simply, as Alfred suggests, follow the present right-hand arête still involving the passage of the great couloir exposed to falling ice, and only then traverse away to the left.

The C.N.R. have engaged Streich to go out again for the next season, and he has accordingly had to cancel his Alpine engagements. He has seen a copy of this Note, and it is probable that at the very earliest opportunity his sound mountaineering experience will determine him to try the Schauffelberger arête. Whoso reads Mr. Darling's able and clear account in *C.A.J.* vi. 29 *seq.* will not expect an easy job. It is certainly no place for beginners, or for anyone, except in fairly good weather.

The only map at present available is Mr. Wheeler's, issued with his paper, *A.J.* xxvi.

Mr. F. H. Peters, the director of the Topographical Survey of Canada, has been good enough to send me an outline copy of the unpublished Sheet 32 of the Interprovincial Boundary Survey, which covers the mountain on a scale of 1 inch = 1 mile. The Sheet will be published later.

J. P. Farrar.

Climbs in the Cariboo Mountains and the Northern Gold Range, Interior Ranges of British Columbia.

By ALLEN CARPE.

THE inland portion of the Canadian Cordillera—as distinguished from the Coast ranges—is made up of two roughly parallel uplifts: the Rocky mountains proper, and the Interior ranges of British Columbia. These are separated by the great structural depression of the Rocky Mountain trench. The territory W. of this trench is divided into separate ranges by a series of lateral valleys cutting in diagonally from the S.W., such as the Purcell trench (Beaver and Duncan rivers), separating the Purcell and Selkirk ranges; the southward flowing Columbia, dividing the latter from the Gold range; and the valley of the North Thompson river, separating in turn the Gold and Cariboo ranges. These lateral valleys intersect the Rocky Mountain trench at a sharp angle, so that the component ranges resemble a series of inverted V's arranged in echelon,

the tip of each area touching the Rocky Mountain trench, while the open lower end fans out and merges somewhat indefinitely into the hill country of the Interior plateau.

The Cariboo mountains are separated from the Rockies by the Fraser river and are bounded towards the S.E. by the McLennan river, Albreda pass and the valley of the Albreda and North Thompson rivers. Their northern limit is perhaps less well defined. Geographically, they should no doubt extend into the bend of the Fraser at 54° 17′ N. latitude, but there is evidence that the alpine portion of the range at least breaks down in the vicinity of the Goat river, whence easy passages exist to Isaac lake and the Cariboo mining country around Quesnelle and Barkerville, on the border toward the Interior plateau. Probably the Bear river, and a line thence around the Quesnelle basin to the Clearwater lakes, will enclose everything of interest to the mountaineer. The distance from Albreda pass to the Goat river is about 75 miles, and the width of the range from the Fraser valley to Cariboo little more than forty.

Early Explorations.

With the inception of surveys for the Canadian Pacific Railway in 1871, the Cariboo mountains assumed considerable importance, constituting, as they did, a formidable barrier at the western outlet of the Yellowhead pass, which was early recognized as the most eligible location for the line across the Rocky mountains. On July 20, 1871, a large party under Mr. James A. Mahood left Victoria for the Cariboo country, charged with surveys between Quesnelle and Tete Jaune Cache, at the western foot of the Yellowhead pass. It was not originally intended that this party should cross the Cariboo range, but information obtained at Quesnelle, together with the lateness of the season, induced them to attempt a direct route *via* Richfield to the Cache. Working N. and E. to Isaac lake, at the headwaters of the Swamp river, Mahood descended this stream for a short distance and then turned up its E. fork into the mountains, crossing 'Dominion pass'[1] to the Castle (or

[1] *Canadian Pacific Railway: Progress Report on Exploratory Survey*, 1872, p. 47: 'Pushing along, despite the innumerable difficulties which beset the way, the party reached the hoped-for pass, which, high and glacier-capped, towered up in front of them, as if to crush out hope and defy further progress. For the animals, a passage over it had to be cut with picks and axes . . . In going

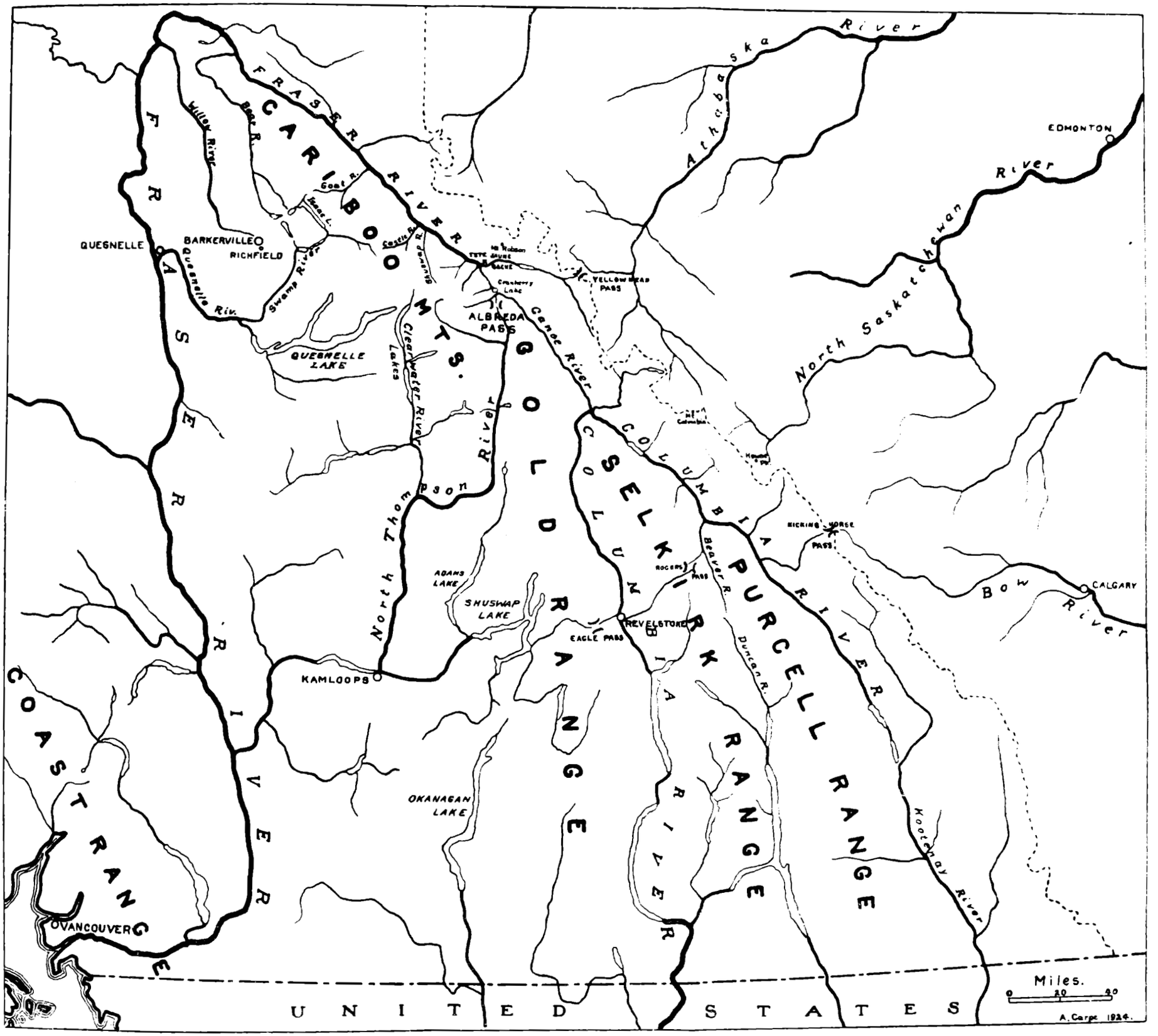


DIAGRAM SHOWING LOCATION OF INTERIOR RANGES OF BRITISH COLUMBIA.

The dotted line represents the Divide of the Rocky Mountains to 120 degrees West Longitude (Alberta-British Columbia boundary). The Rocky Mountain trench is indicated by the Kootenay, Columbia, Canoe and Fraser rivers.

[To face p. 61.

Cottonwood) river late in September and wintering his party at the confluence of this stream with the Fraser, near the present town-site of Eddy. Mahood's expedition is of interest as representing probably the first recorded crossing of a glacier pass in the Canadian mountains ;[2] but it would seem that the route was hardly feasible even for pack animals, and so far as the writer is aware it has never been followed in its entirety since.

Attempts to penetrate the Cariboo range were continued for several seasons after Mahood's exploration, but they failed to disclose any passage whatever across the great barrier of mountains between the McLennan river and Dominion pass. In the fall of 1871 a second party, under Mr. Roderick McLennan,[3] after suffering many hardships in the North Thompson valley, reached Cranberry lake (on the present McLennan river) and took up winter quarters there. During the ensuing winter both this party and that of Mahood searched in various directions from their respective camps 'particularly with a view of finding a valley or pass through into the Cariboo country,'[4] but without success. In 1872 'the attempt to find a direct route through the mountains from the Yellowhead pass *via* Cariboo to the coast was continued. It resulted in failure ; no opening having been discovered in the lofty mountains which bar the way at Tete Jaune Cache and which, at that point, turn the Fraser river more than a hundred miles out of a direct course to its

---

from the forks of Swamp river over the pass into the headwaters of Castle river, a rise and fall of two thousand three hundred feet has to be overcome. . . . The glacier . . . is half a mile in extent and about two hundred feet thick.' In testimony given before the Royal Commission on the Canadian Pacific Railway (*Report*, 1882, *Evidence*) Mahood is said to have estimated that the glacier was '2,000 feet in thickness,' and Marcus Smith states that the pass was 'something like 9,000 feet high . . .' On an early map by Lieut. H. S. Palmer, entitled 'Reconnaissance Sketch of Part of Cariboo' (*R.G.S.* 1864), this area is inscribed : 'Region crowded with immense rugged Mountains.'

