there are several, both north and south of the river. The snow, which never entirely disappears from their summits, acts under the rays of the sun as a feeder to the numerous tributaries of the Big Salmon river. The mountains north of the river attain their greatest elevation in a range which has diverted the general course of the river between the first and second bends. Farther west they, however, change to more regular outlines and lose the forbidding aspect which they had. The same remark applies to the range south of the river, and though their denuded and rocky frontal still continues to flank the valley for several miles below the second bend, they eventually disappear and are replaced by low and timbered hills, which bound the eastern side of the valley of the south branch, while those on the north side of the Big Salmon river slope down to the level of extensive plains which spread westerly, and beyond which can be seen the crest of some low hills sparsely timbered on top and with grassy slopes facing both the Big Salmon river and the plains.

Beyond the south branch, these hills and ridges are in groups on both sides of the valley and without any well defined direction. In some places they approach the river but only for short distances, and when they recede from the stream they leave between it and the foot hills, flat bottom lands covered with thick brush, which are apparently flooded during high water. Such is the character of the country until the south branch of Big Salmon river is reached.

From this point the river flows through a terraced country; both banks are formed by high and steep escarpments of gravel mixed with fine yellow sand. These escarpments, whose crests are at first less than half a mile apart, gradually recede from each other. The width of the valley is thus constantly increasing the farther down we go and by the time its confluence with the Lewes is reached its terraces have merged into those along the latter river. These terraces were at one time timbered with poplar and pine, as indicated by the numerous pieces of decayed timber lying on the ground.

On my arrival at Cary portage, after completing the exploration of the Nisutlin river, I set to work to determine its position by an observation for latitude. I then surveyed the trail across the portage from the right bank of the Nisutlin to the southern extremity of Quiet lake and found it to be nearly four miles long. The path at first follows for some distance the southern side of a small stream, which at the time was dry, the beavers having effectively cut off the water by throwing a dam across its bed, then by a gentle ascent it leads to a terrace which holds a lake, three quarters of a mile long and two hundred and sixty feet above the level of the river. The distance between the right bank of the river and the eastern end of the lake is one and a half miles. Half a mile beyond this lake is a second lake, less than half a mile across, and then a pond which is just north of the path and close to the foot of high cliffs. We had now reached the highest point on the trail, three hundred and seventy feet above the valley of the Nisutlin. From this point the ground slopes a distance of one and a third miles towards the southern end of Quiet lake, where the portage ends. With the exception of a short stretch between the river and the first lake, where the soil is dry and firm, the trail passes over damp ground, thickly covered with moss and some trailing willows with

scattered scrubby black spruce. Owing to the ponds along it, the labour involved in moving boats and heavy supplies across this portage is greatly diminished; it is therefore much more frequented than the one three miles farther north.

We were now in the last week of September and there were many indications of the fast approach of winter. The snow line, which had reached to within 600 feet of the valley, reminded us that we must not delay much longer. We had yet to descend a stream which, by a comparison of the difference of level between its source and its mouth, must necessarily be swift and, at this season of the year, shallow and full of rapids. The mountains from which my observations were to be made were very high and rugged, and the difficulty and labour in ascending them would be greatly augmented by the deep snow, which kept increasing after every storm.

On September 25, we left our camp at the eastern extremity of Cary portage and sailed ten miles northward on Quiet lake, and camped on the eastern shore. In the afternoon we ascended the only hill there is on the east side of the lake; about midway along its length it reaches an altitude of 2,045 feet above the level of the lake. This station, the first established in the basin of the Big Salmon river, was connected with our triangulation points on the Nisutlin river. The next day we moved along the lake a farther distance of five miles, and in the afternoon occupied another mountain, but this time on the west side of the lake. The photographs taken from this station covered the western extremity of the lake, which had been invisible from the station occupied the previous day.

