OUNTAINEERING
D EXPLORATION IN
THE SELKIRKS

HOWARD PALMER

MOUNTAINEERING AND EXPLORATION IN THE SELKIRKS

A Record of Climbing Work among the Canadian Alps, 1906-1912

Mount Sir Sandford, 11,590 feet, the Loftiest Peak in the Selkirks. . . .

Vertically, about 5000 feet of the mountain is shown.

By
Howard Palmer
Member of the Alpine Club
Fellow of the Royal Geographical Society

With Two New Maps and 219 Illustrations

G. P. Putnam's Sons
New York and London
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PREFACE

MY motive in laying the following pages before the public is two-fold: first, to make known a new and extremely beautiful section of the Selkirk Mountains, together with the results of certain topographical and scientific work therein; second, to present, in narrative form, a comprehensive description of mountaineering and travel among them. In the course of five summers, I ascended more than thirty-five of the loftiest peaks, fifteen of which had never previously been climbed. Guides were employed on but six occasions. A large number of photographs was secured, and by reproducing a selection of these it is hoped to convey some suggestion of the real majesty and beauty of the region.

The lure of the highest summit in the chain—Mount Sir Sandford, 11,590 feet—inspired our parties to penetrate the truly virgin territory of which it is the crowning feature. We found there what is probably the largest and the most interesting glacial system in the Selkirks, lofty peaks, gloomy canyons, and spraying waterfalls—in short, types of everything that is noblest in mountain scenery. The exploration of these and the capture of Mount Sir Sandford necessitated four separate expeditions, but, eventually, entire success was won. The new features were named and measured and about three hundred square miles of the Northern Selkirks were mapped for the first time.

Most of these expeditions were carried out in col-

laboration with my friends, Professors E. W. D. Holway and Frederic K. Butters, of Minneapolis. My obligations to them are quite beyond acknowledgment, for in the majority of cases, their coöperation alone rendered the trips possible. When we began our climbing in the Selkirks, a traveller could not go there and hire men to carry impedimenta across the high glacier passes and then to join him in a serious mountaineering campaign. He could procure porters for work below snow-line and Swiss guides for climbing above, but the essential combination of porter and mountaineer in one and the same person was not to be had. In consequence, unless friends or others came with him from elsewhere to act in this dual capacity, the mountaineer's range of movement was limited. Messrs. Holway and Butters and myself, however, discovered that with proper appliances the labor of "packing" over the mountains was by no means to be balanced against the exhilaration of exploring new territory, and to this circumstance the excursions narrated herein were primarily due. Very recently, there have been indications that the above conditions are changing, so that, in the future, travellers may possibly be able to rely upon the Swiss guides for carrying packs to a distance.

The greater number of our expeditions (particularly those described in Part II.) were vacation rambles only. They were inspired purely and simply by the fascination of mountain travel. Not until the region about Mount Sir Sandford was penetrated, did the idea of utilizing mountaineering for more permanent results suggest itself. But here there appeared a section of alpine territory as fine as, or finer than, anything else in the range, a territory so inaccessible that the government would not be called upon to survey it for years

to come. All things considered it seemed to offer such an excellent opportunity for private exploration that we perfected plans for the purpose. The work was done jointly upon our own resources without governmental or other assistance. It is, however, deeply gratifying to acknowledge the courtesy of the Geographic Board of Canada which has officially sanctioned over forty of the names that the writer ventured to suggest. In consequence, the map at the end of the book may be regarded as authoritative in nomenclature. It exhibits the results of our explorations and fills what may fairly be termed the most important gap of unexplored alpine country near the Canadian Pacific Railway.

I have endeavored throughout to subordinate scientific and topographical description to the story of our wanderings, and to confine the discussion mainly to new work and to matters not generally known. It is believed, therefore, that the book will appeal to that mythical individual, the general reader, no less than to those who are fond of mountains and like to follow the progress of the explorer among them.

Not all of the material here presented appears in print for the first time. A number of chapters were originally published as separate papers in journals of mountaineering and geographical societies, both here and in Great Britain. I beg to return my warm thanks to the editors of the following periodicals for permission to reprint them here: the *National Geographic Magazine* (Chapter IX. and part of Chapter VI.),[1] the *Bulletin of the American Geographical Society* (Chapters XVIII., and XVII. in part),[2] the *Alpine*

[1] See "Tramps Across the Glaciers and Snow-fields of British Columbia," *op. cit.*, June, 1910, pp. 457–487.

[2] See "Notes on the Exploration and the Geography of the Northern Selkirks," *op. cit.*, April, 1912, pp. 241–256, with map.

Journal (portions of Chapters VII., VIII., and XXI.),[1] the *Geographical Journal* (Chapter XV. and Appendix C in part),[2] and *Appalachia* (portions of Chapters VIII., XI., and XIV.).[3] The papers have been revised or entirely rewritten to form, as I hope, a harmonious whole.

It is impracticable within an already lengthened preface to acknowledge specifically all of the friendly assistance which has been tendered me in penning this book. I desire, however, to offer my sincere thanks to Professor H. Ries for his report upon various geological specimens, to Professor R. A. Daly for communicating to me the results of the latest geological work in the Selkirks, to the Dominion Meteorological Service for climatological data, to Mr. Walter Moberly for information of historic importance with reference to his early travels in the range, to Mr. Reuben T. Shaw for supplying an account of his own and his brother's expeditions, to the editor of the *Alumni Register* of the University of Pennsylvania for permission to quote extracts, to the proprietors of Baedeker's guide books for leave to reproduce a map, to Mr. M. P. Bridgland for photographs and sketches showing his explorations, to Mr. W. L. G. Joerg of the American Geographical Society, and to Mr. A. A. McCoubrey of the Engineering Department of the Canadian Pacific Railway. To Professors Holway and Butters my very special thanks are due for invaluable aid generally: to the former for Appendix K and for numberless photographs freely

[1] See "Three New Ascents in the Selkirks," *op. cit.*, August, 1910, pp. 215–231, and "The First Ascent of Mount Sir Sandford," August, 1913, pp. 300–314.

[2] See "Explorations about Mount Sir Sandford," *op. cit.*, February, 1911, pp. 171–179, with map, and "Observations on the Sir Sandford Glacier, 1911," May, 1912, pp. 446–453, with map.

[3] The papers in *Appalachia* are mentioned elsewhere.

placed at my disposal from which twenty-two have been selected to appear herewith; and to the latter for writing his informing and comprehensive paper on Selkirk vegetation printed in Appendix A.

In conclusion the writer can express no more benevolent wish than that his pages may communicate a portion, at least, of the pleasure and profit which their preparation has afforded. It is his earnest hope that to votaries of the heights they may serve to recall something of the joys of former triumphs. If, in addition, any who have never felt the spell of a snow-decked peak, soaring into the blue, should be influenced to undertake an ascent, whereby they become thrall to the everlasting hills "whence cometh our strength," he will be gratified indeed.

H. P.

January, 1914.

"The terms of science are generally but translations into precise language of the vague observations of the uncultivated senses. Now, the ice-world is like a new planet, full of conditions, appearances, and associations alien to our common experience; and it is not wonderful that it should be only after a long training, after much fatigue, and dazzling of eyes, and weary steps, and many a hard bed, that the Alpine traveller acquires some of that nice perception of cause and effect—the instinct of the children of nature—which guides the Indian on his trail, and teaches him, with unerring philosophy, to read the signs of change in earth or air."

Principal JAMES D. FORBES, 1842.

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ERRATA

Page 138, the title of the map should read the "Southern" Selkirks. For "Askulan Pass" read "Asulkan Pass."

Page 376, on the map for "Gibralter" read "Gibraltar."

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[Where no credit is given beneath the illustrations, they are from photographs by the author.]

MOUNTAINEERING AND EXPLORATION IN THE SELKIRKS

PART I

GEOGRAPHICAL AND HISTORICAL

CHAPTER I

THE MOUNTAINS GENERALLY

IN the present embryonic state of geographical nomenclature relating to the mountainous areas of British Columbia, it would be rash to predicate any authoritative boundaries for the Selkirk Mountains. That they are an important subdivision of the mighty Cordilleran System of North America, situated mostly in the southeastern corner of this province and having a general trend parallel to the main Rocky Mountain chain to the east, is, however, certain. In popular estimation, the Selkirks are held to embrace the entire territory lying to the west of the great Columbia–Kootenay valley and filling the immense loop between the upper course of the Columbia flowing northwesterly from its source in Columbia Lake, and its southerly

flowing section that carries it into the United States. In the light of recent scientific investigations, however, it seems probable that eventually this tract will not be known under one comprehensive name, but that it will be divided along the line of the Beaver and Duncan rivers and Kootenay Lake, into the Purcell system on the east and the Selkirk system on the west, both of which will extend across the international boundary into the United States in accordance with their obvious topographical limits.

The Selkirk system then may be said, roughly speaking, to comprise that intricate complex of jagged mountains which is included between the 48th and 52d parallels of latitude and is bounded by the Columbia River and Arrow Lakes on the west, and by the valleys of the Columbia, Beaver, Duncan, and Kootenay rivers (the Purcell trench) on the east. Its total length as thus defined is about three hundred miles and the average width forty miles. Although throughout all of this area the mountains display alpine characteristics, only in the northern third, *i. e.*, from about the latitude of Trout Lake to the Big Bend of the Columbia, do the latter reach their maximum development. Here are to be found the loftiest peaks and largest glaciers, and it is with the region of these that the present volume deals. For convenience, the term "Selkirks" is used herein as denoting only this northern section of the chain. The remainder of the range to the south does not often rise above 7000 or 8000 feet, and with its deep valleys, dense forests, and prolific undergrowth, offers little attraction to mountaineers.

Nothing is clearer than that the Rockies and the Purcell–Selkirk group are separate geographical units. Nevertheless, one not infrequently hears "Canadian

Rockies" and "Selkirks" used as if they were inclusive or interchangeable terms—a mistake for which both the general currency given the former, and the fact that the two systems taken together comprise the greater part of the truly alpine territory in this portion of Canada, are perhaps responsible. To aid in counteracting this erroneous tendency and at the same time to provide a term which shall express concretely the grouping of the dominant alpine mountains in one general locality, the phrase, "Canadian Alps," has been brought forward by several writers. This has the added advantage of a suggested comparison and it is to be hoped that in the end it may receive general acceptance. The regional units included would be the Rocky Mountain system, the Selkirk system, the Purcell system, and possibly the Columbia (Gold Range) and Cariboo systems.

Coming now to the physical characteristics of the Selkirks, it will perhaps be best to consider them in relation to those of the neighboring Rockies, for there are many contrasts between the two. Among the first a traveller is likely to notice in passing from one system to the other, is the greater amount of snow and ice visible in the Selkirks. Despite the fact that they do not reach altitudes equal to the highest of the Rockies, being situated about seventy-five miles nearer the Pacific, whence the prevailing winds blow, they intercept and precipitate the lion's share of the moisture upon their frosty shoulders before the chain of the Rockies, the backbone of the continent, is reached. In consequence, at altitudes where the Rockies are bare, the Selkirks support glaciers and névés, while at lower levels their more copious rainfall nourishes a denser forest growth and a far more luxuriant vegetation. The largest bodies of permanent snow and ice

known, three in number, have an area of about ten square miles each. The longest well-defined glacier is approximately five miles in length. The glaciers of the Selkirks are referred to more particularly elsewhere.

Another decided contrast is in the number of lakes. The Rockies are especially favored in this respect, possessing many examples of conspicuous beauty, several being between five and ten miles long. In the loftier portions of the Selkirks, on the other hand, no bodies of water large enough properly to be termed lakes have been found. The comparatively few known are all less than a mile in length and the majority are mere tarns.

In typical sculpture, also, a wide divergence exists between the two groups. The Selkirks abound in abrupt, bold forms such as narrow V-shaped valleys and sharp A-shaped peaks. Even the major trunk valleys are of restricted width, with steep sides and scanty areas of bottom-land. Mountains, valleys, glaciers, and torrents are crowded together in a compact maze. They press upon one irresistibly from every side and merely to be among them is to sense their rugged vigorous appeal. The Rockies, on the contrary, occupy a country of spacious distances. Broad open valleys divide the mountains into definite and rather widely separated groups. As a result, the peaks themselves are farther away from the routes of travel, and there are more opportunities, perhaps, for viewing them "in the miniature of distance." This propensity towards group formations, as it may loosely be described, has resulted in the production of a number of large, single mountains, detached more or less definitely from their neighbors. Of these, Temple, Hector, Douglas, and Assiniboine are examples. In the Selkirks, on the other hand, there is a marked absence of such massifs. Mountains of commanding height so

A VISTA IN THE SELKIRKS: LOOKING SOUTH ACROSS ROGERS PASS

A VISTA IN THE ROCKIES: KICKING HORSE VALLEY

A TYPICAL FRETWORK OF PEAKS IN THE SELKIRKS: THE BATTLE RANGE FROM MOUNT BEAVER

Photograph by E. W. D. Holway

A LARGE SINGLE MOUNTAIN IN THE ROCKIES: MOUNT TEMPLE

isolated that one can encircle them closely below the snow-line, do not occur. Instead, we find a complex of long, continuous, interlocking ridges, from which, at altitudes of about 7000 or 8000 feet, the separate peaks spring.

These basal ridges, with the irregular fretwork of peaks and glaciers that guards their crests like the broken glass upon a garden wall, constitute the typical ranges of the system. Extending, as they frequently do, for ten, or, in some cases, for even twenty miles in winding courses, without low passes, it can be readily seen that, apart from the difficulty of the forests, they render travel across country in a given line all but impossible. The peaks themselves are small and jagged as compared with these broadly massive foundations; they rise in general only from 1000 to 2500 feet above them. The disparities suggest that summits and bases owe their essential sculptures to entirely different cycles of erosion, and indeed, it seems clear that we here witness the effects of Pleistocene-Recent glaciation upon a terrane which had already experienced one full erosive cycle and was fairly advanced in a second. Looking off across the mountains from a height of about 9500 feet, a substantial uniformity of altitude is perceptible in the receding crest lines. By the hypothesis of accordant summit levels, they represent the remnant of that terrane—a peneplain belonging to a remote epoch of denudation. At the coming of the Pleistocene glaciers, it appears that the large features of the mountains and valleys had then been determined, and that, comparatively speaking, the glaciers wrought only minor modifications in them. Since the retreat of the ice sheet, however, its dwindling remnants, the glaciers of to-day, are thought by many to have played an important part in the detailed sculpture of the higher summits. The pyramidal peaks and the notched and

scalloped sky-lines are often ascribed to their erosive agencies.

Returning now to the comparison between the Rockies and the Selkirks, let us consider them from the standpoint of relief. It is manifest, I think, that the grandeur of mountains depends largely upon their actual, visible, uplift above the valleys, combined with favorable opportunities for viewing them from moderate elevations not too far away. In other words, the suddenness and the amount of the relief are the important elements—not their absolute height. In the case of the Rockies and the Selkirks, therefore, the fact that the latter are lower by no means warrants the natural inference that they look lower, even where not covered with snow and ice. In this connection the following table, prepared upon the basis of actual uplift, is suggestive. It includes many of the greatest visible differences in elevation in both ranges.

A Table of Large Vertical Heights in the Canadian Alps

SELKIRKS	*Dist. from Observer (Miles)*	*Approximate Height Visible*		*Dist. from Observer (Miles)*	ROCKIES
Mt. Rogers (10,536) above Columbia River (2400)	13	8100	8000	14	Mt. Goodsir (11,676) above railway near Ottertail Sta. (3700)
Mt. Hermit (10,194) above r'way near Six Mile Creek Sta. (2617)	10	7550	7450	12	Chancellor Peak (10,751) above Palliser Sta. (3283)
Mt. Selwyn (11,013) above Beaver River (3800)	5	7200	7150	5	Mt. Mummery (10,908) above Blaeberry River (3750)
Mt. Sir Donald (10,808) above Beaver River (3400)	3	7400	7300	3	Mt. Vaux (10,881) above Kicking Horse River (3650)
Albert Peak (9998) above Illecillewaet River (2100)	5	7900	6650	5	Mt. Temple (11,637) above Bow River (5000)

(Elevations in feet, taken from government maps or official surveys.)

Besides these, the following cases of great elevation above base-level in the Northern Selkirks deserve mention: Mount Sir Sandford (11,590 feet) as seen from the Columbia River, ten miles away, 9212 feet;

Mounts Austerity and Adamant (11,000 feet), as seen from the Columbia below Surprise Rapids (2300 feet), about eight miles away, 8700 feet each. From the Rockies, there may be placed against these: Mount Robson, which towers 10,000 feet above its immediate base, Bush Peak, which rises 8300 feet above the river of the same name, and Mount Columbia which lifts its apex 8000 feet above the Athabaska. When the Rockies are more widely mapped other exceptional gradients will no doubt be found. Between the known portions of the two ranges, however, it is thought that the foregoing discloses a closer correspondence in real majesty than has been generally appreciated heretofore. With the single exception of Mount Robson, so far as the writer is aware, there is no mountain of the Rockies which some one of the Selkirks will not equal in respect to uplift above the base.

A regrettable tendency is noticeable in various authoritative works dealing with the mountains of western Canada to underrate the Selkirks in one respect or another, largely, no doubt, owing to the circumstance that current information is confined to a comparatively limited belt along the railway, beyond which few persons have penetrated. For instance, in the *Encyclopædia Britannica* (11th edition, 1911), the article on the Selkirks states that "their outline, too, is rounder and less serrated than that of the Rockies. . . . They do not rise much above 10,000 feet, the highest peaks being Sir Donald (named after Lord Strathcona), 10,645 feet; MacDonald (named after John MacDonald), 9940 feet; and Mount Tupper (after Sir Charles Tupper), 9030 feet." Under the article "Canada" we are told that "The next range to the east, the Selkirks, has several summits that reach 10,000 feet or over." One is somewhat at a loss to

account for these archaic altitudes and for such labored conservatism of statement, since even as early as 1905, the government report of Wheeler's well-known survey of these mountains was published at Ottawa, in which no less than two dozen peaks surpassing 10,000 feet are listed, four being above 11,000 feet. Again, in Baedeker's *Canada* (1907), we are informed that "the highest known summits in this range somewhat exceed 10,000 feet." Another passage, referring among others to Castor and Pollux, Dome, Eagle Peak, Uto Peak, and Mount Swanzy, apprises the reader that "these *hills* as a rule have firmer and more reliable rocks [than the Rockies] and give excellent training for the climber"—a rather misleading characterization of peaks, most of which tower a full mile above their bases. Here, however, the altitudes are correctly listed and the nature of the rocks is truly described. Outram, in his *Canadian Rockies*, makes this observation in relation to the Selkirks: "The peaks for the most part are absolutely simple, and the ruggedness, grandeur, and difficulties of the main range summits are to a large degree wanting." Other extracts to the same effect might be quoted, but these perhaps will suffice. That such assertions go wide of the mark is the firm conviction of the writer in the light of a close acquaintance with nearly all of the noblest mountains in the range, and the prediction is hazarded that as they become more accessible and better known, their grandeur and magnificence will be extolled in the most glowing terms.[1] Including the latest work, twenty-two summits have been triangulated in the Selkirks at altitudes of 10,500 feet and upwards, giving an average elevation of 10,800 feet for the loftiest peaks. In Appendix L is presented a list of forty peaks surpassing 10,000 feet. So much is now known of the system that it is unlikely

that any higher mountains will be found in subsequent explorations.

In addition to the contrasts between the Rocky Mountains and the Selkirks already pointed out, the two ranges exhibit conspicuous differences in geological structure and history. Even the casual traveller soon becomes familiar with the prominent, nearly horizontal lines of snow which streak the precipices of so many of the Rockies and afford a ready means of identifying this system over distances as great as from Mount Assiniboine to Mount Robson. (I think one might even say from the forty-ninth to the fifty-fifth parallels of latitude.) These lines of snow mark outcropping ledges of rock stratification and, like courses of masonry, proclaim from afar the internal structure of the mountains. It is literally true that "he who runs may read." In the Selkirks, however, we find no such helpful guideposts. Characteristic lineaments the mountains do indeed possess, but they are due in great measure to other factors than those which prevailed at the time when the rock was originally laid down, and they are much less easy to interpret.

This brings us to one fundamental feature had by the Rockies and Selkirks in common. They are both almost entirely composed of sedimentary rock. The material is thought to have been derived from a land-mass situated in the position occupied by the present Columbia (or Gold) Range west of the Columbia River, for here the bed-rock is most ancient, being of Archean age. In fact, these mountains represent the basal terrane of the North American Cordillera. The primordial land-mass was of much more imposing proportions and frowned down in lonely solitude upon the prehistoric ocean which then covered most of the remainder of the continent. By processes of erosion,

its rocks were worn down and the material thus produced was transported by rivers and deposited over the bed of this ocean during late pre-Cambrian and Cambrian times. Long ages later, toward or at the close of the Mesozoic (Cretaceous) era, the rocks thus fashioned were folded, faulted, and upheaved into a mountain chain which has since been reduced and sculptured by erosion into the Canadian Alps of the present day. The forces producing this stupendous operation were directed from the west, and caused some extraordinary phenomena, in one instance shoving a whole range of mountains bodily out over the prairie for seven miles. The total overthrust in the Rockies along the Canadian Pacific Railway is estimated at twenty-five miles,[2] so that what originally was fifty miles has been squeezed into half this distance. It has long been supposed that a more or less extended interval separated the upthrust of the two ranges under discussion, but the most recent work points to the conclusion that they were uplifted and folded simultaneously.

The rocks of the Selkirks are chiefly to be assigned to an epoch intermediate between those of the Columbia Range to the west and those of the Rockies to the east. The line of junction of the Archean and later sediments is disclosed near Albert Canyon station on the railroad. Between this point and the summit of the chain at Rogers Pass, Dr. R. A. Daly, who has recently investigated the geology in this section of the "railway belt," describes[3] two major divisions in the deposits, the Albert Canyon division and the Glacier division, which together are denominated the "Selkirk Series." The lower, or Albert Canyon, section is composed mainly of metargillites, micaceous quartzites and limestones, provisionally estimated at about 20,000 feet in thickness. "They form a gigantic

monocline of dark gray beds, dipping conformably under the white to light gray quartzites so wonderfully exposed around Glacier House." These quartzites, intermingled with schists, constitute the second member of the Selkirk series and form the rocks of the higher peaks, Sir Donald, Macdonald, etc. "The quartzites probably preponderate and vary in color from nearly white to gray and greenish gray, being seldom dark in tint. They often, however, weather to pale brownish colors and pass into coarse grits and fine-grained conglomerates."[4] Their thickness is estimated at 25,000 feet, so that, taken with the 20,000 feet of the earlier deposits, we have the astonishing total of 45,000 feet as the minimum depth of the sedimentary rock from which the Selkirks have been carved and all of which is believed to have emanated from the Archean land-mass whose dwarfed remains we now see in the Columbia Range. Further work may increase these figures. This mighty series of rock, through processes of folding and faulting, has come to have a most complicated structure, as shown in the crazy loops and serpentine contortions so often to be noticed by the traveller in various parts of the range. Hitherto only the formations along the line of railway have been examined. In the interior even more involved problems await elucidation, and owing to difficulties of travel and to the concealment of so much of the bedrock beneath the dense forests and undergrowth, a long time must elapse before a satisfactory knowledge of the geology of the Selkirks as a whole can be acquired. It is worthy of remark that no fossils have yet been found in the Selkirk series. Nor have volcanoes been reported anywhere in the chain, although local masses of intrusive granite are known and some exposures of basaltic rock and lava. This absence of volcanic phenomena

is the more surprising in view of the marked evidences of such activity in the neighboring Columbia Range where fields of lava and ash rocks are common. In the Rockies as well there is a paucity of plutonic features.

NOTES, CHAPTER I

[1] For purposes of reference, a tentative list of the highest carefully measured peaks in the two ranges is given here:

Rockies: Robson (13,068 ft.), Columbia (12,740 ft.), Forbes (12,075 ft.), Assiniboine (11,860 ft.), Bryce (11,686 ft.), Goodsir (11,676 ft.), Temple (11,626 ft.), and Lyell (11,463 ft.).

Selkirks: Sir Sandford (11,590 ft.), Dawson (11,113 ft.), Wheeler (11,023 ft.), Selwyn (11,013 ft.), Adamant (10,980 ft.), and Austerity (10,960 ft.).

[2] *Report of Geological Survey of Canada for 1886*, Section D, by R. G. McConnell.

[3] "Reconnaissance of the Shuswap Lake and Vicinity," by Reginald A. Daly, *Annual Summary Report of the Canadian Geological Survey for 1911.*

[4] "A note on the Geological Structure of the Selkirk Range," by George M. Dawson, *Bull. Geol. Soc. of Am.*, vol. ii., p. 73.

Besides the above, the following are the principal authorities consulted in preparing this chapter:

"The Nomenclature of the North American Cordillera," by R. A. Daly, *Geographical Journal*, June, 1906.

"Correct Orthography of Geographic Names," *Annual Report of Public Printer for 1910*, being the decisions of the U. S. Geographic Board. (The bounds of the Selkirks in the U. S. are the Purcell trench on the east, the Columbia River on the west and southwest from the international boundary to the mouth of Spokane River, and the edge of the Columbia basalt plateau from thence southward to the vicinity of the southern end of Lake Cœur d'Alene. The extent of the Purcell trench and of the Purcell Mountains within the U. S. are also defined).

Reports and maps published by the Department of the Interior, 1905 to 1908.

"Glaciers of the Canadian Rockies and Selkirks," by Dr. W. H. Scherzer, *Smithsonian Contributions to Knowledge*, No. 1692, published 1907.

"A Note on the Geology of the Selkirk Mountains," by Dr. A. P. Coleman, *Canadian Alpine Journal*, vol. iii., page 119.

The latest and most complete account of the geology of the Selkirks is given in *Guide Book No. 8*, published by the Canadian Geological Survey for the session of the Twelfth International Geological Congress held in Ottawa in 1913.

CHAPTER II

THE SELKIRKS AS A HISTORICAL FACTOR*

THE early history of the Selkirks is not a subject requiring lengthy treatment, for the mountains were too inhospitable, too rugged, too densely forested to prompt even adventurous spirits to push their ways into the interior. The Indians themselves shunned the range as is shown by the absence of their well-worn trails and camping places, both of which are numerous throughout the Rockies. And the same is true of the great fur companies. Pioneers of the wilderness that they were elsewhere, they did not venture to erect trading-posts here. From the earliest times, such commerce and travel as existed in the vicinity passed along or around the range by way of the well-defined routes afforded by the Columbia River and its branches, despite the fact that this involved considerable deviation from a direct line. In consequence, it may be said that for something like half a century after the discovery of these waterways, the Selkirk Range had only a negative effect upon the trend of human affairs, and accordingly we are spared the need of recording the divagations of even an occasional traveller amongst its fastnesses. To detect the causes that shaped the course of events towards the investigation of this *terra ignota*, we must turn to a different quarter of the province.

* Map at page 302.

In a broad sense, to its rivers, perhaps more than to any other feature, British Columbia owes its present prosperity and future promise. With one exception, all the large rivers flowing into the Pacific Ocean have their sources within its bounds, and from the memorable day in 1792 when Captain Gray of Boston sailed the good ship *Columbia* into the mouth of the mighty stream which he christened with the name of his vessel and which afterwards transferred it to the province, down to the present time, development has either followed the course of, or been in some essential particular dependent upon, the great waterways. Along the Fraser, gold was discovered in 1858 and of such magnitude was the resulting influx of people, some twenty thousand in a few months, that the territory was erected into the Crown Colony of British Columbia the same year. By way of the river, the tide of prospectors surged inland wave on wave, until in 1860, they had reached and discovered the rich deposits of the Cariboo country.

The general course of the movement led northerly and easterly, and before long the valley of the Columbia became available as a route from the United States to the different centers of excitement. At this juncture it was that the Selkirk Range began to exert a positive influence upon the affairs of men, for when gold was reported on its westerly slopes, a headlong rush for the new diggings at once set in and drew widespread attention to the locality. The forerunners of this invasion were four boat-loads of Argonauts who set out in the spring of 1865 from Marcus in the State of Washington to prospect the Columbia River. Working their way slowly up-stream, and prospecting as they went, they first struck gold at Cairnes (now Carnes) Creek, twenty miles above the present town of Revelstoke. Washing

here proved so successful that some of their number were sent back to Marcus for additional supplies with which to prolong their stay. The others, meanwhile, investigated the creeks still farther to the north along the Columbia, making promising finds in several cases, principally at French and McCulloch's creeks.

News of the discoveries spread rapidly throughout the West, with the result that in 1866, from eight to ten thousand people hastened into this locality. A steamer was built at Marcus called *The '49*, and during the one season made thirty-seven trips from that place to La Porte where a rapid obstructs the Columbia. Log towns were erected, sluices and dams were constructed, and as much as three million dollars in gold is estimated to have been taken out in the first two years. However, owing to the difficulty in bringing in sufficient supplies, and to the frequency with which the pits were flooded by sudden rises in the mountain torrents, the diggings were gradually abandoned.[1]

Although the advent of this large body of adventurers resulted in the making of trails, and the opening up, to a considerable extent, of the westerly foothills of the Selkirks along the bank of the Columbia, it appears, contrary to what one might naturally suppose, that the region farther inland among the loftier peaks of the range was scarcely invaded at all, owing to the extremely difficult nature of the country, for as late as 1888, the statement was made that "much yet remains to be done in the way of prospecting before it can be considered to have been even fairly run over in search of placer mines."[2]

The first expedition into the Selkirks for the purpose of exploration was a direct result of the journey made by the prospectors from Marcus. Hitherto, details of the undertaking as a whole have not been generally

known, the principal source of information being a summary report contained in the *British Columbia Gazette* for December 23, 1865. It has, however, been my good fortune to obtain a copy of the very rare official report published at New Westminster in 1866 entitled *Columbia River Exploration, 1865*, giving in full the "Instructions, Reports, & Journals Relating to the Government Exploration of Country Lying between the Shuswap and Okanagan Lakes and the Rocky Mountains." By reason of its intrinsic and historical interest as the earliest account alluding to the interior geography of the Selkirks, it has seemed desirable in the following pages to reproduce a number of quotations and to enter somewhat fully into the particulars of such journeys as have the closest connection with my subject.

The surprising speed with which the news of the Marcus men's discoveries travelled, is shown by the fact that the Selkirk expedition was dispatched by the authorities at New Westminster no later than July of the same year. The object was to ascertain the possibilities for laying out a wagon road to connect the new diggings with the Cariboo road and thus to bring them into touch with the more settled portion of the province. The rapid growth of British Columbia and the need for facilities of communication and transportation to and from the widely separated districts where mineral wealth was being produced, had led from the earliest times to the directing of efforts towards the location and construction of roads and trails. Some of the more enterprising citizens had even ventured to look forward to the day when a railroad would connect them with eastern Canada, and to discuss the possible lines that it might follow. Of these Mr. Walter Moberly was one of the most active and prominent, and, possessing a

wide knowledge of the geography of the province as a result of personal explorations, it is not surprising that the Government should have chosen him to take charge of the Selkirk investigations.

Mr. Moberly's letter of instructions, dated July 8, 1865, opens as follows: "The recent discoveries of Gold on the Columbia River, above the Arrow Lakes and on the headwaters of the Kootenay River, having rendered it of immediate importance to determine and lay out the best line for a Waggon Road from the Lower Fraser to these New Mining Districts, you have been selected to conduct a reconnaissance of the Country lying to the Eastward of the Okanagan and Shuswap Lakes, and between the Columbia River north of the Upper Arrow Lake, and the passes of the Rocky Mountains, in the vicinity of the sources of the Columbia and Kootenay Rivers." In compliance therewith, Moberly immediately organized a light party and set out in an easterly direction from the Seymour arm of Shuswap Lake. After crossing the Gold Range and descending to the Columbia River, he established his headquarters a short distance above the "Little Dalles." Working from here, within six weeks after leaving New Westminster, he succeeded in locating the desired pass through this range, the one now followed by the railway and known as "Eagle Pass."

The next step was to see if a continuation of the line could be secured through the Selkirks east of the Columbia. From the heights of the Gold Range, Moberly had noticed a favorably trending valley, that of the Illecillewaet River, running back far into these mountains, and accordingly he now directed his efforts thither. The story of the trip is given in his final report to the surveyor-general (published also in the *British Columbia Gazette* for December 23, 1865) as follows:

"On leaving Mr. Turnbull [Sept. 17th] at the mouth of this stream [the Illecillewaet], I proceeded up its northerly or right bank for a distance of about forty miles, at which point the river divides into two streams of nearly equal size, the general bearing of one valley above the forks, as far as it can be seen from that point, being north 14° east; that of the other, nearly east. The latter valley was evidently the one that, judging from its general bearing, would be most likely to afford a pass in the direction wished for. I therefore tried to induce the Indians I had with me, by every possible persuasion, to accompany me all the way across the Selkirk Range, and make for Wild Horse Creek. (The Columbia River Indians would, from the first, only engage to go so far as the head of the Ille-cille-waut.) All my efforts were, however, unavailing, as they affirmed that if we went on, we should be caught in the snow and never get out of the mountains. As I now found it would not be possible to complete the exploration of the easterly branch so as to arrive at a definite conclusion as to its suitableness for a line of road throughout to the Upper Columbia, and as a partial exploration would only be a waste of time and money, for should it be explored throughout at any future time, which I would recommend, the same ground would have to be traversed again, I decided to explore the northerly fork, and accordingly continued my journey, still keeping on the right-hand bank, until I reached a point about seventy miles from the mouth of the main river. The valley, which had been continually turning more and more to the north, took a decided turn at the above point, its bearing then being nearly N. W., and as the snow, which had been falling on the mountains for several days, was but a short distance above the river bottom, I concluded to return, it being quite

apparent that nothing further could be gained by a longer continuance in these mountains. I, therefore, turned back on the 30th of September, and reached the head of the Great Shuswap Lake on the 10th of October. . . . *It is quite out of the question to pack supplies for any lengthened trip across the Selkirk Mountains without a trail.*" (The italics are mine.)

An instructive sidelight upon the obstacles encountered by this expedition is to be had by a comparison of the distances as estimated by Mr. Moberly, well accustomed as he was to the roughest kind of travel, with the same as determined by later surveys. Instead of forty miles to the forks of the Illecillewaet River, the map shows only about twenty, while from the forks to the "decided turn" in the valley of the northerly branch is actually but little more than half as far as he supposed.

During the time that Mr. Moberly was thus engaged, two of his assistants were exploring the valleys of Gold Stream and of a river flowing into the head of Upper Arrow Lake for possible passes across the range. The rapidly advancing autumn, however, and the reluctance of the Indians employed as packers to go far into the mountains compelled them to leave their several undertakings incomplete. As the expedition up Gold Stream is of interest in connection with journeys by Mr. Moberly and by the writer, set forth in later pages, and also because it is the earliest on record into the heart of the Selkirks, the following account of the trip, condensed from the journal and report of its leader, Mr. Ashdown H. Green, to Mr. Moberly, dated December 26, 1865, is presented here.[3]

Starting from the "Camp" on the Columbia River, September 8th, in a canoe with three Indians, the party reached the mouth of Gold Stream the next day. Turn-

ing up this on the 10th, they traversed a canyon, made two portages around rapids, and arrived at French Creek on the 12th. Continuing up the valley of Gold Stream two days later, they advanced through thick underbrush, where a path had to be chopped out with an axe for much of the distance, and finally gained the forks of the river on the 19th. Throwing a tree across, they went four miles up the north branch the next day, but finding that it swung too much to the north, they returned and on the 22d set out up the east branch. After passing a canyon, the travelling improved, the country being open timbered land, but rather swampy and with much prickly ash. However, they covered six miles by nightfall. Provisions now threatened to run short, and, being without a gun, Green determined to try to reach the headwaters by a forced march, so putting up three days' half rations in their packs, they cached the balance and went ahead on the 23d. After two miles they came to the second forks where they found themselves in a basin surrounded by mountain walls. The northeasterly fork, the only one in the right direction, descended from perpetual snow, but on account of the height it was quite impracticable for a wagon road.[4] So unfavorable did matters appear that they gave it up and started back, reaching the first forks on the 24th. As soon as they struck navigable water they made a raft and went down to French Creek. Leaving there on the 29th they took a canoe to the second portage whence they walked to the Columbia. Green states:

"Gold Creek enters the Columbia through a cleft in the mountains which forms a canyon, but it evidently originally entered about a mile above, as there is a low pass which strikes the creek at the second portage. . . . From the latter to French Creek the river runs

ROGERS PASS AT SUNSET

CLEARING THE TRACK AT ROGERS PASS AFTER A SNOW-SLIDE

Photograph by Harmon

THE ROGERS MASSIF, MOUNT HERMIT, AND MOUNT TUPPER

with about a three and a half mile current through a muddy flat, thickly covered with small willows, interspersed with small prairies and beaver meadows. The mountains on the north side of the river descend almost perpendicularly to the water; on the south they stand back from two to three miles, but I was unable to sketch them very accurately on account of fog. . . . On French Creek some of the men were taking out very good pay. I saw one pan of dirt washed that yielded $34.50 and was informed that a previous one had given $104.00."

From the mouth of the creek, the party walked back to the Columbia "Camp" along the beach of the river, the water being low, and arrived October 1st. In addition to the intrinsic difficulties of these pioneer journeys in the Selkirks, the serious handicap caused by the weather deserves to be noted. Out of the twenty-four days occupied by this expedition, it rained on nineteen, most of the time hard.

Early in the spring of 1866 Moberly continued his explorations on the outskirts of the Selkirks. After opening a number of trails to facilitate access to the diggings along the Columbia, he descended the river to the international boundary and crossed the southern part of the range to the Wild Horse Creek on the Kootenay River near the present town of Fort Steele. From here he traversed the Columbia–Kootenay valley to the Big Bend of the former, thus all but completing a circuit of the range. For present purposes, perhaps the most interesting occurrence of the year was the dispatch of his assistant, Mr. Albert Perry, to explore through the valley of the eastern fork of the Illecillewaet River and through what is now known as Rogers Pass,—the same journey which Mr. Moberly was prevented from accomplishing himself, as described above. With regard to

the result of the expedition, Mr. Moberly states: "His [Perry's] report to me was favorable, and to my knowledge, Mr. Perry was really the true discoverer of that pass,"[5]—an assertion which is far from being as generally known as its importance warrants.

With 1866, the explorations in the vicinity of the Columbia River and the Selkirks, carried on by the government of British Columbia, were brought to a close, owing to the conviction that the expenditure of funds in other directions would impart a greater impetus to the immigration which was so much desired. At this point also, it may be said that the first episode in the history and exploration of the Selkirk Range reaches its conclusion, for not until half a decade later were organized efforts to pierce the complicated labyrinth of the interior resumed.

NOTES, CHAPTER II

[1] For many of these details the writer is indebted to a paper, "The Big Bend District," by H. Carmichael, published in the *Report of the Minister of Mines of British Columbia for 1905*, p. J 149. The paper contains notes on the topography, geology, and travelling facilities of this part of the Selkirks.

[2] "Mineral Wealth of British Columbia," by George M. Dawson, *Ann. Rept. Geol. Sur. of Can.*, vol. iii., 1887–1888, p. 40 R.

[3] The Arrow Lake Expedition was in charge of Mr. J. Turnbull. On September 20th he started up the river emptying into the head of Upper Arrow Lake from the direction of Trout Lake. Reaching the latter on the 22d, he followed the north shore easterly. He then climbed a peak above the lake upon the top of which the snow lay six inches deep and his barometer read 23.40 in. (about 6600 feet). The view on every side was good. On the 24th he travelled easterly along this ridge for four and one-half miles "sketching the features of the Selkirk Range which was nothing but one mass of isolated snow peaks." Apparently the present Lardeau River was then known as the "Ill-com-opalux." Descending from the ridge he advanced to a point eight miles east of Trout Lake whence he returned (by the same route) owing to the obstinacy of the Indians. He then went to Kootenay Lake and examined "Kinbaskit's" Pass leading to "Toby Creek" from near Howser Lake. It is interesting to note that the quoted names were in use even then;

also that the climb which he made is probably the first recorded ascent in the Selkirks.

[4] Although the data given by Green are probably too scanty to permit identification of the streams which he mentions, it is not unlikely that the "north branch" which he followed for four miles is the fork so marked on the map at the end of this volume (See also map at page 302) and that the "second forks" is the one almost directly south of Goldstream Mountain. He would here be in "a basin surrounded by mountain walls" and could see the "perpetual snow" of Goldstream glacier and possibly of Sir Sandford glacier, south, if not of Mount Sir Sandford itself. Green uses the term "Gold Creek" for the Gold Stream of this map.

[5] In " The Northwest Passage by Land," an address delivered by Walter Moberly, C.E., March 7, 1907, before the Canadian Club of Vancouver and published in its *Proceedings* for 1906–1908.

CHAPTER III

EXPLORATIONS IN THE SELKIRKS FOR THE CANADIAN PACIFIC RAILWAY

ONLY rarely in the advance of civilization upon the wild places of the earth has the locomotive preceded the aborigine or frontiersman in the making of a trail. In the building of the Canadian Pacific Railway across the Selkirks, however, this circumstance was true, and accordingly in following the progress of exploration in the range, we must now have recourse to the official reports of the railway engineers. In the section where they worked, they were to all intents and purposes the first to break a way into these trackless mountains.

The great enterprise of constructing the transcontinental road may be said to have been actually launched on July 20, 1871, the day upon which the Crown Colony of British Columbia became a province of the Dominion of Canada, for by the terms of the union the Dominion bound itself to complete the work within ten years therefrom, and on that day parties of surveyors commenced operations in British Columbia. It was obviously of prime importance to select a pass through the Rocky Mountains at the earliest possible moment, since the location of this governed the course of a large portion of the route both to the east and to the west. From the reports of previous explorers, the Howse and

Yellow Head passes appeared to be the most eligible for a railway, and a strong force of men was directed to their examination. As the proposed line through the Yellow Head Pass avoided the Selkirks entirely, it lies without the scope of the present discussion. In the case of the Howse Pass, however, the Selkirks formed a by no means negligible factor in estimating its qualifications as a location for the road, and accordingly, before adverting to the Selkirk explorations themselves, we may dwell for a moment upon the situation in its general locality.

No serious doubts were entertained about the ultimate possibility of bringing a line into Howse Pass from the east and into Eagle Pass through the Gold Range from the west. It was the problem of finding a suitable route between these two points that constituted the main difficulty, for the great northerly promontory of the Selkirks, with its apparently solid phalanx of snow-capped mountains, intervened. There was, of course, the alternative of outflanking this barrier by following the immense loop of the Columbia River around its northern extremity to the neighborhood of Eagle Pass, but this détour would nearly treble the air-line distance. From the outset, therefore, the importance of thoroughly exploring the Selkirks in this general latitude for a practicable opening was fully appreciated. The engineer-in-chief, (now Sir) Sandford Fleming, availed himself at an early date of the almost unequalled local knowledge of Mr. Moberly, appointing him district engineer in charge of the surveys between Shuswap Lake and the Rocky Mountains, including the Eagle and Howse passes. Two parties, S and T, were promptly organized by Moberly and dispatched to these points in the summer of 1871. At first the work was confined to the approaches to the

passes themselves, but when at the close of the season it became reasonably clear that no insurmountable obstacles were to be apprehended, Mr. Moberly lost no time in turning his attention to the Selkirks.

The boldness and iron determination of the man are admirably shown in the audacity of his plan of campaign. Being at the winter quarters of Party S on the Columbia, near the mouth of the Blaeberry River, and having to return to Victoria in order to report upon the results of the work, he resolved to do nothing less than to cross directly through the Selkirk Range to the camp of Party T in the vicinity of Eagle Pass—disregarding absolutely the fact that winter was at hand and that the journey of about a hundred and thirty miles would lie through a virgin wilderness. Since this expedition possesses considerable historical interest as the first known crossing of the northern section of the chain, and, further, since, in later pages will be found an account of a visit by the writer and his companions to the pass then discovered, the following extracts from Mr. Moberly's writings descriptive of the trip are presented in full.

"On the 4th of December, I commenced my journey down to Victoria with the intention of visiting Party T on my way and also of exploring the pass reported to exist through the Selkirk Range between the headwaters of the Bushay and Gold rivers [Gold Stream]. After a long and most difficult journey on snow-shoes in the worst period of the year for travelling, as the snow was newly fallen and the ice not safe, I reached the 'Eddy' on the 22d of September where I found Party T safe in their winter quarters. I found there was not any practicable pass for a railway through the Selkirk Range, because the summit was upwards of 6000 feet above sea level,—4000 feet of which altitude is gained

in about five miles,—and for several miles along the lowest portion of the summit valley which lies between two ranges of mountains that rise from 4000 to 6000 feet higher . . . even at the early part of the winter when I crossed them, enormous avalanches had slid down with such force that in several instances the snow and ice of which they were composed was formed up on the opposite side of the valley to a height of from 1000 to 2000 feet.[1]

Further particulars of this enterprising journey are given in a later account as follows: "Accompanied by my ever-faithful Indians and the late Hon. Mr. Todd, I started for a long snow-shoe walk to New Westminster and proceeded down the Columbia River [on the ice] to the latitude of Gold [or Bushay] River in order to see if I could get a line through the Selkirks by a high pass between the headwaters of Gold River and those of Gold Creek [Gold Stream] or if it would be possible to connect those valleys by a tunnel. If I could get a line this way, it would very materially shorten the distance between Revelstoke and Howse Pass.

"After a very fatiguing journey through the Selkirk Mountains by this high pass in which we were very nearly buried beneath an immense avalanche that came roaring down the steep mountainside when we were near the summit, we reached the almost deserted mining town on French Creek that I had before visited in the year 1866 when I constructed a trail between it and the Seymour Arm of Lake Shuswap.

"I here met several old acquaintances and the following afternoon went on to McCulloch's Creek which was entirely deserted and the remains of the few buildings still standing were in a very dilapidated condition. Two more days' travel against a strong head wind, which was excessively cold, brought us to Mr. Mohoun's

winter quarters at the Big Eddy just before Christmas day.