[2] A possible exception may be the trail constructed by Walter Moberly from Shuswap lake across the Gold range in 1866 (so-called Smith and Ladner trail). There appears to be a summit glacier on this route, but none of the reports available to the writer indicate that it was traversed.

[3] Under the immediate direction of Mr. F. W. Green. Both Green and Mahood reported to McLennan.

[4] *Royal Commission Report*, 1882, *Evidence*, p. 1521.

outlet.'[5] The effort was renewed in 1873 by Mr. Walter Moberly: 'I proceeded to explore the country at the head-waters of the Canoe river, and very soon found there was no pass in that direction. I then went to the forks of the Albreda and North Thompson rivers, and up the valley of the latter. . . . I pursued my way until, at a very high elevation, I was surrounded by snow-capped peaks and glaciers that presented an impenetrable wall of rock, snow and ice.'[6] Early the next summer (1874) Mr. E. W. Jarvis ascended the Clearwater river and crossed from it to the upper valley of the North Thompson, joining Moberly's route of the preceding fall. 'The information obtained from this exploration *set positively at rest the question of a direct practicable route across the Cariboo range* from Yellowhead pass to the coast. The summit of the divide at the lowest place that could be found on this route was an immense glacier 7000 feet above sea-level.'[7] Other explorations were made of the regions of the Clearwater, Horsefly and Blue rivers, but these are south of the area considered.

When it is recalled that the Clearwater is itself a tributary of the North Thompson, so that the divide referred to is merely a spur of the main range, it will be seen that the railway surveyors never succeeded in piercing the real nucleus of the Cariboo mountains between Albreda pass and the Castle river. Whatever topographical information may have been obtained was not preserved, and to-day the region is essentially virgin ground. The references quoted above, largely of a negative

[5] *Canadian Pacific Railway Report*, 1877, p. 15. It is, however, not clear what was done during this season. The reference may be to the explorations of the previous winter by Mr. McLennan's parties. The *Royal Commission Report* shows no other party in the region during this year.

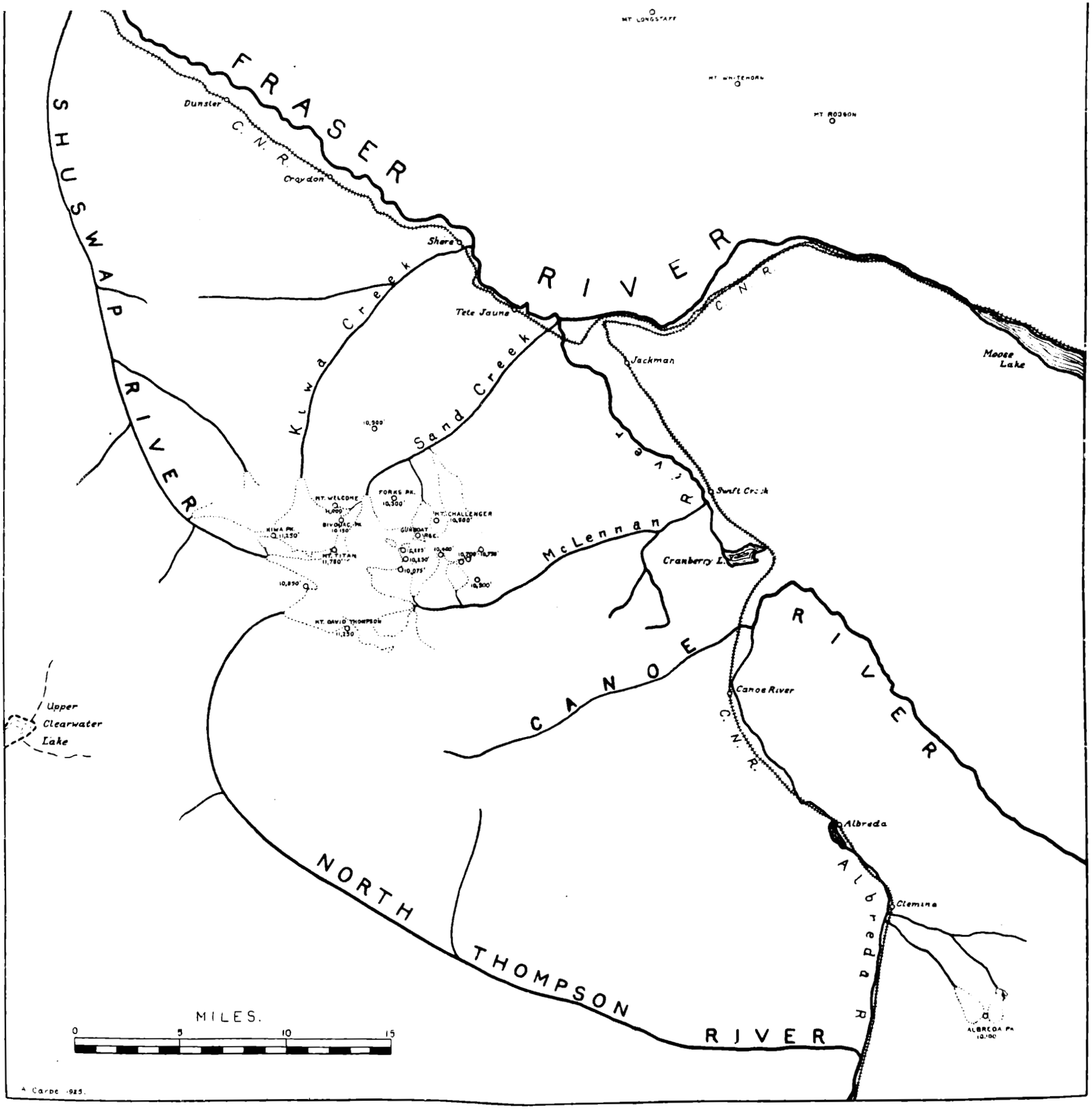
[6] *Early History of the C.P.R. Road*, by Walter Moberly (pamphlet). In testimony before the Royal Commission (*Report*, 1882, *Evidence*, p. 424) Moberly states that this occurred 'near the end of October,' and that he was 'only a few days in there.'

[7] *Canadian Pacific Railway Report*, 1877, p. 21, also p. 118.

SKETCH MAP OF A PORTION OF THE INTERIOR RANGES, ADJACENT TO TETE JAUNE CACHE.

Showing Principal Summits of the Cariboo Mountains, Albreda Pk. and Sources of the North Thompson, McLennan, Canoe and Shuswap rivers.

NOTE:—The position of Albreda Pk. is referred to that of Clemina station as shown on maps of the British Columbia Department of Lands. There is a difference of about 3 miles between there and Sectional Map 262 (Yellowhead), issued by the Dominion Government.



(See reference at foot of p. 66.)

nature, represent practically all that has been known concerning this important section of the Canadian mountains.

In more recent years, the Cariboos were first visited for mountaineering purposes by the late Professor Holway and Dr. A. J. Gilmour in 1916.[8] Having seen the range from the vicinity of Mt. Longstaff, in the Robson group, they selected the valley of Sand creek, a tributary to the Fraser above Tete Jaune,[9] as the most promising approach, and succeeded in establishing a camp near the glacier at its head. Here some time was spent in exploring the country and seeking for passes into the adjacent valleys, but unsettled weather prevailed and none of the higher peaks were climbed.

Professor Holway's glowing accounts, together with the interesting mountaineering, and topographical problems involved, gave the Cariboos a strong appeal, and, following a visit to Jasper in 1923, I was at last able to arrange for a trip to them. In this I was joined by Professor R. T. Chamberlin, of the University of Chicago, but Dr. Gilmour, whom we had hoped to have with us, was forced to withdraw at the last moment.

In default of definite information regarding the other valleys, Sand creek was again chosen for the approach, and the morning of June 25, 1924, found us *en route* from Jasper to Tete Jaune station. The day was very clear and we could see Mt. Alberta, far up the Athabaska, from the train. At Tete Jaune we were met by ' Slim ' Goodell and George Burns, our packers ; A. L. Withers had come over with us from Jasper, and the party was completed by King, a fine collie dog belonging to Goodell. After lunch we loaded our belongings on four horses and set out for Sand creek. An old trail on the left (W.) side of the stream had been cut out in advance for a short distance. Four hours march took us above the first pitch of the fine canyon, which was as far as the horses could go, and we stopped for the night under a big overhanging rock close to the stream. The altitude was 3600 ft., 1200 ft. above the railway. The heat in the Fraser valley and during the ascent over great sandy dunes flanking the canyon had been intense, and we welcomed the cool of the evening and the sound of the rushing water.

---

[8] ' The Cariboo Mountains,' by E. W. D. Holway, *Canadian Alpine Journal*, 1917, p. 30.

[9] Sand creek and the McLennan river enter the Fraser together at the old site of Tete Jaune Cache. The present railway station of Tete Jaune is about a mile further west.

