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Author(s): T. G. Longstaff

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ACROSS THE PURCELL RANGE OF BRITISH COLUMBIA.*

By Dr. T. G. LONGSTAFF.

THE Selkirk system of British Columbia is usually described as consisting of the Selkirks proper on the west and the Purcell range on the east. The "Nelson's mountains" of David Thompson's map include the northern end of the Selkirks and nearly the whole of the Purcell range. I am inclined to think that his "Mount Nelson" in the latter range, obviously a particularly prominent mountain, can be identified with the peak now known as Mount Hammond. At any rate, both are in the same neighbourhood, and Dawson's "Reconnaissance map" of 1886 places Mount Nelson in about the same position. Since the name Purcell range is not in use locally, it seems a pity that such an opportunity was not taken to perpetuate Thompson's nomenclature. But the title has been officially adopted, and must be adhered to.

Though the Purcell range is generally admitted to form part of the Selkirk system, Dawson has adduced arguments for considering each as totally distinct from the other. In any case, its natural boundaries are unusually obvious. It is separated from the Rocky mountains on the east by the valleys of the northward-flowing upper Columbia river and of the southward-flowing upper Kootenay river, which together constitute a part of the great Rocky mountain trench, one of the most remarkable features of the North American Cordillera. The Purcell range is separated from the Selkirks proper on the west by a smaller but equally well-defined trench, which Daly (*Geographical Journal*, vol. 27, p. 600) has aptly designated the Purcell trench. The northern end of this trench is represented by the valley of the northward-flowing Beaver river, whose confluence at an acute angle with the upper Columbia river forms in

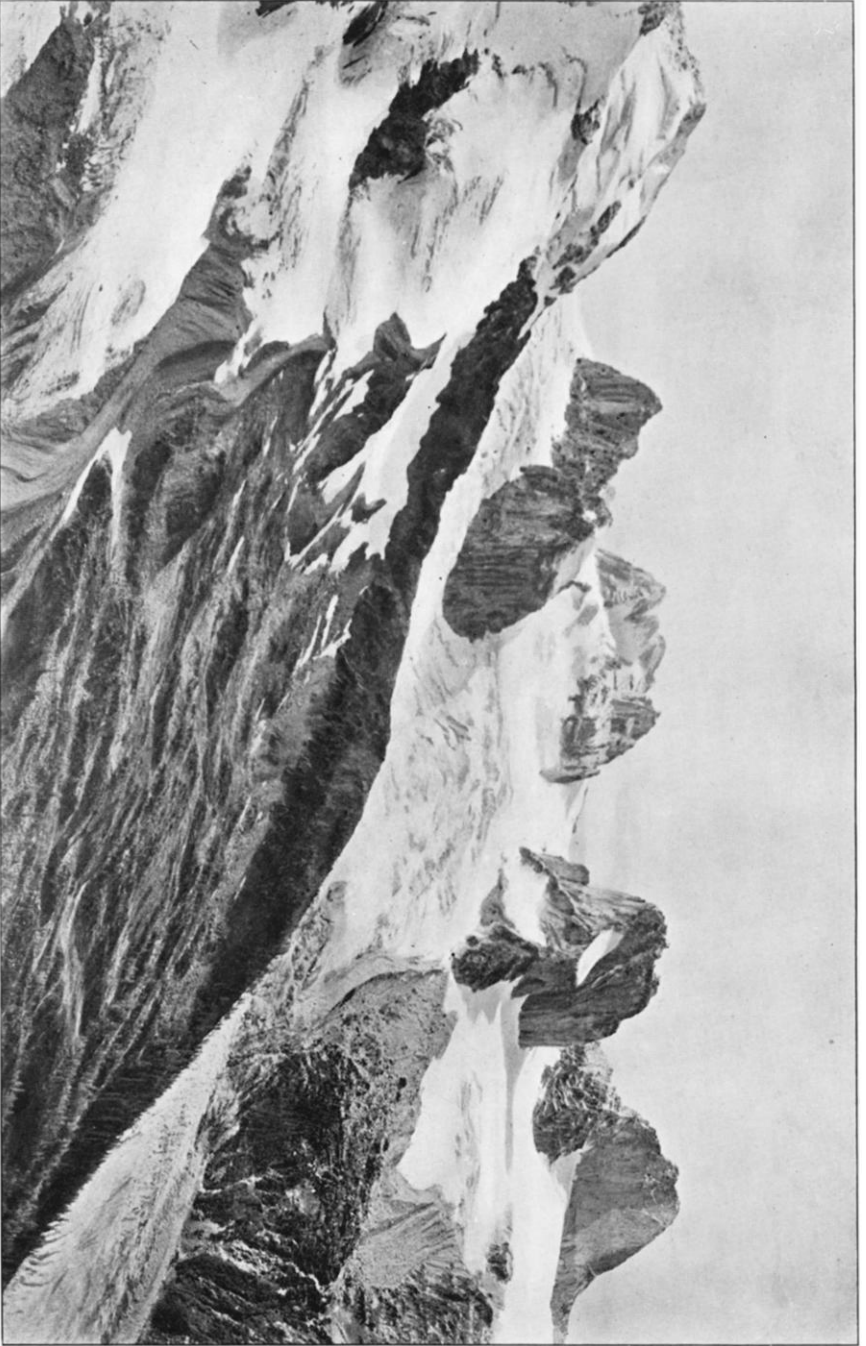
* Royal Geographical Society, March 13, 1911. Map, p. 700.