"I spent a few days with Mr. Mohoun's party waiting for the plan and profile of the line surveyed through the Eagle Pass which I found showed that a very good location could be obtained, and then having arranged with Mr. Mohoun to push forward the survey through the Selkirk Range by the valley of the Illecillewaet River and the pass by its southeasterly fork, which was discovered, as before mentioned, by my assistant, Mr. Albert Perry in 1866 and was subsequently very improperly named Rogers Pass, I resumed my way westerly through the Eagle Pass to the Great Shuswap Lake."[2]

In the report first quoted from above, Mr. Moberly has this to say about the method of travel which he pursued in making his remarkable flying excursions through these rugged mountains: "In all my mountain explorations, I have found that I can move more rapidly when not encumbered with white men. The Indian, when properly handled and made to feel that confidence and trust are reposed in him, will work in all kinds of weather, and should supplies run short, on little or no food without a murmur; not so the generality of white men, particularly when working for a government, although in justice I am bound to say that the white men in both my S and T parties could not have worked better or more faithfully than they did in all kinds of weather."

Early in April, 1872, the government adopted the Yellow Head Pass as the gate to British Columbia from the east, for the reason, among others, that, owing to the non-discovery of a pass through the Selkirks, the route via Howse Pass would be considerably longer on account of the necessity of carrying the line around the

range through the valley of the Columbia River. Accordingly all further work on the Howse and Eagle passes and in the Selkirks was abandoned forthwith.

From 1872 to 1881 we have no record of any explorations in the range. The efforts of the great army of surveyors were concentrated upon the central and westerly portions of the province. When it is stated that no less than eleven different routes were surveyed and that approximately $4,000,000 were expended in this manner before construction was commenced anywhere in the Rocky Mountains, some idea of the magnitude of the operations may be gained. It is aside from our purpose to refer to the vicissitudes which beset the vast project during this period. Suffice it to say that in the end the enterprise was transferred by the government to a private corporation—the Canadian Pacific Railway Company—by which the work of construction was taken up with fresh energy. A new engineer-in-chief was appointed, and early in 1881 Major A. B. Rogers was placed in charge of the mountain division of the line.

The whole question of the route through the Rocky Mountains was reconsidered and active investigations of the southerly passes were again undertaken, for now the company's problem under the conditions of the transfer was only to connect fixed termini (Kamloops and Red River) by the shortest and most quickly-built line. Naturally the old, baffling riddle of the Selkirks at once presented itself, and one of the very first expeditions carried out by Major Rogers was his well-known journey up the Illecillewaet River in the spring of this year with a view to effecting its solution. Retraversing Moberly's line of march of 1865 to the forks, and continuing thence along the easterly branch, he finally reached the long-sought pass, now known by his name,

exactly as Moberly had predicted. The party ascended one of the near-by summits, probably not far from the present Mount Avalanche, although the precise point has never been identified.[3] The climb is notable as being the first recorded ascent in this section of the Selkirks. Shortage of supplies prevented any attempt to complete the crossing of the range and the return was made by the same route.

In the summer of 1882, however, Major Rogers succeeded in reaching the pass from the easterly side and in proving its practicability for the railway. The story of this decisive episode may be given in his own words, not less because it forged the last link in the long chain of devious ways which were to carry the lines of steel from one shore of the continent to the other than because of the interesting side-light thus thrown upon the character of the man himself. The following extracts are quoted from a report[4] by Major Rogers to Mr. (now Sir) William Van Horne, general manager of the Canadian Pacific Railway, dated January 10, 1883:

"On the 22d of May I started from camp on the Columbia for the Selkirk Mountains, but was unable to cross the range owing to very high water in all the mountain streams. Returning, I crossed the valley of the Spillamucheen, striking the Columbia about forty miles above the mouth of the Kicking Horse River, finding a very good route for a pack trail from the Columbia River to Beaver Creek, and reaching camp on the 16th of June. . . .[5]

"On Monday, July 17th, I started from the Columbia with two white men and three Indians for another trip into the Selkirks by way of Beaver Creek, and on the 24th I had succeeded in finding a practicable line across the summit and into the east branch of the Ille-cille-want and returned to camp on the 6th of August."

This is all. There is not a line of poetical description, not even a bare reference to the majestic snow-crowned peaks and glaciers surrounding the pass which he was one of the first to see. And the balance of the report dealing with the Rockies is of the same tenor. Surely, one would think that even a formal report might have been extended to include more than a scant outline of prosaic facts, for this solution of the long-vexed problem of the Selkirk pass was of almost historic significance. With regard to the general nature of the work the report has this to say:

"Owing to the shortness of the season, the difficulties and delays encountered in reaching the work, and to high water in the mountain streams and the enormous amount of labor involved in cutting trails, no instrumental survey of the line across the Selkirk Range has as yet been possible. I have, however, thoroughly examined the line and ascertained the altitudes by repeated barometric observations which have been carefully checked, and I feel entirely safe in reporting a practicable line through this range and with maximum gradients of 105.6 feet per mile, but in this case also I would recommend gradients of 116 feet per mile in order to avoid some points where dangerous snowslides are to be feared. The work through the Selkirks will be very heavy and expensive but I believe that the increased cost will be fully justified by the great saving in distance and in the cost of operation."

In this connection as showing that even then the relative merits of the route around the Big Bend and of that across the Selkirks were given careful consideration, the following statement by Mr. Van Horne, taken from the *Sessional Papers* for 1885, may be of interest: "Assuming that gradients are no heavier on the Big Bend route, there is the extra cost of seventy-seven miles of addi-

tional line and the expenditure of two extra hours for passenger trains and of four hours for freights. Competing for through traffic, this latter consideration would alone justify the use of heavier gradients (on the sixty-three miles across the Selkirks) to save the four-hour haul."

In 1882 the company's decision to adopt the Kicking Horse Pass in lieu of the Yellow Head was confirmed by the government, so with this year the period of exploration in both Rockies and Selkirks, so far as the Canadian Pacific Railway is concerned, may be said to come to a close. Construction proceeded with great rapidity henceforth, no less than twenty-five thousand men being employed in 1883.

As the permanent camps approached the summit of the Selkirks, the courses of the annual avalanches of snow on the mountainsides were carefully studied in order that the line might be so located as to avoid them as far as possible. Following the winters of 1884 and 1885, "it was considered advisable to abandon the location already made upon the side of the mountain (the present Mount Cheops near Rogers Pass) preparatory to construction and to devise some means of crossing the valley and reaching the lower levels before approaching the snowslides. . . . Mr. James Ross, an able engineer and Manager of the Company's works of construction, set vigorously to work to solve the problem, and by a clever piece of engineering succeeded in gaining the necessary distance by taking advantage of the general contour of the country to form as it were a double loop, thus touching the bottom lands clear of the most formidable snowslides and without increasing the severity of the grade."[6] One of the series of slides measured contained 14,220 cubic yards and was estimated to weigh 6527 tons, on a basis of thirty-four pounds per cubic foot.[7]

These annual avalanches have been a factor of far-

reaching importance in the history of the railway. Apart from the operating problems connected with snow-sheds, snow-plows, etc., following the completion of the road, it seems evident from a careful study of the reports of the earliest explorations that it was largely the prevalence of snowslides which was responsible for the neglect to thoroughly survey the Illecillewaet valley during the years immediately succeeding 1865. There is reason to believe that the men who had actually beheld the havoc wrought by slides for long distances through the narrow Selkirk valleys hesitated to recommend them as routes, no matter if otherwise suitable, and that they favored extending the search into other quarters on the chance of finding a more open way. Witness the following extract from Moberly's report first quoted from above: "I may here state, judging from the character of the mountains on both sides of the valley of Gold Creek as reported by Mr. Green, and that of the Ille-cille-waut River examined by myself, that should a further exploration of them result in the discovery of a pass at a lower level, I think it very problematical indeed if it would be advisable to adopt either of them as the line for the main thoroughfare to the Vermilion Pass in the Rocky Mountains, as the valleys in places are very narrow, and the mountains on both sides steep and subject to heavy snowslides." However, no such open valley turned up to fulfill their hopes, and as a result the omission to sanction and perfect the route via the Illecillewaet in 1865 and 1866 had the effect of swinging the scale in favor of the Yellow Head pass in 1872, and of entailing thus the years of costly explorations in the more northerly portions of the province, all of which were entirely valueless to the road as built. It is a significant commentary upon the judgment of those

early explorers that in 1912 it was felt necessary to commence preparations for constructing a four-mile tunnel beneath the summit of the range at Rogers Pass.

In November, 1885, the last rail was laid, completing the line from the Atlantic to the Pacific and permitting the passage of the first through train. It was not until June 28, 1886, however, that regular transcontinental service was begun. On the evening of that day the first passenger train left Montreal for Port Moody, where it arrived July 4th on schedule time.

NOTES, CHAPTER III

[1] From the rare *Progress Report on the Canadian Pacific Exploratory Survey*, S. Fleming, Engineer-in-Chief, for 1872, p. 34, Appendix by Walter Moberly, C.E.

[2] From a recent address delivered by Mr. Moberly before the Art, Historical, and Scientific Association, Vancouver, B. C., on "The Early History of the Canadian Pacific Railway," and published in its reports.

[3] See *The Selkirk Range*, by A. O. Wheeler, Appendix E.

[4] *Sessional Papers*, vol. xvi., 1883 (No. 27).

[5] Another version of this expedition is given by Mr. W. D. Wilcox in his *Rockies of Canada*. He quotes the pioneer Tom Wilson, speaking of some strange things that have happened in the mountains, as follows: "Major Rogers himself was upon one occasion more completely turned round than that trying to cross the Selkirk Range. He started up the Beaver River from the Columbia and turning up Grizzly Creek, struck the headwaters of the Spilimichene, till at last he came out again on the Columbia, seventy miles from where he started in, and on the same side of the range."

[6] Report by Collingwood Schreiber, engineer-in-chief, in *Annual Report of Minister of Railways and Canals for 1884-5*, p. 12. At this time Mr. Ross was only thirty-seven years old. It is interesting to note that the success of his efforts placed him in that coterie of men whose early work in building Canada's first transcontinental road proved to be a stepping-stone to later prominence. He died in Montreal in 1913 at the age of 65 years.

[7] A very interesting and comprehensive paper, "On Snow-Waves and Snow-Drifts in Canada," by Dr. Vaughn Cornish, was published in *The Geographical Journal*, vol. xx., pp. 137–173, for August, 1902. It illustrates and discusses in detail the curious "snow mushrooms" which form during the winter on the stumps of felled trees in the Selkirks as a result of the moist and almost windless snow-falls. Some of these attain a diameter of twenty feet.

PART II

*MOUNTAINEERING NEAR GLACIER AND AMONG THE RANGES TO THE SOUTH**

CHAPTER IV

GLACIER AND ENVIRONS

The Eastern Approach—Ascents of Mounts Rogers and Tupper

ALTHOUGH scenic attractions were far from the minds of the engineers while seeking a way for the railroad through the Canadian Alps, it is a happy coincidence for the traveller that the road as built passes through some of the very choicest scenery in both the Rockies and the Selkirks. There is not a single phase of natural grandeur usually associated with mountains that is not somewhere exemplified either within plain view from the track itself or at most but a short journey distant. Giant peaks, pinnacles, and precipices; glittering snow-fields and glaciers; thundering avalanches, tumbling cataracts, and gloomy canyons—all await the visitor's tribute of awe and praise. Nor are the softer beauties of forest, lake, meadow, flower, or brook by any means wanting, but these, perhaps, one is more apt to take for granted.

The entrance into the Selkirks from the east, whence probably the majority of people come, is as dramatic as one could desire. In approaching the range from

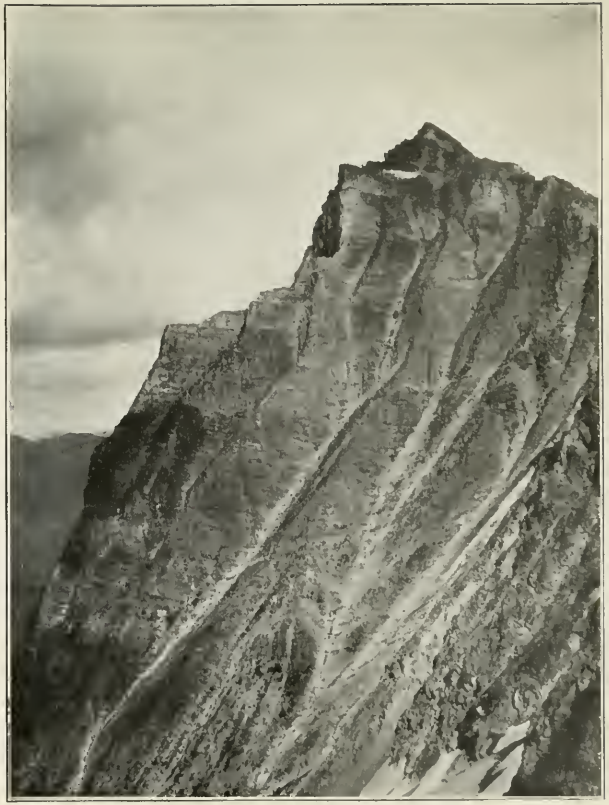
*Maps at pages 138 and 302.

this direction, the railway does not attempt a direct attack, but seeks an opening on the flank by way of the broad valley of the Columbia River. After following the latter towards the northwest for about thirty miles, it executes a sharp turn to the south, near Beavermouth station, and enters the tributary valley of Beaver River. This forms a deep, straight trench along the westerly escarpment of the range for a long distance. The train now begins a slow ascent over the lower slopes, winding in and out of ravines with much groaning and creaking of the cars. The hillside rises with such suddenness that all view of the higher eminences is lost unless the traveller lean out of the carriage window, when, upon rounding a curve, he may be rewarded with a fleeting glimpse of sky-cleaving pinnacles far ahead. The greater number of his fellow passengers, however, will be watching in a more conventional manner the rolling green hills across the valley and the meandering river rapidly being left to its own devices below, first by hundreds and then by almost a thousand feet.

Finally, the train seems to be swinging directly into the mountain, but soon one discovers that it is only entering a branch of the Beaver valley instead. Now an astonishing change comes over the landscape. The hills disappear as if by magic and in their place appears a great gaunt precipice streaked with snow and so high that it is scarcely possible to see the top even by pressing one's face against the window-pane. This is Mount Macdonald (9482 feet), rising a full mile above the line. Had any one commenced to wonder secretly whether that long procession of verdant hills were the far-famed Selkirks, this beetling cliff would set his doubts at rest in no uncertain manner, especially in the presence of the snow-sheds into which the train soon plunges. Upon emerging, one may behold a similar cliff, Mount

THE NORTH FACE OF MOUNT SIR DONALD FROM UTO PEAK

Photograph by F. K. Butters



THE PRECIPICE OF MOUNT MACDONALD ABOVE THE RAILWAY

THE ILLECILLEWAET GLACIER; DAWSON RANGE IN BACKGROUND

GLACIER HOUSE, MOUNT CHEOPS, AND MOUNT GRIZZLY

Tupper (9222 feet), facing the first from across the valley. The two form the imposing eastern gateway of Rogers Pass. The summit (4351 feet) is crossed not far beyond and then the train gathers momentum on the down grade, covering the three miles to Glacier House in short order. Notwithstanding, it is unable to remain in the company of the new-born river which makes a quick drop to a lower level. The track, therefore, is carried along the mountainsides and into lateral valleys where an intricate series of loops permits of a gradual return to the stream below, now swollen with the meltings of many glaciers into the full proportions of a torrent.

Glacier House, situated at the bight of the first loop, is the climbing center for the Selkirks, so here we may alight with full mountaineering impedimenta. Built by the railway company as a tarrying place for travellers who desire to pay a visit to the Illecillewaet glacier near by, as well as to enjoy the beauties of the scenery at their leisure, it forms the natural headquarters for expeditions among the mountains near and far. The hotel and the railway hamlet that has grown up at Rogers Pass, are the only settlements of any consequence within the whole extent of the northern end of the range —an area of some three thousand square miles. The former stands at an elevation of 4100 feet above the sea in the midst of an amphitheater of high snow-decked peaks, elongated towards north and south. The general arrangement of the valleys suggests a distorted letter S with the entrance, Rogers Pass, at the top, the actual divide in the center, and the exit, near Glacier House, at the bottom, but as neither entrance nor exit is prominent from the hotel, one gains the impression of being entirely shut in by towering mountain walls, densely forest-clad for the most part.

The new arrival's attention is caught at once by the glacier, which pours seemingly out of the sky in a magnificent ice cascade and descends into the valley towards the hotel as a massive, fissured tongue, most often, perhaps, silvery white in appearance but sometimes, especially in cloudy weather, tinted delicately with a lovely greenish blue. Not for long, however, can even this unusual spectacle withhold the eye from the soaring pyramid of Mount Sir Donald, upon whose shoulders the glacier partly rests. This fine mountain is the show-piece of the Selkirks and the crowning feature of the surroundings. "A superb prism, shooting its slender apex far above all its royal mates," it attains a height of 10,800 feet, more than a mile and a quarter above the rails. Together with the bulky lower spurs of the range which bears its name, it monopolizes the entire prospect towards the east and north. With but a short pause for the crags of Eagle Peak, cutting sharply into the sky-line, the eye sweeps rapidly over these slopes to the northwest, where, across the vista of the main valley, Mount Rogers (10,536 feet) and the Hermit Range rise above the forest in a series of jagged peaks, surrounded with glaciers and snow. Mount Rogers stands next in rank to Sir Donald among the neighboring mountains. Continuing towards the west, we note the lesser serrations of Mounts Grizzly and Cheops, and then the view is blocked by the steep forests of the immediate foreground until in the south and southeast we catch a distant glimpse of the graceful snowy hollow leading to the Asulkan Pass, and of the boundary wall of the Asulkan valley.

It goes without saying that a locality such as this, densely wooded with magnificent evergreen forests, watered by rushing brooks from everlasting snows, and adorned with a flora of surpassing beauty and

MOUNT SIR DONALD FROM ILLECILLEWAET VALLEY AFTER A SEPTEMBER STORM

LOOKING WESTERLY ACROSS ROGERS PASS

Detroit Photographic Co.

abundance, possesses manifold charms even for those who are not blessed with mountaineering proclivities. The visitor, be he a devotee of science, of art, or of out-of-door life and sport generally, will here find no lack of interesting opportunities to indulge his particular taste. But of Glacier in these aspects it is not my purpose to treat, for full information is already available in several authoritative works. And the same is true with respect to the minor climbs and excursions of the vicinity. As mountaineers and explorers of the heights where glaciers beckon and the winds blow free, our chief concern will be with nature in her severer moods. Accordingly, we may pass at once to some of the more important expeditions that are open from this point.

Possibly the best view of the higher Selkirks as a whole is to be had from Mount Rogers and many will prefer this as an introductory climb. The customary procedure is to leave Glacier House in the afternoon and to ascend to Rogers hut for the night. This cabin, situated near timber-line on the southerly slopes of the mountain at an elevation of 6700 feet, is the only alpine hut of which the Selkirks can boast at the present writing. The climb and the return to the hotel are carried out the next day. If an early morning east-bound train is listed in the time-table, however, it is entirely practicable to accomplish the expedition in a single day from the hotel. The writer's ascent was made in this way.

Taking our departure at 3.14 A.M., myself and one of the Swiss guides alighted from the train at Rogers Pass station twenty-five minutes later. Continuing along the track to the beginning of the path, we spent the next hour and a quarter in surmounting its rather steep gradient to the hut. In the afternoon this is apt to be

a very hot climb, although sunset effects from the cabin may afford compensation. After a brief halt we went on to the glacier, arriving there at 6.15 A.M., two and one-quarter hours from the railroad. Upon refreshing ourselves with a second breakfast and assuming the rope, we set out over the ice, where a scant half-hour brought us to the lowest rocks of the peak at the end of a small spur projecting from the main southeasterly ridge. An hour's scramble up this landed us on the ridge itself at an elevation of about 9500 feet. By keeping to the arête from this point to the summit, one obtains the best in the way of real climbing that the route can offer. The skilled mountaineer, however, will encounter nothing to perplex him. The way lies mostly over well-broken ledges, with here and there a détour on ice or snow. Excluding halts for photography, etc., we spent an hour and ten minutes on this section, gaining the top at 9.35 A.M.

The reason for choosing Mount Rogers as an initial climb is now apparent. Occupying as it does a commanding position at the middle of the most alpine portion of the chain, nearly all of the loftiest peaks in both directions are visible. Taking the line of the railway as a convenient boundary, these two major sections of the range, extending to the Big Bend of the Columbia on the one hand and to the Arrow Lakes on the other, may be termed the Northern and the Southern Selkirks, respectively, although the latter is correct only in a limited sense.[1] To the north and west the eye wanders unimpeded over an immense expanse of territory entirely occupied by an intricate fretwork of ridges, valleys, and peaks, everywhere embellished in lavish profusion with glaciers and snow. Practically nothing was known of the mountains in this direction

[1] See page 2.

until recently, and here it is that the scene of the expeditions described in later pages is laid. At this time, therefore, we need not stop to examine it closely, but after admiring Mount Sir Sandford, the apex of the range, nearly thirty miles away, we will turn to the locality of more immediate interest.

Towards the south the great extent of the Selkirk complex is equally well displayed, the myriads of eminences being revealed to view as if sculptured on a relief model. The most conspicuous features are the dark prong of Mount Sir Donald, lording it over the long procession of peaks which define with a remarkably straight alignment the easterly limit of the range, and Mount Bonney farther to the west, a blunted, sheer-faced dome. Between the two, the horizon is interrupted by the crowded summits of the Dawson group, the loftiest elevation south of the railway and second only to Mount Sir Sandford in the whole range. Behind Mount Dawson, and yet as far again removed, the syenite spires of the Battle Range may be descried, fully twenty-five miles distant. In marked contrast to the northern half of the panorama, these peaks are for the most part mapped and explored, while such as are accessible from Glacier within the interval of a night and a day have all been ascended once, and a number repeatedly. There are, however, countless opportunities for working out new routes of all grades of difficulty and attractiveness, although save in a few instances a light camping equipment will be found practically indispensable. The reasons for the disparity in mountaineering accomplishment between the Northern and the Southern Selkirks are not far to seek. In the latter region there is a greater extent of territory above timber-line and, for a distance of twenty miles, no wooded valley interrupts the continuity of the range.

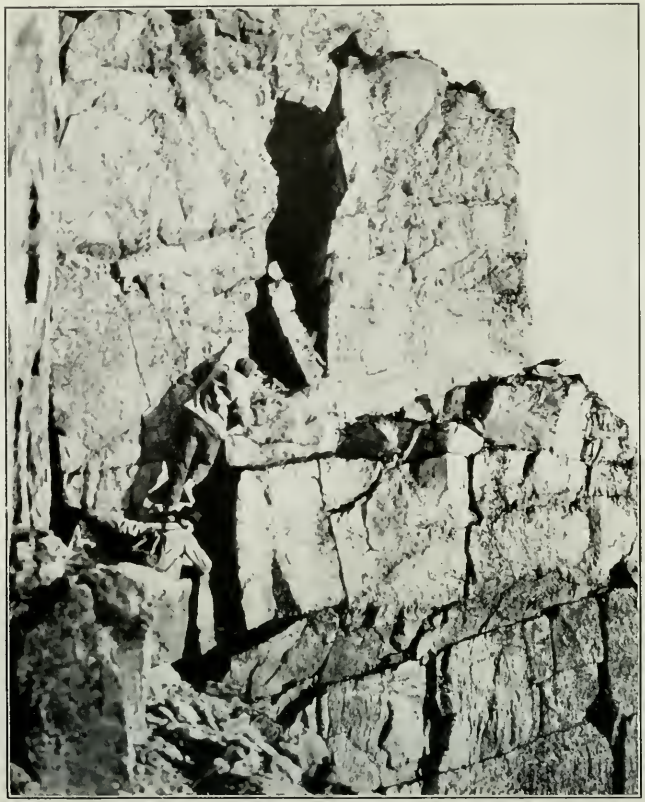
These conditions enabled the early mountaineers to perform long marches, several of the most remote summits being captured as far back as 1890. We shall have occasion to form a more intimate acquaintance with this fascinating corner of the range presently.

My guide and myself remained on the summit of Mount Rogers until 10.40 A.M., returning then by the same route. The hut was regained two hours and a half later and the railway in exactly three. Over the latter part of the way a rapid pace was adopted, as I wished to catch the two o'clock train back to the hotel. This I succeeded in doing. The whole trip from Rogers Pass consumed something more than ten hours, about six being occupied in the ascent and three and a half in the descent. I should judge that this represents a little better than a fair average for the expedition, since, although no attempt to hasten was made, except at the last, the weather was doubtful, and hence there was no incentive to linger anywhere over the view. Furthermore, the mountain was in good condition. While the ascent of Mount Rogers in this way presents no difficulty, save that inseparable from raising one's weight 6300 feet in the air, a more interesting trip may be had, as I understand, by combining it with the traverse of the rocky pinnacles of Swiss peaks which form a continuation of the same massif towards the northeast. For this excursion it would probably be best to start from the hut.

There is another climb in the vicinity of Mount Rogers which merits notice here, that of Mount Tupper, 9222 feet. It is about as different from that just described as can be imagined. Mount Rogers rises in a big, lofty, snow-covered peak; Mount Tupper in a comparatively small, snowless spire that reaches only some 2500 feet above the cabin. The former offers

MOUNT ROGERS AND SWISS PEAK FROM "THE HERMIT" ON MOUNT TUPPER

MOUNT TUPPER, SHOWING SIDE ASCENDED



GETTING INTO THE FIRST CHIMNEY ON MOUNT TUPPER

MOUNT TUPPER FROM THE WEST

Photograph by E. W. D. Holway

very little real climbing, the latter very little of anything else, once its foot is gained.

The writer's acquaintance with the mountain dates from the summer of 1909. A party consisting of Messrs. E. W. D. Holway, F. K. Butters, and myself, went up to Rogers hut one August afternoon, filled with pleasurable anticipations for a strenuous climb on the mountain the next day. It had then been ascended but twice (both times with guides) and the accounts were most alluring. During the early morning hours, however, a thunder-storm broke upon us, bombarding the sheet-iron roof of our shelter with tremendous volleys of hailstones, and raising a truly infernal din. Upon peering out, the sky proved to be heavily overcast and altogether it seemed likely that we would be forced to beat an ignominious retreat to the hotel. But, as the hours passed, conditions improved, and at ten o'clock we determined to have a look at the mountain anyway. Setting forth over the steep slopes behind the cabin, we soon gained the upper meadows below the foot of Rogers glacier. Here we struck off to the right towards the mountain. Ascending the crest of the east lateral moraine, in two hours and a quarter we found ourselves on the top of the long, gently rising ridge which leads directly for the peak. Following this, we arrived at a minor eminence whence, across a large couloir gashed deeply into the slope, the final tower and approaches were in full view. Repellent indeed it appeared, resembling in its dilapidated, broken walls and even stratification a huge ruined building. The narrow arête between us and the mountain supported two low *gendarmes*, so, instead of attempting a direct attack, we descended into the couloir and crossed below them by means of a favorable series of cracks. Working up-

wards wherever we could, we finally regained the arête about a rod from the small isolated pillar called, " The Dog." Squeezing past this, and traversing an obvious ledge beneath " The Hermit," a massive, upstanding finger that the elements have carved out of the living rock, we climbed into a large recess and unshouldered our *rücksacks* for lunch.

The weather had now cleared, and from our secluded corner the mountain world shone forth in its most entrancing aspect. Big, fluffy, white clouds, speeding across the sky, threw ever-changing shadows upon peak and glacier. Suddenly, away in the distance, some unknown nameless dome of pure snow would be illuminated brilliantly for a moment, vanishing even as one watched; elsewhere again what had appeared as an indistinct black mass would perhaps be revealed as a cluster of daring rock towers. After the gloomy prospects of the morning, such a happy outcome seemed too good to be true, and we now felt inspired with an even firmer resolve to force a passage over the sheer, unprepossessing walls that closed in upon us so narrowly.

The only obvious opportunity to get higher was afforded by a compound chimney in the south side of our recess, and towards this we started after about an hour's delay. By standing on Holway's shoulders, Butters managed to gain an entrance, after which he worked his way upwards to the length of the rope, carefully clearing out the numberless fragments with which it was filled. Holway and I then followed, and by moving only one at a time we circumvented the smooth cliff. I should estimate the length of the chimney at about thirty feet. The rock at this point is extremely rotten, and demands great caution in its negotiation. Huge sheets have split away from the mountain and seem to be on the point of peeling off.

As one climbs one may see light through cracks deep within bastions that looked quite solid from below. The chimney brought us out on a flat platform and from here we scrambled over a formation of rough steps, then through a sloping crack to a second platform, and finally up a stretch of steep arête to the broad table-like summit where we arrived at 3.40 P.M.

The top pitches off abruptly on all sides, but especially towards the Tupper glacier. The last bit of arête work along this face is perhaps the most spectacular portion of the climb. A capital expedition awaits the skillful cragsman in the descent of the easterly face of the peak and the traverse of the three remaining summits on the much-bepinnacled ridge. It looks difficult from a distance, and I do not know whether it is practicable, but in any event I feel confident that its assailants will not be disappointed as regards the length or steepness of the route.

Cameras having been left at the base of the chimney, and the hour being late, there was no reason for prolonging our stay, so after tarrying but ten minutes, we returned as we had come. It took us a half-hour to reach the chimney and fifteen minutes to descend it. The couloir with the convenient cracks was buried in deep shadow, but the reflection from the opposite wall proved sufficiently bright to enable us to pass without delay. However, amongst the multitude of parallel rocky ridges, all exactly alike, that traverse the meadows below the Rogers glacier, we were not so fortunate. Darkness overtook us in this labyrinth, and only through the kindness of providence and by dint of much wandering about was the cabin finally regained at 8.30 o'clock, ten and one-half hours after our start.

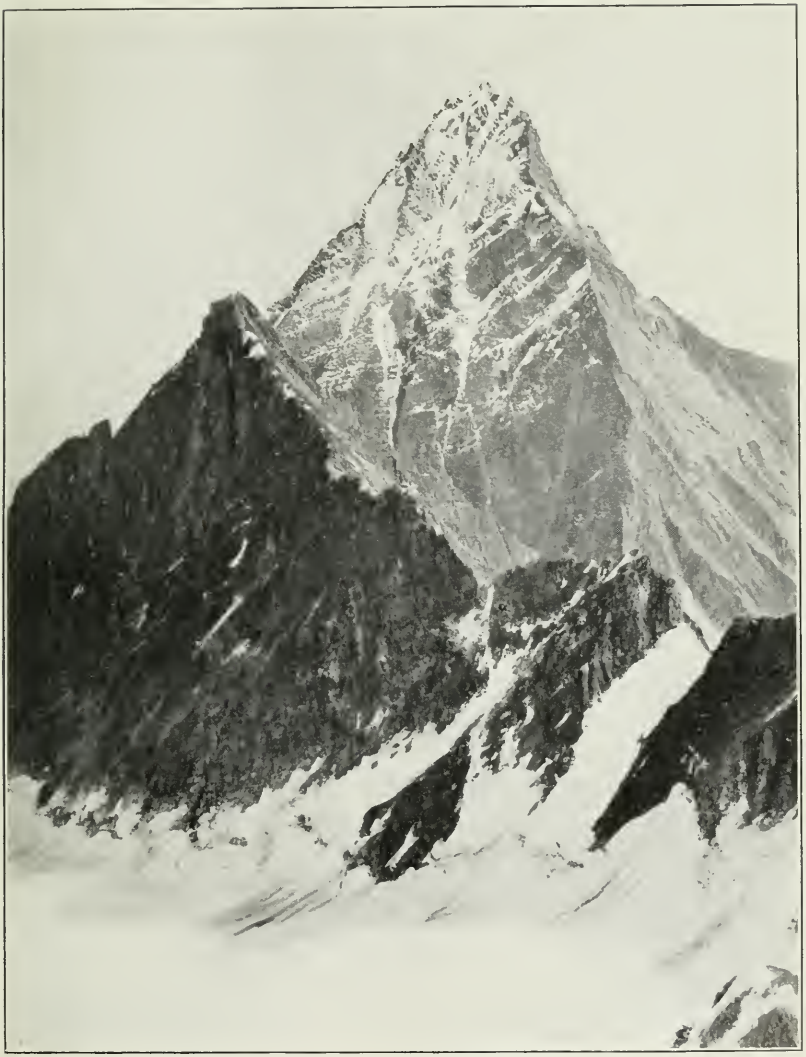
CHAPTER V

MOUNT SIR DONALD AND ITS NEIGHBORS

The Usual Route of Ascent—The Northwesterly Arête—Uto and Terminal Peaks

THE group, or range, dominated by Mount Sir Donald is undoubtedly the chief topographical feature in the neighborhood of Glacier House. Owing to its concentrated grandeur, varied attractions, and accessibility, it is visited at one point or another by almost every one who makes even a short stay at the hotel. Besides Sir Donald, the range embraces, in a length of about five miles, the following peaks, named from north to south: Macdonald (9482 feet), Avalanche (9387 feet), Eagle (9353 feet), Uto (9610 feet), and Terminal (9773 feet).

Mount Sir Donald itself, naturally, constitutes the principal ascent, being accomplished about three or four times a year on the average. The course usually followed lies along the true right moraine and margin of the glacier which issues from the recess in the southwesterly façade of the mountain and is partly in view from the hotel. At the upper limit of the glacier, frequently immediately below the small sharp peak, the *bergschrund* is crossed. This operation is oftentimes not devoid of difficulty, especially after the melting of a hot season. The party then ascends straight up the steep rock wall for a distance of fifty feet or more to a point where a transverse ledge leads directly



UTO AND SIR DONALD FROM AVALANCHE

THE BERGSCHRUND ON SIR DONALD

MOUNT SIR DONALD SHOWING USUAL ROUTE OF ASCENT

towards the mountain (left) across a wide couloir, which ordinarily may be located from the valley by the large patch of snow in its upper portion. When the snow disappears, there is some danger of falling stones during the traverse, particularly in the late afternoon. Near the end of the ledge one finds himself at the place where a second breakfast is ordinarily indulged, and this completes the first stage of the ascent.

Upon resuming the advance, one is confronted with an outcropping band of cliffs that strikes downward from a prominent crag—the same which, with the little peak previously mentioned, bounds the sides of the semicircular col on the main south ridge of the mountain. Ascending a rude step formation along the base of these cliffs, a fine chimney is presently disclosed which provides the means of surmounting the barrier. This chimney is the key to the mountain, for although one can avoid the cliffs elsewhere, the alternative route is subject to frequent stone-falls and is otherwise unsatisfactory. It also, perhaps, constitutes the chief difficulty, for even under good conditions considerable time is consumed in its passage. The height of the fissure is possibly seventy feet, and from a width of four or five feet at the bottom it narrows toward the top to less than half this distance. The upper ten feet furnish the hardest work, owing to the smoothness of the rock and lack of good footholds. The leading guide has to be assisted from below on this portion. Above the chimney a ledge leads one again towards the main mass of the mountain where a steeper repetition of the lower step-like ledges affords straightforward but interesting going to the summit arête. A short bit of careful work here and the top is won.

By reason of the peak's situation on the easterly edge of the range, overlooking the comparatively low

country of the Prairie hills, and also of its lack of any near neighbors that approach it in height, one feels as though he were standing on the top of a steeple of enormously exaggerated proportions. The view is of vast extent, covering the majority of the known peaks in both Rockies and Selkirks, as well as many in the imperfectly explored Purcell Range. Among the latter several bold summits of attractive outline stand up conspicuously above all their neighbors, fully thirty miles away. The most prominent single feature of the prospect is easily the Illecillewaet névé with its ten square miles of shining unbroken snow, and shattered ice stream, crawling ponderously into the valley. With a good glass, the area visible is immensely increased, and if one can succeed in beguiling his guides, by one pretext or another, to compose themselves for a nap, he will find it a remarkably fascinating and enlightening occupation to devote the interval to uninterrupted study of the gems of majestic architecture which nature has erected on every side with so lavish a hand. A glass at such times brings home to one, as nothing else can, the greatness of the heights, the immensity of the spaces, and the infinitude of the separate objects presented to one's gaze. Almost unconsciously one's spiritual horizon is broadened and the recollection of this summit view will prove to be a lasting, precious possession.

Under favorable conditions the ascent of Mount Sir Donald by the route described may be made in five and one-half hours, if the party is in good mountaineering trim and a steady pace be adopted. On the occasion of the writer's first visit to the summit, these requirements were fulfilled. In company with Edouard Feuz, Sr., the veteran Swiss guide of the Selkirks, I left Glacier House at four o'clock on as fine an August

PANORAMA FROM TOP OF SIR DONALD LOOKING SOUTH

MOUNT SIR DONALD

morning as one could desire. The stars were twinkling merrily in the deep blue vault overhead, and there was an invigorating snap to the atmosphere, suggestive of an earlier frost. Feuz led the way at his usual methodical gait over the excellent path that winds up the valley. The familiar features of the trail succeeded each other in due course, until at six o'clock we found ourselves crossing the ledges beneath the lowest ice of the Vaux glacier. With scarcely a halt, we mounted the dusty crest of the moraine and then skirted the cliffs of the peak itself on the hard snow of the glacier. Conditions at the *bergschrund* and on the head-wall proved eminently favorable, so we were able to reach the breakfast place at eight o'clock. After refreshing ourselves abundantly here, we pushed on and arrived at the top at 9.30 A.M.

The day was glorious. Not a breath of air was stirring and the sun shone down with a genial warmth. Unfortunately I had omitted to bring camera or field-glass, so my customary occupations could not be indulged. However, we spent an hour pleasantly enough in signaling to the hotel, by means of a bit of looking-glass, our safe arrival, and in picking out old friends and new adversaries amongst the host of peaks. Then at 10.30 we started down. With such a small party, we experienced the minimum of hindrance on the rocks, and the glacier was reached at 12.30. Instead of taking to the moraine, we continued on the ice itself, gaining several delightful glissades thereby, not to mention a parting shot in the shape of a large rock which the glacier sent flying down between us as we were getting off its sloping tongue. The hour being only 1 P.M., and the rest of the way but a down-hill stretch of trail, alluring visions of a hot repast at the hotel now began to present themselves, until in the end

I yielded weakly, and, breaking into a rapid stride, covered the remaining distance in ample season for a two o'clock lunch.

While according to modern alpine standards the ascent of Sir Donald by this route is doubtless not to be ranked as a difficult expedition, yet its 6700 feet of uplift affords a very respectable climb, and the course can scarcely ever fail to be popular with mountaineers, owing to its directness, to the firm character of its rocks, and to the variety and sustained interest of the work.

There are, however, two other ways of gaining the summit, and these offer climbing of a much more serious character: the northwesterly and the southerly ridges. The latter is gained from the Illecillewaet névé by a traverse of the small pointed peak, formerly known as Green's Peak, and of the arête which connects it to Sir Donald. A difficult couloir on the easterly face then enables the jutting crag to be turned, and above this the arête is followed to the top, the latter portion of the way coinciding with the ordinary route. This line of attack has been adopted but once, the expedition consuming more than twenty hours from the hotel. The heavy work between Green's Peak and the summit occupied seven and one-half hours on the ascent and four on the descent.[1] It is a roundabout course, and the lower part leading up to the Illecillewaet névé is apt to be tedious, particularly in case anything delays the party on the way down, so that the rough talus slopes and obstinate forest have to be traversed in the dark. In the long run, therefore, it is not likely to

[1] See "Ascension du Sir Donald par le Green's peak," by F. Leprince-Ringuet, *Appalachia*, vol. ix., p. 309 (April, 1901). The ascent was made July 26, 1899, the party including, besides M. Leprince-Ringuet, Herr H. Cordes and the guides, Christian Häsler, and Edouard Feuz, Sr.

UTO PEAK FROM EAGLE PEAK

MOUNT SIR DONALD FROM EAGLE PEAK

The northwesterly arête rises in the center; its sharp bend is " The Shoulder "

rival the other routes in the favorable estimation of climbers.

We come now to the splendid northwesterly ridge—that which rises so gracefully from the foot of Uto Peak, and defines with its masterful, clean-cut sweep the left-hand sky-line of the peak as seen from the west. Viewed from this direction, nearly at right angles and at a proper height, the inclination appears to be not far from forty-five degrees, but so smooth is the precipice of the face and so sharp the profile that the prospective climber is unable to form a very definite opinion as to the actual climbing possibilities of the course. If his curiosity is sufficient to tempt him to examine it at close quarters, say from Uto Peak, he will be rewarded with an impressive picture of the immense north face of the mountain, but aside from the discovery that the ridge is in truth narrow and pretty continuously steep, he will be little better off than before as regards its details. The fractures of the rock are so minute in comparison with the huge scale of the mountain, that even with a powerful glass it is impossible to pick out a definite route. Undoubtedly the ascent from this side looks like a formidable undertaking, and, as a matter of fact, it was not accomplished until thirteen years after the original conquest of the mountain. Recently, however, as the tide of travel has increased, the climb has been repeated on no less than three occasions.

My own, the fourth, ascent of this arête was made with the guides Edward Feuz, Jr., and Rudolph Aemmer on July 30, 1912. Our predecessors, with one accord, had lain especial stress upon the importance of attempting the climb only under the best of conditions, and accordingly I had delayed starting for three fine hot days in order to give the new snow, fallen during a

previous stormy week, due opportunity to melt. Since neither of the guides was familiar with the ridge and I wished to have as long a time on the summit as possible, we left the hotel at the unusually early hour of 2.10 A.M. The night was simply perfect. A gorgeous full moon flooded peak, glacier, and forest with lovely radiance and put to shame our flickering little candle lanterns until we entered the velvety darkness of the deeper woods. Quite in contrast with the orthodox state of mind which tradition has decreed to be appropriate for this hour of the morning, our spirits were of the most cheerful description, owing to the auspicious opening of the day, and presently the natural harmony about us was supplemented with the rather more questionable harmony of the mouth-organ. Its touching melodies, I am led to believe, are evoked by the genus Swiss guide, only in moments of supreme exaltation. However, when the path began to attack the acclivity in earnest, which it did before very long, certain more intimate demands upon superfluous breath developed, and the refrains gradually became *tremolo*, then *tremoloso*, and finally ceased. Progress was steady until we reached the moraine of the Vaux glacier where at four o'clock we halted for a brief second breakfast. The rapidly approaching dawn was painting the mountain crests with vivid tints and driving the reluctant shadows into the deeper valleys. Had we been a little higher up, so as to see the sun, we might have witnessed a kind of reversed harvest moon, for the luminary was only just setting behind the frosty crags of Mount Bonney. Reassuming our *rücksacks*, we ascended the moraine to the base of the cliffs, turned upwards to the left, and traversed the slopes of debris, streaked here and there with lingering snow, to the pass at the end of the great arête.

The prospect from here is singularly wild and impressive. Huge bare walls of grayish green rock, towering savagely upwards on both sides, hide most of the familiar landmarks and give the visitor the feeling of being in a deep canyon. But our attention naturally concentrated upon the arête itself. Only a limited section was visible and that did not look alluring. The slopes of the mountain were steep on both sides, intersecting each other in a narrow irregular ridge, greatly foreshortened. The north face appeared well broken, but of the west little could be seen. Nothing short of actual trial would determine the real nature of the work, so, after a short rest, at 6.45 we started on. The altitude was approximately 8200 feet, leaving us 2600 feet more of vertical height to cover, yet the day was young, the temperature only about 50°, and the stratification, as we soon found, all in our favor.

It is impossible to narrate the ascent in detail. The obstacles were all so much alike and so numerous that in retrospect they blend into a confused impression, a hodgepodge of chimneys, cracks, corners, caverns, ledges, and ridges. Except for an occasional platform, the work was unremitting until the "shoulder" was attained—a point just below the stone-sprinkled slope on the west face where two large snow patches are usually to be seen. As it worked out, we found it impracticable to follow the actual arête for more than a short distance at a time, so we kept mostly to the north face just beyond. The rock and holds were excellent everywhere and we encountered no snow to speak of below the "shoulder." Feuz led the way at the end of a long stretch of rope, Aemmer came next, and I last. In several places where the rock was smooth, Aemmer had to shove him from below. The formation is such that one can hardly ever see ahead to plan out a line

of march. Instead, the leader must always adopt the best opening at hand and trust to luck that nothing will block the way above. Almost at the start this method of procedure forced us to traverse far out on the north face, along a series of ledges, before a suitable chance to return to the arête could be found. Higher up, we had to stop entirely several times and then clamber down obliquely over the sloping, broken rocks. The peak is part of a synclinal formation that serves the climber admirably, so long as he can keep to the ridge, but when a vertical wall bars his progress here, its steeply-tilted, shattered ledges prove none too well adapted to his purpose.

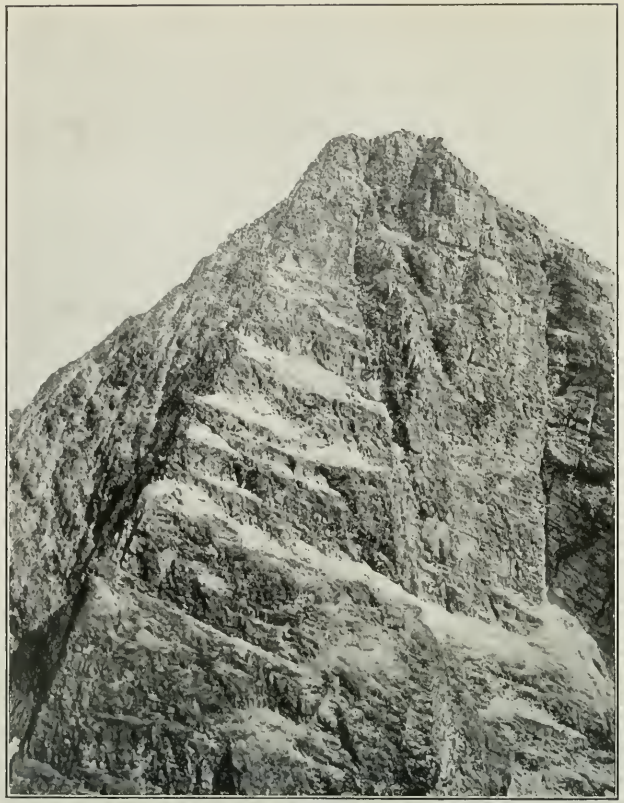
We reached the "shoulder," two-thirds of the way up, elevation about ten thousand feet, at eleven o'clock, and I seized the opportunity afforded by the relaxing gradient to take a photograph looking upwards along the ridge. The final pyramid of the mountain now began to untangle itself from the foreground ahead, and to assume, with each step, increasingly forbidding proportions. Beyond all question the real work of the day was yet in store, despite the fact that already we had been held down to a rate of only about four hundred feet per hour. This gigantic capstone is in many respects remarkable. The nature of the rock appears to change hereabouts, for instead of the greenish quartzite so prevalent below we find stone of a reddish or yellowish cast. The structure likewise seems to vary, developing a nearly vertical band of plates across the westerly façade of the mountain. At the base of this formation, where we halted for lunch, I discovered an excellent three-inch crystal of smoky quartz—one among several clusters of smaller specimens on the ledges.