Quiet lake is a sheet of water fifteen and a half miles long by three-quarters of a mile at its widest part, and with its outlet, the Big Salmon river, an important tributary of the Lewes, occupies a valley which conforms to the north-west bearing of the valleys of two important neighbouring tributaries of the same river; the valley of the Pelly river to the north and that of Teslin river to the south. Quiet lake lies west of Nisutlin river, and for two-thirds of its distance stretches in a northerly direction, it then curves to the north west, which in a distance of thirty-five miles is the general direction of the valley of the Big Salmon river. The level of the lake is one hundred and thirty feet above that of Nisutlin river. Its eastern shore is rocky with forests of conifers to the water's edge. A small stream, which rises in the pass connecting the valley of Muddy creek with that of Quiet lake, empties into the lake near its southern extremity. Besides this one there are several others on the west side of the lake which rise in a massive range of mountains whose summits are amongst the highest of this region. Where these streams discharge, there are long narrow points stretching out into the lake, formed by the gravel and silt which have been carried down by the streams. On the east side of the lake the strip of hilly country, which lies between it and the Nisutlin river, is too narrow to admit of any important stream.

The Big Salmon river issues from the western extremity of Quiet lake. To the north west of the lake there are two other lakes, the first one is at a distance of one and a half miles from Quiet lake, and is one and a half miles long; it may be considered an expansion of the river which on leaving it resumes its course in a northerly direction a farther distance of three miles to a second lake stretching in a north-west direction, whose greatest length is five miles, with a width of a little over half a mile at its broadest part. The position of the longest axis of this lake is therefore lying nearly across the valley of the river, which enters its southern shore at about half way between its ends and flows out of it near its western extremity. Two islands occur in the lake close to where the river enters. The eastern half of the lake is full of islands, none, however, of very large size, and all timbered with spruce. A low tract, being the continuation of that in which this lake lies, leads towards the east to the valley of the Rose river. As the distance is short and the lakes numerous, it was doubtless used by the Indians as an easy way of communication between both valleys, for we found indications of the valley of the Rose river having been travelled extensively at some recent period. From the valley of the Rose river the traveller could also reach that of the Nisutlin river by following an Indian trail, which enters a low pass through the south end of the range which divides both streams. Once beyond the summit the trail turns into the valley of Canyon creek, which it follows as far as the Canyon, where it crosses over to the left side of the stream and finally terminates at the Nisutlin river.

The width of the Big Salmon river where it issues from the last lake is about sixty feet, and is very shallow, with a stony bottom. At the time of the exploration this section of the river was a succession of rapids with a drop of one to three feet in short distances and separated by intervals of still-water. At many places the depth of water was less than six inches and the canvas boats had to be partly unloaded before we could get them over the bars.

Below the lake the country on both sides of the river continues low and marshy, but it changes its aspect three miles farther on, where it receives its first tributary from the south. This stream flows through a wide and thickly wooded valley ; close to its headwaters, another stream rises which flows in the opposite direction and finally enters the Big Salmon river at its second bend. After receiving this tributary the river winds in innumerable and complicated bends from one side of the valley to the other. Its banks for some distance below the lake are low, but rise gradually from a few feet to escarpments reaching an altitude of two hundred feet above the river. These cut-banks are generally composed of gravel and sand, but cliffs are also noticed at different points where the river in its sinuosities strikes the foot of the mountain. The only remarkable change of direction which takes place in the course of the Big Salmon river, occurs at a distance of nearly sixty miles from the last lake. The river, which had been running north-west since its egress from that lake, is suddenly confronted in its course by bold mountains, and is deflected at a sharp angle towards the south-west. This causes the first bend, where three mountain streams, flowing through as many valleys, converge and add their waters to the river.

On the northern side of the valley the mountains may be said to begin with Tower Peak, a lofty mountain which rises abruptly from the northern shore of the second lake, and whose southern slope is so steep that no sign of vegetation is apparent on its surface. Its altitude is 3,140 feet above the lake. From a distance it resembles a high ridge with a knife-edge crest, its summit is capped by a cliff resembling a tower, which peculiarity led to its appellation of Tower Peak. It is one of the triangulation stations. Along both sides of the river there are high mountains rising to an altitude of 4,500 feet above the valley ; within ten miles of the first bend these converge and thus contract the valley. Their forest clad sides often end abruptly at the river, which is reduced in width ; the current at these places increases in velocity, while at other places the channel is, owing to the vicinity of the mountains, full of boulders and required our utmost attention to be successfully navigated. Beyond this swift section, which is not over three miles long, the river bed widens again, but its channel is frequently impeded by sand bars, formed by the silt which is being continually washed from the high cut-banks and deposited in its bed at places where the current is slack.