fact the northern boundary of our range. Crossing the low (4600 feet) Beaver-Duncan divide, the Purcell trench continues southward, occupied successively by the southward-flowing Duncan river, Howser lake, the long fjord-like north and south arms of Kootenay lake, and the northward-flowing lower Kootenay river, whose acute-angled bend in Montana forms the southern boundary of the Purcell range, just as the Big bend of the Columbia river forms the northern limit of the Selkirk system. The remarkable courses of these two great rivers, the Columbia and the Kootenay, can hardly escape comparison with those of several rivers of the Himalayan region. The Selkirks, including the Purcell range, are much older than the Rocky mountains; they represent in this region and for a distance of 300 miles the original main axis of the North American Cordillera. As in the case of the two great Himalayan ranges, the younger range is now higher than the older. On the other hand, in the North American Cordillera it is the younger Rocky mountain range, and not the older Selkirk range, which now constitutes the main water-parting.

The Purcell trench and the corresponding portion of the great Rocky mountain trench run approximately parallel to one another in a north-western to a south-eastern direction. The figure of the Purcell range may therefore be described as that of an elongated lozenge having a length of about 250 miles, and for half this distance an average breadth of about 50 miles. The southern half of the Purcell range, like the southern half of the Selkirks proper, attains no great altitude, and is crossed by the Crow's Nest railway and by several trails. But the northern half rises well above the snow-line into numerous bold glacier-draped peaks. In this portion of the range the surface or drainage area of the eastern slope is uniformly greater than that of the western slope. Precipitation comes primarily, of course, from the Pacific.

The Dog Tooth mountains and the Prairie hills at the northern extremity of the range have been accurately surveyed by Wheeler. South of these are the Spillimacheen mountains, a portion of which are indicated on Drewry and McArthur's sketch-map of 1892. The same area is shown in outline on Mr. F. C. Lang's prospector's map. The headwaters of the south fork of the Spillimacheen, Bugaboo, and Salmon rivers on the east, and of the Reno and Howser creeks on the west were obviously unsurveyed, and are very imperfectly known to a few trappers and prospectors. South of this, again, trails run westward into the mountains at the sources of Horse Thief creek, where the scenery is reported to be very fine. In this section is situated Mount Hammond, the first ascent of which was accomplished by Mr. Ellis, of Windermere, in 1910. Its height is reported to be over 12,000 feet, but this estimate requires confirmation.

South of this, again, comes the fine trail from the lower Columbia lake, now known as Windermere lake, to the head of Kootenay lake.



SPILLIMACHIEN SPIRES FROM THE EAST.
(A. O. Wheeler, photo.)



SPILLIMACHEEN SPIRES FROM THE WEST.
(A. O. Wheeler, photo.)

This pass over the Purcell range has long been known as Wells pass, and is so shown on the Provincial outline map, but the name has recently been changed to Earl Grey's pass, the changing of geographical nomenclature being unfortunately only too common in Western Canada. Those well-known peaks, the Hermit and Mount Carrol on either side of Rogers pass, are now shown on the Dominion maps as Mount Tupper and Mount McDonald, and I heard with regret that the name of Wild Horse peak, east of Fort Steele, is to be changed to Mount Fisher. South of Wells pass the mountains begin to decrease in altitude, and the country, though by no means fully explored, appears to be of less interest.

The suspension by the Dominion Government of topographical surveys in the Alpine ranges of Canada leaves the would-be explorer with a very wide range of selection, but the imminent opening up of the upper Columbia valley by the Canadian Pacific Railway indicates the northern half of the Purcell range as a particularly desirable field for mountain survey work, and I at once fell in with the suggestion of my friend Mr. Arthur O. Wheeler, the well-known mountaineer and lately Topographer to the Department of the Interior, that we should endeavour to cross the range together, and make a survey of the glacier region traversed. We were fortunate in getting Mr. Byron Harmon, of Banff, Alberta, whose Canadian mountain photographs are so deservedly popular, to come with us, and the services of Konrad Kain, the Austrian guide engaged for the summer by the Alpine Club of Canada, were placed at Wheeler's disposal.

We left Golden before sunrise on August 30, 1910, in Captain Armstrong's stern-wheeler, and steamed up the Columbia river for about 40 miles. Dawson describes the upper Columbia valley "as a great flat-bottomed, parallel-sided trough." Its average breadth between the confining mountain slopes is about 5 miles. It is markedly terraced into typical bench lands. The river itself flows tortuously through a depression half to 1 mile in width, containing numerous sloughs.

The upper Columbia river flows down a great strike valley of pre-glacial origin, which probably formerly discharged southward, and is now deeply filled with drift-material. Its eastern boundary is formed by the steep escarpment of the Beaverfoot range of the Rocky mountain system, which here presents an almost continuous wall of bare limestone peaks. The flanking line of the Purcell range on the west present gentler outlines thickly covered with forest, and only assume a rugged character on nearing the main axis of elevation.