After a short rest, we girded ourselves for the fray and pushed on. The ridge did not belie its appearance.

THE NORTH FACE

THE ASULKAN PASS

From the Northwesterly Arête of Mount Sir Donald



UTO PEAK FROM THE NORTHWESTERLY ARÊTE OF SIR DONALD

APPROACHING THE "SHOULDER" ON THE NORTH-WESTERLY ARÊTE, GREATLY FORESHORTENED

Almost immediately it swung straight up into the air and abandoned us to the doubtful mercies of the great north precipice. Here also the formation differed from that met with in the early part of the climb. Instead of more or less well-defined ledges, the face now presented an array of projecting rocky points. Our advance, therefore, resolved itself into a series of strides from one protuberance to another. As a counter-irritant to the possibly disconcerting effect of a glance into the abyss below, the *deus ex machina* had craftily fashioned the only handholds (the next higher set of points) at the awkward level of one's head, so that our gymnastics, as we worked our way out onto the face, must have strongly resembled a cross between the antics of a monkey, swinging from branch to branch in a tropical forest, and the motions of a man getting over a stream on stepping-stones. Fortunately the rocks were not icy, although at this altitude they were well sugared with snow. A particularly precarious bit of work occurred at the end of the traverse, when it became necessary to strike directly upwards towards the ridge, for the projections were not at all well designed for an escalade. Feuz had to make repeated trials here before he could locate a satisfactory route. However, the actual height to be gained was comparatively insignificant, and at about half-past two, we came out on the arête once more, arriving at the summit cairn, at 2.50 P.M., eight hours from the col.

To one of us at least it was a triumphant moment, the realization of a long-cherished desire. For years the ridge had aroused my admiration by reason of its grand simplicity and its importance as a structural feature of the mountain. Furthermore, the climb had obtained a reputation for difficulty among travellers and guides alike, and, therefore, not unnaturally, it

became an object to test the correctness of this report for myself. However, owing to the fickleness of the weather in this region of easy storms, the requirement of three or four fine days in succession was never fulfilled when other circumstances were favorable, and until now the project had of necessity been deferred. It will not be out of place to state at once that as a continuous, exacting rock climb, where both feet and hands are constantly employed, the ridge surpasses anything of similar length known to me elsewhere in the range. The fact that it has never been descended is not to be overlooked in this connection.

We had hoped, at first, to effect a complete traverse of the mountain by descending the southeasterly arête and crossing the col to Green's Peak, but owing to photographic delays and to the peculiarly comfortable feeling of the summit rocks, we did not get started downwards until four o'clock. It then proved to be too late, although we did keep to the ridge as far as the difficult drop into the col. The détour thus entailed retarded us considerably, so it was 6.30 before we arrived at the usual breakfast place. The *bergschrund* looked formidable from here, as the season was very far advanced, but when we had descended the snow tunnel and gained the brink, we found it comparatively easy. Not so the glacier itself. Here a very troublesome network of crevasses awaited us, but Feuz, rising to the occasion with his usual skill, led us through in short order. The most serious obstacle, a fissure of huge proportions, reserved itself until the last, and for a time bade fair to spell retreat. Only a single arch of snow spanned it, and this in a daring, downward sweep like a flying buttress. So unprepossessing did it look that Aemmer and myself felt inclined to demur when Feuz started towards it, but as darkness was at

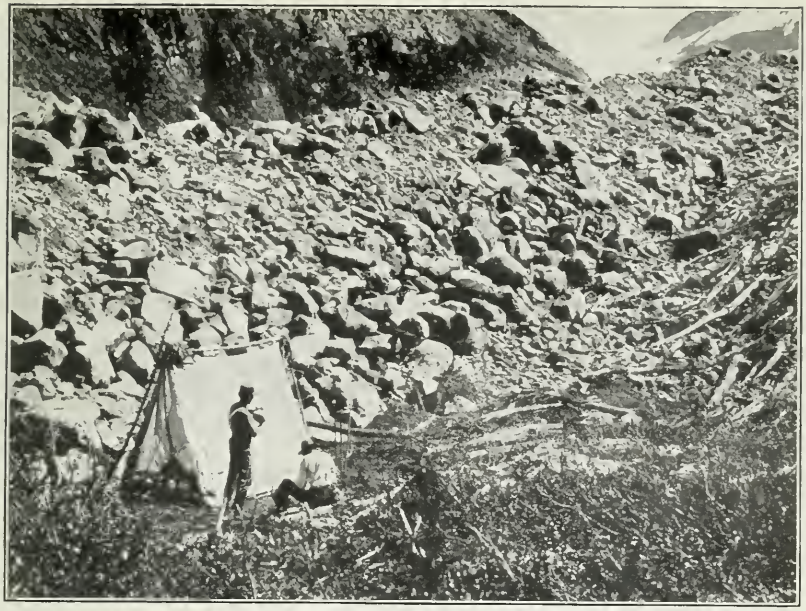
hand and the short-cut would save a great deal, we refrained. Skirting the upper lip of sloping snow with utmost care, we finally reached the place. Near at hand it appeared even worse than before. Feuz, however, after assuring himself that we had solid holds, leaned over on the rope and began to test it. He chipped a niche on either side to serve as stirrups and then, stepping down, straddled the bridge like a horse. In this manner he worked down the steeper portion and finally reached the other side in safety. It was a very neat exhibition of icemanship. We all crossed thus and soon gained the moraine, where, with great relief, we took off the rope which had bound us together almost constantly for the last twelve hours. The rest of the way passed rapidly, and at 9.25 we were enjoying the rewards of the faithful at the hotel. The total time occupied was over nineteen hours, but owing to various petty hindrances that reduced the pace and to the détour on the easterly arête, it is considerably longer than the expedition ought usually to consume. Next day the weather settled down to another week of rain. The mare's tails we had noticed from the summit proved, as usual, to be the harbingers of storm.

Of the other peaks of the Sir Donald Range, Uto probably furnishes the most interesting work, particularly if it be climbed from the col separating it from that mountain and the arête be followed closely. The ridge rises in a series of smooth and rather steep, but well fractured, faces, interrupted quite regularly by platforms. The quality of the rock is good throughout. The writer and two friends made a complete traverse of the mountain, ascending by this route and descending by the long ridge, connecting with Eagle Peak. It took us seven hours to reach the summit from the hotel, three hours and a quarter being spent on the climb

from the col. After remaining an hour and a quarter on top, at four o'clock we started down towards Eagle Peak, following the ridge to the lowest point. Descending then to the small glacier beneath Uto, we gained the hotel at 8.15. The total going time (slow) was about eleven hours. By reason of its splendid views and the entertaining scrambling that it affords, this expedition deserves to be better known. From the summit we noticed two small lakes below the tongue of Avalanche glacier that do not appear on the map.

Terminal Peak (9773 feet), adjoining Sir Donald on the southeast and not easily seen from the neighborhood of the hotel, offers a pleasantly varied expedition. It reveals Sir Donald in a novel aspect and, ranking next to it in height among the peaks of the range, commands perhaps the best view of the névé and its surroundings to be had by any one who does not care to attempt the chieftain itself. The unexpected and remarkably abrupt drop into the Beaver valley is a noteworthy feature. The route leads up the slopes bordering the Illecillewaet glacier on the north until the ice is reached. The névé is then traversed to the foot of the peak and the ascent made at any one of several places over good ledges of unusually hard, flintlike rock. The trip will take about six hours, but the return may be effected in two less without difficulty.[1]

[1] For further notes in relation to the Sir Donald Range see Appendix I.



DAWSON CAMP

BEAVER VALLEY ESCARPMENT FROM TERMINAL PEAK
Note Lakelet with Floating Ice near center

THE ASULKAN PASS AND GLACIER

CHAPTER VI

BEYOND THE ASULKAN PASS, 1908

The Geikie Glacier—Ascents of Mounts Fox, Donkin, and Selwyn —A Circuit of Mount Dawson

FEW people tarry at Glacier House long without feeling a constantly increasing desire to do two things: first, to follow up the "Great Glacier" into the region behind the sky-line, whence it so mysteriously emerges, and second, to investigate the Asulkan valley which opens alluringly near at hand and suggests, with its vistas of verdant meadows and sparkling cascades, a splendid avenue of approach to lofty snow-decked heights beyond. Very probably the visitor will have satisfied himself on the score of the Illecillewaet glacier and névé through some of the shorter excursions in the neighborhood of the hotel, commonly made by tourists, even if he has not done so in the course of one or more of the climbs in the Sir Donald Range. As regards the Asulkan valley, however, it is entirely safe to assume that these expeditions will have increased his original interest, if indeed they have not extended it to include the alpine pass above and the magnificent Dawson Range still farther away. It is fitting, therefore, that we now turn to this quarter of the range and consider the various possibilities for interesting work which it affords.

The Asulkan, which means goat in the Indian tongue,

may be taken as typical of the upland valleys among the Selkirks. Extending almost directly south from Glacier, and then turning southeasterly in a gradual curve, it leads one after three miles of scarcely appreciable ascent to the entrance of a deep glen surrounded by glaciers and rugged mountain walls. From here the ground rises rapidly for a mile more, in grassy flower-strewn slopes or talus piles to the region of upper snows. An excellent path has been constructed up the bottom of the valley, giving easy access to the glaciers and enabling all to enjoy the charming prospects that open on every side. Although the valley is well worth visiting for its own sake, it is chiefly interesting to mountaineers on account of the means which it affords of reaching the Asulkan Pass, a strategic point of importance in more ways than one. For those who simply desire to gain a splendid view, combined with glacier work of a mild description, the ascent to the pass (7700 feet) from the hotel will meet the requirement admirably. If the climbing desideratum is yet more ambitious, the route may be continued up the peaks, about nine thousand feet high, on either side, whence the return in each case may be made by one of several variations. But further still, if one's plans contemplate a visit to the Dawson Range which faces the pass on the south, just across the valley, it furnishes the best, and to all intents and purposes the only way to get there.

It was under the latter circumstances that the writer made the acquaintance of the Asulkan valley and pass. In the summer of 1908, Professors E. W. D. Holway and Frederic K. Butters invited him to join them in a mountaineering excursion among the aspiring peaks of the Dawson group. As old travellers in the Canadian Alps they had all the requisite camping impedimenta,

while he could contribute a certain amount of the *vis viva* necessary to transport tents, provisions, etc., to the scene of activity. As pack-animals were entirely out of the question, and delay and uncertainty would be inseparable from any attempt to obtain porters from Golden or Revelstoke, we decided to do the work ourselves. The outfit included one 5 x 8 oiled silk "A" tent weighing about seven pounds, two sleeping-bags with four thicknesses of light blankets which, laced together, formed one bag large enough for three, an aluminum cooking outfit and dishes, axes, ropes, provisions, etc., to an amount averaging forty-five pounds per man. For the latter, we carried *Erbswurst*, flour, sugar, bacon, beans (cooked and dried), prunes, chocolate, and tea. These were put up in small water-proof sacks.

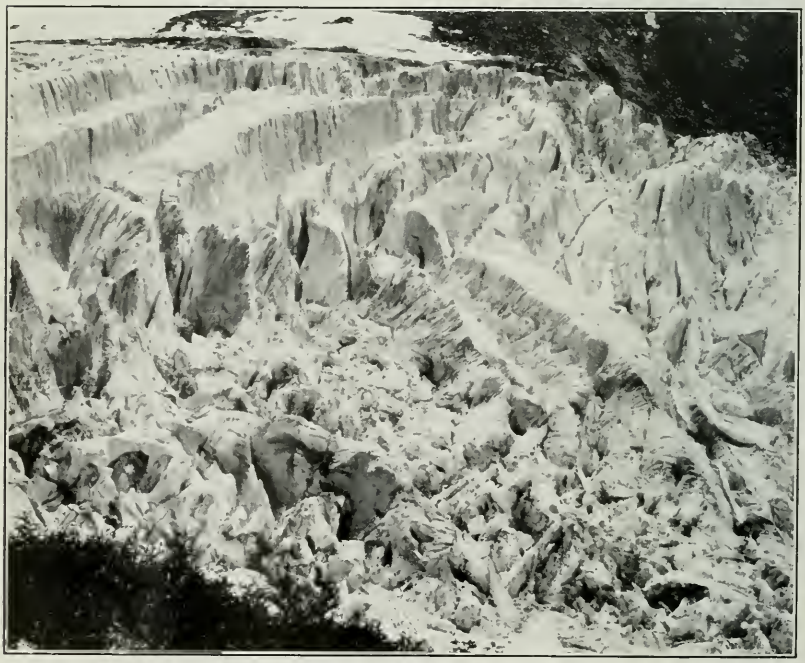
Owing to the hindrances that invariably come up at the last moment on such occasions, it was not until ten o'clock, July 29th, that we actually got under way. Our departure, therefore, attracted rather more attention on the part of the tourists than was entirely pleasant. One lady observed, "You have n't got enough flour in that bag to make one loaf of bread, let alone a week's supply." Another, "You don't tell me that they are leaving for a week—why I thought they were only preparing to go up Sir Donald for the day." In the light of such comments, one can well believe the story of the tourist who had heard that they had two glaciers near the hotel and desired to be directed to the newest one! Swinging along the smooth and pleasant trail, we soon passed the sign-board with its cheering, if misleading, inscription, "*Road* to Fish Creek and the Asulkan Valley." (Alas, did the "road" in reality extend to Fish Creek, mountaineers hereabouts would rejoice and be exceeding glad.) During the first

part of the way, tall, venerable evergreens rise majestically on either hand, spared the havoc of spring avalanches by some obstruction above. Farther on are clearings where numberless streams dash down over rocky walls in spraying cascades. We were never out of hearing of their lively music except when the powerful roar of the Asulkan torrent at our feet drowned all else. In about an hour and a half, we reached the steep moraine near the Asulkan glacier where real work commenced, and we realized that climbing with packs is not unalloyed pleasure. An hour more brought us to the ice at the top of the moraine, and after lunching here, we pushed on towards the summit, over the easier gradient of the glacier. Numerous crevasses, thinly bridged, necessitated constant punching, so that two hours sped by before we arrived at the pass, 3600 feet above the Glacier House. But the magnificent display of mountain majesty across the valley rewarded us amply. The towering massif of the Dawson Range, powdered with freshly-fallen snow and glistening in the light of the afternoon sun, formed a picture of almost unearthly loveliness.

After a short halt, we resumed our way down the southerly slopes of the pass into Fish Creek valley. First we had pleasant glissades over snow, but only too soon this gave way to a stretch of grassy alpland—a veritable garden of brilliant blossoms. So vigorous were they in following up the retreating snow banks, that in many places they had actually pushed through the snow itself. A little lower down, the angle steepens, and clumps of alders and outcrops of fissile shale, which become cliffs below, interrupt the verdant alps. Hereabouts, a torrent fed by the melting snow comes into view at the left, flowing, where it does not fall, down the rapid declivity. Its channel is a gully worn deeply

MOUNT FOX AND MOUNT DAWSON FROM THE ASULKAN PASS

Photograph by E. W. D. Holway



A BIRD'S-EYE VIEW OF GEIKIE GLACIER

Photograph F. K. Butters

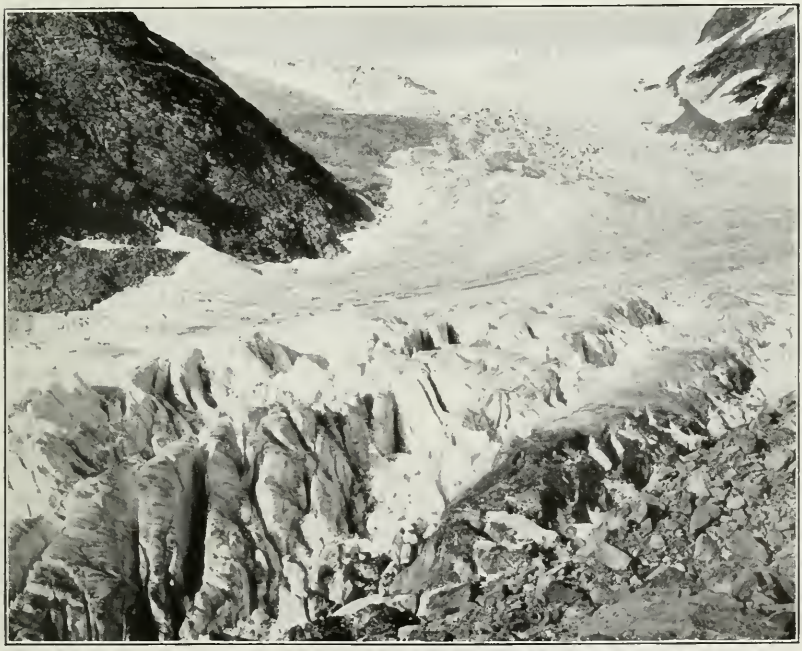
THE LOWEST ICE-FALL OF SAME

into the clayey rock, and one is strongly tempted to continue his descent by its means or by the apparently easy slope of its farther bank. It is better, however, to resist this temptation. As a result of nearly a dozen traverses of the Asulkan Pass, we have selected the westerly, or nearer, margin of the gully as the most favorable and the most direct route. Even so, it leaves much to be desired, for it is steep and in places one has to let himself down blindly through the alders, hand over hand. On the present occasion, succumbing to the wiles of the more open rocks on the farther side of the gully, we crossed the stream just above the brink of the waterfall and commenced to descend. We found that the rock is a kind of soft, soapy shale and very slippery. Occasionally steps could be cut, but nevertheless the work was far from pleasant under the weight of heavy packs. Even when the bottom of the gully was gained the going improved little, for the tongue of snow that occupied it was covered with small stones and one could not glissade satisfactorily. The tongue was of interest, however, from its semblance to a miniature glacier. It had well-developed glacier tables, a *bergschrund*, and marginal crevasses. We consumed about two hours in descending the 2800 feet to the Geikie glacier which completely fills the valley-bottom at this point. Then, crossing its smooth surface, we clambered up the ugly pile of bowlders of the south moraine, whose doubtful equilibrium demands sharp attention lest a disastrous slide be started, and found ourselves upon a little rock-strewn flat in a secluded corner between the Dawson and Geikie moraines, two hundred feet above the glacier. This was the only level spot that we saw in the vicinity and here we pitched our tent, elevation about 5100 feet. With wood and water at hand, it formed an admirable headquarters for a week

of camp life. Its only drawback lay in the fact that it was (and probably is still) a favorite rendezvous for porcupines.

Our first expedition, made the next day, was the ascent of Mount Fox (10,572 feet). We followed the Dawson lateral moraine for about a mile, and then turned directly up the grassy slopes of the mountain near the elbow of the glacier. In the neighborhood of the arête some crags afforded a little scrambling, but when these were surmounted, we came out on a gentle snow slope which brought us to the final rocks. The climb, although longer and rather more laborious than that of Avalanche Mountain, owing to soft snow, was on the whole easier. As with Avalanche, the vertical height covered is about a mile, the time taken being approximately five hours. The view was superb, sweeping to the horizon on every side save that towards Mount Dawson, whose steep precipices, scarcely a mile away, presented a particularly impressive spectacle. The feature next in prominence was the four thousand-foot drop over sheer rocky walls into Glacier Circle, a cliff-girt amphitheater opening between Mounts Topham and Macoun into the still deeper abyss of Beaver valley, where, nearly seven thousand feet beneath us, the silver thread of Beaver River gleamed in the sunlight. After lunching and enjoying the prospect to the full, the return to camp was made by the same route without special incident.

July 31st we decided to devote to an investigation of the Geikie glacier. Its lowest ice-fall, not far from camp, was especially remarkable for the way in which the ice, upon reaching the brink of the sharp decline, broke up into long flat-top ridges or ranks like huge sections of some ancient castle wall, extending almost all the way across. Farther downstream, these con-



CROSSING GEIKIE GLACIER

UPPER COURSE OF SAME

THE UPPER ICE-FALL OF GEIKIE GLACIER

A NOVEL ICE FORMATION

solidated into deep wave-like channels, gradually smoothing out in the direction of the tongue. Through one of these convenient transverse grooves we crossed the glacier and then, skirting the steep rocks of its northern margin, surmounted the fall and took to the smoother ice above. After passing over a broad terrace, we worked our way up through the crevasses to the foot of the loftiest fall of all, where a tremendous mass of ice tumbles down from the névé in a hopeless confusion of splintered séracs. Innumerable glittering towers, grotesquely fashioned and tilted at impossible angles, had been reared aloft by the mighty forces so that the mile of crescentic sky-line resembled a huge wave, frozen solid in the act of breaking into myriads of splashes.

After admiring the impressive spectacle for some time we turned back, as the sun was well down in the west and our surroundings were scarcely calculated to afford a comfortable bivouac. We followed our route of ascent to the middle terrace and then crossing this continued to camp along the southern bank. On the way, a rather striking evidence of the glacier's movement was vouchsafed us. During a halt by a tiny stream, trickling through a crevice in the ice, one of the party knelt down to drink. His surprise may be imagined when the crack opened slightly and the rivulet disappeared bodily into the depths. The Geikie is one of the finest glaciers to be seen in the Selkirks. Longer there are and greater, but for purity, variety of ice formations, and general interest, it can scarcely be surpassed. The stream descends for two miles below the Illecillewaet névé, reaching the extremely low altitude of 4200 feet, possibly the lowest in the range. The trip was of especial interest in that the glacier had been ascended but once previously. That,

however, was made along the southern margin, while we kept to the ice itself as much as conditions permitted.

On August 1st we decided to prospect the route to Donkin Pass (8596 feet) in order to ascertain its practicability for passage with packs. We arrived at the *bergschrund* without particular difficulty, but here a twelve-foot wall of snow confronted us. It was pretty steep, but with the help of all three ice-axes, Holway surmounted it and the others followed, assisted by the rope. From here to the pass the slant was glazed with ice under thin snow, a stretch of about three hundred feet, and there was a cornice at the top that looked as if it might be impassable at the last moment. In reality, however, the slope did not prove to be especially difficult and we got up to the cornice before long. At a convenient rock the middle man unroped to give additional length. Holway then went ahead once more while we kept the best hold that we could. After some cautious maneuvering he managed to get over the edge of the cornice at a low place, and into a cavity beside a slab of rock like a curbstone, one end of which rested on ice and did not look very secure. The other end seemed firm, but he did not offer any encouragement about his ability to sustain a strain on the rope. If the stone had slid, it would have come directly on us. However, we were near the top and with care there seemed to be no reason for testing it, so I started upwards in his steps. Planting my axe firmly above the vertical edge of the cornice, I cautiously pulled myself up and with a lunge, squirmed over it and into the cavity. Holway then advanced to firmer footing, Butters joined me, and presently we were all on the pass. Two hours had elapsed since we left the bottom. The weather had been threatening a storm and now thunder and hail greeted us. We stayed long enough,

however, to note three goats feeding on the slopes below and to grasp the general features of the panorama. Upon starting back, we found an easier route by going farther to the east along the rocks of Mount Dawson. We thus avoided most of the ice and reached the *bergschrund* near a place where a large snowball jammed the opening. By cutting steps along a ledge of ice with hand-holes above, we traversed the upper face of the *schrund*, gained the snowball, and completed the crossing. A pouring rain drenched us as we hurried back to camp.

Next morning, as the weather had cleared, we set forth to climb Mount Donkin (9694 feet). Crossing the Dawson glacier at the first opportunity, we ascended to the crest of the northerly spur. From here we discovered the snow-fields beyond and pushing along the ridge, which at one place was so narrow that we had to straddle it, we made our way over them to the foot of the western face. This furnished easy but interesting rocks, by means of which we gained the summit. The view cannot be commended too highly. It is especially fine of The Bishops and Purity ranges towards the south, and of Mount Bonney and its neighbors in the opposite direction. There is also an admirable picture to be had of the Geikie glacier.

On August 3d we visited the lower reaches of the Geikie glacier and went some distance down the valley beyond its tongue.

Having gained a good knowledge of the approaches to Mount Dawson by these various excursions, on August 4th, the last day that our provisions would allow us to remain, we decided to attempt the climb. Although the dawn was not propitious and mists billowed darkly about some of the lofty peaks, occasional beams of sunlight and a steady barometer were en-

couraging signs, so we left camp at 5.30 A.M. We passed over the long moraine and the snow-covered glacier beyond without incident or difficulty, and then found ourselves before the *bergschrund* beneath the head wall of the amphitheater between Fox and Dawson. Fortunately, being suitably bridged, it yielded at once and we then entered upon the more formidable undertaking of surmounting the wall. No doubt, strictly speaking, one cannot term it difficult, for the strata are well broken and holds and ledges abound. Yet owing to the softness of the rock, every protuberance is coated with slimy, sliding shale, which, in the presence of the gaping *schrund* below, reacts upon one's mental state and makes the place seem worse than it really is. However, as one works upward, the steepness relaxes, until near the top the going becomes a walk.

Here the way turns to the right and follows a curious shaly rib that leads to the minor peak on the arête connecting Dawson with Selwyn. As the rib ascends, the angle increases and the footing assumes the character of a tiled roof, with the tiles pointing downwards into the amphitheater. At one place where the ridge narrowed, I recall that Holway, our leader, had to creep upwards relying solely upon friction. Near this place we found a camp axe of Mr. Edward Franzelin of Austria, who had made the climb previously alone, traversing the entire massif and descending by Donkin Pass. A little higher we encountered ice which necessitated the cutting of a line of steps. This, however, proved to be the last difficulty, for it brought us onto the upper névé where, except for the careful sounding required by the presence of a few large concealed crevasses, the going was all that could be desired. These crevasses can very likely be avoided by keeping close to

SOUTHERLY SLOPE OF ASULKAN PASS ACROSS GEIKIE GLACIER

CROSSING THE BERGSCHRUND ON DESCENT FROM DONKIN PASS

THE DAWSON RANGE FROM CYPRIAN

the arête for a little while longer. As the arête swung away from a direct line to Dawson, it was natural to bear off towards the peak at the first opportunity, and this doubtless got us too near the beginning of the ice-fall. When the small peak began to rise above the frosty horizon of the dome, we turned towards it in order to lunch and inspect our surroundings, for the day had not entirely cleared and mists were billowing about the summit of Dawson. It proved to be an excellent view-point. A curving arête, corniced on the south, connected us with Dawson, while in the opposite direction another, descending into a notch, joined us to Selwyn nearer at hand. Although barely a hundred feet lower, the hurrying mists left the latter untouched, and accordingly, rather than lose the view, we decided to make our way thither. Putting ourselves in motion, we continued along this arête, partly on rock and partly over snow, to the base of the final pinnacle. Here the writer completed the traverse directly to the top over the tilted broken slabs of the ridge. The others, however, sought the goal by means of the slope of loose rocks on the southern face, prospecting at the same time the way down to the Deville glacier on that side. In the stone-man, we found a bottle containing the names of Miss Gertrude Benham and Edouard Feuz, Sr., who had effected the last ascent on September 6, 1904. We scratched our own with the aid of burnt matches and then replaced the record. A fairly extensive prospect was vouchsafed us, although Dawson remained in cloud and the distant features of the landscape were indistinct.

When it came time to go back, we made up our minds to add a touch of spice to the day's work, as an offset to our disappointment on Mount Dawson, by essaying the unseen and untried route via the southern face of our peak, The Bishops glacier and Donkin Pass, the last

two of which we had viewed from Mount Donkin. Accordingly we started down the prominent snow-filled couloir that descends from a notch in the summit ridge directly to the Deville glacier. Near the bottom the angle steepened, and a certain amount of care was required to determine the position and size of the *bergschrund*, invisible from above. We threw a number of stones out on the snow to test its condition and then sent some large rocks sliding down. The latter disappeared only to again come into view on the glacier below. We deemed it best, however, to traverse along the upper lip towards Dawson, where the angle moderated and there was the appearance of a bridge. This actually materialized and by its means we crossed in safety. Heading then for the shoulder of Dawson, which barred us from The Bishops defile, we made good progress over the névé basin. In getting down the front of the glacier along the rocks we found a little steep scrambling, but it did not materially delay us, and about five o'clock we rounded the cliffs into the pass where the last rays of the sun greeted us. The long moraine was something of a trial, as indeed were the easy slopes leading up to Donkin Pass; but at length about 6.30 we gained the summit. A little below, we met our three goats feeding peacefully. When they saw us they betook themselves to the heights with a speed that made us envious. From the pass, the way led over familiar ground. After descending the ice-fall of Donkin glacier, we joined our route of the morning on the moraine, thus completing a circuit around the four peaks of Dawson. Camp was reached at 8.30 P.M., after an absence of fifteen hours. The distance covered as shown by the map was about eight miles; the height climbed not far from 6900 feet. In every way the expedition was thoroughly enjoyable.

The next day, rations being exhausted, we closed up the tent and returned to Glacier House for an additional supply. We felt that the week had been profitably spent since, owing to the kindness of the weather, we had been able to explore the Dawson Range in detail, to climb all the peaks except those of the principal massif itself, and to effect the first circuit of the latter by a novel route.

CHAPTER VII

BEYOND THE DONKIN PASS, 1908

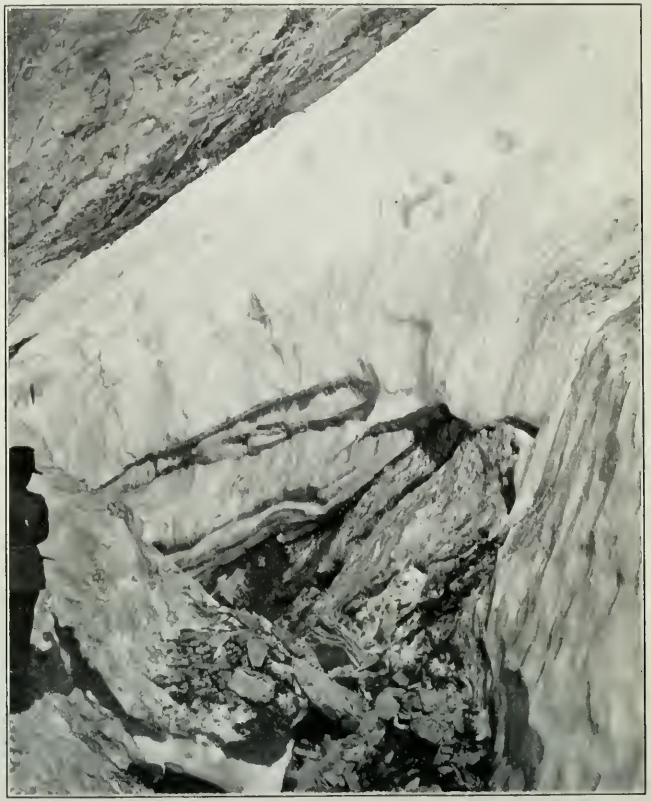
The Ascents of Cyprian Peak and Mount Wheeler

AUGUST 9th found the same party again in camp beside the Geikie glacier. Previous trips having given us enticing peeps into the snowy country beyond Donkin Pass, it now was our object to transport our equipment thither and to reconnoiter certain virgin strongholds in The Bishops and Purity ranges. Only two parties before us had penetrated so far to the south, and there a triad of alluring summits flung their battlements skywards as yet untrodden by human foot.

Next morning we sallied forth for the pass, our packs with the addition of tent and bedding now weighing a round forty-five pounds apiece. Since the route had become familiar upon our earlier trips, our only difficulty was the physical one of fighting gravity for 3500 feet up into the air against these oppressing handicaps. Plodding along steadily, first over moraine, then over slushy snow, we arrived at the *bergschrund* after four hours. The snowball before mentioned was still in place and furnished a convenient platform for attacking the steep wall of the upper lip. An adroit manipulation of the ice-axes soon disposed of the difficulty, and we found ourselves on the slope above. This proved to be more icy than on our last visit, forcing us to resort to step-cutting. Owing to the presence of a

DONKIN PASS AND MOUNT DONKIN FROM THE NORTH

HAULING UP THE PACKS



THE PLACE OF CROSSING

THE BERGSCHRUND OF DONKIN PASS

rickety cornice directly overhead, the work seemed tantalizingly slow, until, about half-way up, we were able to avoid its menace by taking to some outcrops of vertical strata at the left. But the change was of doubtful benefit, for on account of the steepness and the poor holds, our packs became decidedly troublesome, and two full hours elapsed before we deposited them on the pass and turned to enjoy the inspiring prospect.

In the distance to the southwest rose the graceful mass of Mount Purity (10,457 feet), one of the most beautiful snowpeaks in the Selkirks and a fitting climax to its glacier-laden chain, whose spotless snows, brilliantly lighted by the afternoon sun and outlined against a sky of purest blue, formed a dazzling fairy-land of alpine architecture. In somber contrast were the jagged black buttresses of The Bishops Range just across the valley to the southeast. Here Cyprian Peak, with its glacier-scarred precipices, was most prominent, nearly concealing its loftier twin, Augustine, beyond. All of these peaks—in fact every one in sight save Mount Purity, Mount Donkin, and the westerly shoulder of The Bishops Range—were unclimbed, forming therefore a veritable paradise for mountaineers. It was our ambition to investigate this region as thoroughly as the weather would permit, to ascend such peaks as conditions allowed, and to photograph the magnificent scenery from the various points of vantage that we might attain.

Before going farther, a word with regard to the geography may be acceptable. In this vicinity the main axis of the Selkirks runs approximately north and south parallel to the Beaver valley. From Sir Donald it traverses the Illecillewaet névé and passes over Mounts Fox and Dawson, The Bishops Range, Mounts Kil-

patrick and Wheeler, Grand Mountain, etc. Its noteworthy peculiarity lies in the fact that the sub-ranges cut across it almost at right angles, so that the water-parting frequently zigzags up and down across the faces of peaks and minor buttresses. There are four of these parallel transverse ranges or ridges running east and west in the territory under consideration. First, the one without any distinctive name which is crossed by the Asulkan Pass; second, the Dawson Range, crossed by the Donkin Pass; third, The Bishops Range, lacking a definite pass; and fourth, the Purity Range, crossed by the Purity Pass and others. The valleys between these ranges are filled with the following glaciers, named in the same order: the Geikie and the Dawson, The Bishops, the Black, all flowing westerly from the water-parting or its neighborhood. In one case, that of The Bishops glacier, another ice-stream flows in the opposite direction from the same divide, forming an easy open pass. It is worth noting that this is the only well-defined way across the summit range of the Selkirks for twenty miles south of Rogers Pass. But unfortunately, owing to the intractable ice-fall of Deville glacier in its easterly approach, even mountaineers will in all probability never be able to utilize it for crossing from timber on the one side to timber on the other. The natural course of travel is, however, north and south, and for this the topography is better adapted, since the three passes named are almost exactly in the same straight line, a continuation of the direction of the Asulkan valley. Nevertheless the wayfarer, while duly grateful for even small mercies, will, undoubtedly, wish that their gradients and glaciers had been better adjusted to his needs.

The descent of the 2000 feet from Donkin Pass to The Bishops glacier turned out to be as easy as the

VIEW NORTHEASTERLY FROM NEAR MOUNT PURITY

MOUNT PURITY FROM DONKIN PASS

THE BISHOPS CAMP AND MOUNT DAWSON

ascent just completed was difficult. In striking contrast to the glaciers of the northern slope were the waving grasses and gaily colored flora of the southern. After crossing the boiling torrent below by a convenient snow bridge, we soon came upon a heathery meadow not far from a large rock-slide. Here we pitched our tent near a bubbling spring and abundant fire wood. The spot, although at an altitude of 6300 feet, was not especially well located, for a spur of The Bishops Range interposed a 1200-foot barrier on the south between it and the farther valley where we expected to do most of our work. However, its advantages were so pronounced that we reconciled ourselves to the task of doing these 1200 feet up and down as "a warming-up" for each climb from there and to its repetition when returning at the end of the day.

On the 11th the weather looked threatening. A dense mass of stratus clouds obscured the sun and not a breath of air was stirring. The summits, however, were clear, so we resolved to explore the barrier in order to find the easiest way over it. A short half-hour's scramble on steep rocky slopes brought us to the crest only to be greeted by a threatening black cloud that was forming behind Mount Purity. Now and then thunder muttered. Though rather awkwardly placed for weathering a mountain storm we were fairly caught and must make the best of it, so we looked about to see what protection offered. Some distance beyond us, a spur, mounting from the farther valley, joined our ridge, carrying up a few straggling outposts from the forest. These promised some, if rather scanty, shelter, so we hurried towards them along the arête. It was a rough and narrow pathway, sometimes rising into shattered pinnacles, where our ice-axes displayed an activity as alarming as it was unusual. The metal

heads discharged streams of crackling sparks and sent a tingling sensation through the hands that grasped them. We experimented a little and found that the effect was most marked when the axe was planted on a rock with its end higher than our heads. Upon stepping up beside it, the sparking from the axe ceased, and the discharge passed through our bodies with hair-raising accompaniments. Needless to say we did not linger in these places, but pushed on and reached the trees just as the first hailstones fell. Rain presently followed, but protected by a couple of hardy pines we built a fire and lunched in comfort, perfectly dry and warm.

About two o'clock the clouds parted here and there, allowing shafts of sunlight to shoot through and illuminate crag and glacier. Evidently the worst was over for the present. Bidding farewell to our impromptu shelter, we started out to find a way down into the splendid gathering basin of the Black glacier, whose glories the scattering mists were momentarily revealing. From our coign of vantage its whole panorama lay extended before us. Walled in on the north by the steep precipices of our ridge, which mounted rapidly to the peaks of The Bishops Range, it swept around to the south, merging into the rugged, ice-gouged slopes of the Purity Range, whose four large glaciers met in the valley bottom forming the so-called Black glacier. High, well-defined moraines were freighted on its broad back. Over the lofty col at the valley's head to the east, Mount Wheeler was just visible, the second highest peak south of the railroad and 11,023 feet in altitude. Nearer at hand and greatly dwarfing it, though about five hundred feet lower, Mount Kilpatrick towered. Next came four nameless peaks, and then the range culminated fittingly in the sharp apex of Mount Purity.

After enjoying the scene for some moments, we con-

THE PURITY RANGE AND BLACK GLACIER FROM THE NORTH

CYPRIAN PEAK FROM SUMMIT OF AUGUSTINE

tinued along the slope. A belt of cliffs made the search for a way down rather troublesome, but before long we came upon a curious gateway whose rocky portals framed a striking view of the glacier. Just beneath, a wide, grassy gully descended, and as it apparently offered a favorable lead we started down. Though steep at first, the slope gradually became gentler, and in half an hour we found ourselves on the floor of the basin beside the glacier. After following the moraine directly into the amphitheater for about a mile, we took to the ice and pushed out towards the middle in order to get a better view of the peaks of Cyprian and Augustine, which the abrupt rise of the basal cliffs nearly concealed. When we had advanced sufficiently, the twin summits presented an impressive spectacle indeed. To the left towered the massive rocky dome of Cyprian, falling away towards us in sheer cliffs for fully two thousand feet. On the right the sharper and less symmetrical spire of Augustine frowned down in equally rugged majesty from its bulwark of cliffs and buttresses. We studied them for nearly an hour through the glasses without result. The western arête of the dome above the col looked feasible enough, but how to reach it was puzzling, since, lower down, the cliffs rose perpendicularly above the ice for perhaps three hundred feet. Nor was a solution offered by any of the gullies that scarred the cliff belt, for each of these at one point or another contained an impassable drop. The most eloquent tribute to the nature of the obstruction was the discouraging way in which the small streams fell straight to the glacier from the edge of the wall.

Baffled by these unfavorable indications, we started back, pausing now and then to study the changing profiles of the buttresses. Suddenly some one exclaimed,

"Look at that!" and directed our eager gaze to a narrow ledge leading from an accessible talus fan horizontally out across the face of a buttress, well above the impassable wall. Viewed end-on from our recent standpoint, it had been invisible. The ledge seemed to be continuous and the buttress where it ended was well broken, so we hastened down the glacier with strong hopes for the morrow. But the morning sun gave the place an entirely different aspect. As we approached the beginning of the ascent, we saw not a sign of our hoped-for path. Yet it was preposterous to suppose that the mountain had tricked all of us, so we started up the long talus slope, strewn with large rocks. Some were twenty feet square and three feet thick, and we speculated on how they could fall so far and still remain whole. In the face of the cliff, a gully opened, and to the right, we finally made out the missing link of our path. Lying behind the buttress, the morning shadow had concealed it.

As we got nearer, however, we saw that it was not to be easily reached. The cross-ledge joined the gully some distance above its mouth, and only through this mouth was it attainable, for the steep rocks on either hand offered no foothold. The gully or, more properly, chimney, sloped away from us, and was divided into two sections by a rib. Up one of these, Holway finally managed to work his way, amidst clouds of dust and numberless falling fragments. He then lowered the rope and Butters and I followed through the other. Somebody aptly remarked that one had to take it in the posture of a cat on the defensive, as the holds were mostly on the ceiling.

The narrow connecting ledge beyond proved all that we anticipated, and upon traversing it we clambered directly up the buttress. Then, crossing a brook,

LOOKING UP THE CHIMNEY ON CYPRIAN PEAK

ROUTE UP THE CLIFFS OF SAME; CHIMNEY MARKED X

CYPRIAN PEAK FROM BELOW DONKIN PASS

we mounted over interesting but not difficult ledges to the col. From here, after a short halt to enjoy the impressive view of the Dawson Range, we continued to the summit over the broken slabs of the northwest face and west arête. This was reached at 3.30 P.M., about eight and one-half hours from camp. There was no sign of previous human presence, so we built a cairn to contain our names and record.

The prospect was marvellously fine. Standing as we were at an altitude of 10,712 feet (Dominion Survey) on the crest of the ridge separating the valleys of the Black and Bishops glaciers, no more commanding outlook could be desired. On the north the southerly precipices of Mount Dawson faced us; to the east, close at hand, soared the fine pyramid of Mount Augustine; farther off again came Mount Wheeler, somewhat higher than ourselves, but built so deceptively that it did not appear so; then in the distance, the interesting Battle Range rising crag on crag, bristling with glaciers, and finally, to the south, Mount Kilpatrick and the Purity Range, glistening in their snowy mantles.

We stayed on top until about 4 P.M. Returning then by the same route it was not until nine o'clock that we arrived at camp, fourteen hours after our departure. Darkness overtook us and we had a rough time among the bowlders of the rock slide. But nothing mattered, now that we had subdued an unconquered giant of the range. That the tin of corned beef, devoured so ravenously, was no less than eighteen summers old, did not in the least disturb us. We had discovered it nearby on the site of the Topham and Forster camp of 1890, undoubtedly abandoned by them at that time when the weather compelled their return to the Glacier House.[1] Besides this party and our own, the Govern-

[1] *The Alpine Journal*, London, May, 1891, p. 421.

ment Survey of 1902 was the only other that had crossed the Donkin Pass. As they also found a similar tin, along with a package of Swiss edge-nails, leaving nothing themselves, the evidence would seem to be complete. The can was whole, and its contents in perfect condition, preserved by the great natural refrigerator in which it had lain.[1]

While the ascent of Cyprian Peak by this route is not difficult under good conditions (we did not use the rope above the chimney), the work is by no means monotonous and the view alone will well repay the climb. It seems likely that the col can be reached directly from The Bishops glacier on the north face of the mountain. If so, this will afford an interesting variation, with some ice-work.

One of the delights of our camp life beyond the Donkin Pass was its independence. Without the thrall of guides, packers, and their ilk, one was absolutely free to do as his mood prompted. He did not have to commit himself to a definite program to be religiously lived up to, and as a result there was no responsibility to "make" such and such a climb on such and such a day. Above all, there was nobody to grumble at a failure or (what is perhaps more to the point) to criticise one.

On the day when we climbed Mount Wheeler (August 14th) the start was made without a fixed destination. We set out up The Bishops glacier, a favorable commencement for any one of a varied assortment of climbs, and the process of exclusion alone finally determined our course. In the beginning we had some thoughts of attacking Mount Dawson from this side, but, as we advanced, the attractions of new country proved to be too strong and we continued across the pass and down

[1] *The Selkirk Range*, by A. O. Wheeler, p. 101.

THE BATTLE RANGE AND VALLEY

THE DAWSON RANGE OVER THE BISHOPS RANGE

onto the Deville névé, casting studious glances at the northerly face of Augustine Peak the while. Rounding the end of the range to the south, we carefully scanned the possibilities on this side as well, but without discovering an attractive opening. At length we found ourselves again on the divide, this time overlooking the Black glacier and inspecting the cliffs of The Bishops at short range. Our reconnaissance had given us a pleasant morning's walk over the wide undulations of the névé, but now, as we faced these bleak precipices, we had to admit that it had not been much of a success in disclosing a promising way up Augustine, that strange crag in which our interest kept increasing the more we saw of it.

After securing a few photographs we walked over to the col between Wheeler and Kilpatrick where some rocks bade fair to supply a suitable lunching-place. A truly splendid prospect greeted us here, for the col opened into the upper reaches of the canyon-like valley of Battle glaciers, a region of unexplored and unnamed mountains. Across the end of the valley in the distance, the Battle Range, which we had seen from Cyprian, towered up in spires and peculiarly-leaning, chisel-topped peaks, forming at one point a superb amphitheater of perpendicular black walls filled with a wildly crevassed glacier.