At the first bend the left bank of the river is formed by high gravel benches cut by deep ravines, while on the opposite shore the country is low, with some lakes which act as reservoirs for two large creeks flowing from the north-west in two nearly parallel valleys.

Three miles below the first bend the river divides into two branches, the wider one flows along the foot of the mountains to the left of the valley ; two miles and a half farther the branches reunite, and the river continues to flow in one stream towards the south-west a farther distance of eighteen miles. After receiving another stream from the south-east it turns sharply to the right and resumes a north-westerly direction ; this point is called the second bend.

About half way between the first and second bends, I decided to attempt to make the ascent of some of the mountains in the range west of the valley.

I left camp at daylight on October 6, and after having with some difficulty crossed the river, which at this date was already covered with floating ice, I instructed the cook to take the boat back to camp and haul it high and dry out of the reach of the ice. Accompanied by one man I started for the mountains. After travelling over frozen marshes, we entered the foothills by the valley of a creek which we followed for several hours. We soon found ourselves hedged in between two walls, and to avoid being altogether blocked, we left the bed of the creek and climbed on to a long ridge heavily timbered with spruce. The ridge led us to a pinnacle towering at least 800 feet above our heads and which seemed inaccessible from where we stood. After a good deal of

trouble and by a very circuitous route, we at last stood on its highest point only to discover that the view south of it was obstructed by a row of sharp peaks which must be climbed in order to complete the work. These peaks were fully three miles away, and as soon as I had finished the work to be done here we started at once for them. Our progress was greatly retarded, for at that altitude the snow was already several feet deep, and it was after six in the evening before we completed our work. The cold was intense and the night was coming on fast, but it was out of the question to stop, we kept travelling until two o'clock in the morning when we reached the river opposite our camp. But as we could not make ourselves heard, because of the roaring noise caused by the floating ice we had to wait until six o'clock in the morning before the man in charge of our camp came to our relief. Immediately after breakfest we started down stream, knowing full well that no time must now be lost, but we had not proceeded far before we found the river blocked by ice which spreading across a narrow section of the river with high banks on both sides, had filled up several feet high. The temperature had been unusually low for several days, and as a result the river had been carrying considerable ice mostly formed at the bottom of the stream. This blockade had backed up the water for quite a distance and raised its level several feet, as was illustrated by the line of the cakes of ice still strewn along the face of the elevated banks. As the water subsided, a mass of ice was left in such a crumbling state as to render it unsafe to travel over or to attempt to cut a way for the boats through it. In order to get beyond this we decided that to portage the boats and outfit through the bush was the safest thing under the circumstances, though not perhaps a very expeditious one. Once past this obstacle we found the river comparatively free of ice, and the survey of the river was resumed. Occasional stops were, however, made at certain points where the ascent of some prominent mountains was necessary in order to carry on the photographic work. Ten peaks were thus climbed in the basin of the Big Salmon river. 'Last peak,' the last one occupied, is north of the valley of the river, and rises near the western edge of the chain of mountains, whose width measured 45 miles from east to west, and across which the Big Salmon river has cut its way. The slopes of these mountains are as a rule very abrupt; their average altitude is 4,000 feet above the valley. For several miles the valley of the river is flanked by rocky walls so steep as to be entirely devoid of vegetation. West of 'Last peak' the aspect of the country is considerably altered, and marks the termination of the mountains. Those to the south of the river have not those sharp and ragged projections which give to the ones which we had been climbing such a forbidding appearance and rendered their summits so difficult to reach. Their elevation is also greatly reduced, and the farther west we proceed the more curviform their outlines become. The last mountain which forms the western extremity of the range south of the river has numerous spurs or ridges which radiate both towards the Big Salmon river and its south branch. Those facing the valley of Big Salmon river end abruptly at the water's edge, while the spurs which extend towards the south branch eventually break up into low hills before reaching it, and are heavily covered with timber. On the opposite side of the river the characteristics of the country are still more striking. The range of mountains comes suddenly to an end at 'Last peak.' From its foot a plain spreads out in a northerly direction. Several lakes and what appear to be the high banks of an important stream could be distinctly seen through the breaks at several places in the forest. The plain is limited to the west by a high range of hills which terminates abruptly at the Big Salmon river, and just opposite the mouth of the south branch. The top of the hills at this point must be nearly 1,000 feet above the valley of the river, with grassy slopes facing the stream, while their tops are crowned with clumps of pine. The plain extends fully 10 miles towards the north, where one solitary high dome was noticed among a maze of low ridges and hills, through which some narrow valleys could be traced, all converging into the plain.