Near Spillimacheen landing Captain Armstrong pointed out to us a fine snow-peak to the west named by him, in 1886, Mount Ethelberta. We disembarked at Haffner's landing on the west bank and pitched camp, being joined in the evening by W. B. Barrow and Charles Lawrence with a pack-train of ten horses. We could hear of no trail across the

northern half of the Purcell range except Wells pass along Hamill and Toby creeks. The southern part of the Spillimacheen country was said to be quite impassable for horses. But up the river entering the Columbia between the Spillimacheen and the Salmon, and rejoicing in the name of Bugaboo creek, a trail was known to have been cut some years ago by miners. I learned recently, that one winter about twelve years ago Wells and another pioneer crossed the range on snow-shoes by this route, which we subsequently followed. Local information was to the effect that the main divide at the head of the Bugaboo was impassable for horses, but that Reno creek headed from the reverse slope, and would, if we did force our way over, afford access to the valley of the Duncan river. This turned out to be fallacious, for Barrow successfully got our pack-train over the divide, and on the further side we found ourselves descending Howser river and not Reno creek. Wheeler's idea was to cross the divide to the Duncan valley, and, travelling north, to connect his survey with his old stations on the Prairie hills, returning to the Columbia by another pass over the divide of which we had heard vague rumours. But the country was really unknown, and the actual difficulties turned out to be far too formidable to render such a scheme practicable in the month at our disposal, for the risk of being blockaded in the mountains by an October snowfall had to be reckoned with.

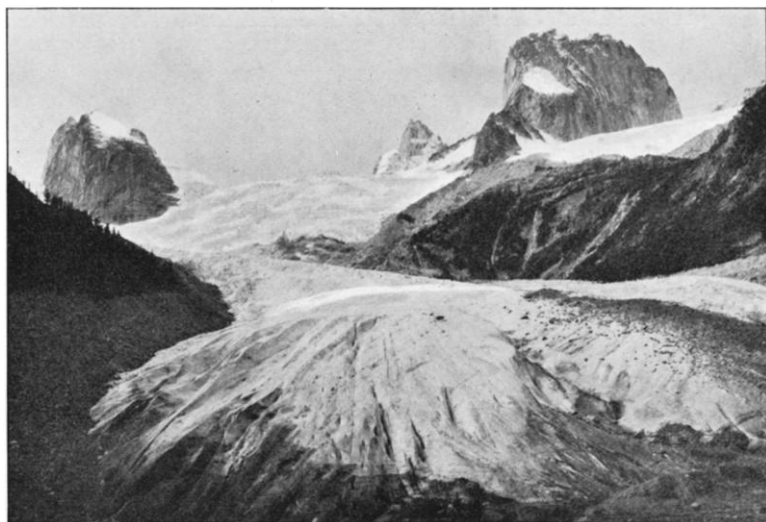
From our camp a good trail led for the first few miles through bench lands clothed with jack pine. Passing to the south of the lower canyon of the Spillimacheen, the trail strikes westward along the northern bank of the Bugaboo river. It becomes rapidly worse after the first 15 miles. In several places it had completely disappeared, and burnt and down timber soon called for the axes and involved frequent *détours*. In one stretch a forest fire was still smouldering in spite of heavy rain all through the previous night.

On the third day after leaving the Columbia, Wheeler selected and occupied a station on the north side of the valley at a height of 7633 feet, while Harmon went up the valley with one of the men to clear a trail for the horses, returning in the evening greatly elated by what he had seen of the remarkably fine glacier at the head of the north fork of the river.

I should here state that the whole of the survey work on this trip was executed entirely by Wheeler. The map, unfortunately for me not yet to hand, and the nomenclature are his. Any discrepancies between my paper and Wheeler's map must be resolved in favour of the latter. Wheeler occupied ten stations between 7000 and 9000 feet in altitude. The theodolite and survey-camera outfits each weighed about 20 lbs., which Wheeler and Konrad had to carry almost daily up very steep wooded slopes to the bare summits, the ascent being excessively fatiguing, not so much from the actual height which had to be made, as from the slippery footing and the constant



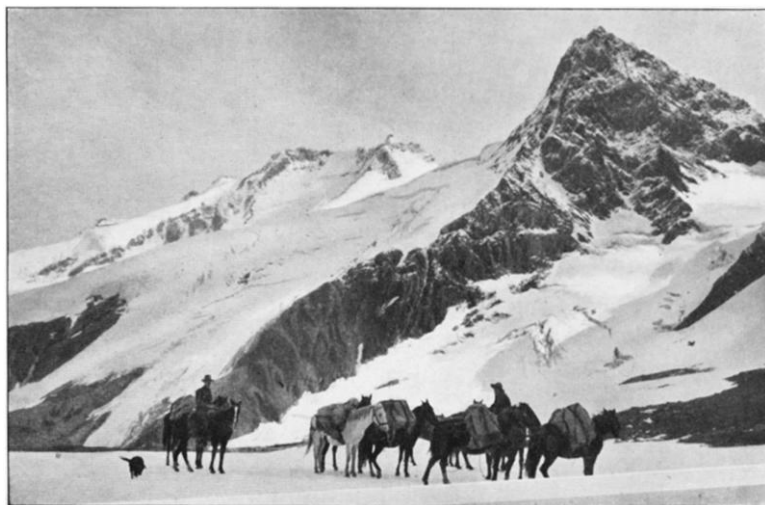
FALLS OF THE BUGABOO.
(Byron Harman, photo.)