After revelling in the scene for some time, we turned towards the arête leading to Mount Wheeler and commenced to ascend it rather aimlessly. The walking over finely broken shale proved to be so good and so easy that almost before we knew it we had gained a subsidiary point on the ridge commanding the rest of the way to the top. We saw that we had ample time to reach it, so, pushing on, we arrived not long after. The day was ideal. Scarcely a cloud flecked the deep

blue vault overhead and not a zephyr was stirring. The only sounds were the gentle clicking of the melting snow beside us and the occasional deep rumbling of an avalanche from the hanging glaciers of Grand Mountain. We threw ourselves down on the rocks in the warm sunshine and drank in greedily each detail of the immense panorama. Rarely indeed is it given to the mountaineer to luxuriate thus at an altitude of 11,023 feet in the Selkirks. And with such a view! No pen could do it justice, and I shall not try. Suffice it to say that the key-note was ice, ice everywhere and in every form. Save towards the Beaver valley, ridges, slopes, plateaus, and valleys, even to the far horizon, were overflowing with it like the frosting on a cake. It was as if an Arctic ice sheet had been dropped down suddenly upon the galaxy of rock-ribbed peaks. We lingered there for two full hours before we realized that we must indeed be off. As we descended the ridge, it was surprising to note that from this direction the profile of Mount Purity is dome-shaped, quite the reverse of its more familiar aspects from the north. Again it was dark when we got back to camp, but that day will remain in our memories forever.

After two days, one of which was spent in examining the upper reaches of Black glacier near Mount Kilpatrick, our depleted larder drove us back to Glacier House. We made the trip across the two passes with twenty-five pound packs in ten hours, arriving about nine o'clock the same evening. The expedition had more than met our highest expectations—in fact, the imposing sculpture of the mountains, the chaste beauty of the snow formations, and above all, the extent and varied configuration of the glaciers were a revelation. Fine as the peaks are about Glacier, unquestionably the scenic center of the Southern Selkirks lies to the

south of the Asulkan Pass. It is to be regretted that the extreme inaccessibility of this wonderland must for a long time to come limit its enjoyment to a select few.

CHAPTER VIII

BEYOND THE DONKIN PASS, 1909

Mount Kilpatrick, Mount Dawson from the South, and Augustine Peak

SO captivated were we with the country beyond Donkin Pass that the next season the same party felt impelled to return once more to the delightful camp on the westerly flanks of The Bishops Range. The untrodden crest of Augustine Peak and the maiden snowy citadel of Kilpatrick still flung out bold defiance to all comers, and it was our intention to accept the challenge and put their defenses to the test. Since the siege might be a long one and we had many other objectives in mind besides, we decided to employ a packer to aid us in the preliminary work of transporting supplies across the passes to our base camp. We therefore wired to a man who had been well recommended and he arrived forthwith at Glacier. Upon showing him our impedimenta he selected about ninety pounds for his load. We then divided the remainder between us and found that the packs weighed fifty pounds apiece.

Next morning, July 13th, a horse took them all up to the Asulkan glacier where heavy work began on the steep moraine. After going a short distance our man put down his load and divided it, carrying only half to the top of the pass. It was then necessary for him to return for the balance, and one of us awaited

him on the summit to act as guide. The others meanwhile descended to set up camp by the Geikie glacier. When he first reached the pass and saw the route we proposed to follow, he barely suppressed a shudder, but the information that we had already been over it five times appeared to reassure him and we thought no more about it. Upon his return with the rest of the provisions, the descent was continued to the camp, but a good load had to be left behind on the pass.

This unexpected outcome caused a decided change in our plans. We had hoped to make the entire distance with the packs in two days, our man returning light to Glacier House on the third, being accompanied, if necessary, over the worst part of Donkin glacier. Now, however, this could not be done owing to the relaying entailed by splitting his pack. Accordingly next morning we decided to leave camp where it was and to take one load up Donkin Pass while the packer went alone to the Asulkan for the last installment. We never saw him again. When we got back to camp that night the tent was empty. The mystery of his absence was not explained until the next day, when, upon repairing to the Asulkan Pass to recover the forsaken supplies, we found the following terse message scratched upon a flat stone: "Gone back; the clim is to much for me." While we toiled up the hot discouraging slopes of the pass I am afraid our thoughts about that packer were not of a kind suitable for record, but as soon as we read those words our disgust melted into laughter. To have returned to Glacier for another man would have taken as long as to do his work ourselves, so we became reconciled to the inevitable with as good a grace as possible.

It was not until July 17th that ourselves and our belongings were safely gathered in The Bishops camp.

To say safely is not strictly correct, for a cache of a spare tent, *rücksack*, bacon, crackers, and a focusing-cloth, left for one night under a ledge at the top of the Donkin Pass (8596 feet), carefully covered with large slabs of rock, was visited by a delegation of mischievous rats that played havoc with its contents. The tent was gnawed full of holes, the tin of crackers torn open, the bacon partly devoured, the *rücksack* rendered useless, and the focusing-cloth pulled out and carried some distance down the mountain. These rodents (*Neotoma cinerea drummondi*) are a great nuisance to the traveller when camping near timber-line in the Selkirks. Very active, numerous, and widespread, unless carefully guarded against, they are likely, in the course of a few nights, to make away with not only food but also anything and everything else in one's outfit. At another place, they pulled out a heavy metal tripod, and moved it quite a way from the rocky crevice where it had been left. We never departed from camp thereafter without hanging up everything in the tent well out of their reach.

All things considered, it seemed best to give Mount Kilpatrick the leading place in our plan of campaign. The trip would afford some interesting snow and glacier work, not to mention an excellent opportunity for studying further the repellent cliffs of Augustine against which we harbored the most nefarious designs. On July 18th, the weather went bad and we had hail, rain, thunder, and lightning, with intermittent snow flurries. Next morning, however, conditions improved, so after consuming a hearty breakfast of bacon, beans, and tea, we left camp at 6.30. The usual preliminary climb to the crest of the ridge occupied the next forty-five minutes. From here our mountain showed up grandly, and we searched its glittering mantle for the best route

MOUNT KILPATRICK FROM THE NORTH

ON THE TOP OF MOUNT KILPATRICK; MOUNT WHEELER AT THE RIGHT

MOUNT PURITY FROM MOUNT KILPATRICK

through the crevasses. Clouds hovered about the summit, now parting and now thickening, but evidently the sun was not far behind them, so we pushed on over the familiar route through the gateway, down the steep gully, and along the moraine of the glacier. An hour and a half later, we were roping up beneath the lowest ice-fall of the Kilpatrick branch of Black glacier at an altitude of about 7300 feet. The angle was so gentle that we found it easy to walk directly up the face without cutting a step. Just above the first slant, we struck the névé where some care was needed in sounding for crevasses. Our course led in a generally straight line towards the odd little sharp rock peak that guards the western arête. Progress was good over the undulating snow, but as we neared the pinnacle, the glacier became more broken and the crevasses correspondingly wider. In several places we had to cross bridges with extreme caution. The angle increased as well, and on one snow curtain we spent a breathless half-hour, breaking through the crust at each step and sinking to our knees in the loose snow beneath. Near the small peak we kept to the left, as we had taken the other and apparently easier route the previous year, only to find ourselves stranded on the col to the west of the peak with no chance of reaching the main arête, except directly over its needle-like summit. The writer ascended this at the time and was not at all impressed with the prospect of the traverse. An ice-slope descended from the peak's farther side and formed the only connection with the Kilpatrick arête, but the arête itself looked inviting. The peak proved to consist mainly of pure white quartz.

Soon we approached the first of the two well-marked *bergschrunds* that guarded the arête. Our precautions were now redoubled, for the new snow, fallen during the

previous day's storm, had drifted deeply and was in a dangerously dry and powdery state. Our axes sinking in easily to their heads, made it difficult to tell much from sounding. However, by mistrusting everything and stepping with the greatest care, we passed it safely at the point where the drift seemed thickest. Beyond this crevasse the snow improved, and we mounted rapidly, soon leaving the col below to the right. Gradually the slope of the sparkling dome grew gentler, and presently the rocky spine of the arête appeared above it cut off from us by the second *schrund*. At this point also the new snow had piled up, and not until after some search was a narrow bridge of solid older snow discovered, over which the party finally crossed. It was not wide enough to allow both feet to be put together, but one had to be placed ahead of the other with a kind of shuffling motion. The arête was attained just beyond at 11.15—550 feet below the top. From here to the summit we experienced no difficulty worth mentioning. In some places the ledges were steep and the holds full of snow, but as it was always possible to find a way around, they did not particularly delay us.

At 12.40 we stepped upon the topmost point (10,624 feet)—the crest of a huge mound of snow on the side towards Mount Wheeler. Earlier in the season it had been a cornice, but now the projecting portion had fallen off. After a hasty glance about us to make sure that we really were on top, we returned to the rocks for shelter from the cutting wind which swept across the slopes at a temperature of 40°. After working down the southern face for a short distance to find something to sit on, it became so precipitous that we had to climb back and make the best of it near the top. Being the first visitors, we found no stoneman, so we built a small one for an aluminum plate with our record.

The storm had cleared the air, giving us the finest possible outlook, and we enjoyed it to the full while eating our lunch. Particularly superb was the view of the valley of the Battle glaciers at our feet, with the remarkable range of the same name towering beyond. To the west the magnificent overhanging ice-cliffs of Mount Purity showed to better advantage than we had ever seen them before.

After taking a number of photographs, at 3 o'clock we started down, following the same route all the way. The going was so much easier that we gained the foot of the ice-fall where we first roped in the morning at about 5.30, saving one and a half hours over the ascent. The small rock peak, which might appropriately be called Mount Kilpatrick, Jr., we found by leveling to be just one thousand feet lower than Kilpatrick itself. Camp was reached at 7.30 P.M., after an absence of thirteen hours, and we voted the expedition well worth the trouble it had cost. It is undoubtedly one of the finest snow climbs in the district.

In 1908, we had picked out an apparently practicable route up the southerly face of Mount Dawson, and ever since we had been reserving it as a sort of consolation prize in the event of failure on any of our other ventures. Now that Kilpatrick had fallen, however, there would be no need for consolation in that quarter and, as regards Augustine, it would be for our advantage to take time by the forelock and get the consolation first, since it was evident that for this climb we must fortify ourselves in every possible way. Moreover, the crags of Dawson would afford a splendid opportunity for examining our most baffling adversary near at hand. Altogether, the time was clearly ripe for Dawson, so on July 21st we started off.

It was a glorious morning and a crisp breeze from

The Bishops glacier made our cheeks tingle as we wended our way over the frosted meadows, dotted with pink and white heather. A short half-hour served to bring us to the ice and the unpleasant preliminary scrambling along the terminal moraine, but beyond, we moved along rapidly over the smooth, snow-covered glacier which stretched away a mile or more to the base of the peak. We directed our course towards the great shoulder that makes out into the defile from the mountain's precipitous face, and by the gentler gradient of its ridge reduces the average steepness. This we hoped to attain by way of the slope descending towards us nearly at right angles to the trend of the mountain. A previous view from Mount Cyprian encouraged us to believe that we should find good going the remaining distance to the summit. Mount Dawson on this side resembles a steep-sided, wedge-shaped pinnacle set high upon a relatively large base.

When sufficiently near, we saw that the shoulder belonged to the type of slab or plate construction, with the cleavage running at about the inclination of the slope and forming smooth reaches intersected by cracks and narrow ledges loaded with scree. An easy scramble over talus brought us to this portion, where advance became comparatively difficult. Though the slabs were only inclined at about 45°, the slope was of that tantalizing description that is just too steep to walk up. Still, we managed to push ahead, now digging out a foothold in a crevice, now sliding across a narrow crack, now crawling on all-fours up some smooth gully. Here and there on conspicuous rocks we set up little cairns to mark our route, for, owing to the change in the shadows, a slope which one has ascended in the morning is likely to present a strange aspect upon returning later in the day, especially when seen from above.

In a little more than an hour after leaving the glacier, the gradient became gentler, and shortly we found ourselves on the broad rock-strewn back of the shoulder. It was about a quarter of a mile square and sloped grandly up to the crags of the peak's southeastern arête. We sat down for a few moments to enjoy our second breakfast and the splendid alpine picture presented by The Bishops Range across the valley to the south.

As we followed the edge of the shoulder towards the peak, it became considerably steeper, and the rock gave place to snow. Luckily this was in good condition, so that we were able to kick steps in spite of the ever-increasing acclivity. Eventually, at about ten thousand feet, we reached the middle one of the three curiously converging ribs that descend from the eastern extremity of the peak. In some places it barely projected above the snow, but for the most part was submerged. This made it rather awkward, for the noonday sun was rapidly reducing the snow to a semi-liquid consistency. Frequently we sank in to our waists, and only by vigorous packing could we obtain even a precarious foothold. The next rib to the left was entirely uncovered, so we determined to cross the intervening strip of snow in the hope of finding it an easier route. However, when we had waded half-way over, we were forced to turn back for fear that the mass would avalanche bodily over the cliffs below. Several miniature streams of hissing snow had already slipped down near us, showing that this sentiment was not entirely groundless.

Returning to the central rib, which at least possessed the advantage of safety, we continued to plow upward from rock to rock along it, though a cliff above warned us that we must eventually find another way. By 12.30 we attained an elevation of about 10,700 feet

without noting any chance of improving our route. It was discouraging to see our goal so near, with the odds so strongly against our reaching it. However, we kept doggedly on, hoping against hope that something would turn up to allow us to accomplish the apparently impossible. Luckily, we were not disappointed. Kind fortune smiled upon us in the form of one of those happy chances that so often save the day for the mountaineer in a moment of despair. Just below the summit ridge, we found a place where the snow, though soft, would furnish some footing. We might now cross the gully and make it after all! By stepping with greatest care, we finally reached the rib that we had tried to gain before. It was steep, but still practicable for a slow advance. Presently a chimney offered an easier passage, and our leader gradually worked his way upward. When he emerged, he stepped out onto the arête. Victory at last! The summit was as good as won, for we knew that here our steps joined those of our predecessors.[1]

We follow the chisel-edged grat, now gingerly balancing on a narrow crest of snow, now crawling up some tilted slab. A curling cornice cuts off our view directly downward into the abyss on the right, but the tremendous expanse of country visible gives ample proof of our exalted position. Soon we reach the final pinnacle. Here the cornice ends, and for a moment, while turning a corner, we are suspended dizzily on the northern face with glimpses of the Dawson glacier appearing between our feet as we climb. Presently we attain the topmost rocks, and Dawson's crest is once more linked to civilization.

It was 2 P.M. on an ideal day. A few fleecy clouds drifted slowly above us, matching in their purity the ice world at our feet and casting entrancing shadows on

DESCENDING THE FINAL PINNACLE OF MOUNT DAWSON

NORTH FACE OF SAME; MOUNT BONNEY IN DISTANCE

ON THE SUMMIT OF MOUNT DAWSON

LOOKING SOUTH FROM SAME ACROSS THE BISHOPS RANGE

peak and glacier. We felt as if suspended in mid-air, so vast was the extent of country commanded,—a veritable sea of snow-capped summits sweeping away ridge on ridge, until lost in the dreamy distance. Here and there, some mammoth mass reared his glacier-scarred head above the others, walled with mighty precipices. Eleven thousand one hundred and thirteen feet above sea-level, our resting-place possessed the distinction of being the then highest climbed summit in the whole Selkirk chain, only one higher being known,—Mount Sir Sandford towering boldly in the north. But I must renounce any attempt to describe or even to enumerate the principal features of the panorama. It is the same to-day and the only way to gain a true conception of its grandeur is to behold it in person.

We soon turned our attention to the baser things in our *rücksacks* which so delight the inner man after a toilsome climb. The barometer showed a rise of 4800 feet from camp, agreeing well with our estimate for its elevation, 6300 feet. We found two rickety cairns and what looked like a third partly buried in snow, but a careful search revealed only the record of Mr. E. Franzelin, left the preceding year. For our own data we built a smaller pile near the others and wedged in it a circular aluminum plate with the initials of the party and the date.

At 3.00 P.M. we started back reversing the morning's route. On the snow curtain, where we had kicked steps, we reversed methods as well, deeming it wise to descend the ladder-like slope backwards securely roped. The angle approximated 60° for a short distance. Camp was reached at dusk, and we felt that with our former ascents of Donkin and Selwyn we had gained a good working knowledge of the Dawson Range.[2]

It was now generally agreed that the hour was at

hand for trying conclusions with our arch-enemy, Augustine (10,762 feet). We had seen the peak from every side and nothing further could be gained by delay. Accordingly, taking a day of rest, we devoted ourselves to necessary preparations.

In form, the mountain is a narrow, fin-shaped spire, with one arête running down steeply to the col below Cyprian Peak on the west, and another at a more gradual slope to a low peak on the east. Both these arêtes are difficult to reach, and, moreover, are interrupted by abrupt drops which appear insurmountable when seen from below. The faces offer scarcely any more encouragement. Those to the north are smooth and extremely steep, partly rock and partly crevassed glacier. That to the south, though more broken and of a somewhat gentler average gradient, none the less rises in bold precipices near the top. As the least of these evils, we finally chose the south face for our first attempt, although not without misgiving.

As the day wore on, it clouded up and we had a thunder-storm which pelted the tent with hailstones as large as marbles. In the evening, however, matters improved, and we felt some hope for the morrow. When we looked out at 5.30 A.M., on the 23d, we were rejoiced to see that we need have no doubts on the score of the weather, so gathering up our impedimenta, we breakfasted and at 6.15 got under way. We took along an extra forty-foot length of rope and a pair of Indian moccasins to serve as *kletterschue*. After following the usual route over the spur of The Bishops Range, at 7.45 we came to a halt below the ice-fall of Black glacier to consider our next move. It turned out to be a rather more decisive one than we expected, for no sooner had we composed ourselves on the moraine, than a bowlder about the size of a barrel came crashing down the face

on our left, scattering fragments in all directions. Needless to say, we lost no time in seeking a more sheltered place for deliberation. The whole southern face of Augustine is rapidly disintegrating, every ledge and cranny being filled with litter. Ascending diagonally across the snow along the margin of the ice, we made for the inner end of a kind of shelf that jutted out from the main mass of the mountain and supported part of the glacier. If we could get onto this by working our way up the corner, a long détour over the ice would be saved. From there it looked feasible to make the face of the mountain that dropped off in cliffs everywhere else. Just below the shelf, the snow ended, forcing us to take to the rocks. These rose smooth and slimy, affording wretched holds. One of the party humorously termed the slope, a "mud precipice." But it was short and our nails were good, so we were soon on the shelf planning out our farther advance.

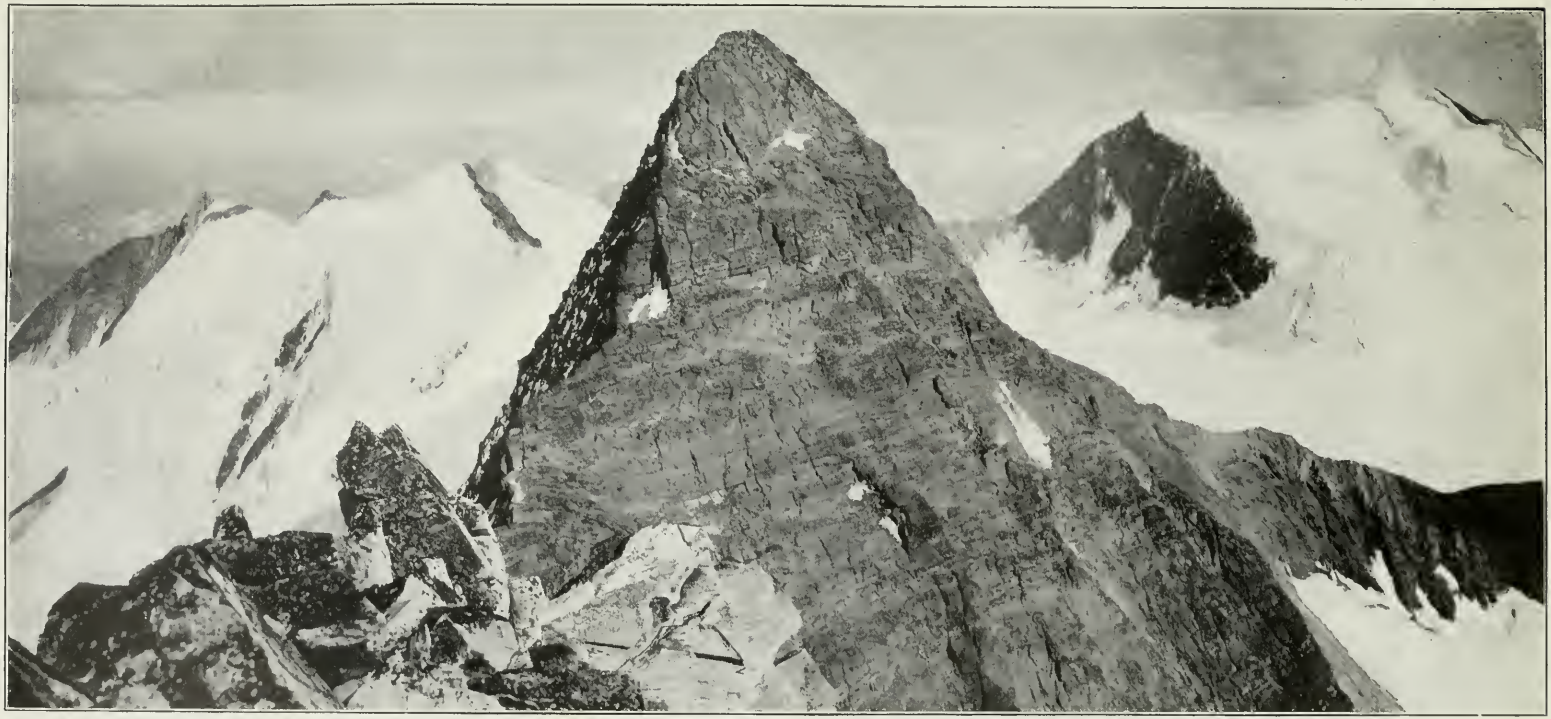
The peak was built up of thick rocky slabs arranged in rough layers somewhat like the shingling of a roof. In many places, the courses had broken off at the edges towards us, and, when we started on, our method of progression was to follow one course until an opening allowed us to pass through onto the back of the next. This was repeated many times for the next two hours. The higher we got, the steeper the strata tilted. At some points they broke out into ribs like the flutings of a column, though with serrated edges that gave us interesting climbing to follow.

At a small snow patch near the easterly end of the summit arête we encountered a steep wall, scarred by a chimney for part of its height. As we believed that the arête mounted a short distance above, it seemed advisable to pass it. Butters put on the moccasins and surmounted the chimney in short order. Then he

disappeared behind a ledge, leaving us only a gradually shortening rope and a steady stream of pebbles to show what progress he was making. Finally a shout from above told us that all was well, and we followed on the rope. We found the chimney simple enough, but the succeeding rock seemed destitute of holds. To make it without the assistance of a rope was indeed a skillful bit of work. No fastening could be found for the rope in descending, so we unanimously agreed to try another way.

Our position proved to be farther below the main arête than we had supposed, but still very favorable for an advance, since a broken ledge led upward to the left (west) across the face, apparently ending in the summit ridge. If this promise were fulfilled no better way could be desired, so we at once proceeded to test it. After conducting us across several interesting couloirs and around some dizzy cliffs, the narrow shelf did bring us to the shattered summit arête. The previous climbing had led us to expect that this ridge would be sharp and none too secure, but we were hardly prepared for the splintered knife-edge that confronted us. Almost everything gave a little when touched. It seemed as if the slightest encouragement would send large portions of the scenery crashing to the glacier. In fact, a good deal did go down as a result of our efforts to find *terra firma*,—perhaps even more than was strictly necessary,—for every climber knows the supreme pleasure in thus relieving his feelings at such places.

The arête was not entirely of rock. Here and there snow from the farther face reached up and hung from it as a cornice. This aided us in crossing deep gaps which otherwise we should have been forced to avoid by descending the face. At several points the



AUGUSTINE PEAK FROM CYPRIAN

Cyprian Augustine

ON THE SUMMIT RIDGE OF AUGUSTINE PEAK

THE SOUTHERLY CLIFFS OF THE BISHOPS

Augustine was ascended over the slopes to the right

arête rose in low towers that required the same tactics to overcome. In getting down one of them over a smooth slab we had to use our spare rope, leaving it in position until our return.

Soon we found ourselves at the place that we had picked out from below as the most dubious of all. It had appeared as a sharp notch with a vertical edge just to the east of the summit on the sky-line. This edge turned out to be nothing less than a practically sheer cliff rising perhaps thirty feet above the place where the arête joined it. To the left, a jagged rib jutted out precipitously from the main mass of the peak, entirely precluding the chance of a traverse on that side, while to the right, the smoothness of the face formed an equally effective obstacle. A way must be found directly up the wall from the arête or we were beaten. On either side of the arête by the cliff, gullies descended, on the one hand, almost straight down to the Black glacier, two thousand feet below, on the other, a like distance to The Bishops glacier. At the base of the wall, however, close inspection revealed a narrow shelf with a kind of smooth lip above it, about waist-high but projecting somewhat beyond the edge of shelf. A little higher there were good holds until another smooth reach was attained, but this we thought could be passed by way of a chimney.

I, being in the lead at this point, climbed down the snow, and crossing the notch with the aid of the rope, got onto the shelf; then, with a long reach out and over the smooth lip, I found holds above and pulled myself up into a sheltered corner. After anchoring there I assisted the others in joining me. Next the smooth slab was turned to the left and the chimney negotiated. It contained a "nose" which required some gymnastic contortions to pass, but otherwise seemed designed for

our purpose. The intervening distance to the top proved to be nothing but a short walk over sharp-edged fragments, and at 1.40 P.M. we arrived on the highest rocks. The actual summit was the extreme edge of a low cornice that overhung the face toward Mount Dawson, but several previous glimpses on that side had effectually dispelled all desire to look over. The day was perfect and our outlook correspondingly magnificent. The intricate system of the Selkirks lay extended before us, revealed to the finest detail. A particularly striking feature was Cyprian Peak, just beyond us to the west. Its rugged southern precipice, seen nearly in profile, looked particularly forbidding. We were interested to find that our cairn built a year ago still occupied its highest point. We photographed, lunched, and then erected a similar cairn visible from Donkin Pass, in which we deposited a small circular aluminum plate with our names and the date.

At 2.40 P.M. we started back. The same route was followed except that we found an interesting couloir leading down to a steep little snow slope by which we avoided the wall and chimney first mentioned. Then, instead of using the "mud precipice," we struck out towards the middle of the glacier. Camp was reached at nine o'clock after an absence of nearly fifteen hours. Mount Augustine, though perhaps lacking striking individuality when seen from a distance, nevertheless furnishes climbing of moderate difficulty continuously from the start. In addition, there is the interesting bit of arête work near the summit, undoubtedly the peak's most distinctive feature from the climber's point of view.

The following day was spent quietly in camp recuperating from the fatigue of the climb and preparing for a return to the hotel. Holway, the energetic,

ON THE SUMMIT OF AUGUSTINE PEAK

IN BATTLE VALLEY

however, could not reconcile himself to wasting an entire day in activity, particularly such a fine one, and, therefore, made the ascent of Mount Donkin alone during the latter part of the afternoon directly from camp. On the morning of the 25th, starting at 6.30, and leaving tent and outfit behind, we retraced our steps to the Glacier House, arriving at three o'clock in the afternoon.

NOTES, CHAPTER VIII

[1] The first ascent of Mount Dawson was effected August 13, 1899, by Professors Charles E. Fay and H. C. Parker. Subsequent ascents have been few: in 1901 (July 16th), Mr. B. S. Comstock of New York accomplished the feat for the second time, followed by Dr. August Eggers on September 4th; in 1902, the Topographical Survey occupied the peak in the course of its work; in 1904, Miss Gertrude Benham of England made the first ascent by a lady. With the exception of the one mentioned below, and our own, this completes the list,—not a very long one considering the lapse of time and the prominence of the massif in the range. Edouard Feuz, Sr., the veteran Swiss guide of the Selkirks, accompanied all these expeditions, dividing the honors with Christian Häsler in that of Professors Fay and Parker, with F. Michel in the case of Mr. Comstock, and with Karl Schluneggar in that of Dr. Eggers. On July 8, 1908, an Austrian engineer, Mr. E. Franzelin, made the first traverse of the whole massif of Mount Dawson. Leaving a camp near the glacier at 1.15 A.M., he ascended Häsler Peak by the usual route (5.45 A.M.) and then continued westerly along the ridge to Donkin Pass, apparently traversing the remaining summits. This notable expedition was carried out alone. See *Canadian Alpine Journal*, 1909, vol. ii., p. 141.

[2] The foregoing paragraphs concerning Mount Dawson are reprinted, with a few changes, from "A New Story About Mount Dawson," *Appalachia*, vol. xii., pp. 123–130.

CHAPTER IX

BEYOND THE PURITY PASS, 1909

The Passage of the Purity Range—Battle Glaciers and Battle Creek Valley—The Ascent of Mount Purity

THE country beyond the Purity Range to the south is essentially *terra incognita*. A strip averaging about four miles wide along the range is shown on the government map, but the data for this were obtained from distant photographs, and, as far as we could learn, no one had actually crossed the range to explore the district in detail. Below the strip the map is blank, except for the words, "Battle Range," in heavy type. Since our first view of this region from the Purity Range, it had strongly attracted us, and I think that we then and there pledged ourselves to accept the covert, though definite, challenge of the map at the earliest opportunity. By our successes in The Bishops and Purity ranges, we had pushed back the ranks of unvisited peaks not a little, and now there remained open from our base no more fascinating undertaking than a visit to the primeval fastnesses of Battle Creek valley.

Accordingly, after diligently devoting ourselves to repairing the bodily wear and tear incident to our strenuous campaign, by a regular attendance at the Glacier House *table d'hôte*, on July 29th, we set our faces again towards The Bishops Camp. Since our packs were comparatively light on this occasion, being

PURITY PASS AS SEEN FROM THE NORTH ACROSS BLACK GLACIER

THE PURITY RANGE FROM MOUNT PURITY; PURITY PASS IN LOWER LEFT CORNER

CYPRIAN AND AUGUSTINE PEAKS FROM NEAR PURITY PASS

limited mainly to provisions, we determined to push through the full distance in one day. Starting about nine o'clock, the Asulkan Pass was reached at two, Dawson Camp at 3.50, Donkin Pass at 8.10, and our destination at 9.30. Considering its 7400 feet of ascent and 5100 feet of descent, this trip of twelve miles across the two ranges with packs may fairly be termed a good day's work. We found everything as we had left it, and after resting a day we resumed the march to Battle valley on the 31st.

It should here be stated that we had already reconnoitered the route and found it feasible as far as the summit of the Purity Range. From the first, we had recognised that the chief difficulty in carrying out the scheme would be to find a way down the southerly slopes of this range, which from Kilpatrick appeared to present a continuous wall of forbidding cliffs. The northerly slopes, on the contrary, looked accessible everywhere, so upon the day following our ascent of Mount Kilpatrick we selected the deepest notch in the sky-line and set out to see if it would afford a passage. It took a morning's hard work to solve the maze of crevasses in the intervening feeder of Black glacier, but shortly after three o'clock we strode into the col. One hasty glance over showed that we had probably found a pass, for a steep finger of snow reached up from the farther glacier to our feet, neatly bridging the rock wall. Only a little of the descent was visible, and a brow in the glacier suggested the beginning of an ice-fall, but we unanimously decided that it was worth risking with the packs. The view of the abysmal valley of Battle Creek was grand beyond description. On either hand rose rocky walls fringed with riven ice cliffs, while through the depths stretched the immense Battle glacier, suggesting in its shroud of snow the

pallid corpse of a prehistoric monster. Across the valley in the background soared the nameless black peaks of the Battle Range in formidable array. Sharp ridges of nearly equal height walled in lofty glacier basins beneath which dark rocky slopes, shining with moisture, pitched steeply into the valley. The retiring snow-clad summit at the right, already seen from several vantage points, again appeared to be the primate of the group.

We left camp on the 31st at 8.30 o'clock and breasted the col with our forty-pound packs exactly seven hours later. Purity Pass is suggested as an appropriate name. The altitude, as shown by the map, is about 8700 feet. With scarcely a pause we plunged down the snow to the glacier and began a winding march between its crevasses. As we had feared, the crest seen from above concealed a large ice-fall. The glacier was gashed from side to side for about two thousand feet down. Surely our way was not there. Carefully following the edge, we turned to our left and made for the margin of the stream, where at length we were rewarded by the discovery of a moraine almost hidden under winter snow. Descending its curving crest, in about an hour we found ourselves at the foot of the ice-fall on the wide level reaches of the upper Battle glacier. The sun had now set for us, although it was but 4.30 o'clock, burying glacier and valley in deep shadow. Only Grand Mountain and the peaks in its chain were still bathed in bright sunlight. Haste was indeed imperative were we to camp before nightfall in the gloomy depression, three miles away, so, after but a moment's halt, we shouldered our burdens and resumed the march. The next two hours passed in a monotonous grind, first, through the slush of the glacier, then over the sharp stones of a great medial moraine which appeared to afford the quickest road.

LOOKING SOUTH FROM PURITY PASS

THE HIDDEN ICE-FALL BELOW THE PASS

BATTLE RANGE OVER BATTLE GLACIERS FROM MOUNT KILPATRICK

On our left, the other branch, emerging from the dismal defile between the walls of Mount Wheeler and Grand Mountain, joined ours, the two forming the mile-wide stream of Battle glacier, shaped like a huge letter Y.

Dusk was upon us as we approached the crest of the high terminal moraine which had hitherto concealed the depths of the valley. For the last four miles, our route had lain through a forlorn waste of ice, snow, and jagged rocks. A few sparse patches of green grass did indeed clothe the slopes here and there, but they only served to emphasize the barrenness by contrast. Not even a marmot's whistle had cheered us with its shrill note. Unless our surroundings changed very considerably in the next hour, a shelterless night on the stones of the moraine, with nothing to eat but crackers, chocolate, and dried fruit, was all we could look forward to. Accordingly, it was not surprising that we hurried rather anxiously towards the top. The scene which greeted us was indeed a wild one. Several hundred feet below a raging torrent foamed out from beneath the glacier, racing into a narrow gorge with a thunderous roar. Lower down it emerged, and we could follow its course for perhaps a mile farther, winding between banks densely overgrown with alders. There the valley widened out and its gradients became gentler, but of forest there was hardly a patch. Alders and steep rugged slopes were the rule. Nearer, on either hand, its sides slanted abruptly back in rough rock-piles, breaking into cliffs higher up where ice edged the sky-line and a ragged succession of sharp summits stood silhouetted against the evening sky. It was a rather disheartening outlook for a hungry party with nothing but green wood in sight for miles, but we could not be worse off than there on the glacier, so we prepared to

push farther down the gorge on the chance that something better would appear.

Just then what was our surprise to see, not two hundred feet away, a fine yearling grizzly bear. He had been travelling in our direction out of sight below the moraine, and his astonishment at suddenly finding himself face to face with three strange creatures was laughable to behold. He stopped short, looked us over for a full minute, then gave a deep "hoo wuff" and, turning around, disappeared. Regretting that our cameras were tightly strapped up in our packs, we continued down into the gorge. We had progressed but little, however, when above us on the mountainside not far off, lo, another grizzly was sighted, this time a full-grown female with a cub. She was nosing about in the alder bushes, obviously unaware of our presence and looking for all the world like a contentedly grazing cow. To one of us, at least, this was a novel spectacle, so we stood and watched them for a few moments. The old bear climbed up over a snow patch among the alders, apparently to better reach their tender tips. But the edge was too high for the cub, who could only get his front paws on it, so he hung there kicking ludicrously with his hind feet. The snow caving away presently, he tumbled down and had to seek a lower place. With no arms but our ice-axes, and no trees for miles, it did not seem wise to disturb the brute or to give her any reason for desiring to make our acquaintance, so we slid down the slippery forefoot of the glacier to the edge of the torrent and pushed on down the valley, rather anxious, it must be admitted, as to whether there were any other specimens in the menagerie.

After a half-hour of rough work among the bowlders along the stream, we reached the more open portion of

CAMP IN BATTLE VALLEY

THE MATTERHORN-LIKE TOWER

the valley and soon found a place in an old avalanche track where dry wood was abundant and the tent could be set up among the stones. It was anything but an ideal camping-spot. The only place for a tent was a six-foot stretch of water-worn rocks, the interstices between which were only partly filled by glacial silt, leaving their tops to indent the weariest portions of one's anatomy. Moreover, even this small area had to be cleared of the ever-present alders. But we were in a far from critical mood, and, in comparison with what might have been our lot, this was luxury. A fire, soon kindled, dispelled the gloom and facilitated our lumbering and culinary operations. Ere long the tent was up, though rather precariously, and copious drafts of hot tea and pea soup were repairing the ravages of a hard day's work. We had climbed about four thousand feet under forty-pound packs, and had descended the same distance with six hundred feet more, covering ten miles through untraversed country.

Next morning we were up early to view our surroundings. In the darkness of our arrival, the heights had shown merely as dim shadows against the sky. Sounds of rushing waters in varying keys had reached us occasionally as the wind blew gustily down the valley, so we expected to see waterfalls not far away. Nor were we disappointed. Directly behind the camp a beautiful cascade leaped out of the sky and came dashing down over the ledges in a foaming thread. Farther to the right, another gushed out, draining a glacier which was partly hidden in a deep notch. Fifteen hundred feet almost straight above this, a single Matterhorn-like summit towered in lonely splendor, forming with its lower and more distant slopes the eastern wall of the valley. The corresponding wall at our backs rose even more steeply to a belt of cliffs that extended for two

miles along that side (west) and supported hanging glaciers as far as we could see. Its southerly termination was a sharp peak around which the valley swung abruptly to the west. All in all, the scene presented the sharpest contrast between heights and depths which we had seen anywhere previously.

After a day spent in improving the camp, we advanced down the valley, in order, if possible, to view its course beyond the turn. We followed a well-worn bear trail that wound through grassy alps, where evidently the animals often found comfortable quarters, to a point where the torrent entered a small canyon. Then we turned to the left, and, crossing a stream below a curious waterfall hidden in a cleft, struck up a very steep alder-matted slope, attaining at length an altitude of about 5800 feet—2400 feet above the valley. From here we obtained splendid views up and down its length, including one of a fine glacier basin below Mount Sugarloaf. We had come a distance of about a mile and a half from camp in an air-line, during which the valley dropped five hundred feet. The creek, in consequence, had in places cut its channel through the loose morainic material to a depth of seventy-five feet below the general level. Lower down at an altitude of approximately three thousand feet the gradient relaxed, allowing the stream to take a winding course through verdant meadows and groves of evergreens until it once again turned abruptly westward and was lost to sight. Numerous tributaries from the high glaciers of the Battle Range bounded down over smooth rocky slants to join it, in two cases issuing from hanging valleys that cut back into the heart of the range. Owing to the absence of trees on the valley walls, the U-shaped cross-section was admirably revealed, and it constituted one of the best examples of a glacial-trough valley that we

had seen. Our plan was to continue still farther, crossing if possible the prominent glacial saddle in the southeastern wall of the valley, but a heavy shower forced us to turn back just before we reached the ice. We arrived in camp about supper time, soaked to the skin. The rain continued intermittently, yet during the lulls we managed to cook and to dry our clothing.

In the morning, under lowering skies, two of the party ascended the glacier occupying the notch east of camp, and reached a knob near the arête joining Grand Mountain and Mount Sugarloaf. From this they obtained unobstructed views throughout the upper reaches of the valley. Everywhere steep rocky walls and jagged cliffs festooned with glaciers met the eye, making it apparent that the camp was not favorably situated for any ascents in its vicinity.

Rain again prevented our accomplishing anything the following day, and as indications promised a storm of several days' duration, at least, it seemed useless to remain longer, especially as our food supply was insufficient to allow us to move down the valley to a more favorable spot. Accordingly on August 4th we started back over the same route. Showers of rain and hail forced us to seek shelter under convenient bowlders from time to time during the march, and delayed us to such an extent that we had to cross The Bishops Range after dark. Camp was reached at 9.30 P.M., in a dense snowstorm.

Our experiences in the upper portions of Battle Creek valley correspond with those of W. S. Drewry of the Dominion Land Survey, who penetrated the valley from its mouth with a view to locating a survey station in the range. He states[1]: "I had travelled through some rough country but that into which we then entered

[1] *Ann. Rept. Dept. Interior of Canada for 1892.*

exceeded anything I had ever imagined to exist in Canada. On the first day we travelled from 9.00 A.M. until 6.30 P.M. and made two miles; while not more than three miles were accomplished in any one day. For miles our route was through tangled jungles of ferns, nettles, alders, and devil's club, and over slides of immense granite bowlders, guarded by thickets of the latter painful shrub." They were unable to reach the peak desired, being "confronted by sheer precipices of rock or ice at every attempt." There is little doubt but that the Battle Range on this side is one of the most difficult in the Selkirks from the climber's point of view. The valley is a low one, which means a long pull to timber-line and a bivouac there before snow- and ice-work commences. Conditions ought to be more favorable on the south side of the range, but even here the sharp aiguilles and threatening towers will doubtless offer most interesting problems.

On August 5th, the elements continued their hostilities, battering us with snow and hail. The thermometer stood at 38° all day, unusually low, even for this altitude where the average of nine early morning readings was 44°. On the 6th, however, it went still lower, reading 34°.

During our various excursions, we had been much impressed with the symmetrical beauty of Mount Purity, and having read the glowing accounts of the first and second ascents of the mountain we felt that we could not afford to miss it. Accordingly, as the weather on the 6th appeared to have resumed its good behavior, we started off at 6.45. The day, as is always the case in the Selkirks, after a hard storm, was exquisite. The contrasting colors of forest, snow, and sky, shone to perfection in a brilliantly transparent atmosphere, while soft woolly clouds, scattered here and there, added

MOUNT PURITY FROM AUGUSTINE PEAK, LOOKING SOUTHWEST

Purity Pass lies in the notch directly below the summit

THE BISHOPS CAMP LOOKING WEST

MOUNT BONNEY FROM THE SOUTH

effectively to the backgrounds. An hour from camp found us at the toe of Black glacier (elevation about 5900 feet by aneroid), which there is reason to believe is rather longer than shown on the map. Crossing the stream here, we walked down to a slope of moraine which led upward around the base of a cliff. Ascending this for a short distance, we traversed below the tongue of a long, slim glacier, then over more moraine to a grassy ridge, keeping generally in a southwesterly direction. Striking up the ridge, we soon came to a mossy flat where the remains of the Huber, Topham, and Forster camp were found. Down the valley Mount Bonney showed up conspicuously, a huge glistening mass of ice and snow. After another brief climb, we reached a stretch of green plateau that conducted us to the foot of the glacier flowing through a rock-bound trench from Mount Purity itself.

This glacier would be worth a careful examination, for, as we travelled along, it seemed to be of the "parasitic" type, with a transverse as well as a downward flow, owing to the presence of a peculiar drift of snow running lengthwise on its surface. A half-hour's walk along the easterly margin brought us at 11.00 A.M. to the foot of the ascent proper, a steep snowy slope leading to the peak. We mounted over loose rocks at the left to a point about half-way up and then, encountering ice, traversed across the face to the right (south) until we gained the west arête. Over this we made our way leisurely to the summit, arriving shortly after two, a little more than seven hours from camp.

O, fortunati! O, terque beati! once again had benign nature granted us the choicest reward of the faithful mountaineer — balmy summit weather. Salubrity, coupled with Purity, what more could be desired? After the days of cold and storm which had been our

portion, it was bliss indeed to relax upon our snug perch and devote ourselves to unalloyed enjoyment of the dazzling world about. And not a little there was to enjoy, for the mountain, although not one of the highest (10,457 feet), is a splendid observatory. Situated well away from the backbone of the range, it commands a sublime panorama, including even the peaks about Rogers Pass, which from most of these southern mountains are hidden by the great wall of the Dawson Range. Towards the westerly quadrants, also, the outlook is superb, sweeping over a vast extent of territory.

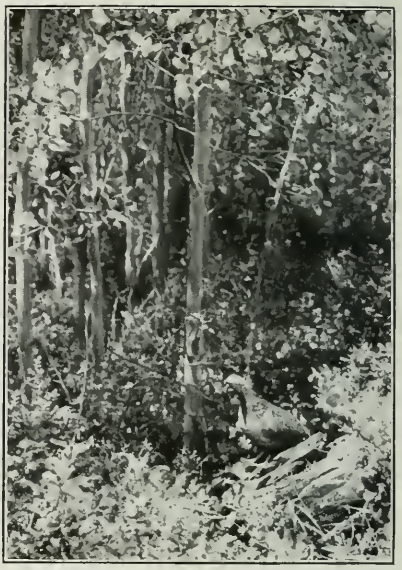
We basked lazily in the sunshine for an hour and then commenced the return journey by the same route. On the way down the arête some one exclaimed, "That 's a typical Selkirk landscape, if there is such, and I must have a picture of it." Whereupon the others bethought themselves of their cameras and the three clicked almost in unison. Clouds, lights, and shadows, being particularly lovely, the views all turned out well. Camp was regained at 7.40 P.M., four and one-half hours from the top. Mount Purity is unquestionably the easiest expedition for its height in this locality. Not a *bergschrund* or crevasse worth mentioning was crossed by us and as long as snow remains on the west face, no difficulty need be anticipated. If ice is encountered on the traverse to the arête, however, the labor would be considerably increased.

The time had now come for retracing our steps to the railway, but before taking leave of The Bishops camp, where so many delightful hours were spent, it may be of interest to allude more particularly to its surroundings and attractions. On one side, but a few rods away, stretched the brink of the ravine occupied by Mitre Creek; on the other lay a heap of bowlders, one of which served as a back for the fire, and at the same time as a

A TYPICAL SELKIRK LANDSCAPE

Looking westerly from Mount Purity; there are several thousand square miles of such territory in the Selkirks

Photograph by F. K. Butters



Photograph by E. W. D. Holway

A SMALL MARMOT AND A "FOOL-HEN"

A TAME MARMOT, "BIG BILL," VISITING THE FIRE AT THE BISHOPS CAMP

rude table for supplies. Between, the ground sloped gently down to a small green flat near the spring. On this slope we were forced to set up the tent, for we could not find a level place otherwise adapted for it. Although the nearest standing trees grew some distance away, a good supply of firewood was at hand in the shape of numerous dry trunks that had long ago been felled by an avalanche. The spring furnished us with a constant supply of delicious water, and as its temperature remained always at 38° Fahrenheit it undoubtedly was of subterranean origin. Next season it read 40°.