Beyond the second bend there is no stream of any importance for 24 miles, when the south branch is reached. This stream rises near the head waters of Boswell river, a tributary of Teslin river. Its valley is very wide, running north and south, and is bounded on the east by the last contreforts of the chain of mountains, while towards the west low hills not over 2,000 feet high extend as far as the Lewes river.

Thirty miles farther, the north branch, the largest tributary of the Big Salmon, flows from the north. Terraces one hundred and forty feet high rise on both sides of the valley of the stream. The valley is fully two miles wide where it joins the main river. Six miles above its mouth the north branch bifurcates; one branch is from the north-east and takes its rise on the western slope of the chain of mountains to which Last peak belongs. Half a mile above the confluence of the north branch with the Big Salmon river there is a rapid, which is frequented during the summer by Indians, who have established a salmon fishing station there. One mile and a half farther down there is another rapid in a sharp bend of the river. From this point to the mouth of the Big Salmon the river flows through a terraced country, where all the timber has been destroyed by fire.

The river is very shallow; below the north branch it increases considerably in width and contains numerous large islands.

The confluence of the north branch was reached on October 12, and as I had some work to do in this vicinity I pitched my camp. The next day, the weather remaining unsettled, I sent most of my men down the river with the heaviest part of the outfit, and with one man I waited for a change in the weather, which would allow me to complete my work. On the 14th, no change for the better being apparent, I concluded that it would be unsafe to remain any longer, we therefore prepared to start the following morning. During the night the crushing of the ice coming down from both the main stream and the north branch was so deafening that it was impossible to sleep. Long before daybreak we were up and getting ready to leave. A thick fog hung over the river and was so dense that we could barely distinguish the outlines of the opposite bank of the river. The trees were loaded down with thick ice, and everything had a decidedly wintry aspect.

The canvas of our boats must have been rendered very brittle by the frost, for our boat had hardly been in the water five minutes and only half loaded, when we noticed that it was fast filling with water. Upon pulling it ashore and unloading it an examination showed that its bottom had been rent by ice, which was now fully four inches thick. The damage was repaired in ten minutes, but to prevent a similar occurrence, an opening was cut for it in the fixed shore ice which extended twenty feet from the bank and the boat placed in it. The loading being completed we waited for a space of water free from ice, when the boat was hoved out into the seething stream and all haste made to reach the middle. We had hardly left the shore when the boat stuck so fast in the slush and ice, that with all our endeavours it was impossible to steer it. To make matters worse a thick fog, caused by the low temperature, was continuously rising from the river. Thus enveloped in semi-darkness we drifted helplessly with the moving mass of ice which besieged us from every side.