GLACIER AT THE NORTH FORK OF BUGABOO RIVER.
(Byron Harman, photo.)



BUGABOO PASS.
(Byron Harman, photo.)



“CROSSING THE DIVIDE.”
(Byron Harman, photo.)

impediment of the vegetation to every upward movement. From this first elevation we saw to the west the upper reaches of a very fine glacier, cropping out of which were a cluster of remarkable peaks. This glacier rises from a group of mountains, the highest of which attains an altitude of 10,244 feet, and was named by Wheeler Howser peak. It turns out to be the highest peak on this part of the divide.

Leaving him at work with his instruments, I scrambled down to the north into a typical alpine hanging valley, showing all the usual signs of glaciation, which cut us off from the Spillimacheen divide. On both sides of the main valley steep hills rise abruptly. Their lower slopes are clothed in forest, and their bare rocky crests, rising on the south side to over 9000 feet, are snow covered. This southern range is dominated by seven peaks, and has therefore been named the Septet range. Ravines, deeply cut by broken mountain torrents, run up into the recesses of the mountains, affording only a very arduous means of approach to the snows.

On September 3 the whole outfit moved on up the valley, here very narrow, keeping to the left bank of the stream. A remarkable spur of bare rock, which I presume gives the name to Rocky Point creek which flows in from the north, almost forced us to take to the water. A trail is said to lead up this glen over to a branch of the Spillimacheen river. For some time we had heard the roar of a waterfall ahead of us, and soon came to a clean step-like ledge over which the whole river is precipitated with a clear drop of between 40 and 50 feet. Above this the valley floor widens out somewhat, and keeps very level right up to and beyond the main forks of the river, suggesting the approach to a region of relatively recent glaciation.

On reaching the forks we had a very beautiful view of Harmon's big glacier, which descends right down to the level floor of the valley well amongst the timber. The "north" fork of the valley runs about east and west, and at first sight appears to be the termination of the main valley. Harmon and I afterwards visited this glacier, and found that its present phase was one of retreat. The ice itself is very clean, and the contrast of colours when seen through the heavy timber is very beautiful. The lateral moraines are well developed and rise high above the shrinking ice. Two fine ice-falls occur in the middle section of the glacier, which is about half a mile broad.

The "south" fork is the main stream of the Bugaboo river, and it was from the head of this that we hoped to get our horses over the divide. We therefore forded the "north" fork and, turning southerly, followed an old miners' trail through dense heavy timber. This led for about half a mile along a ridge which had exactly the form of a lateral moraine. Owing to the undergrowth and the short time at our disposal, proper examination was impossible. But I am inclined to believe that this was in fact a relic of some extremely remote period of ice increase.

Its survival at this particular spot can easily be accounted for by the configuration of the valley at this point, a long spur forcing the river over on to the other side above this remarkable formation, and thus protecting it from undercutting.

The old trail through the heavy timber was frequently completely blocked by fallen giants, and several of the sorely tried horses fell. Late in the afternoon we were stopped by a tremendous windfall, which had been caused by an avalanche from the *opposite* side of the valley. For hundreds of yards the trees were piled in impassable confusion. After some delay we managed to get down into the open muskegs of the valley bottom, which at this season were, fortunately, passable. Our line of march was again westerly. The valley had broadened out to about a mile, the bottom being quite flat, and consisting of grassy muskegs interspersed with small thickets of willow and small timber. To the south a glaciated valley hung 500 feet above us, several waterfalls being visible through the trees. About 5 miles from the forks, we camped on a low gravel bench (*c.* 4500 feet) beside the torrent, now shrunk to very small dimensions. This spot was our headquarters through a week of broken weather, during which Wheeler worked away at his survey whenever possible, and we thoroughly explored the neighbourhood and the pass at the head of our valley.