Marmots and pikas, or little chief hares, abounded in the rocks. During our fortnight's stay the former got quite reconciled to our presence, one, which we nicknamed "Big Bill," even becoming tame enough to approach the fire while we were at work. He developed an insatiable fondness for bacon grease, and the expedients to which he resorted for obtaining it, caused us a good deal of amusement at different times. But the tent always had to be carefully barricaded against them in our absence. The arch-enemies of these animals are eagles, which we saw often. The birds have a crafty way of swooping suddenly over a ridge and catching the marmots away from their holes. Whenever a chorus of excited whistling reëchoed between the walls of the valley, it was a safe wager that an eagle was somewhere in sight. It is laughable to come upon a marmot so unexpectedly that he does not have time to finish his warning before dodging into his burrow, for the rest of the piping emerges from underground in a muffled, spasmodic diminuendo. The pikas worked incessantly among the grass and pulsatilla, cutting little bundles and laying them out on the rocks in the sun to dry. Later, gathering up the hay, they packed it away in their retreats under the stones for consumption during

the long winter. Busy indeed were they, and seldom did a half-hour pass on a pleasant day without their plaintive squeaks being heard, like the bleats of a very young lamb, as they ran to the tops of the rocks to see if danger threatened.

The sun, rising over The Bishops Range, used to strike the tent promptly at 7.30, serving thus as an excellent alarm clock. Owing to lack of shade, the camp got pretty warm at midday. The large, aggravating bull-dog flies then began to dart noisily about, forcing one to be on one's guard constantly, but as we were spared the plague of mosquitoes and porcupines, we felt that we were getting the best of the bargain. The bull-dogs are remarkably tough and a really hard blow on a firm surface is necessary to kill them. They usually fly gaily away after a cuff that would make an ordinary dog howl.

One day we were startled by a dull rumbling and crashing of rocks. Across the valley, from the long spur of Mount Purity a great section of cliff had fallen, leaving a scar plainly visible for miles, and clouds of dust were rising into the air. On another occasion we saw a great stone drop from the precipice of Cyprian. Degradation is proceeding at a rapid pace in the Selkirks and the mountains are frequently not as substantial as they look. They have, however, by no means reached the lamentable state of disrepair which characterizes the Rockies and, comparatively speaking, the rock is sound.

Singularly enough, although the camp stood in close proximity to the giants of the range, none of them were conspicuously in view. Up the valley, the massif of Dawson was dwarfed by foreshortening into an almost insignificant rock pile, the peaks appearing of the same height; while even Donkin, directly overhead, lost all

semblance to its usually well-defined pyramid. In the other direction, the shoulders of The Bishops Range swept down in dreary, treeless slopes of broken stone. To the west, however, the prospect was of quite a different character. There we looked out through the vista of the valley to distant snowy mountains. Resplendent indeed were they in the face of the setting sun, or when bathed with the lustrous sheen of the moonlight. Even on stormy days when scarfs of cold gray vapor floated darkly around their crests we were wont to watch them with pleasure. But I think that the sunsets were best of all. I remember one evening when we were returning down The Bishops glacier after a successful climb. From that loftier vantage point, the eye could penetrate to a vast distance across a seemingly endless succession of snow-capped ridges and peaks. As the orb sank, a wonderful flaming yellow light poured over all, shooting up in radiating rays behind a dense band of purple clouds and kindling into soft effulgence occasional vagrant curtains of mist. Higher still, as in a molten sea, floated dark mauve argosies, outlined in fire. Finally, as the glorious beams pierced some rent in the dusky vestment, a warm, rosy afterglow suffused even the zenith—a bright farewell.

Mount Purity was the last expedition we made from The Bishops Camp and the next day we returned to the Capuan luxuries of the hotel, taking two days for the trip.

CHAPTER X

AN EXCURSION TO GLACIER CIRCLE, 1910

The Deville Glacier—Ascents of Mount Topham and Mount Macoun

ONE interesting locality accessible from Glacier House there was, which we had not visited—Glacier Circle. We had indeed gazed into its depths from the neighboring summits of Fox and Selwyn, but as our lines of march had taken us elsewhere, these distant bird's-eye views constituted our only acquaintance with its charms. Accordingly, when, in the summer of 1910, the opportunity of making a journey thither presented itself, we grasped it with alacrity; the more so, when it appeared that no one had been there since 1890—that red-letter year in the annals of Selkirk mountaineering.

The same party of three having assembled at the hotel early in August, we sallied forth one morning at 7.30 A.M., our burdens reposing on the back of a pack-horse. The sky was overcast and a little rain fell as we pursued the windings of the Sir Donald trail, but our enthusiasm was proof against such dire manifestations, and we bade defiance to the weather. The way, we knew, would be easy and, if worst came to the worst, there was nothing to prevent a retreat. The horse served us well as far as the rock-slide below the cliffs of Sir Donald, but there no further progress was possible for it, so we shouldered the packs ourselves. The

climb over the long stony slope seemed interminable and our pace reduced itself to a crawl. Not until three hours after our departure did we reach the margin of the Illecillewaet névé. After taking some refreshment here, we roped and started up the gently rising trough of the glacier. Neither the walking nor the crevasses were troublesome and we pushed steadily forward.

The weather, however, had by no means played its last card, for as soon as we got well out on the névé, clouds began to make all about us. It was fascinating to see them gathering over Beaver valley to the left, and over Fish Creek valley to the right. Gradually they thickened, and then, stretching out and rising through Glacier Circle and the hollow of Geikie glacier, the two masses united just above the snow between us and Mount Fox. On the peaks at our backs a similar process was under way. Clouds seemed to sprout like magic everywhere, the whole phenomenon presenting a spectacle wonderful to behold. Thunder now commenced to grumble angrily, and in a twinkling the storm-cloud wrapped us in its chill embrace. A deluge of rain and hail beat upon us and not a thing could we see; the universe had suddenly turned completely white. We got out the map, located our position as best we could, and then set a course for Mount Macoun by the compass. The snow was visible around us for a radius of possibly ten rods. Butters, as last man, held the instrument and we tried to maintain a constant direction by keeping the rope straight, stopping now and then to consult the needle. We were on a down grade by this time and, as we knew that the crevasses made huge concentric circles about the funnel-opening of Fish Creek valley, we sought to cross them always at the same angle, and thus to check our line of march. Finally, we brought up short upon the brink of a great

abyss. It loomed darkly through the mist and its immense proportions were divined rather than seen. Feeling our way along the edge and sounding very carefully for cornices, we eventually passed it. Now the crevasses became more numerous, and it began to look as if we had lost our way and were getting into the ice-fall. We stopped to deliberate. No sooner had we done so, however, than a fierce squall smote us. The snow commenced to crackle and our ice-axes snapped and spit sparks so viciously that we threw them down some distance away in order to minimize the danger of a discharge. Sheets of soaking rain now poured down and so full of electricity was the air, that the drops of water crepitated from our hat brims. It was cold standing still, but we could not very well move on in total ignorance of what was ahead, so we bent our backs to the blast and awaited developments, meanwhile laughing the tempest to scorn with occasional derisive shouts. (What is more provocative of cheer at such moments than a soul-satisfying yell?) Probabilities of a wet camp below formed our chief anxiety, for our confidence in eventually finding a way out of the storm and down the cliffs of the Circle remained unshaken in spite of the Swiss guide's warning that the latter were impossible. Luckily, however, we were spared any lengthy speculation upon our predicament, for the cloud lifted as suddenly as it had come and we saw that we were, in fact, down in the stadium of Geikie glacier exactly as we had supposed.

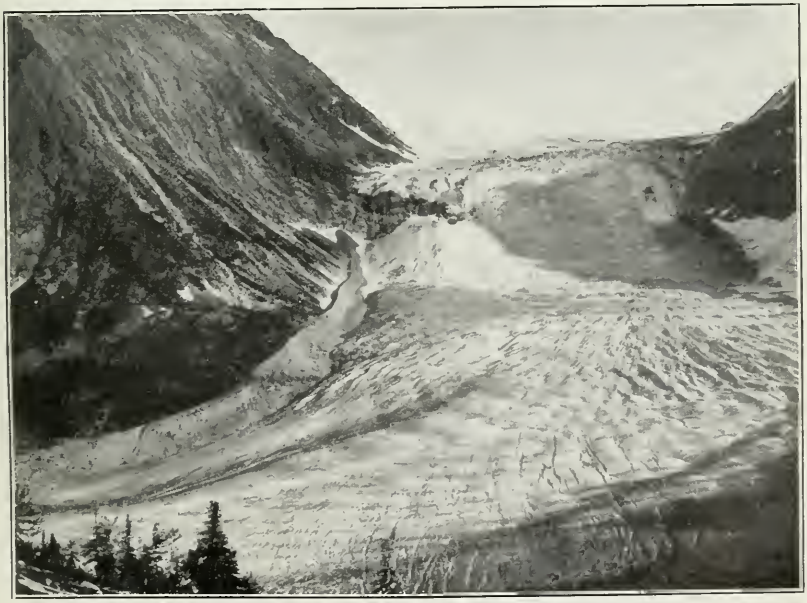
Gathering up axes and packs, we struck out at a lively pace towards Mount Macoun, overjoyed to be on the move once more. Not long afterwards we reached the edge of the cliff-girt amphitheater whose floor was our destination. It was a pleasant relief to unrope and rest on the outcropping rocks. A few rays of sunshine

lighted up the dark forests and meadows below, but the weather did not exhibit a very decided tendency to clear off. A cursory examination revealed an easy way down, first over the rocks along the glacier next Mount Fox, then over a moraine, so we took our time about descending. Upon gaining the edge of a small cliff we beheld a herd of seven goats, feeding and resting on the rocks. They had heard us coming and started off at once for higher ground. A dam and a kid ran out into the ice-fall and furnished an interesting spectacle in their endeavors to untangle themselves from the crevasses and cracks in which they speedily became involved. The old one would trot along a favorable lead until stopped by an obstruction, the kid running spasmodically after. Then she would solemnly look over her surroundings for a way out of the difficulty. Finding none, she would retrace her steps and start off in another direction where the same performance would be repeated. The other five goats, climbing across a steep snow-slope in a dignified procession behind a venerable patriarch, headed towards the north buttress of Mount Fox. There they made a successful landing on rocks that looked most forbidding from our position, and then scampered rapidly to the sky-line over which they disappeared. The leader would stop now and then to gaze at us in grave curiosity, but this our unearthly jodels invariably turned into terror and ungainly leaps. The instinctive ability of the Rocky Mountain goat to take care of itself in any predicament on crag or glacier puts to shame the efforts of merely human mountaineers. I do not know whether the animals can quite compete with the Swiss chamois of which it is credibly reported that they sometimes cross the Märjelen See by jumping from one floating cake of ice to another; but it is certain that the goats

display great intelligence in avoiding crevasses and making détours to find safe bridges. At half-past five we got to the bottom of the declivity and, after following down a shallow stream, camped near a cold spring (36° F.), at an elevation of six thousand feet. Overhead the cliffs of Mount Fox towered for more than four thousand feet.

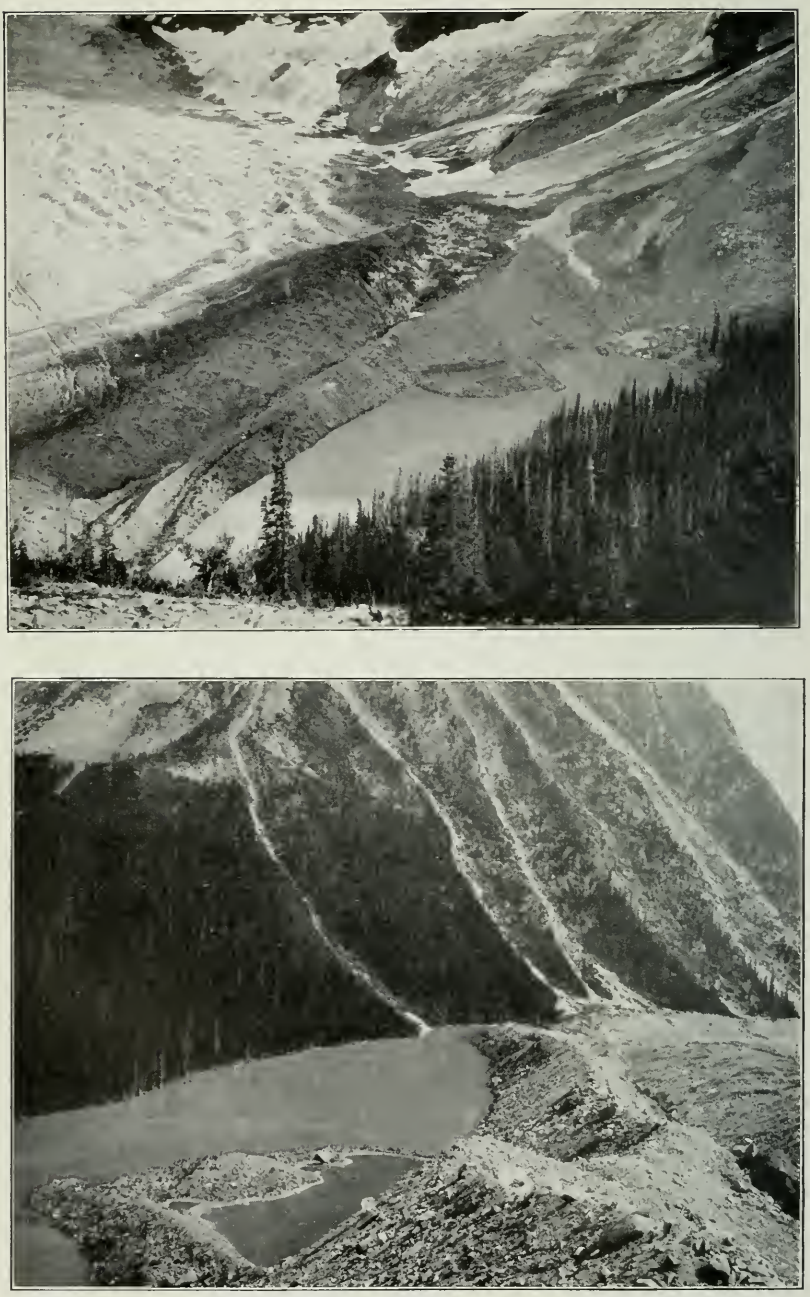
Next morning when I opened my eyes, the first thing I saw was a goat, grazing unconcernedly beneath the broken ice-cliffs of a glacier on Mount Fox. If a piece had tumbled off and hit him, as seemed likely, we would have feasted on mutton for supper, as the carcass would have rolled almost to the tent door. After breakfast, we continued down the stream and then walked over the Deville glacier to the base of the ice-fall. Fragments were constantly crumbling somewhere on its shattered cascade, and loud were the reports that reverberated between the cliffs. The Fox glacier as well exhibited considerable activity. The surface of the Deville is much broken by rounding hollows and knobs, and the crevasse system is complicated, although not very dangerous. We strolled down the middle of the stream to the bend, and then towards the easterly edge, getting fine views in every direction. Rain prevented our attempting anything of importance, however, so we soon turned back towards camp. Owing to long, longitudinal crevasses we had to make many détours, winding back and forth as if in a labyrinth.

The trip afforded an excellent idea of the configuration of the Circle. It is really an immense alcove opening laterally into the range from Beaver valley. The grim duplicate promontories of Topham and Macoun form impressive portals on north and south, while as a connection between, runs an essentially sheer



THE NORTH PRECIPICE OF MOUNT TOPHAM

THE DEVILLE GLACIER BELOW SAME



THE TWO MARGINAL LAKELETS IN GLACIER CIRCLE

wall, a thousand feet high, in a deep horse-shoe curve. Towards the north and west, this is capped with the stagnant ice of the Illecillewaet névé. On the south, however, the Deville glacier pours its torn and crumpled mass over the wall directly into the Circle, and then, after reconsolidating, executes a majestic sweep of 90° out into the gateway. From the high notch between Mounts Fox and Selwyn, the Fox glacier contributes its no inconsiderable quota of ice, flowing steeply down, where it does not actually fall, to the trunk stream. Between the left moraine of the latter and the patch of forest which fills the middle of the Circle is impounded a curious marginal lake within which lies a second lakelet, entirely distinct and at a different level. Here is a prank of nature which will interest the student of geology. It is not unlikely that the smaller lake was fashioned by the melting of a large moraine-covered segment of the glacier after becoming detached, the superficial moraine forming a dam as the ice shrank. Altogether, these attractions combined to render Glacial Circle a unique and impressive, not to say comfortable, camp site.

We had rather hoped that it might prove practicable to reach Deville névé and its neighboring peaks, as had been done twenty years before, but our examination of the ice-fall led to a veto of the project. The passage in its then state would consume too much time to make the attempt worth while, even if some comparatively safe route could be devised, a matter by no means unattended with doubt. In recent years, the Deville, in company with the majority of glaciers in the range, has shrunk to a marked degree, and this shrinkage has undoubtedly affected the conditions of passage for the worse. It was in order, therefore, to seek compensation for our disappointment, and to this end we determined to

essay the ascent of Mount Topham (9480 feet), an expedition holding forth many inducements aside from the fact that it had never been climbed.

On August 6th the weather cleared, but we did not get away for the mountain until the scandalous hour of nine o'clock. This might be taken to indicate a rather disrespectful estimate of its defenses, but nothing could be farther from the truth, for we really had no idea of how we were going to realize our aim. Every side that we had examined displayed unprepossessing cliffs, and our only crumb of comfort was the lack of positive knowledge that the unseen eastern face possessed a similar character. However, the confirmed mountaineer pins his faith to such blind hopes without qualm or question, and therefore we started off merrily enough. We gained the Deville glacier near the outlet of the lake and pushed straight across, first, over rough slimy moraine, then over beautifully white ice in which "blue bands" were conspicuously displayed. Quitting the glacier near the crevassed corner, we climbed a disagreeable veneer of moraine, insecurely poised on smoothly scoured bed-rock, and made a traverse along a steep alder-covered pile of detritus, where it abutted against the northerly cliffs of the peak. We soon came upon a network of goat trails, and these materially aided our progress through the thick evergreen scrub. The path-finding propensities of these animals is a continual surprise to the traveller. There is seldom a cliff, no matter how forbidding, that they will not have found the easiest way up or around. One is always safe in following such a trail, if by its direction it promises to be of any assistance. After several traverses at different levels and scrambles up connecting gullies, often pulling ourselves up hand over hand on roots and branches, we came out on the northeast shoulder of

MOUNT FOX ACROSS DEVILLE GLACIER

Note Forbes's Dirt Bands in the latter

From Glacier Circle

From Slopes of Mount Topham

MOUNT MACOUN

the mountain just above timber-line at 12.30. Here we halted for lunch.

Mount Macoun presented a striking aspect from across the valley, its profile forming a perfect isosceles triangle. Sharp as to apex and upstanding in stature, it looked immeasurably high and inaccessible—a truly ideal peak. But truth compels me to add that in other views its appearance is quite the reverse. Perfection in mountains, as in other things, appears far to seek. The easterly face of our adversary, now partially revealed, proved to be non-committal, presaging neither defeat nor success. The northeasterly ridge was clearly not to be considered, at least so late in the day, but the slope beyond would unquestionably "go," since grassy ledges led upwards for quite a distance. Accordingly, after a half-hour's rest, thither we directed our steps.

The first obstacle was a steep snow-slope, peppered with flakes of shale that had fallen from the cliffs. Lying at an angle of about 45° and being in shadow for most of the day, caution and energy had to be employed in kicking foot-holds across it. Moreover, the surface was crinkled into vertical ribs which did not tend to expedite progress. As we got out on the snow, the slope beneath reached farther down the mountain so that soon there was a giddy sweep into a rocky basin way below. Eventually our traverse landed us on the brow of a cliff where it was a relief to step onto the turf- and shale-covered ledges. Now we commenced to make height rapidly, heading diagonally upwards across the face of the mountain towards the south. The southeasterly arête was gradually defining itself thither, and we hoped that it would take us to the top. Our arrival was a dramatic surprise. Suddenly, and without warning, we found ourselves facing a great

cleft gouged deeply into the mass of the mountain. A glacier lay in the bottom, and thence the precipice shot abruptly up to the sky-line. Beyond the cleft, Beaver Overlook and the upper Beaver valley were imposingly in view. Our ridge, partaking of the general steepness, mounted rapidly, but not defiantly, so with renewed hopes of success we turned to the attack. Ledges gave way to crags, crags to cliffs, and cliffs to snow. The work was slow and interesting. At one place we were driven into the couloir itself with nothing under us but the glacier. At the snow, the ridge articulated with the face of the peak in a kind of outstanding shoulder, and upon this a great drift swept up to the final arête in a handsome ascending curve. Near the top it looked pretty steep, and the slopes on either hand were plainly so, but there was no cornice and we felt confident that success would be ours. Tying on the rope, we found the snow in excellent condition, and a few minutes later, at 4 o'clock, we climbed over the edge onto the summit rocks, near the northerly end. To the south lay another peak which the late hour forbade us to visit. So nearly of the same height was it, that we could not determine certainly which was the higher.

Commanding, as it does, the watershed from Mount Rogers and Sir Donald on the north to Mounts Sugarloaf and Beaver on the south, the outlook from Mount Topham affords perhaps the best view of the highest part of the range to be had in this vicinity. Fox, Selwyn, The Bishops Range entire, Wheeler, and Grand are taken in at one sweep. The unique feature is the absence of Mount Dawson which, although close at hand, takes refuge behind Selwyn, and one would not know that the highest peak of the range south of the railway had any existence. The shadows were already deep in Beaver valley and Glacier Circle so, despite the

THE BISHOPS RANGE FROM MOUNT TOPHAM

"AT SEA" ON THE ILLECILLEWAET NÉVÉ; SIR DONALD AND TERMINAL PEAK

MOUNTS SELWYN, DAWSON, AND FOX FROM MOUNT MACOUN

overwhelming attraction of a wonderful sunset, at 4.30 we had to start back. Our return was made by exactly the same route except that we found an excellent goat trail which took us directly to the tongue of Deville glacier. We got onto the ice with ease and thence reached camp at 8.30 P.M., after an absence of eleven and a half hours.

On August 8th, after a day spent in leisurely enjoyment of the beauties of the Circle, partly from its northerly slopes beneath Mount Macoun, we returned to Glacier House. The weather was unexceptionable and we started at 5.30 in order to take in Mount Macoun on the way. A short two hours brought us to the névé and then we struck out for the peak. After digging a hole in the snow in which to leave our packs, and prevent them from sliding bodily off the slope into the Circle, at 8.40 we attacked the rocks. The climb proved to be interesting in places, but a large part of the way was merely walking and scrambling over loose stones. At 10.15 we stepped out on the summit. The ascent was well worth making for the view, if not for the reason that it had been effected but once before and by a different route. The outlook across Glacier Circle to the Dawson Range is very fine. Again we found a second peak competing for summit honors, but on this occasion we climbed both. Mount Macoun is 9988 feet high.

After luncheon and photography had been disposed of, we started down at 12.30, and an hour and ten minutes later we were getting under our packs. Now came a monotonous trudge over miles of pitted névé beneath a blazing sun. We looked for the vast caverns into which we had peered through the fog but could not identify any, although we passed several. At first, the snow rose gradually, but soon there ensued a tract which appeared flat. Only the tops of the near-by mountains

showed and one felt as though one were at sea, but with snow replacing the water. The effect was especially marked to the south, where the eye swept entirely across Glacier Circle, and Deville névé seemed to be only an extension of the Illecillewaet. The down grade commenced imperceptibly, but gradually rising slopes on either hand indicated the beginning of the Illecillewaet glacier. A heavy cloud was rolling itself up over Fish Creek in a business-like manner when we got to this point and we made haste to get off the ice before the storm broke. It did not materialize, however, but vented its force in a few rumbles of thunder. We gained the rocks at 4.15 and after a rest of twenty minutes for refreshments, continued downwards over familiar ground, arriving at the hotel at 6.30. We had been on the go for eleven hours, part of the time under fairly heavy packs.

Glacier Circle is one of the delightful spots accessible from Glacier House that many persons would visit if encouraged to do so by the construction of a cabin. The ordinary traveller does not include tent and camping appliances in his baggage, and as these are not procurable locally, he is mainly limited to trips performable in a day from the hotel. Here, however, is a magnificent alpine glen, approachable over an exceedingly novel but perfectly easy route, well within the powers of a moderate walker, and it is much to be desired that those in authority should supply the modest facilities required to make the excursion more widely available.

GRAND MOUNTAIN AND MOUNT WHEELER ACROSS DEVILLE NÉVÉ, FROM MOUNT TOPHAM

MOUNT TOPHAM FROM THE BEAVER VALLEY SHOWING NORTH AND EAST FACES

Photograph by E. W. D. Holway

GRAND MOUNTAIN FROM MOUNT SUGARLOAF

Photograph by E. W. D. Holway

CHAPTER XI

TO THE SUMMIT OF GRAND MOUNTAIN, 1910[1]

AMONGST the bold peaks at the headwaters of Battle Creek, where the southerly portion of the range culminates in magnificence as at the adjacent Mount Dawson it culminates in altitude, there is no more imposing massif than Grand Mountain. Discovered as early as 1890 by the Anglo-Swiss party—pioneer explorers of the region—and named and photographed by the Topographical Survey in 1902, its continued immunity from visitation bears striking testimony to the wild and inhospitable character of the surroundings. The Survey accorded the summit an altitude of 10,832 feet, placing it at the head of the list of unclimbed peaks in the locality.

The mountaineer who delights in the rare pleasure of a first ascent could scarcely desire a prize better worth the toil of capture. But that toil to a considerable amount would be involved in the undertaking, was apparent at first glance. An intricate system of glaciers and névés surrounded the mountain on every side, fourteen miles of chaotic alpine territory cut off access from the railroad, and no suitable camping-place existed within easy striking-distance of the peak. However, set off against these impediments, Professor Holway and the writer had the advantage of acquaintance with a large portion of one route of approach, and strong reason to believe

that no impassable obstacles existed in the remaining interval. Accordingly, during our stay at Glacier in 1910, we resolved to attempt the ascent. (Professor Butters had taken his departure.)

Our plan was to carry five days' provisions in the packs and to cross the Asulkan and Donkin passes to our Bishops Camp of previous years. From there, making an early start, we hoped to reach the mountain by a roundabout tramp of eight miles more over The Bishops glacier and the Deville névé. In order to save ourselves as much as possible, we gladly accepted the offer of Mr. S. H. Baker of Glacier, to transport our burdens to the summit of the Asulkan Pass on one of his ponies, a feat which had never before been accomplished, and which the Swiss guides had often avowed no horse could achieve.

Under lowering skies, our party of three left the hotel at 6.45 A.M. on August 16th, the horse loaded with some seventy pounds of duffle in two packs. We experienced no difficulty in getting onto the ice, whose smooth and gently rising surface afforded excellent travelling. The first crevasses soon presented themselves, but the horse stepped over without hesitation. As they became wider, more time was consumed in finding a favorable point for crossing, yet the animal did not balk, and a sharp "Now, Pete, jump!" from his owner never failed to land him successfully on the farther side. Finally we came to what was evidently the crucial portion of the trip—a steep snow-slope which we had to go down to reach the depression leading to the pass. The declivity was probably not above 35° degrees, but a slip would have started the animal towards some ominous-looking holes at the bottom. However, under the skillful guidance of Baker, the horse descended on his haunches in a zigzag series of slides and shuffles, as if ne-

THE FIRST HORSE TO GAIN THE SUMMIT OF THE ASULKAN PASS

THE ASULKAN VALLEY

The Pass is in the background to the left

THE GEIKIE GLACIER AND MOUNT FOX FROM THE WEST

Photograph by E. W. D. Holway

THE BISHOPS GLACIER AND PASS

gotiating glaciers were the least of his accomplishments. Our amazement abated somewhat when we were informed that during the winter he was turned loose on the Kootenay plains, where, to reach feed, the animals are frequently forced to cross rivers on ice jams. In this way they become accustomed to the appearance of cracks and crevasses. The remaining distance to the pass was covered without incident. The snow was hard, and an occasional testing of its condition at doubtful places was the only precaution required.

We reached the top at 9.30, where our steed was photographed with the Dawson Range as a background in order to allay the skepticism which no doubt would later be manifested. Leaving the horse tied to a staff fixed in the ground, Baker accompanied us for some distance down the southerly slopes of the pass, in order to gain a view into the depths of Fish Creek valley. We afterwards learned that the animal freed himself, and made the return journey across the ice alone, following the line of the ascent. He was found quietly grazing near the summit of the trail, having surmounted the snow-slope by vigorous leaps, as shown by deep tracks gouged in its surface.

After lunching at our old camp ground between the moraines of the two glaciers, where little water is to be had so late in the season, we continued towards Donkin Pass. The day had now cleared, and the sun shone with uncomfortable warmth. When we reached the névé of Donkin glacier, we found it very heavy going, and we would gladly have welcomed a horse with sufficient mountaineering ability to assist over this portion of the trip. We crossed the pass at 6.30 and an hour later arrived at our destination, where the tent was set up and supper cooked with the aid of a lantern.

We spent the following day in improving the camp

and preparing for the main ascension. The weather was perfect, showing no indications of a change up to nightfall. This was encouraging, for, although we had chosen for the expedition a period following a several days' storm when the air was free from smoke and fine weather might fairly be counted on, so variable are atmospheric conditions in the region that occasionally even this precaution is of no avail.

The interest of our evening culinary operations was considerably increased by an active mountain rat which flitted about the camp-fire like a shadow. We paid little attention to him until he had opened a large hole in the sugar-bag, but then it seemed advisable to put a stop to his depredations. Having no fire-arms, we attempted to strike him with an ice-axe held motionless over a bit of bacon as bait. Though the rat several times came directly under the poised axe, so wonderful was his quickness that it was impossible to bring it down before he got away.

At midnight we were stirring, but, reassured by the wonderfully brilliant stars, we did not turn out until 3.20 A.M. At this hour, a mat of fluffy clouds checkered the sky and imbued our surroundings with a chilly gray effect that impelled us to crowd closely over the crackling fire—a silent pair, each no doubt questioning himself as to whatever it was that brought him into this remote corner of the world to be cooking at such an unearthly hour an unpalatable mixture that he did not want in the least. However, such are the usual symptoms of a mountaineering party thus early in the day. How fortunate it is that they are always forgotten in the interest of subsequent events! At 4.20 we set out over bowlder-strewn flowery slopes, alternating with rock-falls, towards The Bishops glacier, where, twenty-five minutes later we found excellent walking

on the crisp, hard-frozen surface. Ahead, through the bold gateway of the pass, a growing brightness indicated approaching day, though with scarcely sufficient emphasis to allay all anxiety on the score of the weather.

It was not until 6 o'clock, when we were breasting the crest of the pass, that the more distant horizon then commanded gave, by its clear rose and lemon tints, the desired assurance. The sun had come up behind a bank of leaden clouds, but, emerging, shot a sheaf of rich red rays towards us, touching the icy spires of Mount Dawson and The Bishops Range with a superb molten glow. The Bishops Pass is a broad, flat terrace of ice, from which The Bishops and Deville glaciers descend on west and east respectively in long unbroken slopes of easy gradient. Contrary to our recollection, the summit was considerably crevassed, forcing us to make détours and cut occasional steps to attain it. This and an apparently increased steepness near the top may possibly indicate the beginning of a period of activity in the glacier. For the past three seasons there had been no appreciable change in its condition.

The farther branch of Deville glacier was largely snow-covered, so we put on a doubled rope leaving about thirty-five feet between us. When there are but two in a party, this method is safer, since, if the leader drops into a crevasse, his companion can separate the ropes and fasten one to his anchored ice-axe, by pulling upon which the fallen member may aid in his own rescue. The snow was in the best of condition, and we took the down grade at a lively pace, reaching the end of The Bishops Range forty minutes later.

Here the way swung abruptly to the south around the east end of the range onto the broad expanse of snow—level for the most part, but sometimes rising gently in low swells—named in honor of the surveyor-

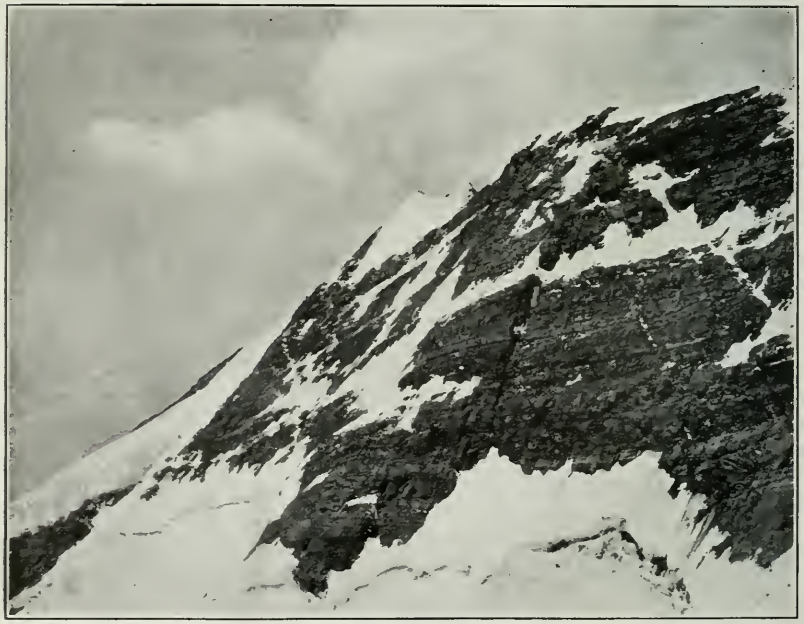
general of Canada, Deville névé. A dearth of crevasses, combined with the firm footing resulting from a cold night, enabled us to make such good progress that at 7.53 A.M. we were passing the east face of Mount Wheeler, and approaching the large *bergschrund*, which all but cut off access to the steep snow curtain of its southeasterly spur. Fortunately, there was one promising bridge above the ice-fall of Grand glacier, and towards this we directed our steps. It was about fifty feet up the slope, in a thrilling situation; but when we arrived at the lip, we found it admirably suited to our purpose. Without this single practicable link between the firm snow on the mountain and the active snow of the névé, Grand Mountain would doubtless be lacking the frail monument which now adds some three feet to its altitude.

The slope above—about four hundred feet of ice thinly veneered with snow—rose at an angle of nearly 50°. The snow packed sufficiently well under foot and afforded a solid hold for our axes, so the margin of safety was ample; but we could not avoid speculating as to the effect of the mid-day sun upon its consistency, when occasionally at softer patches we struck through to the ice beneath. About half-way up, the muffled splashing of running water was indefinitely audible, and not long after, the leader's axe went through into space. It was an eerie place to discover a crevasse, but a short traverse brought us to solid snow once more. Gradually the slope became gentler, and at 9.08 A.M. (a little more than half an hour from the bottom), having surmounted the crest, we halted for breakfast.

Grand Mountain was in plain view near at hand. A heavy mantle of névé, divided by a few large crevasses, swelled upward towards the long crescentic arête, above which in the distance rose a sharp rocky gable of the

THE BERGSCHRUND AND BRIDGE ON THE WAY TO GRAND MOUNTAIN. THE ROUTE IS INDICATED

CROSSING THE BRIDGE



MOUNT SUGARLOAF FROM GRAND MOUNTAIN

EASTERLY CLIFFS OF GRAND MOUNTAIN

summit. Even after discounting appearances, as one must invariably among the mountains, it did not look very appalling, and we had no suspicion that this almost insignificant pinnacle was to form the most serious obstacle of the day. Toward the Beaver valley, the view was exceedingly fine, including the terminal buttress of Grand, Beaver Overlook, and the north branch of Grand glaciers, into whose valley tremendous masses of ice pour from all the near-by mountains. Between this and the south branch Grand Mountain forms a huge cleaver.

Resuming our way at the end of fifteen minutes, we followed a contour towards the arête, and after an easy ascent of an hour and a quarter over snow, reached the rocks, the first we had set foot on for nearly eight miles. The prospect now disclosed was of especial grandeur, since we looked down upon the huge area of riven névé that fills the depression between Grand Mountain and Mount Sugarloaf and serves as the reservoir for the shattered southerly branch of Grand glaciers. Of more immediate interest, however, was the easterly face of our mountain, which still rose four hundred feet higher in a black precipitous wall, for the most part too steep for snow to lie. The edge towards us, which we had scarcely noticed before, now stood revealed as the only possible route, and it appeared jagged and forbidding to a degree. From its base, a heavily corniced snow-arête curved towards us to an outlying peaklet at our right, and thither we presently continued in the hope that a closer scrutiny would dispel our forebodings. The hope was not realized, but we saw that there was nothing to prevent our getting as far as the rocks by way of the arête. At the summit we found a well-built cairn and, from some shreds of white cotton wound about it, judged that it was the work of the Government

Survey.[2] On the arête beyond some care was required owing to ice, to the cornice, and to a *bergschrund* that swung up to the ridge from below and cut directly through it. We crossed gingerly by a bridge on the very crest of the cornice, and then gained the rocks without further trouble at 11.40 A.M.

Our advance up to this point had been reasonably speedy and continuous. Enough vigilance had been required to make the route of constant interest, but no real difficulty had presented itself. Grand Mountain, however, was not to surrender without resistance, and, as we studied these final rocks, we realized that we were here facing a problem requiring careful consideration. Ahead, directly on the arête, two turrets of harder rock jutted out, one above the other, disputing all passage. To the right, a snow-slope covering treacherous ice swept convexly downwards to a precipice above Battle glaciers, that we divined rather than saw, while to the left, on the face already viewed, the rocks fell away with even greater steepness. Several trials to the right, where leads occurred, resulted only in failure, and we returned each time to the arête more baffled than before. Finally, a ledge leading to the left horizontally out across the rock face was spied, and one of us at the end of the seventy-foot rope edged carefully along it. The broken stratified character of the rock was a factor in our favor and encouraged us to use every exertion. The ledge crossed beneath the sheer face of the first turret and terminated near the corner formed by the intersection of its further face with the less abrupt slope of the mountain. In this recess was a series of cracks and ledges, by taking advantage of which the leader gradually wormed upwards. Before the full length of the rope was payed out, he found anchorage, and after pulling up one

ice-axe, aided his companion to join him. The lower tower did not exceed seventy feet in height, and the remaining distance to the top was merely a short scramble.

But from here the upper tower looked even more repellent. On the east it actually overhung, whereas to the west a snow couloir dropped spirally downwards in the direction of the steep ice-slope previously referred to. Where the snow abutted against the rocks they were either smooth or with crevices choked by frozen new snow, making an ugly combination. After careful study it was voted unwise to attempt a direct advance, and we started down the couloir in the hope of turning the obstacle by finding a chance to traverse out onto the west face. Presently we came upon a succession of ledges, formed by differential weathering in the strata, that offered possibilities, and, crossing to them, commenced an investigation. The courses tilted downward, forcing us to descend until a break gave a chance to rise to the next higher layer, which again led us down. The repetition of this process made upward progress slow, for we kept losing nearly as much altitude as we gained. Furthermore, there was barely headroom between the ledges, and they sloped outward, covered with a litter of numberless sharp fragments, to avoid dislodging which we had to be constantly on the alert.

The net result of these impediments was the consumption of an hour and a quarter in gaining the summit ridge, a vertical distance of probably not much over two hundred feet. From here to the top the slope was gentle but again icy and corniced, permitting only a slow and cautious advance, which the leaving of an ice-axe at the base of the first tower, in the belief that ice work was over, considerably retarded.

However, at 1.40 P.M. the last obstruction was passed and we rested on the small pile of rocks that projected through the snow and formed the summit. One of the first things to attract our notice was the vast bulk of the mountain. With its long summit ridge stretching out for a mile and a quarter in a rough semicircle, whose entire course is above the ten thousand foot level, it seemed more like a range than a single massif. We were not surprised to learn later from the map that even at the 9500-foot contour the mountain covers about three-quarters of a square mile. It displays several small peaklets besides the two main summits situated near the southwesterly end. The latter are so nearly of the same altitude that from the northerly one, where we were, the eye alone could not determine which was the higher. Observations by clinometer, however, indicated that we occupied the topmost point, though the difference probably does not reach ten feet. We regretted that time was wanting for a visit to the south summit, which could have been made without much difficulty.

The view from Grand Mountain is fully equal to any expectations its name may arouse. Higher than Sir Donald and occupying a somewhat similarly isolated situation, it commands an unobstructed panorama of the numberless jagged crests of the Southern Selkirks. Unfortunately, owing to smoke which had gradually drifted in during the day, we lost its full grandeur and extent; but enough was distinguished to make it fairly certain that nothing in this direction, at least for a long distance, attains an altitude greater than the mountain itself. Turning to the north and west, the Purity Range, with its numerous névé-basins overflowing into feeders of the Battle glaciers, was particularly striking. Excepting Mount Bonney, the more familiar peaks near the railway were either lost in the haze or

SOUTH PEAK OF GRAND MOUNTAIN FROM SUMMIT

THE FINAL ROCKS OF THE MAIN PEAK, SHOWING SIDE ASCENDED

GRAND MOUNTAIN SEEN FROM MOUNT PURITY ACROSS BATTLE GLACIERS

concealed by the lofty barrier of Mount Dawson. Easterly we looked down upon the gray-brown ridges of the Prairie Hills, gradually rising into the Spillimacheen Mountains farther south; and, but for the smoke, we would have seen the extended pageant of the Rockies beyond.

However, after all is said, the overpowering, dominant feature of the view was the endless array of glaciers and snow-fields that cuirassed each elevation along the range far into the dim distance, but was especially prominent in our immediate vicinity. With the possible exception of the landscape to be seen from Mount Wheeler, that about Grand Mountain is probably unique even in this region of universal snow; for in a circle of three miles radius, with our mountain as center, the area submerged beneath the ice, as compared with the area of uncovered land, stands roughly in the proportion of three to one, and the radius might be lengthened for a mile more without greatly lessening this relation. Below us, on the west, the immense stream of Battle glaciers coursed majestically down through its valley, striped with moraines and glittering with a delicate lacework of tiny rivulets. At its near margin two diminutive tarns sparkled. In the opposite direction we looked abruptly down on the dazzling névé of Grand glacier, draping the flanks of Mount Sugarloaf. It was indeed the sight of a lifetime, a sublime spectacle never to be forgotten.

Hours pass as minutes amid such surroundings. Even after we had lunched, photographed, and constructed a slim and rickety stoneman, we could scarcely believe that an hour and a half had sped by. Hastily strapping up our *rücksacks*, we put on the rope and started back. The afternoon sun had reduced the snow on the ice between us and the rocks to a mass of

slush, and, with merely a single axe between us, extreme care was necessary. Only one moved at a time, the other keeping what hold he could meanwhile. The axeless member finally caught up a sharp-pointed stone and utilized this to chop and clear his steps. It was a relief to reach the rocks. A trickle of water here, the first we had found, furnished a refreshing draft. The descent of the ledges and towers by the route previously used took about the same time, and at 5.40 P.M. we left the arête at the point first reached in the morning. The slope above the *bergschrund* consumed nearly double the time taken in its ascent, owing to the softer condition of the snow. Securely roped, we went down backwards, as if on a ladder, and did not quit the *schrund* at the bottom until 6.52 P.M. A partial collapse of the bridge as the first man crossed was an enlivening feature here.

Shadows were falling across the névé as we struck out for The Bishops Range, and the vivid tints of sunset softened the stern lines of the somber crags about us. In the east we watched the full moon gradually defining itself through the haze, and congratulated each other that it would not be on account of darkness if we spent the night on some cold couch. The two and a half miles to The Bishops Range were made in an hour lacking seven minutes, and then the up-grade to the pass commenced.

This proved to be a tiresome trudge. It was one of those tantalizingly gentle slopes that would have been easier to travel over if considerably steeper. Dusk made it impossible to follow our morning's tracks and obscured the indications of crevasses. Added to this the snow was thin and correspondingly soft and slushy. However, after an interval that seemed to be hours long, we finally got to the pass without mishap, and

welcomed the chance to take off the rope and rest on the moraine below Mount Dawson. It was an awe-inspiring and lonely spot, for the moon did not rise above The Bishops Range which cast a deep shadow over the floor of the pass. Here the network of crevasses was dimly revealed by a ghostly phosphorescent reflection from Dawson's snowy pinnacles high overhead. Not far away, the gaunt outline of a cliff marked the portal of the pass, while on the opposite side the dark precipices of Cyprian rose tier on tier in an imposing pile.

Refreshed by a bit of chocolate and a draft of clear glacier water, we resumed our way. It was actually a pleasure to feel rock under foot once more, even though that rock was lateral moraine. The signs of increasing activity noted in The Bishops glacier near the middle of the pass were here at the margin unmistakable. After an only too brief advance, we came upon a scene of frightful confusion. Crevasses gaped through the moraine in every direction, chopping it into segments that the pressure had reared up into hillocks twenty or thirty feet high, down the sides of which stones were constantly sliding to be engulfed in the dark caverns below. But for the amount of the morainic matter, which in many places was sufficient to jam the openings and form bridges, we should probably have had to stop and wait for daylight. As it was, we were just able to pick our way along, now traversing the mounds and hollows with utmost caution, again circling about a yawning hole whose presence was felt, rather than seen, through the darkness. Altogether the place formed a discouraging, not to say gruesome, finale to a long day.

After the lapse of possibly an hour and a half, we were much relieved to find ourselves on the bare ice once more. Spurred on by thoughts of the good things

in store, we made directly for camp, where, with the aid of the brilliant moonlight, and of a lantern left near the glacier in the morning, we arrived at 10.45 P.M. One member of the party was so thoughtless as to fall asleep on the spot, but the other most kindly kindled a fire, over which he prepared delicious soup and tea. These were consumed with great relish by both during the early morning hours, as the moon gradually sank behind the mountains. We had been absent from camp eighteen and one-half hours, of which sixteen were going time. The height climbed was 5200 feet, and the total distance covered was about eighteen miles.