One mile and a half below our camp we encountered the first rapid; owing to the condition of the river as just described, there was no breaking of the water to indicate the location of rocks and boulders; only the uneven undulating surface of the floating ice as it raced down the stream, with the sudden rearing up of occasional big cakes of ice as they came in contact with the largest boulders. It was a time full of anxiety. The canvas boat unavoidably struck several rocks, but it sustained the shocks without injury, though we could feel its bottom heaving up under our feet; it was owing to its elasticity that no holes were punched through it. As long as we were moving with the ice I knew that no mishap could occur, except from the ice blockades, and after we had successfully passed over the first rapid, we felt confident that we could safely reach the Lewes river. We, however, kept a sharp lookout, and no delay having occurred, we calculated that by noon we had drifted at least ten miles. By that time the sun had dispersed the fog, so that we could better judge what we might expect ahead, and our anxiety was consequently greatly relieved. From early morning until three o'clock in the afternoon we kept up the struggle, and although our position was far from being comfortable we had no thought of stopping. We had now come to a very tortuous section of country and therefore could not see ahead any great distance. The right bank of the river is here formed by high escarpments. We noticed too that the open channel of the river was getting considerably narrower, and before we had time to investigate fully we realized that we were being forcibly drawn by the current into a

regular whirlpool, that our chances of making a landing were gone, and that we were being relentlessly carried to our doom by the stream, whose velocity kept increasing every minute. Barely two hundred yards ahead of us the river was completely blockaded by an ice jam under which the water rushed. The channel had now dwindled to only a few yards in width, but the ice on each side was only slush, which would not bear any weight. I realized that only a very slim chance of escape remained to us, and this was to try and prevent the boat from drifting across the stream; in this we were successful and it certainly saved us.

With the timely assistance of some miners who were camped in the vicinity, the boat was unloaded and brought ashore. They informed me that the river was blocked with ice for a distance of six miles, which could only be overcome by making a portage. The next day everything was carried across the country to open water and the descent of the river resumed. By night we arrived safely at the Big Salmon river post, where we were cordially received by Constable Drewry of the North-west Mounted Police. He informed us that there might possibly be another boat from Dawson, but as the season was far advanced I thought it safer not to delay, but started at once up the river. Two days later the steamer *Flora* overtook us when within eight miles of Teslin river post. Whitehorse rapid was reached three days later. A delay of a few days occurred at the end of Miles Canyon before another steamer put in her appearance. This was the *Gilbourne*, a steel vessel, which brought us safely to Lake Bennett. From this point Skagway was reached in good time, and Victoria on November 6. A week later I reported at Ottawa, where I have since been busy preparing, from the notes and photographs taken, a map of the country explored during the past season.

I have the honour to be, sir,
Your obedient servant,

ARTHUR SAINT CYR, D.L.S.

APPENDIX No. 21 TO THE REPORT OF THE SURVEYOR GENERAL.

(DAWSON TRAIL)

REPORT OF J. J. McARTHUR, D.L.S.

EXPLORATION OF STEWART RIVER AND MACMILLAN RIVER VALLEY.

OTTAWA, July 5, 1899.

E. DEVILLE, ESQ.,
Surveyor General,
Ottawa.

SIR,—I have the honour to report to you on the exploration survey, carried on by me last season of the country drained by the Stewart and MacMillan rivers in the Yukon Territory.

I left Ottawa, April 18, 1898. I had some difficulty in getting suitable horses in Vancouver and vicinity, and was afterwards compelled to wait for transportation to Skagway. The C. P. R. ships took the outside passage and refused to carry deck loads of live stock. I finally arranged for accommodation on the C. P. N. steamer *Islander* and sailed on May 14. We arrived at Skagway on the 20th. The company engaged a tug and lighter which landed us at Haine's Mission on the 21st. The United States custom authorities at Skagway, although satisfied that ours was a Canadian government

expedition, insisted on my taking along a convoy to whom I paid $6 per day and expenses. He was instructed to accompany me as far as Klukwan, but did not come beyond Gantigastaki village, the limit of tide water. At Haine's I met Messrs Flemmer and Nelson of the United States coast survey. The former was going to the height of land on the Chilkat pass, and the latter to explore the Katzehin river.

I moved up the east bank of the Chilkat to a point opposite the mouth of the Takhin, where we swam the horses and crossed our outfit in our Peterboro' canoe. I met Dalton, who had just returned from Pleasant camp. He informed me that the snowfall had been very heavy on the summit, and that the season was very late. He had a large force of men at work on the trail, which he expected would be open by June 12.