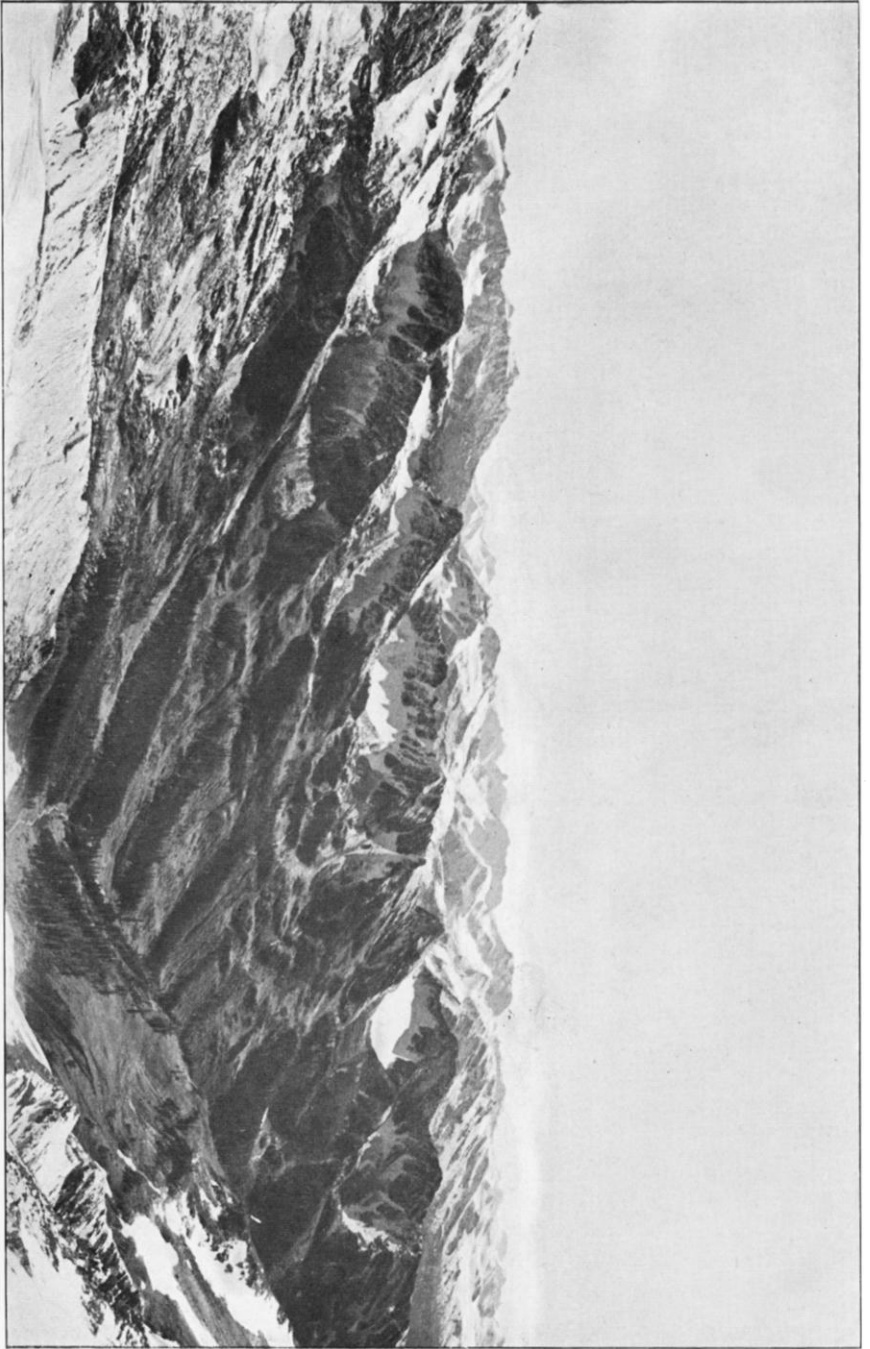
Wheeler's station, at 7677 feet on the culminating point between the north and south forks of the Bugaboo river, gave us an excellent view of our surroundings. To the south-east the seven peaks of the Septet range separated us from the valley of the Salmon river. To the south a semicircle of glacier-hung peaks cut us off from the south fork of Howser river. To the west was our intended pass across the divide, Howser peak, and the remarkable nunataks or aiguilles rising out of Harmon's big glacier. To the north a lower range marked the divide between the Bugaboo and Spillimacheen rivers. To the east the distant peaks of the Rocky mountains showed through the haze of the Columbia valley.

The extreme limit of timber growth, here represented by larch scrub, is approximately 7400 feet. The height of the pass on the divide to the west, which I suppose must retain the euphonious name of Bugaboo, is about 7160 feet. The old Bugaboo claim, an outcrop of galena, lies on the actual crest of the pass between two large beds of permanent snow. On the further side a valley ran west of south, and, relying on information received, we assumed that it was that of Reno creek. As a matter of fact, it was Howser creek. We could only see the extreme upper end of this valley, which, though deep, was open and fairly wide. It soon turns further to the south, and rapidly contracts lower down, where the torrent flowing between steep forest-clad spurs has deeply eroded it.

By hard work we cleared out the old prospectors' trail, which led through dense brush to the foot of the steep and rocky final slope of the



THE FOUR SQUATTERS FROM THE EAST, SEIKIRIS IN THE DISTANCE.
(A. O. Wheeler, photo.)



CENTRAL PURCELL RANGES FROM THE NORTH.
(A. O. Whistler, photo.)

pass. After a good deal of digging it proved to be just practicable for the pack-horses, and Barrow negotiated it with great skill and no fuss on September 9. Wheeler, with Konrad, occupied a station of 8081 feet to the north of the pass. I remained on the crest to prepare a light camp for the surveyor, while the pack-train pushed down into the valley on the other side. Some wind-bent balsams offered a chance of shelter, and here I pitched a light silk tent and collected wood. The intention was that Wheeler should occupy another station on a prominent peak to the south of the pass, but a snowstorm that night prevented a start in the morning. We stayed on in our eyrie, hoping for better conditions; but another 6 inches of snow fell during the second night, and we packed our bedding down to headquarters in disgust.