The next day we reduced the larder still further, and then carried the equipment back over Donkin Pass to Dawson camp in a little over four hours. On the morning of August 20th we returned to Glacier House, thus completing one of the finest mountaineering expeditions we had ever been privileged to enjoy. We had traversed some forty miles of glorious alpine country and climbed nearly eighteen thousand feet, part of the time with packs.

NOTES, CHAPTER XI

[1] *Appalachia*, vol. xii., pp. 362–373 (revised).

[2] This is probably the only other occasion when any part of Grand Mountain has been visited. The following account of the trip is quoted from the *Annual Report of the Topographical Survey for 1909–1910*, Appendix No. 13, by P. A. Carson, D.L.S.: "We ascended Grand glacier and established Station XXIV. on Grand Mountain, lying between the two forks of the glacier (elevation 10,000 feet). . . . The ascent of Grand Mountain (August 7th) was very disagreeable, especially crossing the enormous crevasses of the upper glacier, it being necessary in some cases to descend a couple of hundred feet into ice tunnels and caves to attain the higher reaches of the glacier." The party apparently reached their station by an entirely different route from the one described in the text, and did not go beyond it. The summit was some eight hundred feet higher, according to the figures here given.

THE SOUTHERN SELKIRKS

From Map by the Dominion Land Survey

From Baedeker's Canada

Author's main routes and camps

Geogr. Estab.t Wagner & Debes, Leipzig.

1 : 250.000

Kilometers 0 5 10 — Miles 0 2 4 6

PART III

*EXPLORATIONS AND ASCENTS AMONG THE NORTHERN SELKIRKS: MOUNT SIR SANDFORD AND ENVIRONS**

CHAPTER XII

THE NORTHERN SELKIRKS AFTER THE COMING OF THE RAILWAY

Early Journeys—First References to Mount Sir Sandford—The Naming and Measurement of the Peak

WE have already seen how from the earliest times the orographical features of the northern portion of the Selkirk Range directed the tide of travel in both directions around its edges, and thus preserved the interior of the Big Bend country in essentially a primeval state; how even the mining excitement of 1865 produced only a limited increase in topographical knowledge concerning the territory; and finally how the first recorded crossing of the *terra ignota* was brought about by the endeavor to find a shorter route for the railway than that which had so long satisfied commercial needs.

It is now proposed to present such facts as are available regarding mountaineering and exploratory work in and with relation to this region subsequent to the coming of the transcontinental road, by way of

*Maps at page 302 and in back cover.

introduction to the narrative of our own expeditions therein contained in later chapters.

To Dr. A. P. Coleman probably belongs the credit of making the first journey of this period into the general neighborhood under discussion, with other than a purely pecuniary motive. In July, 1888, with one companion, he descended the Columbia River from Beavermouth by canoe and raft as far as Kinbasket Lake whence he was forced to return because of insufficient provisions. His object was to reach Mounts Brown and Hooker which were credited at that time with altitudes of from fifteen thousand to nineteen thousand feet, but which he later showed were really only of minor importance. Failing in his design for the reason stated, he nevertheless ascended a steep triple-crowned mountain rising 8400 feet above sea-level on the westerly side of the river, overlooking Surprise Rapids and some four miles distant from them, which he christened Surprise Mount.[1] From here an excellent view was had of glaciers and peaks of the Selkirks farther inland rising two or three thousand feet higher. The climb is notable as being, most probably, the first recorded ascent in the Northern Selkirks. While its exact location is uncertain, it cannot be very far distant from the peak now known and mapped as Mount Stockmer.[2]

During the summer of this same year, Rev. W. S. Green of the English Alpine Club and Royal Geographical Society carried out his well-known explorations and survey in the mountains about Glacier House that are charmingly described in his book, *Among the Selkirk Glaciers*. Although he made no ascents of importance north of the railroad, he refers to the peaks seen in this direction from the small mountain near Sir Donald which at one time bore his name as follows:

"Beyond the valley of the Illecillewaet to the northwest some fine peaks were visible; one dark, bare rock pinnacle bearing northwest was most striking and no doubt over ten thousand feet high." This possibly is the present Mount Moloch. Later he visited Corbin's Pass and looked up the valley of the North Fork of the Illecillewaet, noting that "some snow-seamed rock peaks rose into strange pinnacles and crags."

The following season Mr. A. Saint Cyr in behalf of the Dominion Land Survey made a trip by canoe around the Big Bend from Golden to Revelstoke in order to establish the limits of the "railway belt" on the river in this direction. The point where it crossed the Columbia was located near Surprise Rapids. In his report he mentions the Northern Selkirks as follows: "After receiving the waters of Wood and Canoe rivers . . . which discharge within a short distance of one another, the Columbia suddenly changes from the northwesterly direction in which it flows from Beaver downwards, making a sharp turn to the south round the northerly extremity of the Selkirk Mountains. Here these mountains lose the rugged aspect that they present when seen from the east. The glaciers and snow-covered peaks disappear and give place to a long succession of well wooded hills, which slope gently down to the river." Mr. Saint Cyr makes the distinction between Gold River and Gold Stream which are frequently confused on the maps. Gold River is a westerly affluent of the northwestward flowing section of the Columbia; Gold Stream, an easterly affluent of its southerly flowing section.[3]

In 1893, on the occasion of the first ascent of Mount Cheops near Glacier House by Messrs. S. E. S. Allen and W. D. Wilcox, a good view was had of the region to the northwest, described by Mr. Allen as follows:

"Of its peaks and valleys none are named or mapped. They constitute, of course, a portion of the west slope of the Selkirks, the watershed being farther east, and though lower than Mount Bonney and Sir Donald, or the Dawson group, they are rock peaks of strange fantastic shapes, whose snow-fields, very numerous and of all sizes, give a decidedly novel and unusual aspect to this group which is worthy of the best efforts of a climber and explorer."[4]

Between 1893 and 1900 mountaineers were active in the neighborhood of Glacier House, but the published accounts of their work add almost nothing to what has already been stated about the country beyond the sky-line to the north. The first ascents of Mount Rogers and other peaks in the Hermit Range occurred in the interval. Owing to smoke and to cloudy weather, however, the views in this direction seem to have been of limited scope. It was during this time, I believe, that the road up the North Fork of the Illecillewaet to the Waverly and Tangier mines was constructed, but these enterprises came to grief about 1898 and that section has since lapsed into pristine wilderness.

In this general period, exploration was progressing apace in the main Rocky Mountain chain to the east. Accordingly, it may be appropriate to include a few brief quotations from the publications of travellers in that region which refer to the Northern Selkirks, for, apparently, the latter present as magnificent an array from there as the Rockies do from the Selkirks.

In 1900, a party consisting of Dr. J. Norman Collie, Mr. Hugh E. M. Stutfield, and Mr. Sydney Spencer, the first two of whom had already made extensive explorations among the Rockies from the east, now undertook an expedition from the west, with a view to securing an easier approach to some of the highest

mountains from this side. Descending the Columbia valley over the government trail, they turned up Bush River and climbed a number of the outlying peaks of the Rockies. In a paper by Mr. Stutfield describing the trip and published in the *Alpine Journal*, London, for November, 1901, under the title, "Mountain Travel and Climbs in British Columbia," the author makes the following reference to the Selkirks: "Down the Bush River the view was bounded by the Selkirks, with a grand Weisshorn-like pyramid in the center. Some weeks later I had a good look at this unnamed monarch of an unknown region from the top of Sir Donald, and it is undoubtedly the highest peak of the Selkirk group." This is the first certain allusion to Mount Sir Sandford which I have been able to find in literature, a somewhat curious fact considering the number of persons who have traversed the Columbia River from which the mountain is in full view.

In their delightful book, *Climbs and Exploration in the Canadian Rockies*, published in 1903, Messrs. Collie and Stutfield, after repeating the above quoted reference to Sir Sandford as seen from the Bush valley, add: "It would seem to be unquestionably the highest summit of any of the known parts of the Selkirk Range. One of these days, no doubt, some hardy explorer will be able to tell us more about this peak and the unknown mountain region around it, but we do not altogether envy him the journey to its base." Later on, the authors, when describing the prospect from Mount Freshfield, again mention Mount Sir Sandford thus: "One of those queries which could not be answered was the height of the splendid pyramid of snow gleaming far away in the Selkirks which we used to see day after day from the Bush valley. Now, from a still greater distance, its height seemed even greater; but

what that height may be must be left to others to determine."[5]

In 1901, Herr Jean Habel of Berlin visited the Rockies in the neighborhood of the western sources of the Athabasca. Standing on the summit of Mount Chaba (10,300 feet) he says: "To the left of Mount Eden the broad, wooded depression of Bush valley was visible, and in the same direction stood the apparently highest elevation of the region within our horizon: two mountains in the Selkirk Range; the one a long ridge, its flank studded with pinnacles and small towers, like a Gothic cathedral; the other a massive mountain, in shape like the upper part of a medieval house, the roof snow clad, the gable black rock."[6] The latter very clearly identifies Mount Sir Sandford. The former is undoubtedly the granite group, mentioned later on in these pages, whose highest summits we measured at something less than 11,000 feet each.

These references, although they represent a fairly complete outline of all that had been published about the northern portion of the Selkirks down to and including 1903, are manifestly of a very fragmentary description and convey only the scantiest information. They tell us of lofty, pointed peaks, strange fantastic pinnacles, and numberless glaciers, but of definite geography they disclose hardly a hint.

It remained for the survey of Mr. Arthur O. Wheeler topographer of the Department of the Interior, to throw the first real light upon this fascinating territory. During the course of his work in mapping the region adjacent to the railway for the Dominion government in 1901 and 1902, he occupied many stations, commanding unobstructed outlooks to the north. In his sumptuous and exhaustive volumes, *The Selkirk Range* (1905), containing the report of the survey as well as a

full account of previous mountaineering in the chain, he makes numerous references[7] to the northern mountains. Of these I may quote the following: [from Mount Bagheera in the Hermit Range] "Twenty glaciers were counted to the north and west; three in particular on the north branch of the Illecillewaet River being of large size and specially attractive. From the center of the nearest one rises a sharp pinnacle of rock which is seen prominently from many points. This we named Fang Rock; altitude 9302 feet. At the head of the Illecillewaet branch could be seen a number of fine isolated peaks, ten of which are over nine thousand feet and at least three reached to ten thousand feet. The more that was seen of the region surrounding this stream, the more attractive it appeared and the stronger its claims to be included in the area of high Selkirk peaks worth visiting." He goes on to say: "But little is known of this interesting portion of the Selkirk Range. It has not been mapped in detail and except by a few stray prospectors has not been travelled. Looking from the summit of Swiss Peak, Rogers Peak, and Mount Grizzly, the eye meets a vast array of snow-caps and glaciers cleft by deep blue valleys broken by jutting spurs and timbered gorges; beyond, rising from the general level of the summits, three or four bold snowy peaks stand out prominently. There is plenty of room here for the explorer."

But of the greatest importance for our present purposes were the naming and measurement of the towering tent-like mountain on the far horizon which he describes thus: "Northward, across the main valley of Mountain Creek, a number of isolated high peaks attracted our attention. They seemed to be as high as and higher than that on which we stood [Mount Rogers, 10,536 feet]. The altitude and distance of two

of them have been computed. One, a little west of north, is twenty-seven miles distant according to angular readings taken upon it from points over five miles apart, and rises a square massive form topped with snow to an altitude of 11,634 feet. It is the highest peak yet determined in the Selkirk range and is probably situated not far from the head of Gold Creek. It is suggested that it be named Mount Sir Sandford in honor of Sir Sandford Fleming, K.C.M.G.[8] The other [now known as Mount Iconoclast] lies still farther to the west and apparently rises immediately across the valley of Mountain Creek. It is, however, twelve miles distant, and reaches an altitude of 10,618 feet. The peak is easily recognized by its elongated structure and black precipitous face." As a result of these observations Mount Sir Sandford has escaped all such exaggerations of height as have so often been current concerning its neighbors in the Rockies, but at the same time it is to be noted that since the mountain lay well outside the limits of the map, as far as the prospective visitor was concerned, its actual location and the ways of access remained about as much of a mystery as before. The Wheeler survey embraced little new territory, being designed rather as a detailed representation of the topography adjacent to the railway to serve as the nucleus of a more extended contour map. The four published sheets are models of careful draftsmanship and form a *sine qua non* to every mountaineer in the district covered.

NOTES, CHAPTER XII

[1] For a detailed account of this trip and other allusions to the Northern Selkirks, see *The Canadian Rockies: New and Old Trails*, by A. P. Coleman, New York and London, 1911.

[2] The scientific results of the expedition were embodied in a paper, "Notes on the Geography and Geology of the Big Bend of the Columbia," by Professor Coleman, read May 15, 1889, before the Royal Society

of Canada and published in Section IV. of its *Transactions* for that year. In view of the fact that this article is not generally accessible, the following extracts may not be amiss. Referring to the Northern Selkirks he says: "Maps of this part of the province appear to be so defective as to serve only as very general guides to the traveller, who is indeed beset by many difficulties not found in most other regions," a statement which still holds true to-day. Surprise Rapids, "are well named since they are almost unseen until one is just upon them, though their roar may be heard a mile or two above." The fall in the Columbia from Donald to the head of the rapids was ascertained by barometer to be 138 feet, while the fall in the rapids themselves in the course of four or five miles was 140 feet. They are caused by barriers of steeply inclined mica-schist. The rocks observed nearby were typical mica and hornblendic schists dipping about 40° S. S. W. with a strike E. S. E. and W. N. W. (magnetic). The rocks on the Selkirk side of the river are probably of Archean age. Evidences of a great fault between Surprise Mountain and the corresponding mountain in the Rockies were noted. The statement is made that "the boundary between the (Archean?) schists and the Palæozoic limestones, slates, and quartzites of the Rockies for the greater part of the distance between Surprise Rapids and Lake Timbaskis, lies northeast of the Columbia. The general course of this portion of the Columbia corresponds to the usual strike of the rocks." The paper is a mine of valuable information and should be consulted by every one interested in the district.

[3] "Annual Report of the Department of the Interior, 1889," part ii., p. 53. For another reference to the mountains lying north of the railway, see "The Annual Report of the Department of the Interior for 1892," *Sessional Papers*, vol. xxiv.; Paper No. 13, Report of W. S. Drewry on "Triangulation in the Railway Belt, British Columbia."

[4] *Alpine Journal*, vol. xviii., p. 106.

[5] In addition to the above, these gentlemen make elsewhere the following brief references to the Northern Selkirks: *Geographical Journal*, March, 1901, p. 165, and vol. xxi., May, 1903, p. 489; *Alpine Journal*, vol. xxi., p. 370; *Climbs and Exploration*, p. 202. (*Note.* Probably the first published view showing Mount Sir Sandford is contained in the latter volume opposite page 150.)

[6] "The Western Sources of the Athabasca," by Jean Habel, *Appalachia*, vol. x., p. 36, May, 1902.

[7] Pages 38, 57, 59, 71, 72, 74, 105, 232 (note), 256 (note), 261, 309, (note).

[8] Sandford Fleming was born in January, 1827, in Kirkcaldy, Scotland. He was chief engineer during the construction of the Intercolonial Railway and of much of the Canadian Pacific, including the exploratory surveys. Later he took a prominent part in promoting the Pacific cable between Canada and Australia. He has been chancellor of Queens University, Kingston, since 1880.

CHAPTER XIII

THE EARLIEST ATTEMPTS ON MOUNT SIR SANDFORD

Accident and Death near Gold River, 1907—The Shaw Expedition Reaches the Southerly Base of Mount Sir Sandford, 1908—First Governmental Surveys in the Neighborhood of Gold River, 1907.

ALTHOUGH Mount Sir Sandford is a prominent feature from many of the oft-climbed summits about Glacier, and even from some of the lower foothills to the east, so far as I have been able to discover, its majestic form, rising fully two thousand feet above everything in the adjacent ranges as thus seen, did not provoke an actual assault until 1906. So formidable were the intervening barriers in the shape of narrow valleys, rushing torrents, and pathless forests, which even the Indians shunned on account of their disheartening tangle of undergrowth, that whoever gave preliminary consideration to the expedition invariably abandoned its execution.

In the summer of this year, however, five young college men organized a party to explore Gold River, to climb the "White Mountain," and then to continue by canoe around the Big Bend of the Columbia to Revelstoke. It consisted of Messrs. Merkle H. Jacobs, Edward R. Heacock, Marriotte Goode, and Reuben T. Shaw of the University of Pennsylvania and Roy H. Jamison of Ohio Wesleyan University. Two canoes were purchased in Montreal and shipped to Beaver-

mouth station, on the railway. Here the party found the Columbia in flood and, being especially warned against attempting the long trip around the Bend with the water so high, they waited several days for better conditions. The improvement was slight but, as time pressed, they determined to go as far as Gold River at any rate. In a few hours they reached its mouth and started upstream. In the swift water the deeply laden canoes proved to be exceedingly difficult to manage, so after some eight hours of struggle, the party landed on the right bank at a point about three miles above the Columbia. Here they cached most of the provisions in the canoes and then started into the woods with eight days' rations on their backs. Before long they arrived at the base of a steep draw or gully where the remains of a snowslide were found and, as darkness was approaching, they camped. The next day the party ascended the gully about 3500 feet, reaching an altitude of approximately 6000 feet. It was steep work all the way, but here, where camp was made for the night, the angle was so abrupt that they had to dig out shelves to lie on. The following day the summit of the spur was gained and the party camped on the heights, altitude about 7500 feet, whence they had fine views of the big mountain and of the valleys of Gold River, Bush River, and the Columbia. They were all swollen very badly from thousands of mosquito bites and activity was at a low ebb, but nevertheless a number of short trips were undertaken in the neighborhood. They visited the peak above Six Mile Creek Pass now marked 8453 on the map and made the first ascent of what has since been named Sentry Mountain, 8320 feet. They did not, however, accomplish anything towards climbing Sir Sandford, since it proved to be too far away, but a good knowledge of the country

east of Gold River was obtained together with many photographs. After returning to the canoes, and visiting Surprise Rapids, the party went back to Beavermouth.[1]

Nothing daunted by these experiences, Messrs. Jacobs and Heacock returned to the attack in the following year, 1907. Since this adventurous, and unhappily tragic expedition was the first on record to attempt the overland route to Mount Sir Sandford and, moreover, since its story graphically portrays not only the conditions of travel hereabouts, but also the consequences of a crippling accident, I have ventured to include here a short summary of and a few extracts from an interesting account of the trip by Mr. Herbert E. Ives entitled, "An Ill-fated Summer in British Columbia."[2]

The plan of campaign on this occasion differed considerably from that above described. Starting from a base on Gold River, Jacobs and Heacock were to attempt a complete crossing of the range in a westerly direction. By carrying four packs forward in double journeys they hoped to insure a sufficiency of food, together with what they might shoot, to sustain them until they could connect with another party of friends which was going to work easterly from the upper Columbia on the other side of the range.

As matters transpired, however, the expedition came to grief almost at the start. In returning over the mountains from Beavermouth, early in July, to a base of supplies, which they had previously established on Gold River, a large rock turned over on Jacobs's leg, breaking it above the knee. They were in a wild spot above timber-line and many miles from the railway, so there was nothing for Heacock to do but to make the injured man as comfortable as possible and go out for assistance. For four days Jacobs lay there alone,

helpless. Medical aid then arrived and his leg was set, but he could not be moved until the bones had knitted, a matter of months. Heacock, meanwhile, had been making preparations for this exigency and presently he returned from Golden, bringing additional supplies and Mr. Ives, a friend, who was to remain with them for the rest of the summer. Including Bob Jacobs, a brother of the patient, who had come previously, this brought the party up to four.

The cripple lay on an improvised rock bed over which was slung a light silk tent. This was far too small to cover him, so in rain and at night his exposed legs were protected with rubber blankets. He was fastened to a long board in such a way that he could not bend his body and a stone was hung on a rope over a log at the foot of the couch to serve as a stretching-weight. All summer long Jacobs lay on this rock while the others tightened the bandages, fed, and attended him. But an even greater misfortune was in store for this unlucky party. Mr. Ives tells the story thus:

"On Tuesday, July 24th, Heacock and B. Jacobs departed northward for Gold River to find the canoe and secure a cache on the north shore. I, as the least expert canoeist stayed in camp. Late in the afternoon of the third day, Bob returned alone, empty handed, to tell us of a disaster worse than the first. In crossing the river, now swollen with melted snow, their canoe had been overturned. They had clung to it until it began to sink then Bob had struggled ashore. Heacock disappeared around the bend while Bob was trying to obtain a hold on the bushes. That was the last sight had of him, for dense underbrush prevented following along the bank. After waiting for nearly a day close by the river, Bob finally struck back to camp, hungry and fearing the worst.

"We fed him and talked over the situation. The one hope was that Heacock might have made the north shore. There he was cut off from civilization, but with the caches would be safe from starvation. We decided on the one thing to do. Next morning I should start for Beavermouth and there organize a search party to go by canoe down the Columbia to Gold River, to hunt the north shore, and find the caches. . . .

"This search party and another we sent later failed to find Heacock. Pieces of the canoe were found for a long distance below some rocks in the stream. By the end of the summer both caches were located and found untouched. It was made certain our brave and lovable comrade had lost his life."

Now ensued weeks of waiting and they were far from pleasant weeks, for bad weather set in with a persistency that is not often equaled even in this land of storms. In the month of August, 1907, I was at Glacier House, and during the course of five subsequent visits to the Selkirks, I think I have never experienced worse weather than that which beset us then. For the little hospital on the exposed crags in the mountains, it must have seemed to be the last straw.

On the 26th of August, after the arrival of a rough stretcher, the return trip was commenced. Jacobs was fastened to the stretcher by straps passed beneath his arms that he might be supported when it stood on end. It took five men to manage it. Over slopes of large rocks and loose earth they worked upward in long zigzags, bridging the stretcher across rocks for rests every fifty feet. On steep snow slopes rows of steps were cut, a separate row for each of the five men at the different positions on the stretcher. Again and again a misstep would have sent their burden and themselves crashing far below. No sooner had they gotten well

started than the storm recommenced with increased fury so that they finally had to halt for a day lest a fatal slip be made on the glazed rocks. Upon resuming the advance, a real blizzard overtook them and this they were compelled to face for fear of becoming snow-bound.

"For hours we climbed, blinded by snow, ice caked upon our bodies, our hands freezing, our feet uncertain on the treacherous, hidden rocks. The ridge reached, there was no rest. We were completely exposed to wind and snow. Valley Two was our nearest shelter. So all that day, with snow swirling about us, an icy wind trying to carry us bodily off the ridge, we travelled with stretcher and packs. Late afternoon saw us at Caribou Pass. A slow, careful descent brought us to one of the numerous lakes there and for the first time we had all the water and firewood we needed. Best of all was the happy consciousness of the worst of our journey over."

The weather now cleared and progress was easier until the final descent from the crest of the ridge to the railroad track was reached. Here, however, the work became so severe that every one had to be with the stretcher continuously and the packs were left behind.

"The remainder of that day will always stand in my memory like a long nightmare. We were all ready to drop with the accumulated fatigue of five days' fight with nature. We carried our burden but a small distance each time, then toppled over and silently dozed till Fred gave the command to move. This was repeated for hours. At about six o'clock we struck a spring, two-thirds of the way down; this revived us a little. Then darkness began to fall. We tried to hurry, for without light we could not hope to reach the railroad. Fred cut our stops shorter, then told us we could no

longer spare time for rests, and the last two hours we dashed through without halting, merely changing our places at the stretcher. That dash was the awfulest thing I ever experienced. Each step seemed the last our strength could make. All the time the railroad was in plain sight; we simply could not seem to make it before darkness fell. Had we been ten minutes later, darkness would have beaten us, and our night would have been passed in the alders and mosquitoes a few hundred yards from our goal. A big freight engine, rounding a curve, opportunely cast its headlight across our path as we were blindly struggling in the darkness; in that flash we saw our way and, as darkness became total, climbed up the embankment and laid our burden across the track, thirteen hours after our start and six days from Valley Six. . . .

"The central figure in our memories of that summer will always be Heacock. His courage and devotion saved his comrade's life in the first place and in his death he truly gave his life for his friend."

For downright hardship and misfortune this ill-starred expedition is without a parallel in the annals of British Columbia mountaineering. As an inspiring exhibition of the finest kind of disinterested devotion, or even heroism, in the face of the cruelest odds, it cannot fail to thrill every one who has wrestled with the heart-breaking barriers of the Selkirks. At the same time one must not shut his eyes to the warning conveyed. Let him consider carefully lest he be tempted to plunge rashly into this wilderness, so alluring to look upon from a distance, but so savage in reality that only ample forethought, due experience, and competent local assistance can avoid or overcome what in the absence of these factors may be gravest dangers.

Although, perhaps, strictly speaking, it is question-

able whether these two expeditions should be listed among the *bona fide* attempts upon Mount Sir Sandford, owing to the fact that neither got within a half-dozen miles of the mountain, yet I have preferred to mention them in this connection, not only for the reason that the lure of the peak was largely responsible for their inception but because they were the means of giving to two of their participants first-hand knowledge of the conditions attending a serious campaign against the peak itself—knowledge which was put into practice to good effect no later than the succeeding year.

To the late Dr. Charles H. Shaw and his brother, Mr. Reuben T. Shaw, of Philadelphia, belongs the credit of being the first to force a passage to the actual massif of Mount Sir Sandford.[3] Possessing a wide experience with general pioneering in the wilderness of British Columbia as a result of a number of arduous expeditions among the Rockies, Purcells, and Selkirks for the purpose of collecting specimens of the flora, these intrepid mountaineers packed all necessities for the journey upon their shoulders and set out alone in August, 1908. Leaving the railroad at Six Mile Creek, they ascended to the heights traversed by the Jacobs–Heacock party, pushed on across a long even ridge nicknamed the "Board Walk," and camped the second night in a lofty place beyond the pass leading to Gold River. The next day they descended to the latter where they were held up for several days while felling a suitable tree across a branch of the river to an island just below the junction of its two arms and another tree from the island to the northern bank. This island constitutes the key to the overland approach to Mount Sir Sandford, for elsewhere the river is reported to be too wide to bridge in this way, especially at high water. The first tree cut down lay so near the surface of the water that they

feared to trust it until their return, and, therefore, had to fell a larger one. This fortunately came to rest a safe distance above the stream, and ultimately proved to be a happy precaution, for upon their return, when pressed by a deficiency of supplies, the small lower tree had been washed away.

Advancing then diagonally upwards across the southerly slopes of the Sir Sandford Range in the direction of their goal, it took them three days to reach a point from which an actual assault upon the mountain could be undertaken, five miles from the crossing. The work was most severe but finally they succeeded in ascending a small peak at the foot of the great southeasterly ridge of Sir Sandford, having an altitude of about nine thousand feet. From here it was seen that the tremendous precipices bounding this side of the massif offered a problem far beyond their resources and that under the circumstances there was nothing left to do but return. The party christened the glacier beneath the east face of Sir Sandford "Cyclops Major" and the one adjoining it on the east "Cyclops Minor." The trip is noteworthy as being one of the most spirited and plucky excursions in the records of Selkirk mountaineering.

Mr. Ives, in the paper above quoted from, mentions meeting a government survey party not far from the railroad. This was the party of P. A. Carson, D.L.S., the first of the kind to enter this portion of the Selkirks. From various distant points Sir Sandford had been selected as an excellent position for a primary station and it was his hope to reach and occupy its summit. Advancing to the pass at the head of Six Mile Creek and leaving the horses there, the party took packs on their backs and crossed over a range of mountains to the west. Mr. Carson describes the trip as follows:

THE SOUTHEASTERLY APPROACH TO MOUNT SIR SANDFORD
SHOWING THE ROUTES OF THE SHAW AND CULVER PARTIES

THE SOUTHERLY CLIFFS OF SAME FROM MOUNT SONATA

Photographs by P. A. Carson

SIR SANDFORD FROM AZIMUTH PEAK

"We then descended some four thousand feet into the valley of Bachelor Brook or south branch of Gold Creek, a rapid mountain stream about thirty feet wide. This creek flows through a narrow valley from the southwest, obtains its water from snow and ice in the very heart of the Selkirks, and empties into the main branch of Gold Creek about fifteen miles from the mouth of the latter. We made a difficult crossing over the swiftly flowing Bachelor Brook by means of an improvised foot-bridge, and finding that progress was extremely slow through the dense timber along the banks of the creek, we ascended to timber-line of Sonata Mountain, the mountain lying between Bachelor Brook and Gold Creek. From Sonata Mountain we soon discovered that we were a long way from Mount Sir Sandford and that that mountain, alas, was covered with fresh snow. We established a secondary station, XXXc., on Sonata Mountain (nine thousand feet) then returned to our main camp after an absence of five days during three of which it had rained. A heavy storm now set in which covered the whole district with nearly a foot of snow so we returned to the railway at Six Mile Creek siding."[4]

In continuing the work the following season, 1908, this region was again visited by Mr. Carson. In his report for this year he refers to Sir Sandford as follows: "As far as location is concerned Mount Sir Sandford (elevation 11,600 feet), the highest peak in the Selkirks, is a most admirable situation for a triangulation station, and I had proposed to place Station XXX. on its summit. This mountain is at present the Mecca of all alpine pilgrims in Canada, but at the close of the year 1908 all worship at its shrine had been done from afar. During 1908, two parties of aspiring alpinists attacked this majestic mountain only to be repulsed before

reaching the main peak. Sir Sandford's magnificent hoary summit rises over one thousand feet above all neighboring peaks and is the most conspicuous feature in this large district of prominent and majestic mountains. From the view-point of an alpine climber the victorious ascent of Mount Sir Sandford will be an honorable feat, but for the triangulation or topographical surveyor a snowless and more accessible mountain is the goal to be sought.

"Station XXX. was finally established on Cherub Mountain, elevation 9740 feet . . . being about three miles westerly from our camp at Sunbeam Lake. The ascent of Cherub Mountain is by no means a difficult one except for the wide névés and glaciers which must be crossed." [5]

Two sketch maps were published as a result of these expeditions. They delineate the country from Beaver River as far to the northwestward as Gold River, including some of the topographical features in the drainage basin of the latter. One also shows the course of the north fork of the Illecillewaet River. Since the work in the Selkirks was principally of a preliminary nature, they naturally leave a good deal to be desired in the way of details, but so far as they exhibit the general relations of the terrane, they will prove of much value to travellers.

NOTES, CHAPTER XIII

[1] For these particulars and for information concerning the expedition to Mount Sir Sandford, by the Messrs. Shaw, the writer is indebted to Mr. Reuben T. Shaw.

[2] See *The Alumni Register*, published by the General Alumni Society of the University of Pennsylvania, August, 1908, pp. 279 to 293.

[3] Moberly in travelling up the valley of Gold River in 1871 had only passed along its base.

[4] *Annual Report of the Topographical Surveys Branch, 1907–1908*, Appendix No. 18, Report of P. A. Carson, D.L.S.

[5] *Annual Report of the Topographical Surveys Branch, 1908–1909*, Appendix No. 18, Report of P. A. Carson, D.L.S. In 1909 Carson reoccupied a number of the stations in this territory but nothing new was accomplished. The *Canadian Alpine Journal* for this year contains an illustrated paper by Mr. Carson on "How to Reach Sir Sandford" (vol. ii., No. 1, pp. 45–48).

NOTE.—It is convenient at this point to allude briefly to the route of Mr. G. W. Culver's expedition to Sir Sandford, made in 1911. The following particulars are taken from an account in the *Manitoba Free Press* for November 9, 1912: The party included besides the leader, a packer, and the Swiss guides, E. Feuz, Jr., and R. Aemmer. Leaving Six Mile Creek station, August 8th, they camped the next evening just beyond Six Mile Creek Pass. The going time (with two hundred pounds of provisions in the packs) was about eighteen hours. All of August 10th (eleven hours) was spent in laboriously cutting their way down the valley to Gold River, where they passed the night. [This was a departure from the route of previous travellers.] On the 11th the porter returned and the others made directly up the valley. By nightfall, however, they had gained only two miles. Four trees were felled in an effort to cross the river, but the water swept them away, so they were forced to follow the bank. On the 12th they found the island already mentioned and spent the night there. This solved the problem of a crossing and next day they made good headway, climbing to 8000 feet on the Sir Sandford Range. On the 14th they advanced to within striking distance of the mountain and camped.

From this the first attack on Sir Sandford was made August 15th. Getting under way at 4.30 A. M., they worked towards the easterly ridge across the [Cyclops?] glacier. This occupied them until 9 A. M. Progress now became very slow, as the ridge was icy and steps had to be cut along a slope 'of at least 55°.' They climbed until 1.30, turning back near the top of the ice at a point about 1000 feet below the summit. Steep slabs of rock were visible above. On the return, the crevassed glacier was avoided by keeping to the skyline ridge. They got back to camp at about 7 P. M. The next day their efforts were directed towards the southeast ridge which they reached at 8.30 A. M. They worked for two hours on 'soft, smooth, and rounded rock,' devoid of foot- or hand-holds, but it then repulsed them as they had no rope-soled boots. Leaving camp at 2 P. M. they regained Gold River at 7.30 and returned thence to the railroad by a slightly different route. Owing to a cache of supplies having been consumed by some animal, the latter journey was made with very little to eat.

A comparison of the foregoing with the paper noted above, shows the deceptive nature of the mountain. Mr. Carson predicted that "no great difficulty should be found" *via* the southeast ridge.

CHAPTER XIV

THE AUTHOR RECONNOITERS MOUNT SIR SANDFORD

Down the Columbia—The Sir Sandford Range—Cornice Mount

EVEN a far-off view of Mount Sir Sandford is sufficient to arouse enthusiasm in any one with a proclivity for alpine scrambling. As seen from the southeast, twenty-seven miles away, its mighty, roof-shaped mass, walled with snow and outlined by long, even ridges, produces a singularly impressive effect. Despite the diminution of distance, there is no mistaking its supremacy in height, for the nether buttresses alone stand well up above the surrounding peaks, and from these yet farther skywards soar its shining summit snows.

Magnificent and alluring indeed it looked, as I beheld it for the first time from the top of Mount Hermit (10,200 feet) one day in 1908. I was making my initial high climb in the Selkirks with a party from the Canadian Alpine Club, encamped that summer at Rogers Pass. Mr. B. S. Comstock of New York was among the number, and so impressed were we with the splendor of the mountain and the unsolved riddle of its approaches, that at the close of the camp we arranged to undertake a flying excursion into its vicinity. No sanguine hope of gaining the summit inspired us, but we did feel some confidence that the trip would dispel

in part, at least, the mystery of its location. At that time, we knew practically nothing of the previous expeditions described in the foregoing pages, nor was the mountain named on any of the maps.[1]

Careful inquiry among trappers and others who had been down the Columbia River disclosed a general sentiment favoring this for the first stage of the journey. Then we were advised to strike into the mountains by way of Gold River, advice which the story of a hunter that he had seen high, snow-clad peaks in that direction from Bush River served to confirm. It was reported that Gold River cut off access to them by pack-train, since in the summer season the water is so high and swift that fording with horses is impossible even could they be gotten to the bank by an overland traverse of the rugged mountains and dense forests that intervene between river and railroad. In the end, we determined to adopt the course outlined, namely, to drop down the Columbia by canoe to Gold River and then to push our way into the mountains as far as its current would allow, where, landing on the westerly side, we would strike inland with all the provisions that we and our men could carry.

Our party assembled at Beavermouth, July 17th. Besides Mr. Comstock and the writer, it included M. Dainard and E. Robinson of Golden, whom we had engaged to outfit us with boats and provisions. We spent the night here in order to avoid camping lower down on the Columbia where the mosquitoes are renowned for their numbers and ferocity. I have been told that they appear there in the spring before the

[1] The following paragraphs of this chapter are based upon a paper, "A Pioneer Reconnaissance in the Northern Selkirks," published in *Appalachia*, Boston, July, 1909. They have, however, been entirely rewritten and certain changes, rendered necessary by later observations, have been introduced.

snow is off the ground, but this perhaps needs confirmation. Even at Beavermouth they were by no means lacking, and their buzzing filled the air with strains that were far from suggesting the "music of the spheres."

Beavermouth, like Donald and several other stations on the railroad, has declined from a state of prosperity, owing to the exhaustion of the supply of workable timber in the vicinity. The large saw-mill is falling into decay, weeds are invading the yards and platforms, and the machinery is rusting away. Nearby lies the yard locomotive, overturned and half submerged in the river. Following the example of "The One-Hoss Shay" it ended its service on the last day of the mill's operation by toppling into the water upon the collapse of the siding onto which it was being run for storage.

Next morning we turned out early into a cold fog that blotted out the landscape and concealed even the opposite bank. The question of waiting until it had dissipated was raised, but the long day's work ahead permitted of but one answer and, after loading the two canoes, we pushed out into the stream at just 5.30 A.M. For a river of such size, the Columbia has a very swift current which sweeps along about as fast as water can without breaking into rapids, something like six or seven miles an hour. Paddling except to steer has little effect and, besides, one may need undiminished energy to pull away from some obstruction. For the first half of the way to Gold River the stream divides into numerous tortuous channels, forming low, wooded islands and bars whose bows, so to speak, are usually piled high with log jams that cause the water to foam up and divide with a noisy rush. Care has to be employed at these points to avoid being carried directly into the disturbances. Alertness and skill on the part of the helmsman are also needed to choose the right

channel, for the current is quick and variable. The penalty of a mistake is to find oneself in a *cul-de-sac*, closed by piles of driftwood, from which the only escape lies in an arduous trip back upstream. This portion of the river has the greatest fall and in places the grade of the current is quite appreciable.

One peculiarity of navigation on the Columbia deserves to be noted here, for we discovered it almost immediately on passing through the swifter eddies. This is a subdued but distinct hissing sound that appears to come from the bottom of the boat, as though it were slipping gently over a sandy bar or a myriad of tiny bubbles were exploding beneath it. The effect is doubtless caused by the minute particles of mineral matter held in suspension by the current which is fed so largely by glacial streams from the neighboring ranges. But a really satisfactory explanation of the phenomenon is yet to be advanced. The sound was much more noticeable in the canvas-covered boat than in the wooden-sheathed one.

Gradually the fog melted away, disclosing the splendid scenery of the lower valley. High banks confine the river on the east, limiting the view, but to the west the Selkirks rise grandly above their forested bases which slope gracefully down to the water's edge. Frequently the river encroaches upon these and appears to cut a swath directly through the trees. The effect is heightened by the number that lean out over the water in all stages of prostration on account of the undermining of the banks. Some brush the surface itself, but by virtue of the strong moorings that the roots afford, the stream is unable to complete the destruction so confidently begun. "Sweepers," the rivermen call them.

Soon we entered a straight, narrow channel, almost

a sluiceway, about a mile and a half long. Through this the hurrying flood whisked us in seven minutes, a rate of about twelve miles an hour. Next came "Snagtown" a portion of the way which at low water often gives difficulty because of the number of tree-trunks anchored in the oozy bottom, and swaying back and forth in the current. Owing to the high stage of the river, however, we glided over with hardly a ripple to indicate what was beneath us.

About twelve miles below Beavermouth the character of the surroundings changes. The valley opens out and the Columbia relaxes its headlong rush. The scrub-covered slopes to the right retreat, disclosing the Blackwater Range, whose barren summits with their bleak expanses of broken, grayish, rock, spotted with snow, form a minor offshoot of the Rockies. On the Selkirk side as well the foothills begin to take on a more impressive aspect, with bands of snow fringing the sky-line and suggesting snow-fields behind. A few miles farther on, the river collects its scattered channels into a single, broad, placid stream, where snowy heights are prettily reflected. This is the back-water from Surprise Rapids a half-dozen miles below.

But of greater interest than the charming scenery was the decided break now making itself evident in the mountains on the left, without doubt the valley of Gold River. Paddles were plied in earnest, for we were filled with a keen desire to know whether Sir Sandford was in fact visible from the Columbia. We had not long to wait. Our steady progress caused the overlapping hills to draw gradually back like curtains, until all of a sudden a big peak stood revealed in the distance. It towered aloft above a massive glacier-capped base, and from the apex a long plume of mist waved in the bright morning sunshine. No other mountain in sight

SUNSET ON THE COLUMBIA AT BEAVERMOUTH

A DANGEROUS "SWEEPER"

"LINING" A CANOE UP GOLD RIVER

MOUNT PALMER FROM LOWER COURSE OF SAME; VALLEY OF WEST BRANCH BEHIND CLIFFS AT RIGHT

supported a similar banner which, therefore, truly evidenced an uplift of the first rank. The characteristically regular arêtes that sweep up in geometrical lines and angles could not be mistaken. It was in truth none other than Mount Sir Sandford.

The current soon carried us below the narrow belt from which the peak is visible, allowing the more easterly portions of the range to come successively into view through the gap as in a slowly unfolding panorama. In this vicinity, a double-gabled mountain at the extremity of a steep rock wall formed the dominant feature. Two ridges descended from it, one towards the north and the other towards the northeast, confining between them a conspicuous glacier. The last named ridge seemed to offer the best way of reaching the top of the wall whence the base of Mount Sir Sandford looked accessible, and it was on this ridge that the greater part of our climbing took place as will hereafter appear. The twin-peaked massif, we christened Mount Taurus because of its dual summit, but, since then, the Geographic Board of Canada has done me the honor to name it Mount Palmer.

Not until close to the western shore did we discover the actual outlet of Gold River, since it joins the Columbia diagonally. The stream is perhaps two hundred feet wide and sweeps with a powerful current through a most circuitous channel. Our method of procedure was to work up to a turn in the backwater and then to dash out into the full current, pulling with all our might until we reached quiet water once more. Sand-bars that would have enabled us to line the boats around the rapids were submerged, and after two hours and a half of struggle, during which we made only about two miles, we decided to land upon a strip of shingle and establish our base camp.

By mid-afternoon the outfit was distributed among the four packs and the tent, which was to be left behind, and then we set out upon our way. Robinson knew of a trapper's cabin in the general vicinity and we entertained the hope of coming upon this for the night. In the face of the jungle into which we immediately plunged, however, it seemed a forlorn one. The alders had clearly not been placed there to make an easy road for travellers; nor were those hordes of mosquitoes at all inefficient guards to the fastnesses above. If the truth be told, our introduction to the *chevaux-de-frise* of the Selkirk wilderness was about as bad as could be imagined. Stumbling through pools of water up to our knees, fording shallow streams, falling *into* rotten stumps, and, of course, grabbing prickly devil's club for support, we slowly forged ahead. At each halt relief from the attacks of our tormentors could only be obtained by waving a leafy branch continuously, for head-nets cannot be worn with advantage in the thick undergrowth. After an unconscionably long period of such aggravation we came upon a line of blazes which soon led us to the cabin, a small low-lying structure, nestling among tall evergreens on the river bank.

Throwing down our packs before the door, we unceremoniously broke the fastening and plunged into the cool interior. That the trials of bog, devil's club, and torrid heat were over for the present did not particularly elate us, but the opportunity to escape the unremitting onslaughts of the villainous mosquitoes—this was the *summum bonum* and no philosopher could then have convinced us that any other existed.

The morning of July 19th dawned clear and somewhat cooler. We decided to make for the westerly side of the valley in order to avoid, by keeping along the slopes, the swamps and thickets that filled the

bottom-land. In the distance, the snowy ridges of the Sir Sandford Range formed an alluring picture, but they were cut off from us by a branch of the river entering on the west. Although as the crow flies, this stream lay less than half a dozen miles away, so continuous were the obstructions of the forest that we did not reach it until nightfall. Forks Camp was set up on the bank, while one of the men felled a suitable tree for a bridge, for we now planned to ascend the farther slope in the direction of Mount Sir Sandford.

The torrent had a width of about fifty feet, so the crossing which was effected next morning proved to be a rather delicate operation. Despite the fact that the trunk sloped down towards the opposite bank, presented a slippery surface, and vibrated from the rush of water against the under branches, no mishaps occurred. Of course, we used a rope, but even so, a plunge into the pounding, icy flood must unfailingly have been fraught with serious consequences.

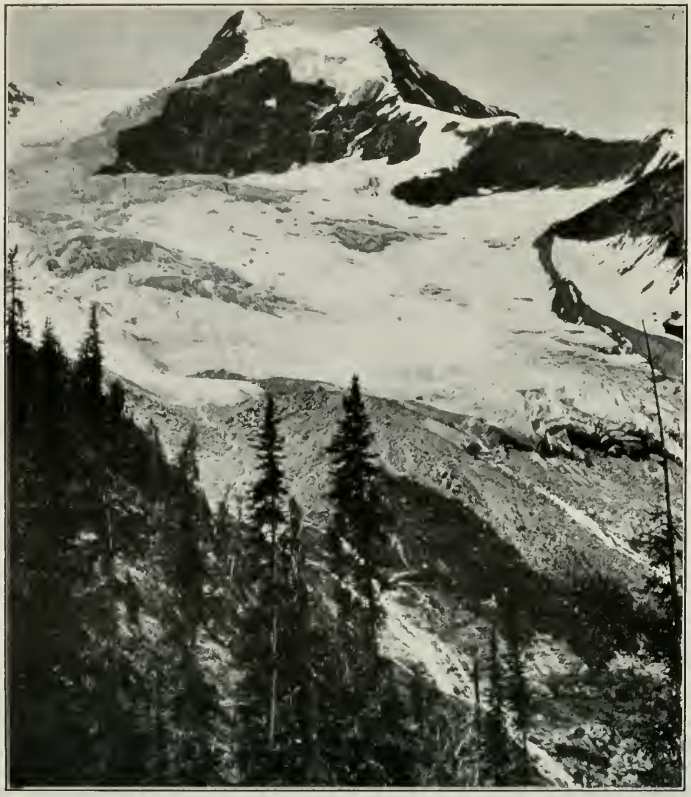
Climbing commenced almost at once on a series of ledges which lower down formed the walls of a canyon. It was work of the roughest description. Heaps of fallen timber, dense-packed alders, snaky devil's club, and all sorts of insidious traps combined to retard us. Only at the expense of extreme exertion was each inch of progress won. The day grew warm and soon a consuming thirst added itself to our difficulties, for we came upon no water. Our course led diagonally upward along the southerly side of the lateral valley, but so slowly did we advance that late afternoon found us no farther than the rocky groove down which pours the drainage from the glacier before mentioned. Here, as the cliffs barred passage with the packs, we decided to camp. The weather was mild and pleasant and accordingly we did not set up our small silk tent, but passed

the night in niches dug from the hillside with only the pines for a roof.