The next morning Goodell and Burns took the horses back to Tete Jaune,[10] Chamberlin, Withers and myself getting off to a late start up the valley, after caching the remaining supplies out of the reach of the omnivorous porcupine. The going was rather thick in spots, but there was a recognizable foot-trail in the clearer places, and at times we could walk on the gravel bars, glittering with a fine micaceous sand. Mica is everywhere in these mountains,[11] and the stream water has a peculiar flocculent appearance from the swirling particles of it. The valley is narrow and trough-like, as in the Selkirks, the vegetation characteristic of the Interior ranges, though hardly so dense as I had expected. About four miles above the horse camp a glacier tongue comes down deep into the valley through a narrow cleft from the E. A mile beyond this another side valley, with a waterfall, discloses suddenly a fine striking peak with two black towers rising from shining snowfields. This we have named Mt. Challenger,[12] and later found its altitude to be about 10,900 ft. Sand creek at this point must be some 4000 ft.

Beyond this the valley curves sharply to the left and the main glacier, two miles further on, is hidden behind a wooded shoulder of 'Forks peak.'[13] We made camp about noon of the second day in a patch of trees some 600 yds. from the ice, at an altitude of 4440 ft. The valley is quite open here, but continues to bear to the left, so that only the lower part of the glacier is visible. Above it, on the right, is a high, steep wall, culminating in three graceful peaks, the true height of which we did not realize until later. The first of these, Mt. Welcome, was so named by Holway and Gilmour, it being in view far down the valley. Adjoining it is a lower pyramid which for reasons evident below we have named Bivouac peak. Beyond this,

---

[10] The horses were taken on from there to Swift Creek. Goodell and Burns then returned with a few additional supplies, and acted as a support party during our stay in Sand creek, relaying provisions from the horse camp to the head of the valley. King did his share in this, carrying a load of some twenty pounds in canvas side packs.

[11] Most of it is not of commercial quality. There is a small mine (not worked at present) on a shoulder above the mouth of the valley, on the east side, stated to be 5000 ft. above the track.

[12] The names used in this article have not yet been acted upon by the Geographic Board of Canada.

[13] One of the first peaks seen on the way up the valley. We called it by this name from its location between the main stream and the tributary with the waterfall. The latter is, however, hardly a true 'fork,' as it comes from a pronounced hanging valley.

Photo by A. Carpe.

UPPER PART OF SAND CREEK VALLEY.

Forks Pk., Bivouac Pk. and Mt. Welcome. Glacier tongue entering at left.

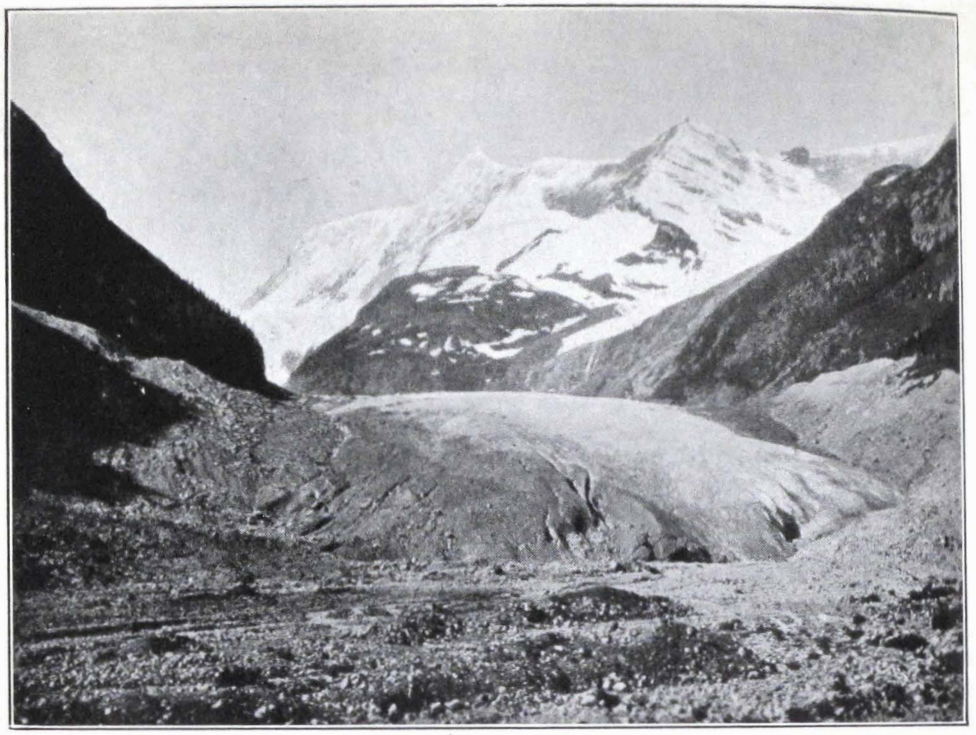


Photo by R. T. Chamberlin.

MT. TITAN AND BIVOUAC PK.
from head of Sand Creek.

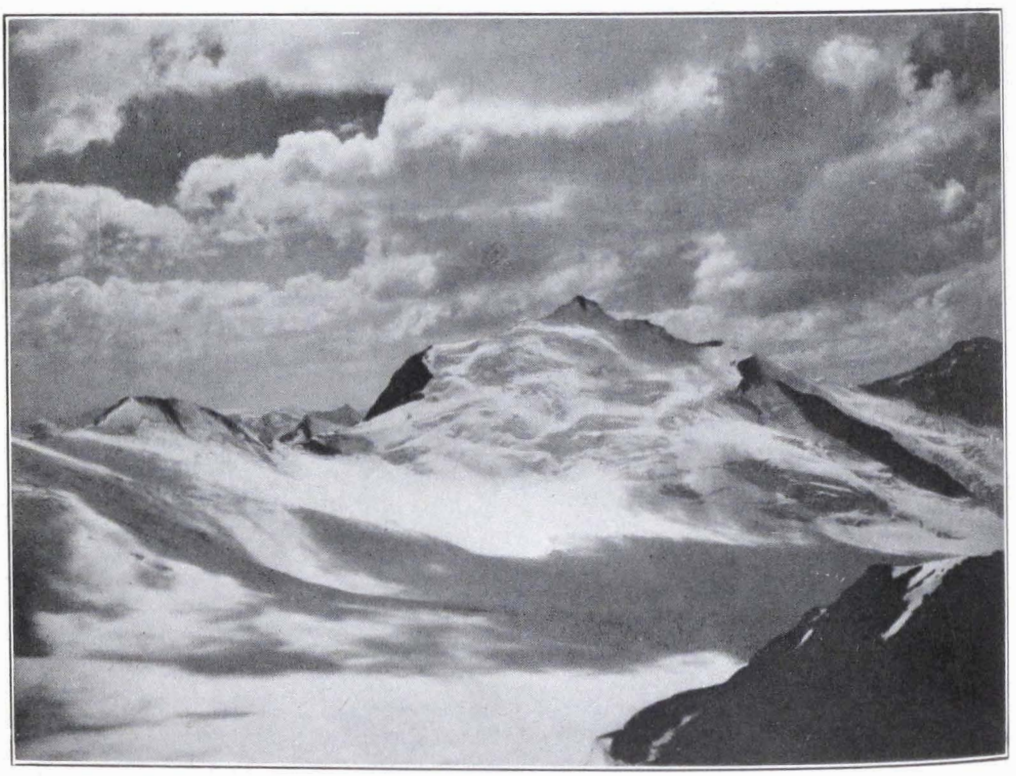


Photo by A. Carpe.

KIWA PK.
from Bivouac Pk.

some miles up the glacier, soars the slender summit which we have called Mt. Titan, much foreshortened and not at all betraying its great bulk from this angle. Between these the range is continuous and does not drop below 10,000 ft. at any point; a steep ridge leading up to Bivouac peak is the most promising access to its crest.

Chamberlin and I were off early the next morning (4.30) up the glacier, with the intention of climbing Mt. Challenger if possible and so obtaining a view of the surrounding country: photographs secured by the previous expedition had indicated a side glacier leading back in that direction. Naturally the trip was in the nature of a reconnaissance, as we could see nothing of the route from below. As we progressed, the glacier opened out to a splendid cirque or head-wall, glistening white in the morning sun. Behind us Mt. Robson, 30 miles distant, came into view. Presently crevasses began to open up across our path; thinking to avoid them, we took to the E. bank under 'Forks peak,' but soon became entangled in a mass of juniper scrub and cliffs and wasted a good deal of time before reaching the edge of the expected side glacier. This led back (toward the E.) to a rounded summit with a col on either side. We selected the one to the right as most likely to lead to our objective, but the choice proved wrong, and after labouring for some time in the soft steep snow of the upper glacier (a light crust giving way under each step) we were content to scramble up on the rather shapeless mass at its head, just over 10,000 ft., which we dubbed 'Gunboat Ridge.'

Not perhaps a very distinctive peak, it left little to be desired as a viewpoint, and in the radiant clearness of a perfect June day we had an inspiring introduction to our new range. Whitehorn, Longstaff, Bess, Chown, even peaks far up at the head of the Jackpine and towards Mt. Sir Alexander, stood forth as if suspended in crystal. Albreda peak and the Gold range seemed near. Round about us was a wilderness of shining peaks and swelling snowfields that stretched away to the W. and S. as far as the eye could see. Across the upper basin of Sand Creek névé Mt. Titan reared his mighty head, ice-capped above beetling precipices, clearly the monarch of the group. To the left there followed a maze of glaciers and serrated peaks at the head of the McLennan river,[14] the highest

[14] This branch of the McLennan river, properly its true source, is known locally as 'Mica creek.' This name is duplicated so frequently that it seems preferable not to perpetuate it here.