On September 12 Wheeler and Konrad returned to the pass, picked up the instruments left there, and successfully occupied the selected station (8254 feet) south of the pass. On the same day Harmon and I visited a large glacier flowing west down towards the valley from Howser peak. Mounting a steep rocky spur of this peak to a height of about 9250 feet, we obtained for the first time a really comprehensive view of the region.

The contrast between the formerly ice-protected alp-lands and the forest-clad depths of the torrent-eroded lower valleys was most marked. An unexpectedly large portion of the Purcell range was seen to be covered by glaciers and perpetual snow. The most striking peaks were amongst the wild Spillimacheen mountains to the north, but the snow area was greater and the altitude of the range was higher to the south. The culminating point appeared to be a peak about 20 miles to the south. From the remarkable arrangement of cliff and glacier we called it, for purposes of reference, *Eye-brow peak*. This may turn out to be *Mount Nelson* or *Mount Hammond*, which again, as I have already pointed out, may be identical. But I think Wheeler's peak is somewhat too far north. No direct transit readings were taken to the summit, but by the methods of photo-topography an altitude of 11,489 feet was deduced, with a range of only 37 feet for three different computations. Another fine mountain south of the main forks of Howser river, and giving birth to several large glaciers, has been named *Mount Aurora*. To the west a group of peaks, rising to 9743 feet, and named by Wheeler the "*Four Squatters*," hung over the misty depths of the Duncan valley, and beyond this, again, were the snowy ranges of the southern Selkirks. Eastward the continental divide of the Rocky mountains loomed mistily through the smoke-haze of the forest fires then raging in distant Washington.

From our camp at the head of the valley—that is to say, at the west foot of the pass we had just crossed—the forks where the southerly and northerly arms of Howser river unite, a distance of less than 12 miles in a straight line, cost us six days of hard labour. We only made four marches with the horses, but on the other days we cut trail ahead.

returning to camp in the evening. We were constantly compelled to ford waist-deep from one side to the other of the broken torrent to avoid the steep cliffs which bordered this section almost continuously. A striking feature of the valley is the beauty and frequency of waterfalls in the side glens. Meanwhile Wheeler continued to occupy high stations, as day by day we made 2 or 3 miles down the valley. The labour of climbing up several thousand feet through undergrowth full of poisonous devil's-club was extremely exhausting, and I found cutting trail with Harmon and the men a much lighter job.

The forest growth on the western slopes of the range is much denser than on the eastern side, and, in consequence, insufficient grass for the horses was a constant source of anxiety. Larch, balsam, spruce, and hemlock gradually gave place to cedar, white pine, and Douglas fir, with cotton wood, at Forks camp (*c.* 3000 feet). Underneath was a dense growth of azalea and blueberry, while the horrible prickly aralia, or devil's club, was everywhere. In places subject to spring avalanches the hillsides are clothed with dense alder, all bent downwards by the weight of the winter snow, and costing much labour to cut through. They are known locally as slides.

On September 18 we reached the point where the north and south forks of the Howser unite, and camped at about 3000 feet in a magnificent cedar forest. From this camp Wheeler occupied a station on a high shoulder of the Four Squatters. Due south was the pyramidal cone of Mount Aurora, sending down a large glacier into a hanging valley, the stream from which discharged into Howser river below our camp.