The trail crosses the Takhin about a mile and a half from the mouth, and worms up into the foothills, along which it continues to within three miles of Klukwan, when it descends to the broad fan-shaped moraine at the mouth of the Tisku river. I did not take advantage of this part of the trail, but kept along the river flat, where the feed was excellent.

While at Haine's, I decided to send my canoe, loaded with supplies, over the Chilkoot pass, in charge of two men, to await my arrival at Fort Selkirk, and on June 18, I placed the pack train in charge of J. E. McMullen, my most experienced man, with instructions to move to the 'park' beyond Pleasant camp, and as soon as it was possible, to cross the summit and travel towards the Five-finger rapid. I would hasten to overtake him after I had seen my canoe over Chilkoot pass. I arrived at Dyea on June 22, and made arrangements with the 'Tramway Co.' to transport my outfit to Lake Bennett. The delivery to the summit was prompt, but some days elapsed before all of my supplies reached the lake.

I returned to Haine's on the 27th, and next morning about 10 o'clock, I left Pyramid harbour, in company with Dalton and several others, for Pleasant camp, where we arrived about midnight. It took two and a half days from here to Dalton's post. We passed several large parties of prospectors packing supplies on their backs to Shorty and Alder creeks.

I overtook my pack train on the evening of July 8, about forty miles from the Lewes river. From Hutshi village the trail follows the Nordenskiold valley and the country presents no difficulties to the building of a wagon road or railway. The soil is largely composed of volcanic ash and the cloud of dust made travelling rather disagreeable. We reached Five-finger rapid on the 13th. From the mouth of the Nordenskiöld the trail passes through a very hilly country, which could be easily avoided. There is no trail on the west side of the Lewes, between Rink rapid and Fort Selkirk, but one could be made at a trifling cost. At the rapid I found a notice that my canoe had passed down some days before. We were delayed some time by strayed horses and the difficulty of securing a suitable boat with which to cross, but on the evening of the 16th, we had our horses and outfit on the opposite bank. Next morning I left McMullen to take the pack train by the trail down to the mouth of Pelly river, and took a small boat for Fort Selkirk, where I arrived about 9 p.m. My two men, in accordance with instructions I had given them when separating on Chilkoot pass, had signals set on the highest points in the neighbourhood. On the 18th, I measured a base on the flat behind the trading post, and connected it with Ogilvie's survey of the North-west Mounted Police reserve. I then started to observe at the different stations. The pack train arrived on the evening of the 20th. On the 21st and 22nd, while I, with one man, was occupying stations, the rest of the party were engaged swimming the horses across the Pelly, crossing the outfit and making a trail through the 'rim rock' to the plateau above. This wall of basalt is about 250 feet high, and extends about two miles up the Pelly, and down the Yukon about the same distance.

On the 23rd we started for Stewart river. Our course was nearly due north. We had to make our own trail, but two men with heavy brush-hooks were able to open up from four to six miles per day. The country between Fort Selkirk and Stewart river, is a succession of high wooded ridges, the general direction of the valleys being east and west. There are few remarkable elevations. The highest point on our trail is 4,150 feet and the highest station occupied, 5,467 feet above the sea. The altitude at the

mouth of the Pelly is 1,525 feet. We saw no large timber but in places the growth of small spruce was very dense. We crossed the headwaters of Scroggie, Rosebud and Lake creeks. Ten miles north of Forth Selkirk is an extinct volcano. The stream of scoriaceous lava, which flowed to the north-west is visible for many miles. The Indians say that about fifteen years ago, smoke issued from the mountain. There are evidences of a comparatively recent and mild eruption, and as it subsided the lava solidified in the form of a cone. There is evidence of three distinct eruptions, all of which flowed to the north. The crater lies between two peaks, several hundred feet in height, which are connected on the south side by a low saddle. The Indians informed me that to the south-west between Fort Selkirk and White river is a similar mountain.