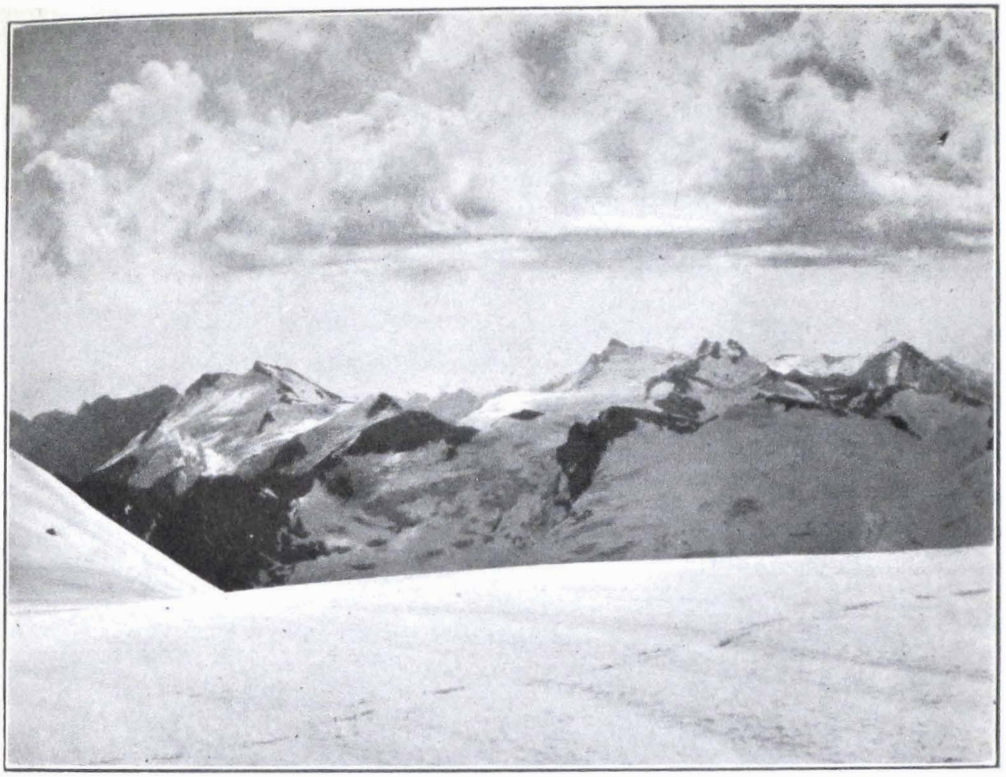
partly hidden by jutting nearer summits. We were not high enough yet to unravel fully the intricate topography of the range, and the impression was that of a sea of mountains, frosted and laden down with snow, impressive yet baffling in their newness and unexpected splendour.

Sweeping around through half the compass to the S. and E., a broad snowfield led to Mt. Challenger, our erstwhile objective, more than a mile distant and still high above us. A deep break cut us off in that direction, even had there been time for an attempt, but the way seemed clear for a later attack from the col N. of our peak. We descended by that route to the main glacier and down it to camp, finding the crevasses not very bad, and certainly preferable to our route of the morning.

The ascent of 'Gunboat Ridge' left little doubt that Mt. Titan was the highest peak of the group. At the same time it dispelled any hope of an easier way up it from the side we had seen: the entire flank facing the Sand Creek glacier was an immense glacier-scarred precipice 5000 ft. high. The only possible access from Sand creek seemed to be by the ridge leading up to Bivouac peak, whence the long crest of the range could be followed to Mt. Titan. This ridge comes down towards the main glacier at a point perhaps two miles above its snout, enclosing between it and Mt. Welcome a steep-walled little cirque whence a hanging glacier discharges in a waterfall.

By 3.30 A.M. on June 30 we were under way, following the glacier to the base of our peak, then up the moraine of the side glacier to steep, heathery slopes and a small snowfield. We struck the ridge at about 8000 ft. and followed it straight to the top. The lower part is a soft, rotten mica schist, full of garnets; higher up the rock is harder and quite steep, interspersed with stretches of snow. The climb is remarkably similar to that of Paragon peak, in the Tonquin valley. The altitude surprised us. From below it had looked hardly more than 9000 ft., but the barometers passed that figure when we were scarcely half-way up the ridge, and it was noon before we finally stepped out on the summit at 10,200 ft., 5800 ft. above camp.

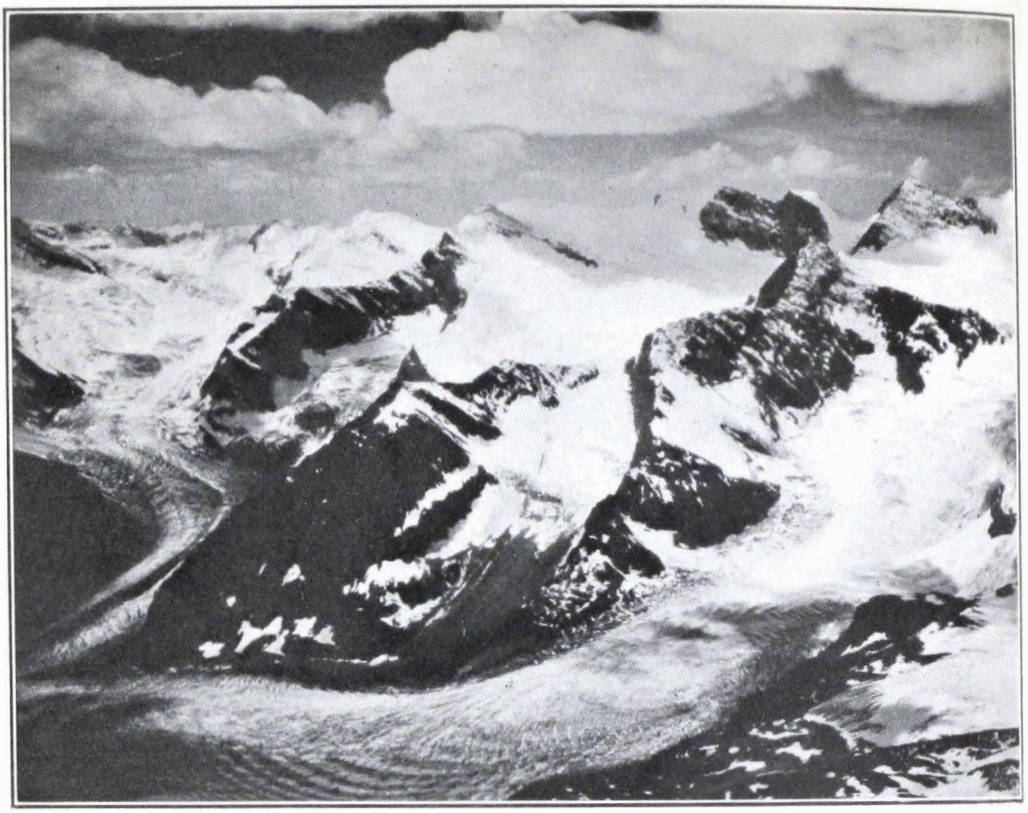
We looked down upon the whole course of Sand creek to the Fraser, with the Rockies beyond. The Challenger group, with its sub-ranges overlooking the McLennan river, made a pretty picture of interlocking ridges and snowfields. It was interesting to note that one of the two apparent summits of Mt. Challenger—in fact, the more prominent one from below—



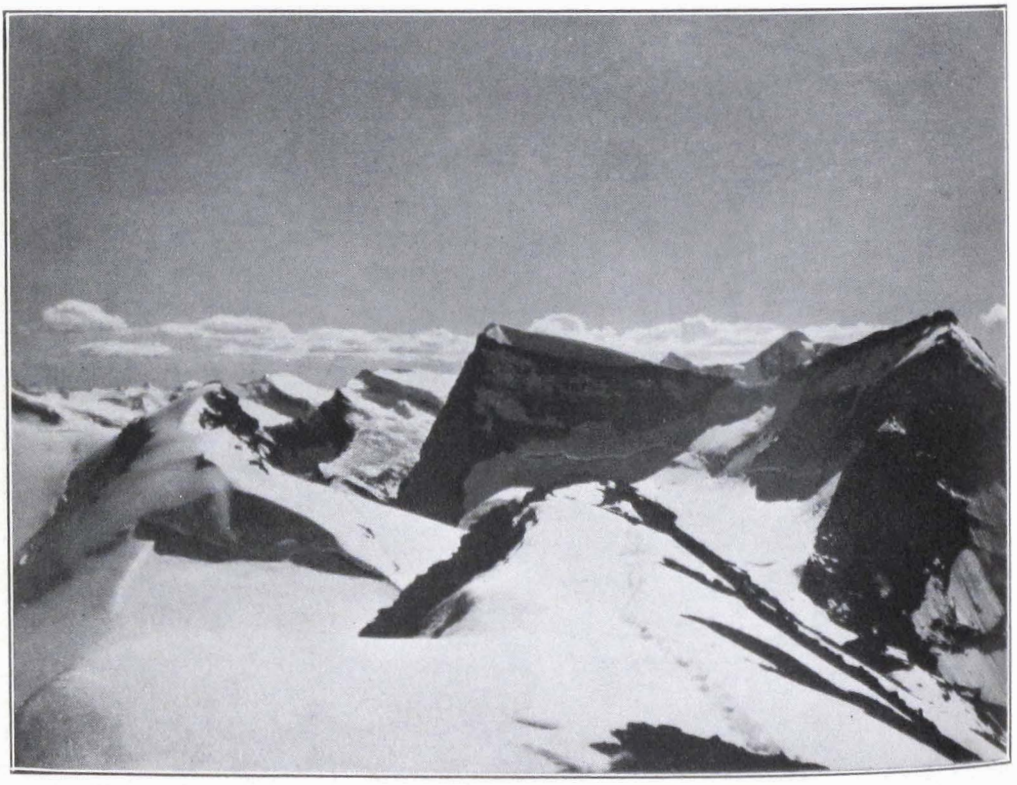
THE CHALLENGER GROUP FROM MT. TITAN.
Mt. Challenger at left.