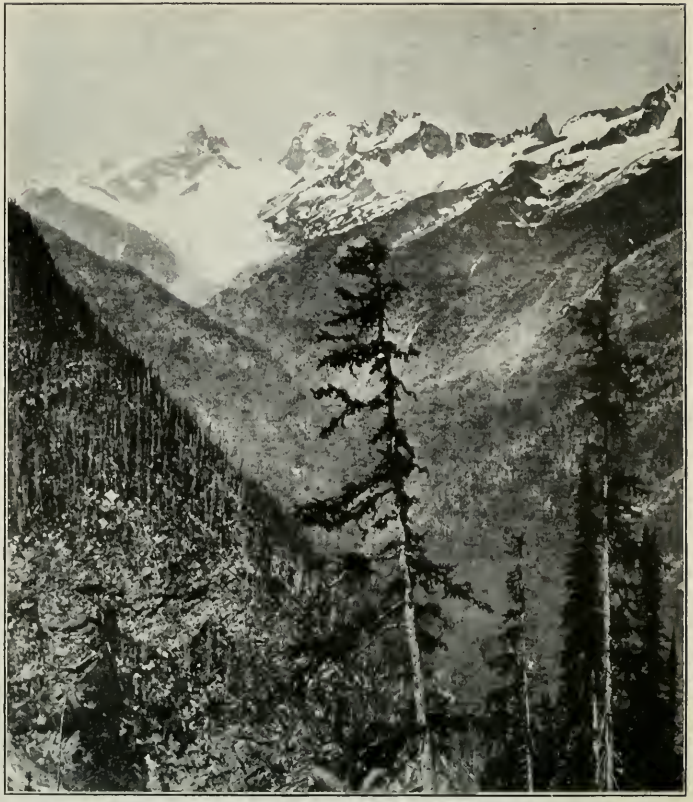
On the 21st it seemed best not to attempt to pass the cliffs but to strike straight upwards with a view to obtaining better going above timber-line. The dry course of a stream nearby offered an open way and up this we started. In spite of steep, smooth rocks, we managed to mount steadily with the aid of branches and tufts of grass. At noon we reached the crest of the ridge and camped on the heather above the highest trees at an elevation of about 6850 feet. We found ourselves on the main easterly arête that swings down from the principal peak of Mount Palmer and forms the corner of the range. This mountain blocked all view in the direction of Mount Sir Sandford, not a glimpse of which had we caught since leaving the Columbia. Clearly, our next endeavor must be to ascend Mount Palmer or to discover some way around, for although we had long since given up all thought of climbing Sir Sandford, we did aspire to view it in relation to the country already seen, and, if possible, to make a near approach. As our supplies would allow us to remain at this camp one full day more and the weather looked promising, these aims did not appear to be beyond realization.

However, the first desideratum was to secure a wider outlook that we might employ our day of grace to best advantage, so the afternoon was devoted to a climb along the ridge. An easy ascent brought us to a pointed eminence at the north end of a serrated shoulder (*ca.* 8900 feet). It commanded the details of the easterly extremity of the range, a long stretch of Gold River to the south, and the valley of the west branch. The entire easterly face of the range in its upper portions afforded excellent going over grass- and heather-

CROSSING THE WEST BRANCH NEAR FORKS CAMP



MOUNT PALMER



THE ADAMANT RANGE LOOKING UP THF VALLEY OF THE WEST BRANCH

VIEWS FROM HIGH CAMP, 1908

covered slopes, and we saw that it would be an easy matter to make a traverse to the southeast ridge where the chances for reaching a higher point seemed of the best. A direct attack on Mount Palmer from our general locality also looked perfectly feasible, but as it was a more difficult undertaking for a party of two, and as, moreover, there would be no new view unless the summit were gained, we soon rejected this alternative. It was in closer harmony with our purpose to make certain of a comprehensive outlook than of a good climb, and this requirement the trip to the south fulfilled. After erecting a cairn to mark what is probably the first ascent on the Sir Sandford Range, and securing a few photographs, we descended to camp, enjoying a delightful glissade on the way.

Setting out at 6.00 A.M. the following morning, we worked across the slopes to the south for about two miles, maintaining the same altitude. Then having passed below a small glacier, we mounted a steep moraine, crossed a snow-slope, and finally attained the southeast ridge. Exclamations of pleasure broke forth as each overtopped the crest and caught sight of the bold wall of precipices and glaciers that faced us from across the farther valley. In the clear morning sunshine they presented a majestic aspect indeed. We now commanded about three-quarters of the horizon, but Mount Sir Sandford was nowhere to be seen. The arête mounting still higher on the right undoubtedly concealed it.

Anticipation was too keen to permit of any real delay, so we continued upwards by way of a small snow-field that promised an easy means of circumventing a rugged outcropping crag on the ridge itself. A little later we again got onto the arête which now consisted of sharp slaty edges of upturned strata smothered

in unstable scree. Here a careful bit of climbing ensued, but in about forty minutes, the last obstacle was overcome and we stepped out onto the unexpectedly broad summit of the ridge.

One glance sufficed to reveal our success. Off to the west, some four miles away, towered Mount Sir Sandford, the object of our search. Four clean-cut arêtes outlined its ponderous mass, sweeping rapidly up to a sharp angular apex. Below, snow and glaciers draped its flanks. Instantly all our geographical perplexities vanished; isolated fragmentary observations pieced themselves together; and in the resulting whole we had our reward for the journey. Sir Sandford and its range occupied the entire territory between two westerly arms of Gold River flowing approximately parallel to each other and to the Columbia. The shorter we had crossed at Forks Camp and its valley we had studied from the ridge the day before. Now the second was in full view, the vista apparently extending to the watershed and beyond into the wilderness of the westerly slope of the range.

Although, of course, we were too far away from Sir Sandford to form a definite judgment with regard to the possibilities of ascent on this side, it was manifest that the mountain offered no vulnerable point for attack. Indeed it looked most repellent and the lower glaciers over which the approach would lie were broken and steep. All things considered, I felt that investigation of its other faces would certainly be warranted before making a serious attempt from the east—an opinion which was to receive justification no later than the very next month in the plucky effort of the Shaw brothers. Of their experiences, however, I did not learn until over three years later.

The ridge continued northerly at about the same

THE MAIN VALLEY OF GOLD RIVER AND THE SOUTHERLY SLOPES OF THE SIR SANDFORD RANGE FROM CORNICE MOUNT

A CLOUDY DAY IN THE WEST BRANCH VALLEY

LOOKING ACROSS THE COLUMBIA VALLEY TO THE ROCKIES

height to the foot of the final peak of Mount Palmer, which presented a precipitous face. From here the crest ran westerly to Mount Sir Sandford nearly at right angles. We thus occupied a pivotal position well away from the south face of the range—a splendid natural observatory. From the Columbia and the long chain of the Rockies to the north, around through the easterly and southerly quadrants, the panorama was unobstructed, although our elevation of 9350 feet was insufficient to overlook the mountains generally. Through a gap, however, Sir Donald and the Hermit Range were unmistakable. Part of the alternative approach from the railroad by way of Six Mile Creek could be seen, but under all the circumstances it did not impress us as favorably as that by way of the Columbia, especially in the light of what we now knew about this side of Sir Sandford. We named our crag Cornice Mount because of the snow cornice that overhung its easterly face. Although 9350 feet may seem a comparatively insignificant altitude, the prospects from such outlying peaks in the Selkirks are disproportionately grand, for the valleys in general lie mostly below four thousand feet and the actual relief therefore is often as great as six thousand feet.

Our one encounter with the *ferœ naturæ* of the Selkirk wilderness took place on this summit. While engaged in building an appropriate stoneman, we were alarmed to see one member of the party who had been dozing on the warm rocks some distance away and out of sight, suddenly appear rushing towards us, wildly waving his arms and shouting, "Get your camera. I was nearly butted by a goat." At the same time we heard the grinding of rocks on the mountain below us and upon looking over the edge, saw a large goat descending at tremendous speed in a cloud of dust, his

back working up and down like the walking-beam of a steamboat. Upon repairing to the place where this quiet nap was being enjoyed, there was no questioning the evidence of the tracks in the snow within six feet of the victim (?) whose camera yet reposed beside his rocky couch. Moral: There are more dangers in mountaineering than are dreamt of by *The Badminton Library*.

Early in the afternoon we made our way back to camp and on the 23d commenced the return march. We adopted a shorter route than that of our approach, descending the easterly face of the range directly to the river and following this along to our tree bridge near the forks. Owing to avalanches in the spring, these slopes are kept clean of heavy vegetation aloft, but in the valley the tangle of debris is frightful. Great piles of timber have to be climbed log by log until oftentimes one finds himself high above the ground. The spaces between are filled with lesser growth which forms a far from comfortable, not to say dangerous, cushion to light upon when some piece of loose bark slips maliciously aside. To get ahead at all, we were driven to walking the trunks, and one may imagine our joy in finding several 150-foot trees lying end-to-end in the line of march.

But the real struggle was yet in store—the fight with the relentless Columbia, which commenced the next day after reaching the boats. Although we adopted every subterfuge in the way of narrow devious channels we still had much swift water to face. Oars, poles, and paddles, bent almost to breaking under the superhuman tugging which alone would avail. Words cannot convey any adequate idea of the work, but to mention that it cost thirty hours to make Beavermouth will indicate its severity—a period ten times the length of the trip down-stream.

Our last camp occupied the loveliest spot of all, the tip of a narrow island in the main channel. At dusk we lolled about the fire, watching the ruddy sunset glow, which suffused the distant summits and filmy clouds above and was painted again in the smoothly speeding waters at our feet. The weariness of the battle was in our bones and the memory of our toils fresh, yet who will deny that such evenings make up for all? Bestowed unexpectedly as a free gift from nature's bounty, they cast a magic spell over whatever of hardship and discouragement has gone before, transmuting all later recollections into the sweetest that one can know.

CHAPTER XV

FORCING A WAY TO MOUNT SIR SANDFORD, 1909

Camps and Climbs in the Valley of the West Branch—The Discovery of Sir Sandford Glacier—Our First Attack on the Mountain

THE excursion of 1908 showed clearly that the region about Mount Sir Sandford would well repay another visit even without the capture of the mountain. It also showed that the proper way to get to close quarters with the peak was to follow up the west branch of Gold River which almost certainly had its source in the near-by glaciers. Accordingly, the following summer, the same party with the welcome addition of Professor H. C. Parker, went out to British Columbia with a view to undertaking a more extended campaign in this vicinity. Our experience with the inexpressibly difficult forests, which have been described by a well-known traveller as among the very worst to travel through on the face of the earth, convinced us of the hopelessness of attempting to maintain a party near the mountain without a trail over which supplies could be relayed in from the Columbia by porters, so we engaged two men to precede us and begin the work. Owing to unforeseen circumstances, however, this project failed of execution, and therefore the time allotted to reaching the advanced camp was considerably exceeded.

Upon our arrival in British Columbia, we chanced

to meet one of the Swiss guides employed by the railroad, an old mountaineering acquaintance. The interview developed some interesting phases of the guide question which here, under conditions so different from those prevailing in Switzerland, has taken on new aspects. It may be worth while to digress for a moment to consider what these are. To reach the remaining unclimbed peaks in the Rockies and Selkirks, it is necessary to make long marches, often through the roughest country. Sometimes horses can be used, as in the Rockies, but frequently it is needful to resort to other methods of transportation such as back-packing, or boat. Accordingly a large part of the total time and activity of an expedition is apt to be spent in reaching its destination, while correspondingly little can be devoted to actual mountaineering.

All this is without parallel in Switzerland, and the guides, steeped in the methods that long usage has sanctioned there, are only slowly adapting themselves to the new order of things. Witness our friend's comments (in substance) when asked how he would like to go on such an expedition: The trip down the swift-flowing Columbia was unthinkably dangerous. Whoever heard of starting to climb a mountain by canoe? And then the packs—are not guides who have been licensed by the Commune more than mere porters? Do not our contracts say that we need carry no more than thirty pounds?

The attitude thus indicated cannot easily be overcome. It is rooted in the established conservatism and lack of enterprise and enthusiasm which is often mentioned as a characteristic of Swiss guides as a class. There have been and are brilliant exceptions, some of whom may perhaps be recognized in these pages, but for the most part one cannot but feel that

aggressiveness and love of the sport for its own sake are absent from the men more often than not. The upshot is that inspiration for the preliminary work of reaching the scene of action, frequently a severe grind lasting for days, is lacking and even the lure of a big peak and the renown resulting from its capture may not suffice to conquer their aversion. In the pioneer days of alpinism it was the fear of spirits in the high places that had to be overcome by the prospective employer; now it is the fear of the river, the forest, or the pack.

Not only from the view-point of the guide are fresh elements introduced. The traveller also must consider the situation in a new light and his difficulties are by no means over when he has wrung consent from the reluctant party. If it takes perhaps weeks to reach the peak and only days to make the climb, what part is the guide to play in the economy of the campaign where every detail is weighed with a care proportionate to its value in contributing to a successful result? Aside from the question of expense, is a unit that comes into action for only a small fraction of the time worth the support that reduces the stock of provisions upon which the whole scope of the expedition depends? This problem must be carefully considered. Obviously, every packer added to the party to offset these limitations not only increases its unwieldiness but adds one more mouth to feed as well. The chances are that the decision will be to omit the guide and to content one's self with whatever can be accomplished without professional assistance. This, as a matter of fact, is exactly what has often happened in the Canadian west and some of the most important exploration and mountaineering has been performed by amateurs alone. From this cause guideless climbing has received a strong impetus in the region and the number of competent

mountaineers is already comparatively large. That they have thoroughly mastered the rudiments of the art, is suggested by the surprisingly small number of fatalities which have occurred, though it is doubtless true that the dangers associated with other regions of loftier mountains are not present here in the same degree.

It is for the best interests of the guides to understand the situation and to endeavor to meet it by learning the elements of frontier work, for otherwise they will not share in the important expeditions, and the history of mountaineering in this new Switzerland will fail to accord them the place that their fathers occupy in the annals of the old. Signs have not been wanting in recent years that the earlier tendencies are disappearing.

Preliminary arrangements were completed on June 14th, and that morning we took the train to Beavermouth[1] where our outfit was assembled under the charge of M. Dainard of Golden. It included two canoes and three men besides ourselves. At just noon, after an *al fresco* lunch, we pushed off the heavily laden boats into the Columbia's swirling flood. Nature was in her most benign mood. Warm, brilliant sunlight bathed the mountains and forests, while overhead tiny fleecy clouds flecked a deep blue sky. The river was higher than on our previous trip and shot us along rapidly with a stealthy, gliding motion about as much like flying as any mode of purely terrestrial locomotion could be. In the bow seat of the canoe, the illusion was truly striking owing to the vivid reflections on the water. About a quarter of an hour from Beavermouth we

[1] We here met Mrs. A. H. MacCarthy and Miss M. L. Jobe of New York, who had planned a camping trip down the Columbia and at Mr. Comstock's suggestion had arranged to unite their party with ours for as long as served mutual convenience. They employed two men and a canoe and both parties coöperated until June 25th.

caught a capital backward view of Mount Rogers which appears lofty and ethereal in its muffler of pure white snow rising eight thousand feet above the river. This is the only glimpse had of the major summits until the vicinity of Gold River is reached, since intervening spurs crowd the Columbia closely. Thus early in the season even the latter were snow-covered, giving a decidedly alpine aspect to the landscape.

As we neared the place where Mount Sir Sandford comes into view, interest and expectancy were at a high pitch, for so dramatic is its disclosure between the slowly retreating hills that nothing is lost from having seen the spectacle before. A skillful stage manager could not have calculated the suspense and uncertainty attending its appearance more admirably, nor could he well have arranged a more suitable setting. The receding crest lines of the mountains on either side decrease in height to form a sharp V-shaped notch in the distance. Gradually, as the boat advances, an upward-slanting ridge begins to appear at the very bottom of the notch. Higher and higher it carries the eye until presently it halts in a peak. The impatient observer exclaims, "Ah, there he is," but, no, for soon the sky-line ridge commences to mount once more. Up, it goes, edged now with a band of ice, and supporting a glacier below. Suddenly it pauses, rounds over, and starts to descend. This time there is no chance to err, for it must be obvious to any one who knows mountains at all, that the soaring hump-backed pyramid which now glides majestically into view and closes the vista could not possibly be other than one of the giants of the range—Sir Sandford itself. It looked even more imposing than when we saw it from here the previous year, for then in the clear, garish light of the early morning the effects of distance and perspective were

THE SELKIRKS WEST OF GOLD RIVER

THE ROCKIES, LOOKING DOWN THE COLUMBIA FROM MOUTH OF GOLD RIVER

SUNSET ON THE SIR SANDFORD RANGE

MOUTH OF THE WEST BRANCH VALLEY

lacking. Now, flooded with the misty golden sunlight of late afternoon and outlined against an exquisite ultramarine sky with the foreground in shadow, it seemed infinitely remote and unattainable, like a vision of the Holy City to some toiling pilgrim of the past. After a moment it is lost to sight and unless one is on the lookout and the day cloudless it is easy to miss altogether. As one enters the mouth of Gold River, another view of the monarch is disclosed which lasts while the boat is tracing the meanders of this part of its course. The current soon increases and oars, poles, paddles, and ropes are brought into requisition to make headway. It took about three hours to cover an equal number of miles to the bar where we camped.

Next morning we pushed on against even swifter water which, with the breaking of an oar, retarded us still more. At ten o'clock we reached a place on the left bank suitable for a base camp. Here we unloaded the outfit and made up the packs for the march. The surplus was cached beneath the canoes turned bottom upwards under the trees and at noon after everything was snug, we continued up the valley. This portion of the way struck us then and has since, as being one of the least interesting sections of the entire route, no doubt owing to the marked contrast between monotonous trudging through the forest with an unaccustomed pack torturing one's anatomy and the excitement of the river work. At first one has the aid of an overgrown, faintly marked trail which follows a narrow causeway, elevated but a few feet above the surface of the stream and forming a dam for a series of small ponds and swamps that fill the valley bottom. Here the beaver finds comfortable quarters as numerous cuttings bear witness. Presently avalanche tracks, thickly overgrown with high grass and alders, alternate with the forest and

afford glimpses of the rugged, unbroken wall to the right, and of Mount Palmer ahead. They apparently form happy hunting-grounds for the bears, since we saw many places where the grass had been freshly rolled down. Blueberries, strawberries, and huckleberries grow abundantly and furnish additional attraction. Besides the evergreens, large cottonwoods, aspen poplars, and some white birch grow along the way. One frequently noticed the fragrance of balsam of Gilead.

At half-past four we reached the West Branch at our Forks Camp of the previous year. As we now planned to diverge from our route of 1908, which had involved a direct attack on the Sir Sandford Range on the opposite bank, and to follow this unknown lateral valley instead in accordance with the observations then made, we decided to halt, even though the spot was not a wholly suitable camping-ground for our larger party, since it did not seem likely that we could find a better one so late in the day. Accordingly the axes were soon ringing out clearing the necessary space for the tents. What with the rough ground and the continual turmoil of the water, Forks Camp is not ideal, yet as one always reaches it after a considerable period of pack-carrying, one is not disposed to be hypercritical and I have never heard any one complain of its defects.

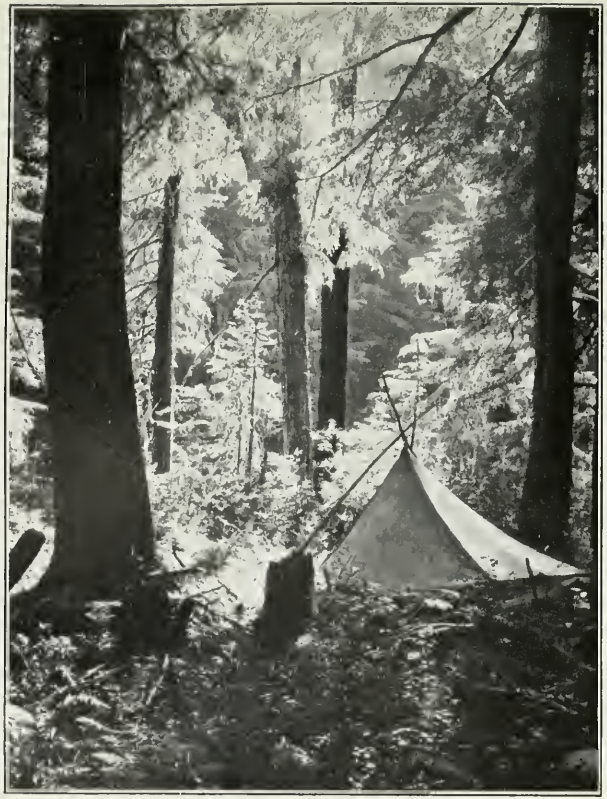
Next morning the men sallied forth at an early hour to prospect our further line of march, for the ancient trail which had helped us thus far could no longer be counted on. They returned at breakfast-time, reporting execrable going over steep slopes above a box canyon. They had blazed a trail for some distance, but advised that no general advance be made until it had been extended to a suitable camping-place. This counsel was adopted and shortly after we set out to

continue the work. Although the canyon was not as deep as one we discovered later, it proved to be a savage place of rushing waters and swirling spray. In an earlier age, the valley had apparently been of the "hanging" variety, thus suggesting a much greater extension of the glaciers hereabouts formerly. Once past the canyon, the going became easier for a time through the cool shade of heavy timber where here and there a snow-drift lingered in the hollows. But it did not last—the valley was too typical of the range, narrow and rough with precipitous slopes that fell down steeply to the stream and drove us to the water's edge to make headway. Occasionally avalanches had plowed down through the trees on either side piling up a tangled chaos of old trunks and branches at the bottom. In some cases the impetus had carried them across the current and up the opposite slope, leaving thick snow arches over the stream. By afternoon, we had gained perhaps two miles and three of us camped to prolong the work, while the others returned to Forks Camp. A light rain commenced to fall but the trail was advanced none the less during the afternoon.

The following morning, a more rapid rate was obtained owing to the easy going afforded by another stretch of big timber. While one progresses up the valley, vistas suddenly open through aisles in the forest, crowned by spires of snow-draped rock which seem to tower an astonishing distance overhead. Such glimpses go far towards renewing the traveller's energy and patience as he forces his way through thickets of stiflingly pungent weeds, perspiring as if in a Turkish bath. Even the aggravation of the pack is lessened. On the south, a steep wall of bare rock bounds the valley, buttressed by smaller spurs. Mount Palmer is the loftiest point in view and from here the sky-line

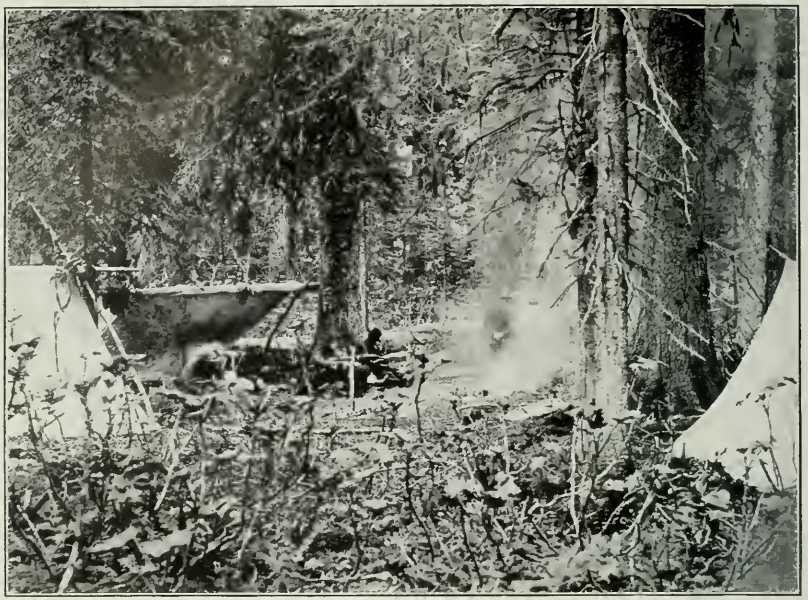
slopes gradually down towards the valley-head. Below the peak there are two glaciers, the drainage from which shoots down over the cliffs in cascades. The more westerly fall we named The Veil. As a whole, the valley forms a fitting avenue of approach to the snowy magnificence above. After cutting for two hours across a wide belt of stout alder-scrub, we descended to the creek where we discovered a comfortable camp ground beneath tall cedars and the others joined us later. This we named Taurus Camp.

It was now apparent to all that the best time could be made by halting for a day or two in one place until the men were able to locate an advance camp and hew out a trail to it with their axes. Then the whole party would move forward and the process be repeated. Accordingly, on June 18th, while the trail was progressing, an ascent was made over the slopes of Mount Palmer to the south in order to see how far we had already come up the valley and what lay ahead. Crossing the stream on a log-jam, we mounted over a fan of avalanched snow that brought us to a long straight gully leading steeply upwards. We climbed steadily for about six hours, often pulling ourselves up through the downward-pointing alders hand over hand. Near timber-line we struck the winter snow-banks, which at this early season completely covered the stunted evergreens. The snow was uncertain in consistency and often let one through into the caverns filled by small trees where much futile floundering was involved in extricating one's self. At other times, the disturbance of the snow in stamping out a path would allow a heavily weighted branch to whip suddenly out of its frosty casing, showering the climber with the powdery flakes and perhaps even rebuking him by a vicious slap. These impediments were largely to blame



SHADOWY FOREST AT TAURUS CAMP

A VISTA OF THE WEST BRANCH FROM THE "TRAIL"



DEVIL'S CLUB CAMP

TAURUS CAMP

for the six hours it took us to reach the ridge, four thousand feet above camp, where we lunched at 1.00 P.M. Mount Palmer rose for perhaps 2500 feet higher across a basin containing a small glacier. In other directions, we obtained excellent views of the valley and encompassing mountains.

The valley views in the Selkirks are singularly beautiful in their contrasts between the belts of dark evergreens and the rich light greens of the alders. The latter flourish wherever avalanches have swept away the forests, for, owing to their flexibility, they are not harmed by the annual spring snowslides which rush over them. Seen from a distance, they resemble smooth meadows of softest turf, but let the traveller beware! In reality they are the most discouraging of obstacles. The limber branches grow along the ground and then turn upwards for eight or ten feet. Being all combed parallel by the slides, and each tangled with its neighbor layer upon layer, climbing through them is exceedingly arduous. The endeavor to pull them apart only drags others into one's face and stepping on the stems concealed by rocks and weeds brings still more down upon one. Progress is most trying except in a downward direction. After securing a round of photographs covering the valley from Azimuth Mountain to Sentry Mountain, and a portion of the Columbia River, we returned to camp by the same route.

Taurus Camp, although infested with porcupines, was one of the pleasantest that we occupied on the trip. Its situation in a spacious level glade, overshadowed by splendid specimens of spruce and fir, with delicious ice-cold water not far away, left nothing to be desired. Some of the trees were over six feet in diameter. The dark green canopy of their branches, interlacing far

above one's head, shut out most of the sunlight and gave a dim weird tone to the surroundings. Not until afternoon did the slanting beams gain entrance and pick out the festoons of black and grayish-green moss, that fringed the under branches. The silence amidst such giants of the forest is impressive in the extreme. An indefinable sense of solemn mystery pervades one who wanders away from the camp-fire. Almost immediately every sign of human presence vanishes, voices are scarcely audible, and the bustle of the camp is swallowed up in the omnipresent stillness. The rat-a-tat-tat of a woodpecker or the chatter of a squirrel is startling in its suddenness. Under these conditions one gains a vivid realization of the tremendous, silent energy that such prolific growth represents. Although the development is slow beyond perception, it is utterly relentless, and in final result becomes of almost staggering magnitude. The mind seeks in vain to picture the evolutions of the endless cycle; the millions of trees now standing in full maturity, the millions more that are struggling up to replace them, and the millions of their predecessors that have rotted away, supplying thus some of the necessary sustenance for the conflict.

Work on the trail continued during June 19th but not until the following day was another general forward movement made. After leaving this camp, one of the worst bits of going in the lower part of the valley is encountered; it would have been almost impossible for loaded men to traverse without a trail. In some places the traveller swings along the bank above the rushing water, hanging on by tufts of grass and alder roots, with scarcely any footing. A stretch of fire-scarred country next ensues where the way lies over a rock-fall sprinkled with prostrate trunks. This was as far as the men had been able to extend the track and we

had a taste of virgin conditions from there on. Slipping and sliding on the soft, burnt earth among nettles, devil's club, and stones, we advanced at the pace of a tortoise.

Presently another alder-slide cut the forest in a solid belt and we decided to make camp before attempting a crossing, for every step of the way must needs be hewn out. We called this Mosquito Camp for obvious reasons. We had come about two and one-half miles from Taurus Camp and increased our altitude to 3800 feet. Without waiting for lunch I hurried off up a strip of unmelted snow in the alder-slide to gain, if possible, a view of the head of the valley, which always heretofore had been concealed by a jutting spur. The situation was fast becoming intense, for if the cliff formation ahead prolonged its unbroken walls thither, it seemed very probable that all our trouble would go for nothing and that Sir Sandford would be immune from assault by us. Happily, however, the higher I mounted, the lower and more open the notch became, and a vague sense of confident elation began to take possession of me. Little by little a glistening expanse of snow defined itself in the notch until at length I perceived that it was a smooth glacier still clothed in winter snow. Only a narrow strip was visible, but farther back an opening to the right evidently admitted a tributary. Mount Sir Sandford itself was either in cloud or concealed, for not a vestige of it did I see. Nevertheless, this glacier would undoubtedly give access to it and the four or five miles of forest intervening could scarcely block us now. It was an exhilarating moment this, when the Sir Sandford glacier was seen by human eyes for probably the first time. So well hidden is it from the east by the Sir Sandford Range, that one would not suspect its existence from that direction. Having thus taken

courage, I descended to camp with the joyful news and took sustenance. During the afternoon the clouds lifted and the others followed up my trail, obtaining excellent views of Sir Sandford and the glacier. Both Parker and Comstock pronounced the arêtes in view as steeper than those of the Weisshorn.

In spite of its drawbacks, Mosquito Camp had several pleasant features. The valley was wider and through an opening in the forest a striking backward view of Mount Palmer was disclosed, its aspiring snow-clad apex towering over a mile above our heads. To the west, the northern side of the valley took on the forbidding wall-like aspect, thrusting out a bleak greyish cliff that hid the higher crest-line of the range. This led towards a small pointed rock peak at the head of the valley (Azimuth Peak) which was destined to become well-known to the writer later on.

We stayed at Mosquito Camp until June 22d, during which time Comstock and myself ascended a mountain on the north side of the valley which by right of first ascent we named Mount Stockmer. The early part of the climb was again accomplished by means of the low-reaching strip of avalanched snow that opened an inviting way upward. Above this, a scramble over steep crags and across some snow-slopes brought us to the middle peak at 4.30. It was a memorable excursion for it gave us our first good view of Sir Sandford's surroundings. The very top was wrapped in thick clouds, but the lower and easterly portions of the range shone brilliantly in the afternoon sunlight and we obtained an excellent idea of the glaciers. A cold wind made photography a rather chilly operation, so we ran across the shaly ridge to the higher eastern summit to restore circulation. From here we saw that towards the Columbia, the range supports extensive

THE SIR SANDFORD RANGE

From Mount Stockmer showing Palmer Glaciers

GIBRALTAR, TONGUE OF ADAMANT GLACIER AND MOUNT WOTAN FROM SANDFORD CAMP

FALLS BELOW ADAMANT GLACIER

snow-fields. After a rough descent through thickets and over cliffs by a more direct route, we reached camp again at eight o'clock where a warm supper awaited us. Mount Stockmer has an elevation of about nine thousand feet.

On June 22d we continued with heavy burdens over the new trail, passing a splendid cataract high up on the cliffs towards the north. There are no less than five fine waterfalls in the valley, any one of which would attract visitors from near and far in a more civilized locality. A four hours' march brought us to Devil's Club Camp, so christened because of the quantity of these plants that had to be removed before the tents could be set up. It was situated in the neck of the valley on a small alluvial flat below a series of rocky steps that formed a hanging valley of the higher portion. Nearby, the stream raced through a narrow canyon, from which it plunged with a dull roar into a cauldron worn out of the solid rock to a depth of fifty feet. Just above, the slit was bridged by a bank of avalanched snow—an easy means of crossing. Unfortunately, it did not prove to be a permanent feature, for, upon our return later, the warm weather had left only a few fragments, and we had to get back by means of a felled tree.

On June 23d we visited the hanging (Adamant) glacier on the north side of the valley that we had seen from a distance. We followed the deep gorge of the West Branch beyond the cauldron to the fine waterfall, where its drainage rockets down over a cliff for several hundred feet in a white curtain of foam. Then, mounting the slippery, alder-matted slopes along its near margin, we reached the lowest ice, elevation, 5870 feet, about noon. The outlook was excellent, for it included the portion of the valley we had already trav-

ersed, as well as that ahead of us in the direction of Mount Sir Sandford. This, we were glad to see, would lead us directly to the tongue of the great glacier fed by its snows, a mile or two away. We noticed with some misgiving, however, that the gorge offered rough travelling for men cumbered with heavy packs. Its densely timbered slopes descended to the torrent's edge in a series of steep flanking ridges and sheer-faced ribs, over which the streams tumbled in cascades. Up these a way must be forced, for just beyond a canyon barred all passage.

On returning to camp, we learned that our apprehension was not unfounded. The men who had spent the day in locating and clearing a trail, reported that the going was the worst yet experienced, but that they had finally reached the ice, and it was possible to get through with the packs. Our satisfaction at this good news, which meant the performance of the first part of our program, was but short-lived; for presently Mr. Comstock announced that he must leave us and return to New York. On account of delays in starting and the slowness of our advance, the time originally estimated as sufficient for carrying out our plans was nearly exhausted, and pressing engagements there demanded his presence. It was with much regret that Professor Parker and myself witnessed his departure on June 25th.

The next day, having previously relayed part of the outfit, we climbed about 1900 feet and established a camp at an elevation of 5726 feet on the crest of the moraine near Sir Sandford glacier in a spot leveled off with our axes. This section of the march proved to be the most difficult in the entire distance from the Columbia. At one point a ladder cut into a tree had to be employed to gain a rocky gulch which formed the only

means of surmounting an awkward belt of cliffs. We called the camp Sandford Camp. Here the party now reduced to four spent the ensuing week. It was situated near the upper edge of the forest and with wood and excellent water in abundance, constituted a well-placed base for exploring the vicinity.

On our first excursion we crossed the ice and walked three miles along the west lateral moraine, getting a good view of the great southerly cliffs of Mount Sir Sandford. Its southwesterly arête springs directly from their base, sweeping up to a blunt snow-peak near by and forming a narrow col. In the center, as if balancing on the arête, a slender minaret towers, its somber mass making a striking contrast with the brilliant whiteness of sky and snow. Dwarfed by the proximity of Mount Sir Sandford, its aspect is puny, but we estimated the height as at least four hundred feet.

June 29th we started out along the easterly margin and moraine of Sir Sandford glacier to visit this interesting col from which we hoped to discover some easier way of ascent than any the nearer face of the mountain presented. Ascending the main ice-fall close under the bleak cliffs of the Ravelin, we continued over piles of avalanched snow at an easy angle. The crevasses, though large, were not numerous, and our progress was rapid. Beyond the Ravelin, however, conditions got worse. The snow was lightly crusted, and we broke through constantly. In addition a filmy vapor partially obscured the sun, diffusing its light in such a way that shadows were obliterated, and making it impossible for us to tell whether we were going to step into a hole or find solid footing. Directly ahead the curious minaret beckoned us on, and though we crunched steadily along, it seemed to stay as far away as ever.

It was not until four hours after leaving camp that

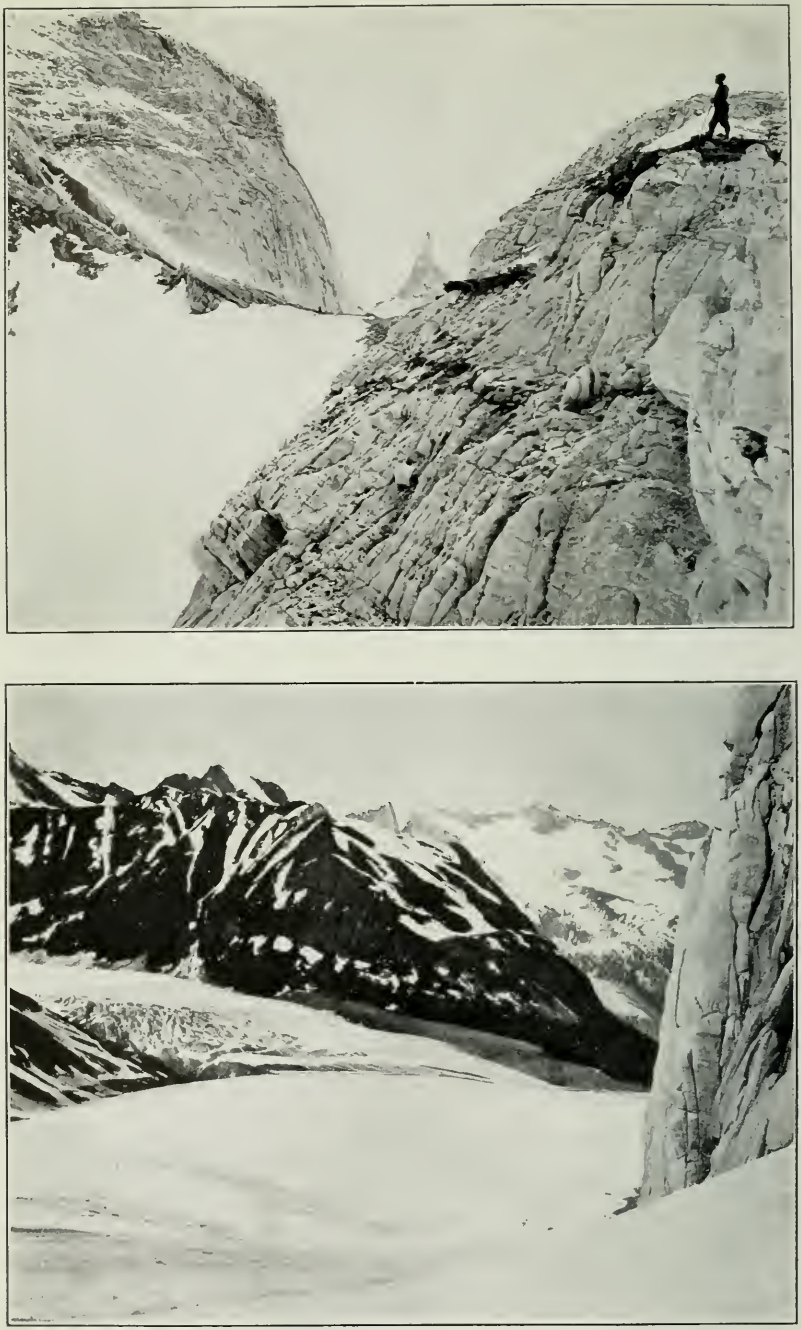
we arrived at a deep depression immediately beneath it. The trough resembled and occupied the position of a *bergschrund*, but we found that it was nothing but a hollow scooped out of the snow by the wind blowing through the col. This was still one hundred feet above us, cut off by a forbidding rock wall, over which a narrow snow curtain formed the only passage. The snow was soft, nearly in an avalanching condition, but we managed to surmount it by carefully packing the steps. After this, a scramble up some threateningly loose rocks brought us to the col in which, half-an-hour after leaving the bottom, we huddled with scarce room enough to unshoulder our *rücksacks*. Indeed it was only at the expense of some ingenuity that the three members of the party were able to dispose of themselves in turn in such manner that all could occupy the tiny nick at the same time. The altitude was about 8800 feet.

It was a particular satisfaction to attain this point, for it commanded the grim southerly precipices of Mount Sir Sandford, and we could all but see Cornice Mountain, from which in 1908 I had viewed the range in nearly the opposite direction. There was nothing in sight, however, that promised an easier access to the mountain on this side. The face of the arête fell away beneath us perpendicularly, bare of snow, suggesting what our route would probably be later in the season. A riven glacier filled the cirque below, cutting off the view into the depression of Gold River's main stream. An icy wind whistled through the notch and the sun was hidden so we stayed only long enough for our lunch and a few photographs, returning then over our tracks of the morning.[1]

[1] This route is not to be recommended for transferring a camp to the south side of Mount Sir Sandford. It is thought that a better way may be found between Mount Vidette and Mount Citadel.

APPROACHING MINARET COL

THE CLIFFS OF RAVELIN MOUNTAIN; MOUNT REDAN IN DISTANCE



VIEWS SHOWING THE ROCK FORMATION OF SIR SANDFORD

Cliffs of Ravelin Mt. at the right in both

As these excursions demonstrated that there was no more favorable side for assailing the peak accessible from camp than that directly at hand, it now became necessary to give the latter a careful examination in order to select the best line of attack. For this purpose, as well as for obtaining a photographic panorama of the vicinity under good conditions, an ascent to some favorably situated station was essential.

Accordingly on June 30th I set out *soliter* to climb the mountain across the glacier northwest of camp, which is seen so prominently from lower portions of the valley. Crossing just above the terminal ice-fall without difficulty, I clambered up a pile of unstable moraine at the corner where Silvertip glacier joins the trunk stream. Some interesting work on steep cliffs came next, but above, the way led over easy slopes to the summit ridge. There are four peaklets to the massif, the highest being some distance to the west. This I had visited on the 28th when prowling about on an off day with the clouds hanging low on the higher peaks. It commands the finest outlook of the glaciers to the south and west, but Sir Sandford may be seen almost equally well from the north buttress, Azimuth Peak, so I continued thither, across a large patch of snow.

The ponderous mass of Mount Sir Sandford entirely dominates the panorama. Its northwesterly face for two thousand feet below the summit is a broad undulating ice-field, broken into séracs in places, but for the most part fairly smooth. When seen in profile from the direction of the Columbia, it seems to rise at an angle of less than 45° and to be easy of ascent. Unfortunately, however, this ice-hung "roof" of the mountain is girdled with precipices below, which form an essentially vertical wall of rock around it on every

side except at the westerly edge where an arête pushes out and connects in a graceful sweep with the small outlying mountain named the Ravelin. Over these precipices the ice-cap discharges its excess flow from a practically continuous line of hanging glaciers. The problem of a route, therefore, becomes a simple one; it reduces itself to the single locality not directly raked by falling ice, the westerly arête. The formation here is rather extraordinary, since a broad sloping platform or shelf, itself supporting a secondary hanging glacier, follows up the ridge proper along the north side. This connects in steep snow- and ice-slopes both with the summit ice-field at the top and with the glaciers below, forming a substantially continuous band. Here, then, was the best line for our attack, for on the arête itself two difficult buttresses bar passage jutting out one above the other like dormer windows in a roof.

Turning to the other compelling features of the prospect, the splendid glacial system that guards Sir Sandford is perhaps of next importance. Southward and westward, as far as the eye can reach, stretches a wilderness of billowing snow-fields and snow-muffled peaks relieved by scarcely a touch of the green world below. This is the catchment-area of Sir Sandford glacier, and four névé-laden ridges divide it into three basins, from each of which a glittering stream issues to become confluent at length in the single trunk stream. The latter flows northerly along the base of the Sir Sandford Range for five miles, is but little less than half a mile wide at the narrowest point, and follows a nearly straight course throughout. An evenly crested, roof-shaped ridge named the Palisade bounds it on the west and separates it from the adjoining névé on that side. Between the Palisade and the Ravelin occurs the chief ice-fall, occupying the full width of the glacier

SIR SANDFORD FROM AZIMUTH PEAK

THE GLACIER MANTLE OF THE RANGES NEAR MOUNT SIR SANDFORD

Looking south from Belvedere Peak

for a height of some seven hundred feet. Below the ice-fall the glacier is smooth and almost level until it approaches the final descent to the tongue, but here numerous longitudinal crevasses appear, and retard the crossing.

The other two glaciers mentioned may be appropriately considered as one—the western tributary of the Sir Sandford—since they unite before joining the latter about a mile westerly from it. The larger branch lies just west of the Palisade. Its névé overtops the latter at the southern extremity, and joining that of the trunk glacier at its source, forms a nunatak of the Palisade. This snow-field has been named Silvertip névé. The other, Silvertip glacier, shorter and more crevassed, descends from the northerly slopes of Mount Silvertip and a pass of the same name farther to the west.

Besides this westerly tributary, the trunk glacier is augmented by yet another, which enters on the opposite side at the Ravelin. Taking its source on the snowy ridge that forms a continuation of Sir Sandford's east arête, it sweeps across the northerly face of the peak and descends to join the main glacier two miles distant.

With these ramifying arms contributing their icy quotas to one consolidated stream, the Sir Sandford glacier constitutes perhaps the finest and most interesting hitherto discovered in the range. It is a better example of a dendritic glacier than any in the southerly ranges: Battle glaciers, Grand glaciers, Black glacier, or Deville glacier.

From Azimuth Mountain to the northwest an impressive view is obtained of the Adamant group, next in height to Sir Sandford in this vicinity. With its cluster of closely-packed pinnacles it more nearly resembles the famous aiguilles of the alps than anything

I have seen elsewhere in the range. The peaks are arranged in an imposing amphitheater which forms the reservoir of Adamant glacier. This flows easterly for three miles and ends on a steep rocky slant over which its drainage dashes down in a striking series of falls for a thousand feet.