We struck the Stewart about three miles east of the mouth of McQuesten river. The distance from Fort Selkirk is 53 miles. The Stewart is a magnificent stream, more than one hundred and fifty yards in width, and is deep, with a four mile current. McQuesten river is about 100 feet wide and is swift for a distance of fifty miles from the mouth, when the valley widens and it becomes more sluggish. Prospectors have ascended one hundred and fifty miles in small boats. It has several large tributaries. A large number of people were camped at the mouth, also a band of Stick Indians. The Galvin Co. were erecting a large warehouse, and several other buildings were under way, and a town site had been roughly laid out. A mining recorder and police escort had just arrived from Dawson.

The course of the Stewart valley is nearly north-west. About ten miles down stream from McQuesten, the river makes an abrupt turn, and cutting through a mountain range flows to the south-west. The valley, however, several miles in width, continues to the north-west, and must extend to the Klondike river.

On August 6, we started up river extending the triangulation and had no difficulty in keeping our camp up with the work. About 35 miles above McQuesten, we come to Crooked creek, which enters from the south. It is not navigable for small boats, but considerable prospecting has been done along it. About a half mile above this, the river leads to the north-east out of this broad valley, which continues to the south-east, and must fall into MacMillan some distance above its mouth.

Fires were raging along the river flats and hill side, and the smoke became denser day by day. About August 12 I had to abandon the triangulation, as I could not wait for the smoke to disappear, but I continued along the valley making a track survey, every now and again touching the river at one of its many bends.

I beg leave to call the attention of the department to the wanton destruction of timber throughout the country. Prospectors seem to have a mania for setting fires, and if strict measures are not taken to prevent this vandalism the timber on the mountain sides and river flats will be destroyed in a very few years. To those who have faith in the Yukon Territory as a permanent mining country, the rapid disappearance of the green forest is harrowing, and it will, unquestionably, in a short time, affect the navigability of the rivers.

About the 18th the atmosphere cleared, and the triangulation was resumed with the expectation of being able to fill in the gap on the way back.

About seventy-five miles from McQuesten, Mayo brook comes in from the north. It is too swift and shallow for boating, but has been much prospected and some encouraging reports sent out. On the 21st we reached what is shown on the old maps as Frazer falls. It is a twisted rapid which, near the foot, rushes through a gorge. At extreme high water, there may be a fall of 8 or 10 feet from a table rock on the east side. From the head to the foot, one third of a mile, the descent is 40 feet. There is a portage road. For a distance of four and a half miles above, the river is broken at intervals by short rapids. About five miles above the falls, Nogold creek comes in from the south-west. It is about seventy-five feet in width, crooked and rather sluggish, and flows through a broad valley which is dotted with small lakes. It is partly fed by a large body of water about fifteen miles in length, which I have named Ethel lake, and which lies about twenty five miles to the south-west.

Above this the river resumes its general character. The valley is broad and on the south side are many small lakes and swamps.

Although the feed along the trail was abundant the animals did not thrive. Hoof disease and mud fever broke out among them, and we had to drop them one by one at places where pasturage was good, hoping that they would recover; but on the return trip we found many of them dead and the rest had to be shot.

There had been rainy weather for some time and our progress was slow. On September 4, we reached the 'Forks' with only five horses out of a band of nineteen. After occupying two stations to take in the neighbourhood of the forks, I decided to turn back. We built a raft, and relieving the horses of all loads, started them on the back trail in charge of two men and with the rest of the party I continued down stream. We had to abandon our raft when we came to the rapids, and build another below the falls. At suitable points along the valley I made camera and sketch stations, and by making a few ascents succeeded in filling the gap in the triangulation. On September 19, I reached the point where our trail from Fort Selkirk struck the river, and next day my men arrived with four horses. I went down to call on the mining recorder at McQuesten, and in exchange for some moose meat, he was good enough to let me have flour and tea, of which we stood very much in need.

There had been quite a rush during the latter part of the season, and the recorder informed me that about two hundred good men were wintering on Haggart, Johnston and Nelson creeks, tributaries of the McQuesten. While at the office about a dozen men came to file claims, and a number paid their fees with gold which they claimed to have gleaned from the properties they were recording. Very promising quartz ledges have been discovered on Johnston creek. Only four men are wintering on Stewart river above McQuesten. They are on Mayo brook.