Photos by A. Carpe.

MT. DAVID THOMPSON FROM MT. TITAN,
showing glacier passes to North Thompson and Shuswap rivers.



SOURCE OF THE MCLENNAN RIVER
from Point 10,075.



Photos by A. Carpe.

VIEW SOUTH-WEST FROM GUNBOAT RIDGE.
Summit of Mt. David Thompson behind Points 10,250 and 10,225.

was merely a shoulder of no independent importance. To the right the gathering basin and broad upper snowfields of the Sand Creek glacier were spread out map-like at our feet.

In the other direction a scene of truly arctic grandeur burst upon us with dramatic suddenness as we breasted the summit. The whole N. face of Mt. Titan towered before us, a solid wall of ice, blindingly white against an indigo sky. At its foot a great undulating névé drained to Kiwa creek.[15] Across this, rising with a gentle dignity from the white expanse, stood the most beautiful snow-peak I have ever seen—a Monte Rosa-like summit of terraced ice, its upper spire edged with the thinnest imaginable line of rock. A delicate symmetry of outline gave it a strangely soaring and intangible aspect. We named it Kiwa peak.

Our own peak was little more than a buttress of Mt. Titan. The connecting ridge dipped down a few hundred ft., then swept upward with increasing steepness 2000 ft. to the apparent summit, the highest point being a little beyond. It was a snow arête throughout, integral with the N. face and Kiwa névé on the one hand, on the other overlooking a precipitous rock wall dropping away to the Sand Creek glacier. The distance in air-line was over a mile. The snow was deep and soft under the mid-day sun, and by the time we had lunched and obtained the necessary pictures it was 1 P.M. It would be a long pull, not without avalanche danger and with little prospect of getting back before dark, yet we were loath to give in without an attempt. We started down the ridge towards Mt. Titan, but when we found that the rocks of our own peak would force a descent practically to the level of the Kiwa névé it seemed useless to continue. We spent some time photographing and drinking in the view, started back at 3.45, and were in camp by 8.20.

We now had a fair knowledge of the country on both sides of Sand creek, and it behooved us to make a more serious attack upon the high peaks of the range. It is perhaps too much to say that we had been repulsed in our first attempts: pioneering would lose much of its appeal were the defences of a new region to fall without some preliminary skirmishes. Nor could we wish for greater rewards than we had had on

[15] A tributary to the Fraser about six miles below Sand creek. *Canadian Pacific Railway Report*, 1877, p. 262, mentions: 'Kiwa (Crooked River), 100 feet wide, three to six feet deep . . .' Also known locally as the 'Little Shuswap.'

'Gunboat Ridge' and Bivouac peak. Yet we had each time turned back from a higher summit largely because of the distance and lack of time, and it was evident that we had underestimated the scale of the mountains and the elevations to be overcome. We accordingly agreed to make a high camp part way up the glacier, and have another try at Mt. Challenger.

Packing up our sleeping-bags and a few provisions, we set forth at 3.45 the next afternoon. Withers, who had been a warden at Maligne Lake in Jasper Park, and was keenly interested in the mountains, came with us and proved himself most useful on this and subsequent climbs. We went perhaps two miles up the ice, then followed a goat-trail along its E. margin, and at 7.30 P.M. reached a grassy shoulder in the angle between the main glacier and its tributary coming down from 'Gunboat Ridge,' directly opposite Mt. Titan, at an altitude of 6900 ft. It was an ideal location, overlooking the icefall of Sand Creek glacier, with a patch of juniper scrub for shelter, and small dead wood for fuel. Water was at hand and the only drawback was the mosquitoes, which, for some reason, were worse than in the valley. The night was warm.

We were under way at 2.50 A.M., reaching the col N. of 'Gunboat Ridge,' altitude about 9200 ft., in just two hours. Here Mt. Challenger came into view. Roping up, we headed towards it across snow-covered glacier slopes, circling the base of a small peak en route. A steepish traverse under a curiously bulging schrund put us on the ridge between this and Mt. Challenger, along which we walked, cutting a few steps, to the base of our peak. The altitude was only 9600 ft. The mountain was composed of a mixture of quartzite and coarse mica schist, the latter in many places almost a pure foliated mica. The material is characteristic of the region, especially of the corner between Sand creek and the McLennan river. At a little distance it looks almost black, but close by the light is reflected from countless facets that flash and sparkle like snow crystals. Although smooth and a little slippery to the touch, the boot-nails bite in and seem to hold well. The climbing was easy, but the ridge was longer than we had expected, and we were gratified to find the barometer above 11,000 ft. when we reached the summit. The corrected altitude worked out later as 10,900 ft. It was 8.45 A.M.

The thermometer registered 49°, but a bitter wind made it a task to complete the usual summit panorama before retreating to a ledge just below for shelter. The air was filled with flying particles of mica dust. It was another brilliantly clear

day, save for a thin wisp of bluish smoke that rose from the Fraser valley near Mt. Robson, heralding the approach of that perennial curse of the Canadian mountains. The entire chain of the Rockies was in view, from Sheep Creek pass to the Big Bend. We could trace the Gold range to beyond Blue River. Mt. Geikie was very distinct, but we sought in vain to make out the Columbia group or Mt. Clemenceau. Far to the S. of us were rounded snowy domes of the Clearwater mountains.

We were definitely higher than anything else in the eastern portion of the range. Our immediate surroundings, a rather distinct area bounded by Sand creek and the bend of the McLennan river, can perhaps best be described by likening 'Gunboat Ridge,' a mile S.W. of us, to the hub of a wheel from which ridges radiate spoke-like in four directions, each pair enclosing a glacier. The first connects to the N. with 'Forks peak.' The next makes out toward Mt. Challenger. Between the two lies the glacier over which we had come, draining directly to Sand creek by the waterfall two miles below camp. We were on the divide between this and a rather larger glacier to the S. and E. which, although our ridge was nearly parallel to Sand creek, made a sharp turn around the N. base of Mt. Challenger, and reached Sand creek by the slender tongue entering a mile further down. This glacier occupies a broad, flat basin heading back against 'Gunboat Ridge,' bounded on the S.E. by a range of beautifully Alpine peaks along the McLennan river, three reaching 10,700 ft. in altitude. These were particularly impressive in the morning sunlight from the base of our mountain, and for sheer beauty of architecture are hardly surpassed in the range.

The fourth ridge is directed towards the head of the McLennan river, carrying the two jagged summits that had obstructed our view when we were on 'Gunboat Ridge' and forming the divide between Sand creek and the McLennan river. Crossing at the head of the Sand Creek névé, this ridge connects with the S.E. base of Mt. Titan. We were high enough to see the white pyramid of Kiwa peak beyond.

At the head of the McLennan river was a magnificent peak remembered from Holway's views. From its flanks, and from a broad white col between it and Mt. Titan, glaciers streamed down. The reverse slope of this col, as we later discovered, forms the true source of the North Thompson river, and we have therefore proposed to name the peak marking this important site 'Mt. David Thompson.' It is a mountain worthy of that great name.

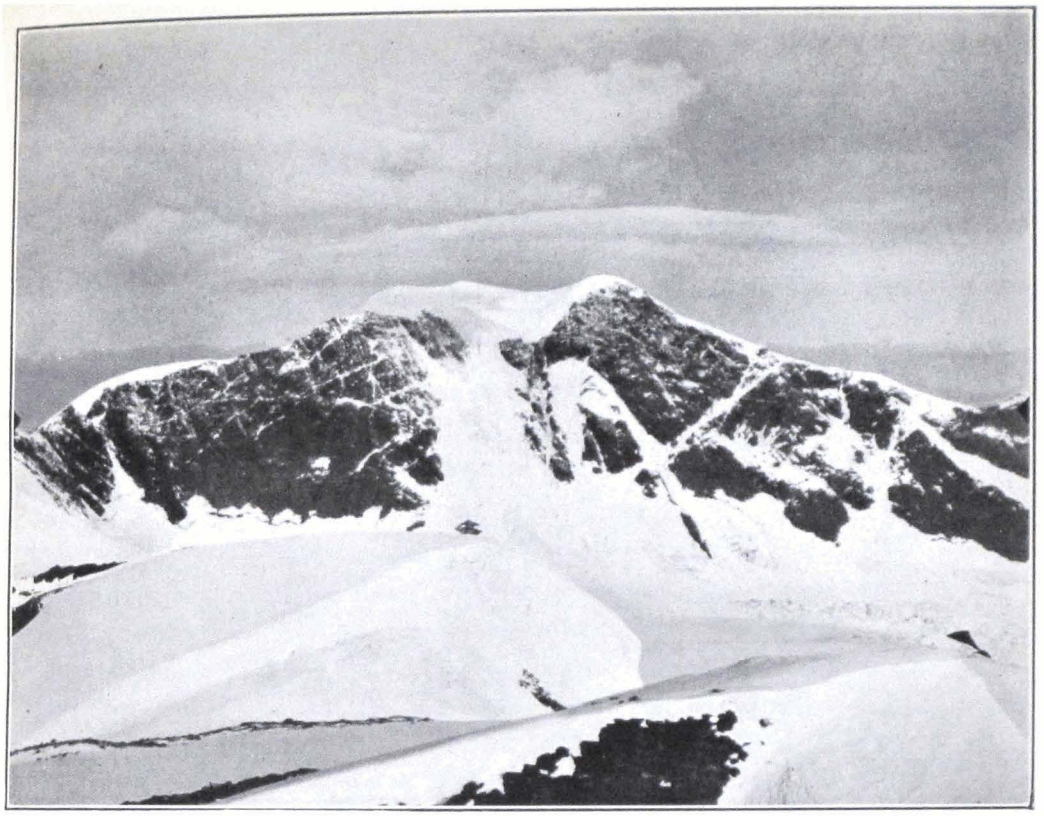
We could look down on the gravel flats of Sand creek, where the waterfall enters, and a stoneman was built so that it would be visible from below. On our way out ten days later we picked it up easily with the glasses. On the way down, Chamberlin and Withers stopped to climb the small peak referred to above, between 'Gunboat Ridge' and Mt. Challenger; it is perhaps 10,250 ft. high, with an attractively pointed summit, and an interesting snow arête. The writer, more lazily inclined, dropped down meanwhile to the col and photographed. Then we plunged on through the almost intolerable heat of the lower snowfields to the bivouac place and were back in camp by 5.45 P.M.