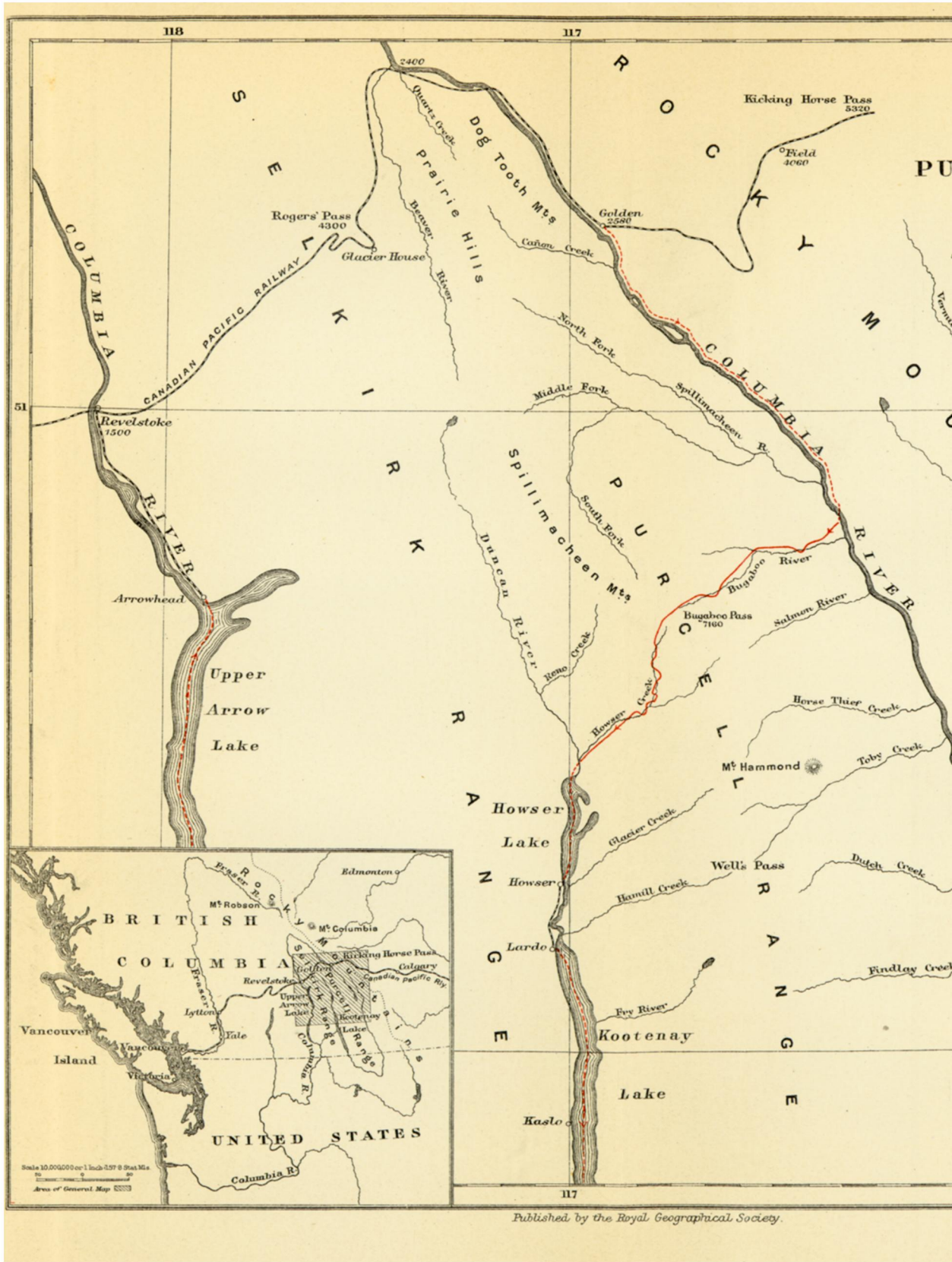
Since crossing the divide we had seen no sign of a trail, though a trapper had obviously wintered in the valley some years previously. And when, on September 20, soon after leaving Forks camp we crossed the river, now only just passable on foot, and came upon an old trail, we thought that our troubles were at an end. We were soon forced to cross over again to the right bank, this time by felling a tree, only to recross a few hundred yards lower down. Soon after this third crossing we fell in with a trapper who was bringing up his supplies for the winter. He told us that we were on Howser and not Reno creek, and assured us that it was impossible to get horses down the lower canyon, the old trail being carried on staging which was now either rotten or altogether carried away. Owing to the danger of avalanches, he himself would be a prisoner in the valley above this canyon from the first heavy snowfall till after the spring melting.

There was nothing for it but to send our pack-train back over the pass to the Columbia river. Wheeler accompanied it, as he had now to connect up his survey from the other side. Harmon and I walked down with the trapper, doing the 15 miles through the canyon to the Duncan river on September 22, and reaching the hospitable settlement on Howser lake the next day.

As a result of our observations, I feel confident in placing the highest and most glaciated portion of the Purcell range to the south of our pass, and not, as local reports at first led us to believe, in the Spillimacheen mountains to the north. The mountains between Wells pass and the Bugaboo pass may fairly be considered as unexplored ground, and are certainly unsurveyed. The great extent of the snow-fields and the general altitude of the range was quite a surprise to me, and is not, I think, generally appreciated. It undoubtedly offers a very attractive field alike to the topographer and the mountaineer. While access to this region is probably easier than to the Spillimacheen mountains, no attempt should be made to take in a pack-train, except from the Columbia valley side, and, with the possible exception of an old trail down Glacier creek, which is really only a variation of Wells pass, no attempt to get horses over the divide and down to Howser lake is likely to be successful. Horses can be taken up the valley of the Beaver river, over the divide, and on to the upper Duncan river, but they cannot be taken through the valley of the lower Duncan river down to Howser lake owing to a canyon similar to that which stopped our pack-train on the lower Howser river.

My thanks are due to Mr. Harmon for most of the slides which I have shown this evening, and without which my lecture would have failed to convey to you any adequate impression of the country. I trust that in spite of the many calls on his time Mr. Wheeler's map will shortly be ready for publication in the *Journal*, together with his own report. Meanwhile I am greatly indebted to him for the valuable photographs and notes which he has already sent over.