I took seven days to cross to Fort Selkirk. The snow was deep on the high ridges, and we had to relieve the horses of their loads. We managed to get them to Pelly river, where we arrived on the 27th, but they were too weak to swim and I left them where feed was plentiful. I notified the police officer where they were, and he promised to have them shot when winter set in.

I boarded the steamer "Ora" at Fort Selkirk on October 1, and reached Skagway on the 15th. I arrived in Ottawa on November 3.

THE STEWART RIVER.

Between the mouth and McQuesten there is a ripple which, however, does not interfere with navigation. From McQuesten to Mayo brook the river is deep, and the current about four miles per hour. From Mayo to the falls the current is barely two miles an hour with good navigation all the way. From the rapids to the forks there is nothing to impede navigation. On September 3, I met two men coming down stream; they were the latest prospectors on the Upper Stewart, and claimed to have been to the head of Beaver river. They had taken notes and allowed me to make a copy of their sketch. The north fork retains its good character as far as the '7 mile Canyon.' It was the prospectors' opinion that a steamer could go through the canyon, in which case there would be uninterrupted navigation for a distance of one hundred miles up the Beaver, which they described as a rather sluggish stream. The north branch above the Beaver is very swift. Lansing river is a considerable stream, which comes in from the south east, one and a half miles below '7 mile Canyon.'

The south branch of Stewart river is the smaller. It is rather swift, and for 30 miles from the mouth flows through a succession of box canyons. A number of prospectors crossed over this season from the MacMillan. They report an easy portage. Moose and bears are very plentiful. We never had to walk more than a mile or so to secure one. We saw many beavers along the river. Fishing is good below the falls. There are no extensive timber areas, but there is quite enough for building and mining purposes, mostly spruce.

List of Distances by the Stream.

McQuesten to	Moose creek,	20	miles.
do	Crooked do	35	do
do	Mayo brook,	725	do
do	Frazer falls,	112·5	do
Frazer falls to	Nogold creek,	6	do
do	South fork,	55	do
South fork to	Lansing river,	35	do (estimated).
do	7-Mile canyon	36·5	do do
do	Canyon	7	do do
Canyon to mouth of Beaver river,		45	miles do

I have the honour to be, sir,
Your obedient servant,

J. J. McARTHUR, D.L.S.

APPENDIX No. 22 TO THE REPORT OF THE SURVEYOR GENERAL.

REPORT OF J. L. COTÉ, D.L.S.

SUBDIVISION AND OUTLINE SURVEYS IN EASTERN MANITOBA AND RESURVEYING AT WHITEMOUTH.

OTTAWA, April 11, 1899.

E. DEVILLE, ESQ.,
Surveyor General,
Ottawa.

SIR,—I have the honour to submit the following report of my survey during the past season.

Upon the receipt of your instructions, dated June 14, I left Ottawa for Winnipeg. On the way I stopped a day at Whitemouth to ascertain the nature of the surrounding country, in which a part of my work lay. I learned that horses could not be used for transport, on account of swamps and muskegs, and that packing on men's backs had to be resorted to at this season of the year. Mr. Bourne, D.L.S., who was appointed assistant, reported on the 25th of the month.

Having outfitted at Winnipeg, I at once began to resurvey the village of Whitemouth. Much difficulty was experienced in making this survey because most of the old posts were lost. The people seemed more or less indifferent to the marking of their lots; however, they expressed their satisfaction when they saw that I had posted a road allowance along the Canadian Pacific railway right of way, and one between lots 6 and 7 so as to give access to the river. The location of the road is good, as it follows a natural gulley running to the river, thereby avoiding the otherwise necessary expense of grading.

I completed the survey of the village on July 7, and the next day started for the north east corner of township 12, range 11. Though it was only seven miles distant it required a good day's work to get there, five miles and a half being through muskegs partly open. The burning sun of July, and the wet spongy ground, into which we sank to our knees, made packing almost unbearable.