A day of rest was now in order, on which we discussed plans for Mt. Titan. It was evident that another high camp must be established. There were heather slopes at perhaps 6000 ft. along our route of June 30, but we were not sure of finding a level place. Even if we did, there would be a long climb ahead of us before we could reach the summit snows, which we wanted to attack as early in the day as possible. In the end we decided to take the bull by the horns and sleep out on top of Bivouac peak, where nothing short of a complete break in the weather would rob us of victory.

On July 4 we retraced our route up Bivouac peak at a leisurely pace, reaching the top at 4.15 P.M., after a climb of nearly nine hours. On the very summit the rock had weathered to a sloping platform of soft scree, where we spread our bags. A wall of stones was built as a wind-break and to keep us from sliding down towards the Kiwa névé during the night. In the absence of water, snow was melted in the sun for soup, and while this was boiling over Meta units among the rocks a second hatful was made ready for the morning. As daylight faded we crawled into our bags. A thin crescent moon hung low over Kiwa peak.

There was a stiff breeze, and we had to secure our belongings with stones to prevent them from being blown away. The wind continued during the night, and seemed unnaturally warm. Tepid blasts roused us from time to time. It was an eerie sensation to peer out on the ghostly world around us, thick cloud-banks blotting out the stars along the horizon. Evidently the weather was turning. On the whole, however, we passed a comfortable night, rose early, and resumed the climb at three the next morning.

The ridge between Bivouac peak and Mt. Titan had changed greatly since our last visit. Large masses of wet snow had slid

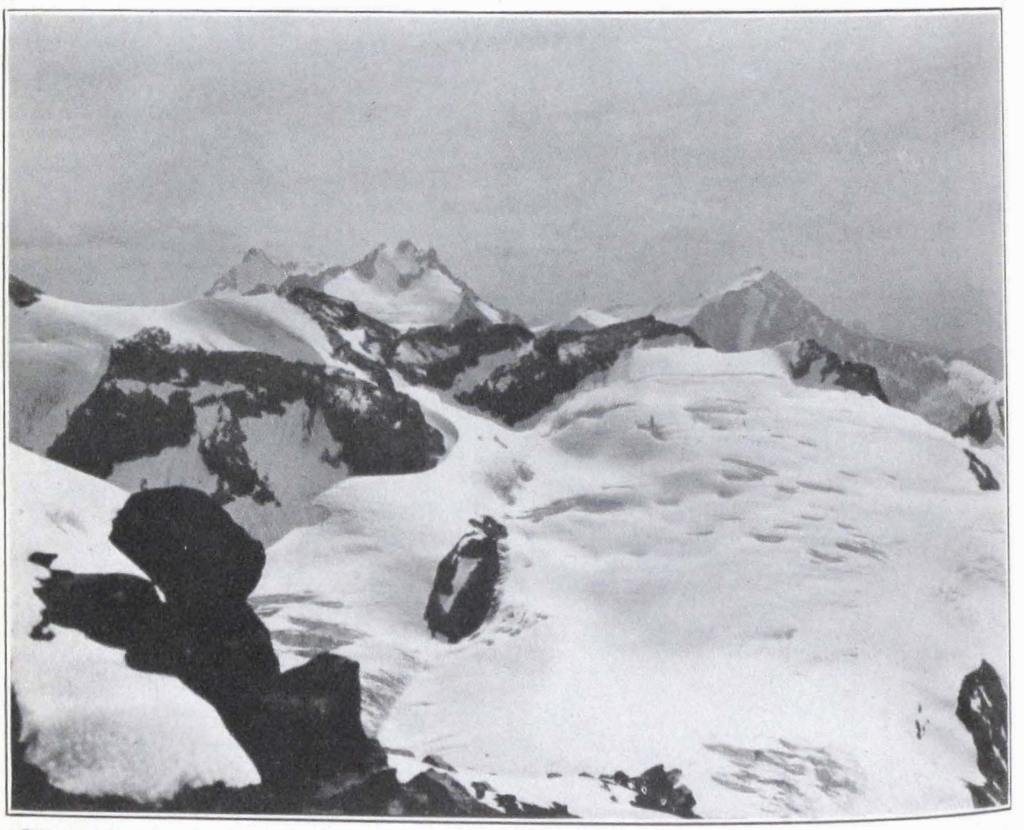


MT. TITAN
from Point 10,075.

Photos by A. Carpe.

MT. DAVID THOMPSON
from Point 10,075. Pass to North Thompson at right.

VIEW NORTH-EAST FROM POINT 10,075.
Mt. Challenger at left; Mts. Robson and Resplendent in background.



Photos by A. Carpe.

VIEW EAST FROM POINT 10,075.
Points 10,700-750 and 10,500.

off bodily to the Kiwa névé, exposing ugly patches of black ice underneath. The lower part was not steep and might have been climbed with a little step-cutting, but higher up the conditions were not promising. We therefore abandoned this route, dropped down instead a thousand feet to the Kiwa névé and crossed at the base of the N. face towards the westerly ridge of our peak. Here a smooth trough or corridor led up toward the sky-line, beyond a crater-like hot-plate. Above this the ice-face is dissected by a series of long crevasses running diagonally down toward the W., with relatively clear stretches between. The climb was simply a matter of crossing each crevasse at a suitable place, which was not hard to do so long as the snow was firm, and working up the intervening slope as far as possible before crossing the next one. The route was thus somewhat of a zigzag affair. The snow was slightly crusted low down, generally in fine condition, but with a few deep drifts. Higher up it was thin on the ice. It held well and few steps were required, but it seems possible that the greater part of this face may be bare ice later in the season.

Once on the mountain, we pushed upwards at a good pace. At 11,000 ft. we out-topped Mt. Welcome. Presently Kiwa peak followed suit and still the summit was not in sight. The sky was overcast and there was a keen wind, but the bulk of the mountain sheltered us. A few hundred feet below the top we worked out on to the rocks of the W. ridge, a small outcrop and the only one on this side of the mountain. The wind was upon us here with full force. After a little space the rocks gave way to the ice-cliff of the summit cap, steep, but with good snow. Once over this, the slope flattened off quickly and the summit was ours. It was 7 A.M.

The top is a plateau-like mass of solid ice, so that one cannot say to within perhaps a hundred feet which is the highest point. Crevasses cut across it. As we had expected, we were on the higher of the two summits, some hundreds of yards back of the point seen from Sand creek. It was a dramatic moment when a hasty calculation placed our barometric height at just over 12,000 ft.; this was reduced later by the descending reading and corrections from instrumental levels to 11,750 ft., which we believe to be conservative. We were hundreds of feet above our nearest rivals, Kiwa peak and Mt. David Thompson, apparently of nearly equal height. For the first time we could see the western slopes of the latter; it is a bulkier peak than would appear from the E, bearing considerable ice. The North Thompson river curves around it like a great horseshoe, rising

from its northern slopes, flowing at first almost due W., then turning in an enormous arc through nearly 180° to its confluence with the Albreda river 40 miles to the S.E. From the bend of this arc we could make out low passes to the Clearwater and Quesnelle drainages. The source of the Canoe river is enclosed within this arc, between the Thompson and McLennan rivers, but we could not see it clearly. Immediately N. of the source of the North Thompson river, somewhat between us and Mt. David Thompson, was a long ridge-shaped mountain of considerable height (nearly 11,000 ft.), which separates the North Thompson from the Shuswap river.[16] The latter, rising from a long, narrow glacier heading against Mt. Titan, circles to the right around Kiwa peak to the Fraser, its arc as seen from Mt. Titan being almost a mirror image of that of the North Thompson. There appear to be passes from it to the North Thompson, and it is understood that a trail exists between the two by way of the Thunder river (Clearwater drainage ?). There were no mountains, as far as we could see, that approached in altitude those in our immediate neighbourhood, and it must be concluded that the highest portion of the Cariboo range forms an extraordinarily concentrated nucleus closely surrounding Mt. Titan. This area, however, is the hydrographic centre of a very considerable territory. Mt. Titan is probably the highest point in Interior British Columbia.[17]

The necessary photographic work was completed with difficulty, owing to the high wind. It was fortunate that we had reached the top early, for scarcely was the panorama finished before the clouds hovering just overhead closed down upon us. They barely grazed the summit, for when we descended a little towards the other peak we soon got clear of them. After

[16] A sizable stream entering the Fraser some twenty miles below Kiwa creek. Known locally as the 'Big Shuswap.' *Canadian Pacific Railway Report*, 1877, p. 262, has: 'Shuswap River, a rapid stream, 4 feet deep, 150 feet wide at low water, 18 feet at floods (*sic*). . . .' On p. 131 of the same Report we find: 'The mountains on each side of the [Fraser] valley are very high, many of them capped with permanent snow; but after passing the River Shushwap, 83 miles from Yellowhead pass, they decrease in height and recede further from the river.' Some recent maps, to avoid a conflict with the Shuswap river in the Kamloops district, designate this stream as the 'Raushwap' (from Rivière au Shuswap) or 'Raush' river. It is hoped that such barbarisms will not survive.