Mr. DOUGLAS FRESHFIELD (Chairman), before the paper: I am sure all present will share the regret that I feel myself in the announcement I have to make, that our President has succumbed to the inclemency of an English spring, and is unable to be here to-night. We are to have to-night one of the mountaineering papers which have become more frequent of late years in the Society. He has therefore asked me, as having some connection with mountain exploration, to take the chair. Mountaineers may be roughly divided into two classes. There is the mountain climber, who tends to lapse into the sportsman and the athlete; and the mountain explorer, who tends to lapse (or should I say rise) into the traveller, the geographer, and the cartographer. The mountaineer has to study the mountains with a very careful eye, because upon his accurate observation of the character of rocks and the condition of snow often depends his safety. He is able to bring back to us valuable details as to the glaciation, the geological structure, and the physical characteristics of the regions into which he ventures. He also, as in the present case, may furnish interesting details with regard to the effects of the atmosphere at high altitudes on the human frame and energies. Dr. Longstaff, who is going to lecture to us to-night, requires no introduction here. We know his name too well. We may say of him that he is the worthy son of a worthy father, to both of whom geography is largely indebted. Dr. Longstaff began his climbing career in the Alps; he then, about seven years ago, went to the Caucasus, where he made a number of brilliant ascents without guides.



117

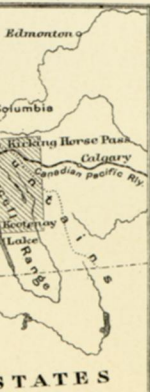
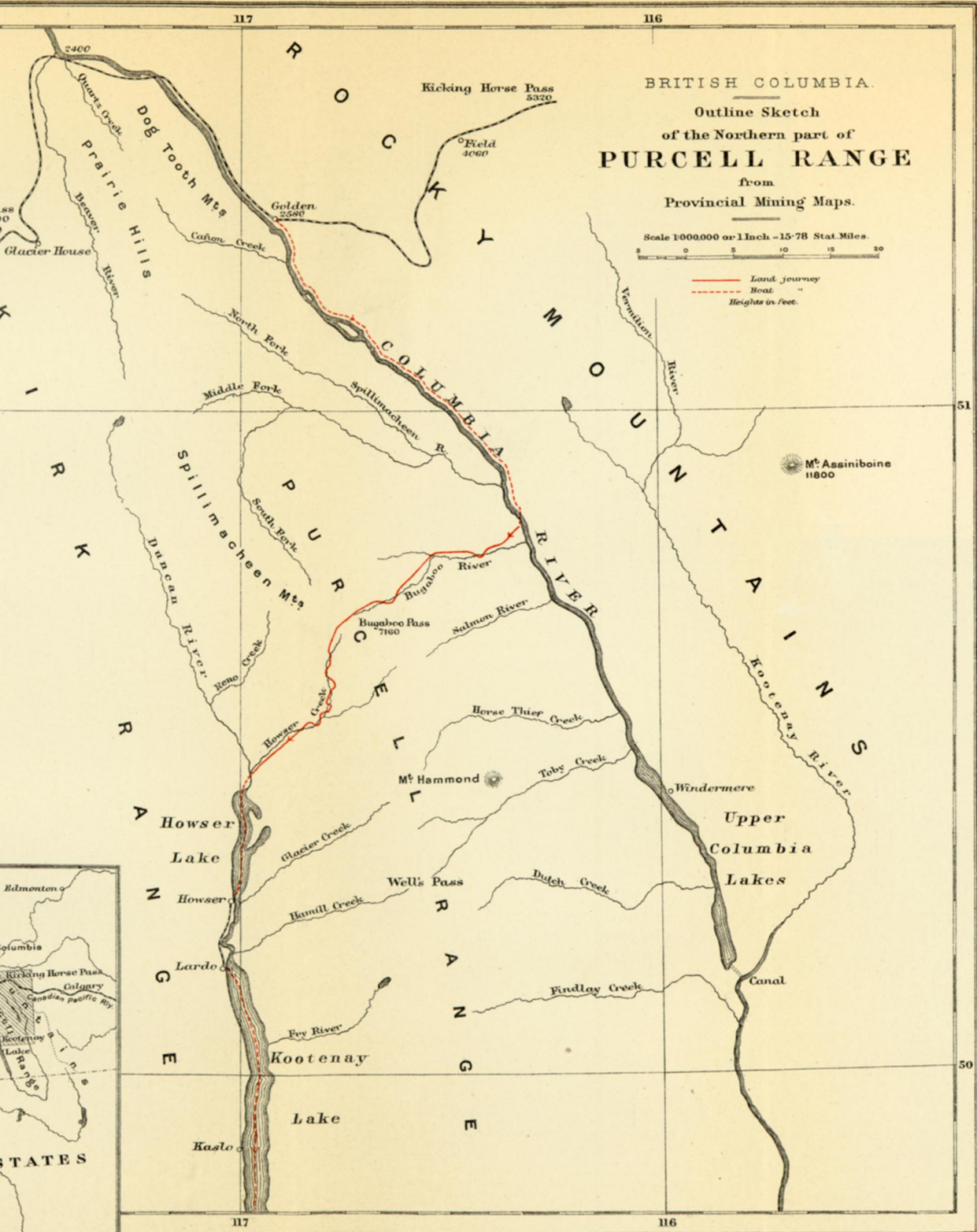
116

BRITISH COLUMBIA.
 Outline Sketch
 of the Northern part of
PURCELL RANGE
 from
 Provincial Mining Maps.

Scale 1:000,000 or 1 Inch = 15.78 Stat. Miles.



— Land journey
 - - - Boat
 Heights in feet.



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PURCELL RANGE
Longstaff.