[17] Hitherto Mt. Sir Sandford, 11,590 ft., in the northern Selkirks, has held that honour.

indulging in the baser satisfactions of sardines and biscuit we crossed thither, finding the intervening saddle barely 200 ft. deep. The peak, unlike the higher summit, is a rather narrow ridge paralleling Sand creek. The wind was so high that it was difficult to move about with any feeling of security. We made sure that we could see into the valley, then returned to the other summit. The difference in elevation between the two is only a few feet.

We started down at 9.10 A.M., stopping at the rock outcrop to build a small cairn. We were thankful now for the cloudy sky, for without it parts of our route where the snow was barely deep enough on the ice to grip the boot-nails might have made less pleasant going on the descent. As it was, the crevasses had softened up considerably, especially lower down, and we floundered into a couple of them. When we got to the Kiwa névé we went out on it some distance to get pictures, then back over long snow stretches and some rocks to our bivouac at 12.30 P.M. A trickle of water here refreshed us ; we had had little at breakfast and none during the day. As we set our faces towards the valley the mists clung threateningly to the summit of Mt. Titan. Kiwa peak was incredibly beautiful in a mantle of cloud shadows. About half-way down the ridge it started to rain, but the steeper rocks were behind us and we made camp without mishap, although somewhat wet, just in time for supper. It rained all night.

There followed two days of rain. On the 8th it cleared, and we sent Burns back to Tete Jaune to fetch up the horses, while we went up during the afternoon to our camping-place above the E. side of the glacier for a last climb. We wanted to go to the head of the Sand Creek névé, where we could see down into the McLennan river. In the morning we crossed the side glacier to a large ridge or nunatak between it and the main ice-fall, then up beside this through the ice-fall and out on to the upper plateau. The weather was far from settled. Clouds gathered low, and a wintry wind flung frozen ice crystals from the névé crust in our faces. At 6.25 A.M. we reached the top of the first peak of importance rising from the crest of the névé, rather to the E. of its centre. The altitude was about 10,075 ft. We were interested to find here a cairn containing a Canadian one-cent piece, but no other record, doubtless left by Professor Holway's party in 1916.

The weather was very dull ; we spent three and a half hours on the summit and got a little sunshine, but soon it clouded over again. Our peak was on the edge of a very steep

escarpment dropping away to the McLennan river, giving us an unobstructed view in that direction as well as across Sand creek. A continuous glacier mantle extends across the head of the McLennan valley from Mt. David Thompson to Mt. Titan, presumably continuing up the S. side of the latter to the summit. Set somewhat back between the two is the mountain separating the North Thompson and Shuswap rivers. Here is a triple watershed between the North Thompson, Shuswap, and McLennan rivers. The pass to the left towards the North Thompson is very broad; from it a magnificent glacier flows to the McLennan river. The rugged upper ridge of Mt. David Thompson rises above.

Some distance to the left of Mt. David Thompson a long, winding glacier comes down into the valley from lower snow-clad ranges to the S. Across from this, just E. of us, the group of nameless peaks S. of Mt. Challenger sends down a third tongue. We could look down where the three glaciers almost meet and form the source of the McLennan river. The range to the E. of us, along the N. side of the valley, S. of Mt. Challenger, presented a wonderfully varied network of ridges and broken glaciers, reminding one of the Selkirks. It contains several fine peaks, which might be accessible from the McLennan river side.

We crossed with little effort to two adjacent summits, altitudes 10,250 and 10,225 ft. respectively, rising from the eastern margin of the névé between our first station and 'Gunboat Ridge.' Both drop off very steeply towards the glacier draining to the McLennan river from the range to the E. On the second one, a rather sharp rock ridge at the top, a snow flurry overtook us. Soon we were enveloped in clouds and driving sleet. We beat a hasty retreat across an area of unpleasantly crevassed, slushy ice to the nunatak; it was a relief when the rocks loomed out of the mist. The descent to camp was completed in rain and hail.

After another day of unsettled weather the morning of July 11 dawned cloudless and perfect. It was the day set for our departure. For the first time since July 4 Robson was free of cloud. Reluctantly we bade farewell to the splendid mountains that had become so familiar to us. Five hours' march, from 8.20 A.M. to 3.25 P.M., brought us to the horse camp. In the evening Burns came up with the horses, and the next morning, another perfect day, we got down to the railway by noon. From here, some distance E. of Tete Jaune, we could still see the top of Mt. Titan.

Albreda Peak.

On practically all of our climbs in the Cariboos we had been impressed with a fine snow peak at the extreme northern end of the Gold range, not perhaps quite so high as the mountains further S., but the most distinctive summit of the range. This mountain lies in the angle between the Albreda and Canoe rivers, and is in full view from the Canadian National Railway for some distance S. of Albreda pass. It is the only important mountain in the northern Gold range that can be seen from the track. I had admired it when passing that way in 1920, and conceived the notion of climbing it at that time. A particular incentive arose from the fact that, since no other high peak of the northern Gold range is visible from the valley, it constituted practically a key-point for the further investigation of the range. We had a few days left after our Cariboo trip, and the time seemed appropriate for an attempt on it.

When Milton and Cheadle went down the North Thompson in 1863, they named this mountain ' Mt. Milton.' [18] The name has since fallen into disuse, and the peak is now universally known as ' Albreda peak,' or ' Mt. Albreda.' This name is used in current railroad folders and appears on a large sign erected along the track S. of Albreda pass. The name ' Albreda,' as applied to the river and pass, undoubtedly also originated with Milton and Cheadle ; Milton's aunt was Lady Albreda Wentworth-Fitzwilliam, and an earlier ancestor married Albreda de Lisoures.[19] The present usage thus does not violate historical priority and is topographically consistent, so it has been retained.

After our descent from Sand creek we rested during the heat of the day at a spring near the Sand Creek railway bridge. From a meadow here we could see far down the Thompson valley. In the Gold Range, probably as far off as Blue River, a strange white peak stood up against the sky ; we took it at first for a distant cloud. It was a suggestive sight, for nothing of the kind can be seen from the railway and there seems to be a

---

[18] *The North-West Passage by Land*, p. 274 : ' . . . the next day we passed the height of land, and gained the watershed of the Thompson. . . . We . . . saw before us a magnificent mountain, covered with glaciers, and apparently blocking the valley before us. To this Cheadle gave the name of Mount Milton.'

[19] *Canadian Alpine Journal*, 1915, ' Place Names in Vicinity of Yellowhead Pass,' by James White, p. 154.

general impression that there are no mountains of importance in the Gold range. About 4 P.M. we saddled up the horses and set out on a march of nearly fifteen miles across the dry sandy plain along the McLennan river, known locally (and quite appropriately) as 'Starvation Flats.' We reached Swift Creek just at nightfall and camped near the station, among tin cans, broken bottles, and other signs of the progress of civilisation. In the morning we shipped most of our goods back to Jasper and boarded the south-bound train for Clemina station with supplies for a six days' trip. The air was thick with smoke from fires in the Canoe and Thompson valleys, the first bad smoke we had had.

If the Cariboo mountains were in many respects *terra incognita* when we went into them, the northern Gold range was a complete mystery. We knew only that our mountain was near Clemina station and that a stream of white water, presumably coming from the glacier on its W. face, entered the Albreda river a short space below there. This glacier is very conspicuous from the railway, covering the whole face of the mountain, but lower down the valley is narrow and wooded and little can be seen from below. On the train we met a young trapper who gave us elaborate directions for getting to the 'big glacier' by a route which sounded quite reasonable at the time; unfortunately it developed later that he meant a different glacier. To add to our worries, when we got to Clemina we found that one of the fires was quite near the station, so that the mountains were completely hidden. The altitude of Clemina station is 2753 ft.

We went down the track about a quarter of a mile to the mouth of the glacial stream, where we found a cabin left over from some abandoned lumbering operation. After lunching at the stream we went up it about an equal distance, following a line of old blazes, to a second cabin. Crossing here on a log, we ascended the steep hillside to the S., as directed by our informant. The going was very much harder than in the Cariboos. It was big cedar country, reminiscent of the lower valleys of the Selkirks, the ground often covered with deep moss, and with alders and devil's club above a tall man's head. We had to relieve King of his side-packs, as he got hung up continually in the low brush. We could see nothing but the trees around us, and their majestic canopy overhead. There were some blazes of a very old trap-line, but they were difficult to follow. Presently they ceased, and we dropped down 600 ft. to the stream bed, where we camped, not far from where the stream

MOUTH OF STREAM LEADING TO ALBREDA PK.

Photos by A. Carpe.

SUMMIT OF ALBREDA PEAK.
Route of ascent in background.

forks, at an altitude of 4000 ft. It was 7.30 P.M. We were interested to find the rocks in the stream to be largely a coarse, solid gneiss, containing enormous crystals of hornblende. On the opposite bank was a trapper's cabin.

The next morning we crossed again and went up the N. (clear) fork until the going became very bad, then climbed the wooded shoulder between the two branches with a view to dropping down into the head of the S. fork, where the big glacier of our peak was supposed to be. After a hard pack we reached a place where we could see out a little through the trees, for the first time since we entered the woods. It was very smoky. There was ice at the head of the valley into which we looked, and we were reassured at first, but when we got a better view everything was unfamiliar. The expected western face of Albreda peak, with the big glacier seen from the railroad, was not there. Instead the valley was rather open at its head, and a high peak on the S. side of it rose in a steep wall. It was clear that we had been in the wrong valley from the start and were now on the unknown northern side of our objective.

The mountain was still a good distance off and did not look inviting from this side. But there was no time to retrace our steps, so we had no alternative but to make the best of our position. We descended through steep alder thickets to the valley and pushed up its swampy bottom, alternately wading ankle deep among the marsh grass or forcing our way through dense timber. Shortly after five it started to rain, and we just managed to reach a moderately dry spot and get our tents up before a heavy downpour. We had been on the march since 9.30 A.M. The altitude was only 4650 ft.

During the following days rain alternated with clouds, and the barometer went up and down without visible effect on the weather. Our provisions were low. On the 15th the men shot a marmot. We went up the valley to examine the E. ridge of our peak, our principal hope of ascent, but got in a snowstorm and could not see to the top. The glacier comes down about a mile above camp, its tongue reaching an altitude of about 5250 ft. Beyond it a goat trail along the sharp crest of a moraine leads to a high grassy bench overlooking a hanging basin at the head of the valley. Here we found two pretty lakes, one glacial, the other clear, side by side. The glacier really has two branches—the one draining directly to the valley, the other feeding these lakes. Their altitude must be close to 6000 ft.

On July 17 our larder permitted us only one more day. Although there was little change in the weather, we took our

sleeping-bags and a tent up to the shoulder N. of Albreda peak for an attempt. When we first looked out in the morning we were in the clouds, but by 5.45 they lifted sufficiently for us to find our way to the glacier. This we crossed at a level of perhaps 7000 ft. to the E. base of our peak. A rock ridge comes down in this direction, but we had never been able to see to the top of it. It was connected with the glacier by a sharp little snow arête, up which we climbed to the rocks at a height of about 9100 ft. We were just level with the clouds. The snow slope to the right of the arête measured 52° by clinometer.

As soon as we touched the rocks we felt sure of success, for they were a solid gneiss, interspersed with big pieces of vein quartz, superior to anything I know of elsewhere in Canada. As we worked higher into the clouds our surroundings were indeed spectacular. Great blocks and slabs loomed up through the mist, frosted with sleet feathers. Snow had sifted in between and covered the looser material, freezing it fast in some places. Near the top were two big gendarmes which would have made good climbing even under more favourable conditions. At no time could we see more than a short distance through the fog, and it was fortunate that the ridge was well defined and admitted little deviation.

At 10.34 we reached the second of two points of nearly equal height, from which a western face, merging into ice, sloped vaguely down into space. It was the top. The temperature was 28°. The barometric height (corrected) of 10,090 ft. is necessarily only approximate under the circumstances ; photographic levels from the Cariboos yield a slightly greater figure.[20] A wet snow was falling and we could see nothing. It was difficult to realize that we were on the summit from which I had hoped for years to study the Gold range, the Cariboos, and the little-known mountains down the Canoe river. It seemed an empty victory.

We descended at once. At the base of the rock ridge the clouds gave some hope of lifting, and a patient vigil yielded a few tantalizing glimpses into a very deep valley to the S. of us, with mysterious peaks and glaciers beyond. Those that we could see were apparently lower than Albreda peak, but from our Cariboo views the range further S. must exceed this altitude

[20] Due to the distance (about thirty miles) these sights are probably little more reliable than the barometric figure. The two may perhaps be averaged at between 10,100 and 10,200 ft.

by nearly 500 ft. To the N. and E. we looked across the Canoe river to the Rockies, but elevations of importance are lacking in this part of the range.

The next day we regained our forks camp in about three hours' time, following the valley bottom, which proved much better than our route on the way in. On July 20, with the mists still low in the valley, we reached Clemina by a march of four hours and caught the afternoon train back to Jasper.

Topographic Work of Expedition.

Three barometers were carried, two of which were checked against a mercurial standard before and after the trip. By sending one instrument out with Burns when he went for the horses, readings were obtained on two complete round trips to the base camp. All readings were corrected for temperature, which ranged as high as 82° in the Fraser valley. A prismatic compass and Abney hand level were also used. The latter had been checked against a transit and read to five minutes.

Principal reliance was placed upon photographic data. The camera used for this purpose was a folding hand camera of rigid construction, fitted with transit plate levels. For use it was attached to a miniature three-screw base arranged to screw into a small hole tapped in the head of an ice axe, and except on very windy days could be levelled satisfactorily to about thirty seconds of arc. Index marks were placed in the back of the camera and photographed on to the film; horizon line and vertical centre were obtained from these by test photographs. The effective focal length was computed from the closure of several actual panoramas. Ordinary roll film was used, and in practice it was found that angles checked as closely as measurements could be made on the film, *i.e.* to about 5 ft. per mile. A strong ray filter was used to bring in distant features. Complete summit panoramas were taken with this camera at all stations occupied.

Barometric elevations obtained on the different peaks were interrelated and mutually corrected by means of the angles secured in this way and with the Abney level. The nearest points of known height were the peaks of the Robson group. Useful checks were obtained from angles to these points, as well as to Albreda peak in the Gold range. The distance is approximately 30 miles in both cases. The results of these sights are in substantial agreement with the barometric heights.

From the data obtained the Cariboo summits have been

located approximately with respect to the known peaks of the Robson group. A view obtained by Mr. Wheeler's survey of 1911 from the vicinity of Mt. Robson was used to good advantage in this work. It has been found, however, that the locations available at this time in the Robson area are not of sufficient accuracy, nor do they extend far enough to the north, to give very reliable resections because of the acute angles involved. The positions shown on the accompanying sketch map are, therefore, only correct to within about one mile so far as absolute location is concerned, although the relative positions of the peaks are substantially correct. It is expected that more reliable locations will be worked out when the results recently obtained by the Canadian Geodetic Survey N. of the Yellowhead pass become available.

In addition to Mt. Titan, the only peaks certainly exceeding 11,000 ft. are Kiwa peak and Mt. David Thompson. These are close to 11,250 ft. and differ only slightly from one another. Next in line are Mt. Welcome, the mountain between the Thompson and Shuswap sources, and Mt. Challenger, probably in the order named. These three are between 10,900 and 11,000 ft. Three of the peaks S.E. of Mt. Challenger, along the McLennan river, appear to exceed 10,700 ft.; a fourth is 10,500 ft. A high rock peak on the N.W. side of Sand creek, opposite Mt. Challenger, reaches the same height. There may also be some points W. of Kiwa creek in this class, although in general the mountains soon take on a more rounded appearance in that direction, but with many large dome-shaped glaciers. Due to the strong tendency to ridge formations there is a great number of lesser summits exceeding 10,000 ft.

The glacier mantle centering about Mt. Titan is practically continuous and feeds the Shuswap, Thompson and McLennan rivers, Sand and Kiwa creeks. Glaciers are said to flow from the vicinity of Kiwa peak to the Shuswap river, one coming down clear into the valley. The trail to the North Thompson[21] passes close by its snout, and Goodell told us that the ice had receded perhaps a hundred feet during the last three years. In our part of the range we could detect little change as compared with pictures taken by Prof. Holway and Dr. Gilmour in 1916.

In conclusion it may be stated that the Cariboo mountains are rather inaccessible now because there are practically no trails in the valleys. The actual distances are not great. A

[21] To avoid misunderstanding, it should be stated that this trail does not continue down the Shuswap to the railroad, and is therefore not available as a means of access to the mountains from that side.

comparatively small amount of work in making trails would open up a region very similar in its attractions to the Sandford district of the northern Selkirks,[22] and relatively much nearer the railway.

Note on the Geology of the Cariboo and Northern Gold Ranges.

By ROLLIN T. CHAMBERLIN,

Professor of Geology at the University of Chicago.

The Cariboo mountains, so far as we saw them, are composed of a vast series of ancient metamorphic rocks which bear strong resemblance to the Shuswap terrane of the western Selkirks and the region of the Shuswap lakes. The Shuswap has been classed as Archaen, but the proper correlation of these metamorphic rocks is exceedingly difficult. They may perhaps be of Proterozoic age. In the Cariboos mica schists predominate. Subordinate to them are gneisses, some of sedimentary derivation, others developed from granitic intrusions. Veins of pegmatite are abundant.

The mica schists have been derived in large part from old sediments, through strong regional metamorphism while deeply buried. The secondary schistosity is essentially parallel to the original bedding. While sharp recumbent folds are prominent locally, the schists have a general south-westerly dip throughout the greater part of the range. Much shearing between beds and low angle thrust faulting is to be suspected.

Certain members of the series are composed so largely of coarse biotite, muscovite and sericite, that they weather and crumble readily. In crumbling, they yield in some places quantities of small red garnets. Interstratified with these weaker layers are quartz-biotite members of greatly superior resistance, which are excellent rocks for climbing. This combination of hard crystalline rocks with weaker schists, subjected to glacial sapping and high altitude weathering, has given rise to picturesque, rugged peaks of great variety and sustaining interest to the mountaineer.

While the Rocky mountains of Canada have resulted largely from a single orogenic disturbance (the Laramide Revolution, following the Cretaceous Period), the region of the present Cariboo range has suffered from two great orogenic upheavals which have left their records in the rocks. At the close of the

[22] *Mountaineering and Exploration in the Selkirks*, by Howard Palmer (Putnam, 1914).