After reveling in this entrancing prospect for a whole afternoon and taking many photographs and angles, I started back, stopping now and then to enjoy still further Sir Sandford's magnificent display. During one of these halts my attention was attracted by a movement below me, and glancing down I saw one of the goats which we had previously noticed on the mountain. By her side trotted a little kid with amusing antics. I had one film left, and thought that now was my chance, for neither of them could have suspected my presence. Accordingly I worked cautiously towards them along the ground. The wind was rather variable, though predominating from the direction from which they were approaching. I finally crouched behind a projecting rock, and focussed my camera for fifteen feet. Having often heard that the instinct of a mountain goat is to run directly upwards when first alarmed, I laid my scheme accordingly, and confidently expected that if I rolled down rocks from my hiding-place she would dash by me at the distance focussed for. If I had adhered strictly to this, perhaps my story would be different, but to make sure of her position, I advanced my head slowly to the edge, sprawled at full length. The animals were about two hundred feet below me, and I determined to watch them for a few moments before commencing my bombardment. The dam kept turning her head nervously backward as if suspicious of danger, and then suddenly looked up towards me. In an instant she comprehended the situation, and lost

no time in making off horizontally around the ledges below, with the kid cavorting after. My heavy rocks failed to affect her course. Dejectedly I continued my way along the trail which she had been following, lined with many tufts of white wool, and finally reached camp at dusk.

On July 1st we set out for Sir Sandford on the route selected from Azimuth Mountain. It was an ideal day and conditions could not have been more favorable. In about three hours we gained the knob at the foot of the arête in the tracks of our previous trip to Minaret col and then we halted to study out our immediate advance. Two obvious ways of attack presented themselves: one along the spine of the arête directly towards the lower buttress, the other a traverse around the buttress by way of the slope on the north to a point where it again connected with the ridge higher up. While discussing these alternatives, a mass of ice broke off a hanging glacier near by and rattled down a couloir. It did not threaten either of the routes, but taken in connection with the traces of small slides that had crossed the snow-slopes, it led the majority to decide that further progress was unwise. Owing to the backwardness of the season, the winter's snow had apparently not yet entirely left the mountain. Before turning back, one member pushed on along the arête to the foot of the buttress, five hundred feet higher, without especial difficulty. The rocks on this face of the mountain, however, are hopelessly smooth and offer no allurements to the climber. Shortage of supplies preventing the continuance of the siege, the next day we turned homewards.

It was extremely hot in the valley, and the two days spent in reaching the canoe were the most exhausting on the trip. We found the Columbia in full flood, giving us the stiffest kind of pulling at the oars. Often

progress was made only an inch at a time, and frequently Professor Parker and myself had to land and break through the thickets along the banks to lighten the boat and enable the men to work it up some difficult bit of water. In this way we finally regained our starting point on July 7th, after twenty-three days of wilderness life.

Our accomplishment was less than we had hoped for, but the difficulties had exceeded expectations. If the trail had been cut before our arrival as arranged, it would not have been necessary to expend most of the allotted time in the approach, and the climbing strength of the party would have remained undiminished. Mr. Comstock's unavoidable departure was a serious handicap. Neither of the two remaining woodsmen, Dainard and Duncan, was used to ice-work nor were they at all prepared to perform it. Their boots were without suitable hobnails, snow glasses were lacking, and but one additional ice-axe was at hand. Much credit is due them for volunteering to assist us in uncongenial work which they were under no obligation to perform. Dainard accompanied us on all the glacier trips, suffering in consequence a severe attack of snow-blindness.

The results of the expedition may be summarized in a short paragraph. A practicable route to the base of Mount Sir Sandford was worked out. A general conception of the mountaineering problem presented was obtained by a traverse around it, by an ascent to nine thousand feet on its westerly arête, and by a careful examination of its northerly and westerly faces from these routes and suitably elevated stations elsewhere. In addition, what seems to be the largest glacier in the range was discovered and the splendid group of granite peaks that faces Sir Sandford from across the valley to the northwest was seen in its full grandeur for the first

time. Thus my earliest impression of the district was fully confirmed. Here in the very shadow of the monarch of the range lay one of the chief scenic centers of the entire Selkirk system, a glorious land, absolutely primeval, with peaks, passes, and glaciers in profusion and all unknown, unnamed, and unmapped. Despite the disappointments of the journey, we were not without the rewards of the pioneer.

CHAPTER XVI

RENEWED ATTEMPTS ON MOUNT SIR SANDFORD, 1910

The Ascent of Pioneer Peak and the Return to Donald

THE exhilaration of our partial discoveries in 1909 and the lure of the splendid *terra incognita* then revealed in tantalizing glimpses, added a fresh spice to the absorbing alpine problem of Mount Sir Sandford. Moreover a feasible route was now open and the general character of the massif known. The whole situation seemed to offer such a fruitful field for mountaineering and exploratory work, that the following season I was able to prevail upon my friends, Professors E. W. D. Holway and Frederic K. Butters of the University of Minnesota, with whom most of the expeditions described in earlier chapters were made, to join me in another journey thither. In conjunction with the attack upon the mountain, we planned to carry out a prismatic compass survey of the vicinity and to supplement it with observations by aneroid and boiling-point thermometer. The route of approach was to follow exactly that already described, arrangements being made for a stay of about three weeks.

We arrived in Golden, June 30th. Provisions to the amount of three hundred pounds were purchased and men engaged the same day. We endeavored to secure a motor boat to facilitate the river work, but none was available so we had to content ourselves with a canoe

as before. The suggestion was made, however, that the return journey would be simplified if we followed the Columbia trail, leaving the men to take the lightened boat back up the river and in the end this was the course pursued.

The next day we went on to Glacier whither our baggage had preceded us. A day was spent here in sorting out the supplies brought from the east and in measuring and marking off a thousand feet of piano wire, which I had procured for laying out a base on the level ice of Sir Sandford glacier. For this operation we were driven to utilizing the top of an adjacent snow-shed, as Dr. Green had done many years before, since the vicinity did not possess a noticeably greater amount of flat, open ground than he found at that time.

On July 3d we returned to Beavermouth, where men and boat awaited us. Provisions were divided up among small water-proof bags, tents were overhauled, the canoe was pitched, and the thousand and one details that crop up at the last moment were attended to. Next morning we turned out at four o'clock. The night had been a cold one, freezing a quarter of an inch of ice in the buckets. Temperatures as low as this are not of infrequent occurrence in the outlying valleys of the Selkirks during the summer months, owing doubtless to the downflow of air from the snow-fields. Often it is warmer at a height of four thousand or five thousand feet on the mountainsides than in the valley bottoms, especially in the forest. On one occasion that I recall, the mercury stood at 60° for a day or two at about this altitude. Sleeping-bags were too hot and we passed several nights under the trees with only light covering.[1]

Embarking at 6 A.M., it took but three hours and a quarter to cover the eighteen miles to Gold River.

The interval seemed much longer, however, for the canoe leaked at a rate of several gallons a minute and kept the passengers bailing constantly in relays. Sir Sandford was completely veiled in the mist. The battle with Gold River was as hard-fought as on other occasions and we had to camp without getting started on the trail.

The next day in cloudy but comfortable weather, we made Forks Camp at nightfall and then, the day after, continued up the West Branch. Several large slides had come down on each side of the valley since the previous year, necessitating a relocation of the way around the masses of debris. Growing trees more than three hundred years old lay heaped up in tall bulwarks like huge jackstraws. These were not the first signs we had noticed of the heavy snowfall. Near the mouth of the river, where it sweeps the foot of the mountain on the east, an avalanche had passed right across the stream, leaving behind bowlders and a big pile of snow, covered with trunks and branches, to tell the tale. At Field in the Rockies it was reported that an avalanche had rushed down from Mount Burgess, carried away a barn, and, after crossing the Kicking Horse River, had only stopped just short of the hotel itself. A man about to enter was bowled over by the flying snow-spray.

An amusing incident occurred during a short halt on the mountainside. A grouse, known locally as a "fool-hen," alighted on a branch near us, and one of the men, after slipping off his pack, opened fire on the inquisitive visitor. Six times the revolver blazed with loud reports but the bird did not stir a feather. It simply cocked its head to one side as if in wonder what all the disturbance was about. Although the creature was a tempting delicacy, cartridges were scarce and

CAMP AT BEAVERMOUTH

THE SIR SANDFORD RANGE FROM OUTLET OF GOLD RIVER

CROSSING THE CANYON NEAR DEVIL'S CLUB CAMP

therefore the would-be marksman retired, rather nettled. His discomfiture was not allayed when his companion walked quietly over to the bird with a slip-noose made from a shoestring dangling at the end of a stick, bent down the branch on which the bird sat, and deliberately pulled the loop taut around its neck. Fool-hens are common in the range and furnish many a delicious repast.

Rain commenced as we were approaching Mosquito Camp, so we spent the night there. July 7th we continued to Devil's Club Camp, wet to the skin by shower baths from the dripping undergrowth. Since there was nothing to be gained by going farther under such conditions, camp was pitched here for the night. Another great slide had fallen near by and we scarcely recognized the spot, surrounded by deep banks of snow. In the afternoon the men started back to the boats for additional tents and provisions. We had covered in four days what had taken more than twice this time when the way was unknown and there was no trail.

The following day we got under way for the final and most arduous stretch to Sandford Camp. No snow-drift bridged the canyon now and our only recourse was the broken tree used the previous year. Half severed in the middle it had sagged during the interval most suggestively. To walk a level foot log across a rushing stream without any support is difficult for most people, but when it slants downwards and then upwards it presents a considerably more formidable obstacle. However, the distance was not far and the weight of the branches on our side acted as a cantilever, so Holway worked cautiously across on a rope while we made ourselves as heavy as possible on the end. Then the packs were hauled over separately and we followed.

The trail is really nothing but a line of blazes and even one who knows it well may easily lose it. On one occasion this occurred on a steep muddy hillside in the midst of a thicket of rhododendron and devil's club, the latter covering every foot of the ground with a network of long snaky stems. While we were all separately plunging around in search of the path and occasionally sprawling at full length on the sharp spikes, one member announced that he had put down his pack and could not find it again. It might be supposed that this would have aroused a full measure of disgust but the end was not yet. After finally regaining both pack and trail by dint of systematic search, we had progressed but little before the next vexation presented itself. This time it was the smooth belt of cliffs that pitched abruptly down the mountainside across our course—the same that we had surmounted the previous year by means of a very steep gully to which a ladder of tree trunks gave entrance. The original discovery of the place had been hailed as a triumph of perseverance, and now in the jungle of devil's club and ferns its location completely baffled us. But it had to be found, for there was no other way, so we commenced to skirmish up and down along the base of the cliff. After an unconscionable amount of the roughest work it turned up behind a thick screen of bushes and trees. However, even now our troubles were not over. No sooner had we started up, than one of the new ice-axes snapped in two amongst the logs. Higher, a hundred-foot evergreen had fallen lengthwise down the cleft, filling it with a tangled mass of branches and confusing the blazes so that we lost the track again and wasted still more time in hard scrambling over slippery bush-choked ledges to find it. Incidents such as these are the daily portion of the traveller in Selkirk valleys.

Although when one is surrounded by the comforts of civilization they may seem too trivial to deserve mention, yet in the environment where they occur, quite a different importance attaches to them. Then each detail is magnified and even the loss of a pencil or the breaking of a watch crystal may assume the proportions of a calamity.

Above the gully the path winds back and forth over ledges almost concealed by dense thickets of snow-brush and rhododendron. Just before arriving at the open country near the glacier, an inspiring view of Sir Sandford's clean-cut white apex is suddenly disclosed. It is less than three miles away, yet rises a mile and a quarter above the observer. After the aggravation of the forest, it is refreshing indeed to throw down one's pack and drink in the bracing breeze from the ice-fields. The eye wanders over vast spaces with pleasure after the days of limited view. Annoyances efface themselves as by magic; the toils of the lower valley are forgotten and one enters the new world of frosty beauty with liveliest enthusiasm. Sandford Camp is about half an hour farther on, but although the way ascends some seven hundred feet over rough moraine, it is scarcely felt, owing to the interest of the surroundings. The camp occupies a fairly flat place on the crest of the easterly moraine, a high bank of which protects it on the west. Wood and delicious water are near at hand and on the whole it is a comfortable site. The altitude is 5726 feet.

We arrived late in the afternoon of July 8th. As the weather seemed settled and there was nothing to be gained by delay, we decided to attempt the peak on the morrow, relying on the days of continuous pack-carrying as a substitute for a training climb. If the truth be told, we did not anticipate any serious difficulty in

subduing Sir Sandford. A minute study of photographs from different points, combined with my observations through powerful glasses the year before, revealed no pronounced obstruction such as a vertical cliff or impassable *bergschrund*. On the contrary the snowy shelf formed a clear and continuous way from the base to the upper ice-field and, as far as any one could tell from below, the worst to be expected was a long climb over steep snow combined with careful work among the huge cornices of the summit ridge.

Accordingly on July 9th, we turned out at 3 A.M. Indications were promising, so an hour and a half later we set forth. The way lay first over moraine and then along the margin of the glacier which afforded easy going on dry, crisp ice. The stillness up among the great peaks before sunrise, when everything stands clasped in the firm grip of the frost, is impressive in the extreme. Each rivulet is hushed, snow is hard, and only rarely is a falling rock heard. An occasional creaking of a glacier and the muffled booming of a torrent far down in the depths of some crevasse, as one passes, are nature's only sounds. In the chill, melancholy twilight the awful majesty of the mountains—their inordinate bulk and eternal solidity—is felt intensely as a deeply solemn chord. Not until the growing brightness, creeping downward from the sky, bathes with gorgeous tints each embattlemented crag and tender snowy crest, is the note of glowing beauty sounded. But then, in the keen inspiring freshness of the dawn, one seems transported to another world. Cares and doubts vanish and the sheer joy of life permeates one's being as never before.

At the end of the moraine we roped up and headed directly across the tributary glacier for the recess behind the Ravelin. Presently we came upon a set of ice

SANDFORD CAMP, ELEVATION 5726 FEET

THE APEX OF THE SELKIRKS

(Morning light)

dykes six or eight feet high and about one hundred feet apart extending in parallel lines up the slope to the cliffs. The unusual formation was probably due to the fact that the edges and bottom of an avalanche are retarded by friction which, when gentler slopes are reached, becomes sufficient to bring them to a stop. They thereupon solidify, allowing the main mass to slide between as in a trough. Near the corner of the Ravelin were two or three deep crevasses; then a level reach of snow ensued which brought us to the foot of the steep slant leading to the arête. Just below the top there is a *bergschrund* in two parts which interlock and may cause difficulty. Having passed this, the route swings directly towards the main mountain up the shelf. Owing to the proximity of the ice cliffs of the hanging glacier which edges the shelf on the north, the crevasses run parallel with the slope and need to be watched with care although they are not wide. About 3300 feet above camp the way turned directly up the steep snowy roof of the lower buttress. Hitherto Holway, as leader, had been bearing the brunt of the labor of treading out a path in the snow, so at this point I went forward to relieve him. Two *schrunds* at right angles guarded the bottom but they were easily passed and then real work began. The snow was soft but in every way safe, yet such was its steepness that in resting one could lean against the slope with ease, and in rising to the steps one's knees would dig into the surface. No times were taken, but it seemed very long before we reached the arête at 10.15. Here we stopped to enjoy the magnificent view to the southwest.

After a short halt we continued upwards along the north side of the smaller buttress, but the snow soon turned to ice. Holway, now in the lead once more,

began to cut steps to the left in the hope of gaining a crack in the ice which promised to be of assistance. Owing to the hardness of the ice and to the need to chip hand-holds it was slow work.[2] At noon the full length of the rope was out but he had not reached the crack. A short advance would have brought me as last man to an ice step with practically no hold. Butters had already been on ice for some time but my hold had been sufficient to anchor the whole party. The lack of sound, sharp axes was keenly felt as the broken one was almost useless and only one of the others had edge enough to make any impression on the flinty glacier ice. It was exceedingly cold in the shadow and the whole party was beginning to feel its effects. Under all the circumstances it seemed to be the part of wisdom to retreat until we could have another length of rope brought up from the base camp, and thus avoid trusting ourselves to an ice traverse where a slip by any one would have meant the destruction of all. We now knew exactly what the difficulties were and meanwhile we could look the mountain over for another easier route. This outcome was particularly discouraging, for the worst part of the climb was evidently behind us and could we but have passed the ice belt, the way beyond appeared free from difficulty.

Accordingly we returned to the arête and from there started back at 2 P.M. Carefully backing down the long slope in our steps of the morning, we finally reached camp after an absence of fourteen hours. The following day we went back to Devil's Club Camp in order to help the men bring up the rest of the outfit.

On July 12th we set out at 4.30 A.M. to visit the ridge east of Sir Sandford and give that part of the mountain a careful examination. Turning straight up the slopes

SILVERTIP GLACIER AND GRANITE RANGE FROM ARÊTE STATION

CLIFFS OF SIR SANDFORD AND VIDETTE FROM SAME

EAST AND NORTH FACES OF MOUNT SIR SANDFORD FROM NEAR THE FOOTSTOOL; NORTHEAST ARÊTE IN CENTER

NORTH FACE AND NORTHEAST ARÊTE OF SAME; FOOTSTOOL AT LEFT

near camp in the direction of Mount Guardsman, after an easy climb without roping, we reached the top at 7.30. Here we took breakfast and obtained a round of angles and photographs which consumed so much time that none remained for building a stoneman. The weather was not of the best, as the air was full of haze and a high scud was driving in from the southwest before a stiff breeze. The northerly cliffs and easterly arête of Sir Sandford appear entirely hopeless from here. The view of the snow-fields that cover all this side of the range is especially fine and in clear weather the Columbia would be visible.

The east face of Mount Guardsman drops pretty steeply to the glaciers without offering any obvious route. Accordingly we scrambled down wherever we could find a lead, commencing towards the left and finally ending up on the arête in the direction of Sir Sandford. Here some interesting bits of climbing ensued, involving in one instance a traverse of the knife-like ridge *à cheval*. It finally brought us to the snow after crossing some outcrops of mica schist full of small garnets. At the end of an hour's plodding, part of the time in cloud, we attained the ridge about 10.30 where the wind was felt in full force. Our mountain looked very precipitous and forbidding on this side and a careful study with the glasses failed to disclose any promising way of attack. We climbed to the top of the snow dome (The Footstool) at the foot of the arête, but this nearer view-point only confirmed our earlier observations. Later I followed the almost level shaly ridge for some distance to the east and took a panorama and compass bearings for mapping purposes. We started back at 12.45 over the same route except that the edge of the glacier leading down to the trunk stream was followed instead of again traversing

Mount Guardsman. Camp was reached four hours later.

We spent the next few days in exploring Sir Sandford glacier, visiting Silvertip Pass at the source of its westerly affluent and the snow dome between the névé of the same name and the main stream. The views obtained gave a clear knowledge of the entire glacier. Having thus assured ourselves that there was no other way of assailing Sir Sandford from our base with any chance of success, we prepared for a final effort over our earlier route.

We got under way at four o'clock on July 18th in somewhat doubtful weather. At the plateau below the Ravelin we noticed millions of living animalcules upon the surface of the snow. The going was good until we reached the acclivity beside the large buttress, but here, owing to the furrows made by small snow slides, whose bottoms were hard and glassy, some axe work was necessary.[3] Nevertheless we reached the foot of the long steep slope leading up to the arête at about 7 A.M. Conditions hereabouts had changed to a marked degree since our first visit. The *bergschrunds* had opened and a good deal of snow had disappeared disclosing underlying ice. The easiest path seemed to lie among the projecting bosses of broken glacier to the left. After working upwards here as far as possible, Holway made a gallant attempt to get out onto the smooth slope at the right, but he had to come back and we descended a little and tried again. We were perched on the lower lip of a crevasse whose other wall, a cliff of ice, must have overhung, for there were clusters of icicles on it from which water dripped on and outside of us. The position was somewhat spectacular. I was last on the rope and in the best place for maintaining an anchorage in the firm snow of the lip as well as for viewing events. Hol-

way, with practically nothing to hold on to, was performing on my sky-line, chopping vigorously but with nicest care. The slope fell away beneath him with what appeared to be a tremendous drop and mounted above at an equally violent angle. In reality, I suppose that the grade was not particularly severe but the mental effect produced upon us corresponded with appearances. I would have given much for a photograph,[4] but to have removed my hands from the ice-axe would have placed our lives at the command of the slightest give in the snow, since Butters, who was ahead of me, could obtain only a conventional kind of hold. His footing was solid but did not convey an impression of much security in the event of a sudden strain.

Positions such as ours give rise to reflection upon the comparative qualities of snow and rock in the eyes of the mountaineer. Snow is a deceitful substance. Oftentimes it will seem firm enough to sustain one and will actually do so for a moment, only to subside a little immediately after. This may be sufficient to spell catastrophe in a position of delicacy. Rock, on the contrary, is less tricky. If it is insecure, this is usually apparent at first touch; if it is firm enough to support one's weight it rarely fails later. Moreover the character of rock is likely to be homogeneous in one locality; it is either all loose or all firm. And when it changes its texture, it has the advantage that the alteration is visible. With snow, on the other hand, there is always an element of uncertainty. Its condition and consistency vary with the exposure, with the altitude, with the nature of the base on which it rests (rock or ice), with the depth, with the time of day, with the season; and in all of these instances the texture may alter from place to place. Accordingly snow travel requires constant watching. Perhaps its most

reliable condition is when compacted by avalanches. Then crevasses are filled or safely bridged and one can feel confident that it will not betray him. Hard-frozen snow is almost invariably trustworthy also.

By cautious work we eventually found ourselves on the face of the long slope and then slowly worked upwards. The arête was gained at 9 A.M. where a temperature of 38° went far towards counteracting any satisfaction that we might have felt over previous progress. Without much delay we continued to the ice-slope. It seemed advisable on this occasion to cut directly up toward the ridge which from inspection below did not appear to be more than three hundred feet away. After working for about two hours, however, the cold proved to be unbearable. We were in the shadow and a boisterous gale chilled us to the bone as we stood motionless in the steps. Chips of ice sliding down the slope and packing around our feet had taken away all sensation and there was nothing for it but to retreat. When we got back to the rocks and removed our shoes we found that but a short time more and frozen members would certainly have resulted.

This second repulse was a keen disappointment, for we could scarcely renew the attack again. Every succeeding day was reducing the snow on the slopes and exposing the underlying ice which meant the expenditure of more and more time in step-cutting lower down. Moreover the *schrunds* and crevasses were constantly widening, with attendant destruction of the snow bridges. Even the eight days intervening since our first attempt had wrought great changes in the mountain so that the second expedition was made over a different and considerably more difficult route. There is no place for spending a night on the mountain

with advantage, though it would not be impossible to bivouac at the foot of the arête near the Ravelin or on the rocks below the upper buttress. The latter would be of most value for the climb, but it would involve transporting everything up the long snow-slope where there is no chance to rest. Even supposing this were successfully accomplished, no good place for a tent is to be found. There are no loose rocks for a platform and unless it were set up in the snow the party would have to sit with their backs to the cliff without any real protection.

On the long snow-slope in places the angle is from 48° to 50° by clinometer. It drops for a thousand feet without a break and only under the best of conditions is it safe to negotiate. Although the sun never strikes it directly, the snow becomes alarmingly soft by early afternoon, and we were glad to back down, moving one at a time, much as an inch-worm progresses. From the lower glacier we looked back many times at our Waterloo. It was disappointingly insignificant, and with its innocent smooth snowy covering one could not possibly convince a person who had not been there, that the slope was anything but an easy walk. The trouble with Sir Sandford lies not in the gross structure but in the details of its architecture. We got back to camp at 8 P.M., after an absence of sixteen hours.

The mountain is essentially an ice climb and preparations must be laid accordingly. The large amount of ice encountered was something which our previous experience in the range had given us no occasion to anticipate and we were ill-prepared to deal with it. We had no crampons, which would have saved time on the lower slopes of hard snow, and only one axe of any value for ice. Of the others one was loosely mended

with wire and the third blunted and dull. These handicaps, combined with the gales at low temperatures, formed a total of difficulty that we were unable to overcome.

In consequence of these experiences we decided to give up Sir Sandford and to devote the remainder of our stay to exploration and the observations necessary for topographical and other scientific work in the neighborhood. A base-line a third of a mile long was measured off with the special wire on the nearly level surface of the glacier and a prismatic-compass survey of the immediate vicinity was commenced. Observations were made on the tongue of the Sir Sandford glacier which appeared to have retreated about thirty feet since 1909. A panorama of the forefoot and terminal moraines was taken from a prominent bowlder on the east moraine to show by comparison with future photographs any change in conditions. The station was marked distinctly with a [P.] in green paint.

On the exploratory side we determined to visit the striking group of peaks to the northwest which we had seen to advantage from the high points of the Sir Sandford Range and which among the surrounding elevations undoubtedly occupied a position next in importance to Sir Sandford. The easiest way of approach appeared to lead directly over the summit of Azimuth Mountain and on July 21st at 4.30 we sallied forth in this direction. It was unusually hot and sultry, though the sun was dimmed by a thin veil of smoke. Not a breath of air was stirring and the climb over the grassy slopes of Azimuth proved to be a toilsome grind. Myriads of mosquitoes and flies pursued us from below, and altogether it was rather an unpropitious start for a long day. Seven o'clock found us on the middle peak (8200 feet) working out the next section of the route.

From our feet the névé of Adamant glacier promised an easy descent to the floor of the basin and presently we continued thither. It took us half an hour to traverse its level but deeply pitted surface to the foot of the tributary glacier on the opposite side. The atmosphere felt lifeless and the opportunity for a second breakfast offered by its moraine was only too eagerly accepted. Sir Sandford glowed through the prevailing murkiness with a ghostly radiance like that of a mercury-vapor lamp. After spending nearly half an hour in this satisfying manner, we turned to our task once more at 8.20 A.M. We aimed to gain a col in the ridge by way of the glacier beside us and then to traverse the snow-fields on the north side of the range towards the summit of the group's most easterly massif which has been named The Gothics. The snow was wet but tolerably easy to travel over, and we plodded steadily on making altitude rapidly. Near the top of the glacier we came upon an unusual formation which it may be of interest to describe.

The ice flowed parallel to the rocky cliff of the basin, but separated from it by a trench some fifty feet deep and of the same width. The glacier wall, facing the rock, was plastered with a steep curtain of snow which had also piled up on the upper surface of the ice along the edge. The wall, accordingly, constituted a longitudinal section of the glacier but the vertical crevasses that would otherwise have cut it were plugged by the curtain of snow, except in two cases where deep V's split into it. The drift of snow along the edge of the trench formed the easiest pathway and this we were following when the first crevasse brought us to a halt. Towards the middle, the glacier was much riven and to have continued thither would have speedily involved us in a net of crevasses. Ahead, across the

fissure, the snow kept smoothly on. Holway, who was leading, did not long delay his decision. Requesting us to advance until Butters was near him, and then to anchor, he kicked out a descending staircase in the steep snow edging the notch formed by the crevasse, to a point where it narrowed sufficiently to step across, and then climbed up on the opposite side until he was on our level once more. It was a clever exhibition of snow craft and absolutely safe with the rope, although doubtless to a tyro it would have appeared spectacular, for the snow was as nearly perpendicular as it can stand of itself—say 75°—and the dark depths of the glacier yawned ominously at one side. Of course its condition was perfect. The other crevasse was more easily passed by means of a surface bridge. The glacier was working actively, for as we approached the ledges we were startled by a sudden report and a slight subsidence of our footing. We reached the rocks at 10 A.M. and climbed the remaining distance to the ridge unroped. The formation was different from any we had previously seen in the vicinity, being granitic instead of sedimentary. Many specimens of delicate pink orthoclase strewed the ledges over which we scrambled.

The point where we attained the ridge (9700 feet) lay not far to the east of the small tower with a slanting top that effectually guards The Gothics from this direction. On the farther side a wide snow-field split by several huge *schrunds* afforded a possibility, withal a doubtful one, of passing the massive easterly peak and of reaching the lowest rocks of the principal summit. The granite hereabouts gives smooth faces to even the details of the ridge and it took us some time to get down twenty feet to the snow. But the great fosse that confronted us a little farther on caused the most misgiving. It ranged from fifty to

10,407 ft. Pioneer Peak East Peak 10,250 ft.

THE GOTHICS

HEAD OF NAVIGATION ON GOLDRIVER

A DANGEROUS OBSTRUCTION ON SAME

one hundred feet in width and followed a bending course down the length of the glacier. Fortune was with us, however, for a single lobe of snow still spanned the gap and proved to be safe for crossing. One involuntarily holds one's breath at such places when all are on the bridge at once.

We got to the final rocks at noon, and it was a welcome relief to unrope and quench our thirst with a draught of water. From here we had a fine view to the east and south, though the smoke had become denser. The easterly peak of The Gothics near us presented a most forbidding aspect, for it was nothing but a thin wall and, seen end-on, looked like a steeple. We keenly regretted leaving our cameras behind on account of the smoke, since we had never seen such a summit on a mountain of equal importance anywhere in the Rockies or Selkirks before. It reminded us strongly of views of the Grépon. After a twenty-five-minute scramble, we came out on the narrow crest of the top.

Our success afforded some satisfaction for the previous reverses, for the peak was obviously important. Only Mount Adamant and the eminences along its massif out-topped us. But for the dense pall of smoke our view would have been magnificent and, notwithstanding, many new features of the region were revealed. To the north we looked down into a glacial amphitheater across whose distant outlet a section of the Columbia could be seen. Northwesterly a series of similar basins indent this side of the range to the limit of vision, piling the snow well up against the wall of peaks. Mount Adamant dominated the largest, supporting a wonderful series of ice cliffs and *bergschrunds*. Our peak was on the easterly rim of the basin and descended into it as a sheer wall.

The weather was steadily becoming worse, so at 2.35,

after building a stoneman and leaving our record in an aluminum box, we started back. At the col it grew dark and thunder commenced to rumble. However, only a few drops spattered us as we followed our track down to Adamant névé. But here the storm broke in earnest and as we hurried over the rough snow we discussed the wisdom of crossing the Azimuth ridge and descending directly to the Silvertip glacier instead of returning over the summit as we had come. Though the route was unknown, we finally took the chance and made for a small pass to the west of Azimuth's west peak. The wind was battering us with hail and sleet as we mounted into the col, so with but a brief pause to unrope, we started down the steep grass-covered ledges. Our guess was justified, for no obstructions were encountered and we descended rapidly to the ice without incident, save that a few pebbles, loosened by the wind higher up, swished viciously by us, humming like hornets and going so fast as to be invisible. Camp was regained at 7.30 after an absence of fifteen hours. The height climbed was 5600 feet, the distance covered being about nine miles. We named the summit Pioneer Peak, and its altitude has since worked out to be 10,660 feet.

Only enough provisions now remained to take us back to the railroad, so after a day of rest and preparation when new snow fell upon the mountains, we bade farewell regretfully to Sandford Camp. We lunched at Mosquito Camp where we accidentally discovered a bowlder of micaceous schist from which we dug handfuls of garnets and then went on to Taurus Camp for the night. On July 24th we reached the boats and embarked soon after. Like all similar torrents, the channels of Gold River are continually changing, and as the stream was nearly at its daily maximum, naviga-

tion was somewhat hazardous. At such times the man at the helm must be familiar with riffles and eddies, since surface indications are the only guides in muddy glacial water; he needs a strong arm as well, for the turnings of the stream prevent any distant views ahead and quick action may be necessary. Fortunately our steersman was equal to all requirements. In rounding a sharp bend in the swiftest water, a long prostrate tree, entirely bridging the channel, appeared directly in front. It was too low to pass under; landing was the only escape from an upset. Paddles and poles splashed in earnest, but the heavy craft responded with tantalizing slowness. Could we make it? A few moments of suspense brought a favorable answer and we swung along shore, scarcely a boat's length away from the tree. Not long after we reached the Columbia. From here we planned to vary our return, the principals of the party taking the government trail that leads from Bush River to Donald, while the others worked the lightened canoe back to Beavermouth with the outfit.

Bush River empties into the Columbia from the northeast a mile below Gold River and thither we steered our course across the placid surface of the master stream. How peaceful everything seemed here in the open valley after our three weeks' close contact with nature's forces in action! But in British Columbia nature is never quiet, and if in one phase she appears at rest, in some other her mighty energy will be found whirring on. This is exactly what was occurring here, for whirring, murmuring, humming, buzzing, and singing were growing louder each moment. In addition there were certain stinging, biting, aching, and scratching accompaniments of an altogether unusual kind. The mosquitoes and other winged pests of the Columbia

valley deserve more than passing notice, for they must be taken into account by every traveller whose way lies thither. Bush River is a notorious locality for them. It is scarcely possible to exaggerate their viciousness and unrelenting ferocity here during the hot summer months. Of mosquitoes, there are several kinds: small ones that sing and bite as soon as they alight, others that bite unceremoniously without notice; still others, larger and slower, that hum and make considerable fuss before commencing the attack. Besides these there are no-see-ums, black flies, bottle flies, and bull-dog flies named in the order of increasing size but inversely with respect to their nuisance. All these may and do bite savagely but the mosquitoes are by far the worst tormentors. They swarm in millions and vitiate everything with their presence. They boil in the soup, they bake in the bread, they are crushed in one's note-book; they get into one's eyes, nose, mouth, ears, and hair. No hole is too small for them to find and once found legions will use it. Brown and gray particularly attract them and hordes alight on stockings and hats. They ride on one's back from the forest, and when open country is reached above timber-line they return to the assault at each halt. Wind is their greatest enemy, so pitch camp in the open whenever possible. Temporary coldness only stupefies them. When warmth returns their activity is undiminished. Head-nets and gloves should form a part of every outfit and mosquito-bar curtains for the tent are indispensable.

We camped on an island in the mouth of the river and at 7 A.M. next morning (July 25th), started on our thirty-four-mile walk to the railway at Donald. Each took fifteen pounds of duffle in his pack, for a camp would be needed even if we covered the entire

distance in a day. But to attempt this was useless, since in any case we would have to wait at Donald for a morning train, so we adopted a steady pace and let nightfall find us where it would. The trail, being under government jurisdiction and cleared of windfall each season, was in excellent condition. It follows the east bank of Bush River for a mile or two and then turns up Succour Creek, a small tributary that drains the foothills along the easterly bank of the Columbia. It traverses dense timber for the most part and only occasionally are glimpses of the mountains obtained. About ten or twelve miles from Bush River several small lakes are passed in a saddle between the hills. This point is not far from seven hundred feet above the river but the grade in either direction is scarcely noticeable except for brief stretches. We arrived here at 2 P.M., seven hours from the Bush, and halted an hour for lunch. It was a rather novel experience to set out on one day to catch a train the next and this gave a spice of excitement to what might easily have been a wearisome grind; nor did our uncertainty with respect to the actual distance to be covered and the rate of travel detract from it. Continuing, we maintained a regular pace until 6.30 P.M., when a good camping-place appeared beside a rushing brook. It was too tempting to pass, so we halted for the night, though our calculation of distance covered left a substantial remainder to be accomplished before train time next day. Most certainly there must be no oversleeping, for to miss the train meant a whole day at Donald whose attractions were scarcely of an absorbing kind. At this time, I believe, the place boasted of about half a dozen inhabitants, and one or two log cabins besides the station building.

Accordingly, 5.30 o'clock the following morning saw

us carefully throwing pails of water on the fire and coaxing blistered feet into seemingly shrunken boots. (Assuredly heavily-nailed alpine boots are not designed for hard trails.) However, packs were light, the morning was cool and civilization was not far away, so distance slipped by rapidly. We crossed the Blackwater on a foot-log and then, an hour or so later, the Bluewater by an excellent bridge. Next we came out on a bench covered with jack-pines high above the muddy Columbia where we could see far up its broad valley. We got into Donald at just 10 A.M., with a margin of forty minutes before train time. We had covered nearly forty-five miles with packs in about three days' travelling, and it was not without some pleasure that we looked forward to real beds, bath-tubs, and the other ordinary comforts of life. Even the rankle of defeat could scarcely diminish this. The monarch remained unscathed but we had taken his measure and it was the hope of at least one of us that opportunity would serve yet again to assail his icy fortress.

NOTES, CHAPTER XVI

[1] See, in this connection, *Alpine Journal*, xxi., p. 371.

[2] "To cut steps transversely across a very steep slope or wall of hard ice is the most difficult and tiring process of all, and a dozen such steps may cost nearly an hour's work."—*Mountaineering*, by Claude Wilson, p. 111.

[3] Professor I. C. Russell mentions a similar formation on Mount St. Elias, Alaska: "The paths ploughed out by the avalanches are frequently sheathed with glassy ice formed by the freezing produced by the melting of the snow on account of the heat produced by the friction of the moving mass."—"Expedition to St. Elias," *Nat. Geog. Mag.*, vols. iii–iv., p. 156, May, 1891.

[4] A similar one was secured later. See page 232.

CHAPTER XVII

THE FOURTH AND FIFTH ATTEMPTS ON MOUNT SIR SANDFORD, 1911

The Survey and Sundry Ascents in Connection Therewith: Mount Palisade, Mount Citadel, and Belvedere Peak—A Three Weeks' Storm

THE acquisition of detailed knowledge concerning a complicated mountainous district such as that surrounding Mount Sir Sandford is at best a lengthy process, for no one view-point, no matter how well situated, can disclose more than a single aspect. Rather is it requisite to travel about in different directions, occupying many, though not necessarily lofty, stations. In this way, step by step, a definite conception takes form. The piecing together of these scattered fragments into a congruous whole is one of the most fascinating sides of mountain exploration.

In the region about Mount Sir Sandford good progress had been made in the collection of topographical data for a map that would materially reduce the blank hitherto representing this portion of the range. Each excursion undertaken had pushed the unknown farther away, but at the same time it revealed more and more territory that merited exploration. There seemed to be no bounds to the galaxy of jagged peaks and cloven glaciers that stretched away in both directions along the range. And these worthily sustained the interest

of Sir Sandford's immediate vicinity. Although indeed the peaks were not so exalted, nor so bold in form, yet in their varied architecture they were far from being mere repetitions of each other and the glaciers looked exceptionally fine. From high up on the arête of Sir Sandford we saw a beautiful névé completely blanketing a broad-topped ridge, evidently an extension of the Sir Sandford glacial system towards the southwest. Beyond this, snowy crags gave way to densely forested ridges and valleys. Definite results to be gained from exploration thither were the ascertainment of the watershed of the range (the boundary line between the districts of East and West Kootenay), the location and measurement of the various passes, and the determination of the number and extent of the glaciers. It was also desirable to fix, with greater accuracy than the survey by prismatic compass and barometer had afforded, the heights of sundry peaks. Thus on the geographical side it is seen that not a few interesting problems awaited solution in the environs of Mount Sir Sandford, most of which but for the expedition of 1910 would have remained a sealed book. Indeed, this trip, generally speaking, is to be regarded mainly as a necessary preliminary to a serious assault upon the monarch of the range and to the settlement of the larger orographical questions of the vicinity.

Accordingly, during the winter of 1910, when matters began to point towards the possibility of another visit to this region, Messrs. Holway and Butters and myself laid plans for a somewhat more pretentious expedition than any we had previously undertaken. Mount Sir Sandford we proposed to besiege without quarter, straining every human resource to plant our feet upon its sovran crest or to prove it inaccessible. In the field of scientific accomplishment, which was to be the

writer's especial charge, our hopes were scarcely less ambitious. It was desired to commence an instrumental survey of the immediate vicinity and to extend it as far as possible by the methods of photographic surveying. The tongue of the main glacier was to be mapped, its surface motion determined, and reference marks established for exhibiting the future behavior of its forefoot. We aimed to make mountaineering and scientific work mutually complementary. Even if the mountain should persist in its obstinacy, the observations would afford ample justification and requital for the expedition. There is a sentiment current, though perhaps not as common as formerly, that mountaineering is an aimless dare-devil kind of sport whose attraction consists of neck-risking scrambles in mid-air and of hairbreadth escapes from every sort of peril imaginable—in short, a pursuit that no one in his proper senses would indulge in. Whatever modicum of truth this charge may contain with respect to some varieties of mountain climbing, unquestionably it cannot be supported when alpinism is practised in the interests of exploration and geographical work. Here mountaineering may justly lay claim to a higher appreciation than that often accorded it.

Our equipment was planned with the greatest care, every appliance that could in any way contribute to success being procured. The list included new ice-axes, crampons, extra ropes, sleeping-bags, and tents. Five of the latter were taken so that some might be left at various points in the valley for the use of the packers who were to keep the upper camp in supplies by continuous trips between it and the boat. A large set of aluminum cooking utensils was provided for the same reason. It was expected that the principals and the porters would be entirely independent of each

other. Besides the usual scientific instruments, a small barograph was brought in order to secure an unbroken record of the atmospheric pressure at camp and thus to increase the accuracy of the altimetric determinations by the separate aneroids. A full account of the scientific work will be found in the Appendices.

As regards the employment of Swiss guides, we decided adversely for the following reasons: first, the complication of the commissariat; second, the narrow margin of past failures despite unfavorable conditions; and third, the possibility of returning to the railway and securing them if ultimately desired. It was essential to keep the party as small as possible in order to prolong its stay to the utmost, and guides would have been useless for any of our purposes except the one climb.

An early start was to be an important element of the program, for we felt that a prompt attack on Sir Sandford while the winter snow yet covered the icy slopes held forth by far the best prospects for victory. If steps could be kicked in snow, it would not matter how long it took or how cold and windy the weather was. Even a thin or a partial coating on the *mauvais pas* would expedite passage, but in any case the new axes and longer ropes ought to furnish a safe solution. Accordingly, we met in Minneapolis on June 4th and started at once for Golden where we arrived in due course on the 6th. No marked departures from previous visits were contemplated. We decided that six weeks would afford more than enough time to complete our designs, but to be on the safe side we prepared for a stay of this length, purchasing five hundred and fifty pounds of provisions. Some difficulty was experienced in finding men who could go as packers, notwithstanding previous efforts made in our behalf, and, therefore, we were

forced to wait several days pending the arrival of an outfitter from up the river and of a trapper from a remote district. But on June 10th everything was assembled in readiness for departure and the entire outfit, including a twenty-foot canoe, was put on board the train and the party went on to Beavermouth. Arrived there, the final sorting of provisions and the making up of packs at once commenced, for the canoe could only carry a small part and the residue was to be left where it would be accessible when needed. It was expected that the men, D. Henry and P. Bergenham, would come back up the river for it after we were established in Sandford Camp.

At 2.45 preparations were complete and we pushed off into the current. The river was at about the same height as in 1909 but considerably lower than on our trip of the previous year. The lowest stage of water occurs near the middle of April when the winter ice begins to break up. This lasts until about May 1st at which time the spring melting commences in earnest on the mountains and the river rises rapidly. Through the winter months the water is clear and blue, but during the spring melting it becomes clouded with a large amount of mineral matter held in suspension. The temperature of the water is about 50° in June, but its tributaries from the Selkirks are considerably colder, Gold River affording a reading of 42°. The trip down the river was uneventful and we camped near the mouth of Gold River at 6.15.[1] It was a pleasant spot. Sir Sandford and its snowy range welcomed us with a gorgeous sunset glow while the birds warbled cheerful evening melodies. Now and then the staccato drumming of a partridge added a home-like touch, sounding astonishingly like a motor starting up. After nightfall, occasional cries of loons

and owls echoed back and forth across the water giving poignancy to the stillness. We lolled comfortably about the camp-fire exchanging tales of the great out-of-doors and especially of the animals that make these trackless forests their homes. The splashing of a pair of beavers in the darkness a few rods away formed an appropriate accompaniment. Although their work is everywhere in evidence, their number is now greatly reduced owing to the high prices commanded by the skins. And the same is true with the marten. Bird life, however, seems to be abundant hereabouts, for the soft shores recorded all sorts of tracks. Sandpipers, Wilson's snipe, ducks, and geese had wandered up and down and even the footprint of a bear was sunk deep into the mud. Garter or grass snakes up to three feet long are common near the river, but I have never heard of a snake of any kind in the mountains themselves.

The next morning after being ferried to the south bank, we started directly up the valley across a wide swamp-meadow that fills a loop in the river. Meanwhile the men worked up-stream with the boat. An hour later, we reached the bank again and from there on progress consisted in ferrying from side to side and following the bars until the water got so shallow and so swift that the canoe could not go farther. This point was very near the end of the long spur that comes down to the river from the shoulder of Sentry Mountain and here the main supply depot was left. We raised a slender tripod about fifteen feet high from the center of which large water-proof bags were suspended by means of wire and ropes. It was porcupine-proof and sufficiently high to discourage any wandering bruin unless inspired by abnormal curiosity. The cache was in use for six weeks and remained intact except for the depredations of squirrels or chipmunks that climbed

down the rope and gnawed a few holes through the outer coverings. The traveller in these regions must look to the security of his surplus supplies, for here lies one of his most vulnerable spots. Upon leaving this point, our shoulder packs averaged forty-six pounds apiece by spring balance, although the porters carried between sixty and seventy-five pounds each. The writer's load was almost entirely made up of instruments, for it was essential to preserve them as far as possible from knocks and blows. We made Forks Camp at 6.20 and spent the night there.

June 12th we continued up the valley over our old trail and reached Taurus Camp in the late afternoon, finding the going as good as could be expected. No new slides retarded us on this occasion. The next day we advanced to Devil's Club Camp and on the 14th completed the march to Sandford Camp in three and one-quarter hours. The season was so early that few of the leaves were out even in the lower valley, a condition that expedited progress considerably as did the felling of a sound new tree across the chasm. The morning dawned with mists on the heights which sprinkled occasional showers on us during the march, but when we got to the upper camp conditions had improved. Big, sunlit clouds were drifting across the mountains and their shadows raced over snow-slope, glacier, and forest. If it was May in the valley it was scarcely April here, for some three feet of snow submerged our old fireplace and the alders were in the "pussy" stage with the buds just starting. In the hollow below the moraine, the brook was covered by drifts twenty feet thick. Obviously the first requirement was a snow shovel and this our man Bergenham most skillfully fashioned out of a slab of cedar. He proved to be an adept with his axe and before our return cut out a pair of oars and

finished them neatly with a small block-plane improvised from a table knife. The snow was soon shoveled off and by late afternoon the ground had dried sufficiently for the tents. Having seen the camp well under way, the men started back to the boat, for a round trip would take them six days at least, and we had barely enough supplies to last us.

About sundown we strolled out on the glacier to look at Sir Sandford. In its marvelously white mantle, the great cliff-girt pile gleamed with an unearthly purity—a strange apparition of supernal strength garbed in robes of gossamer lightness. Only a sugaring of new snow fallen in combination with sleet so as to freeze to even sheer rocks can produce this effect. Unfortunately we were destined to see it but too often. The only new feature of the mountain noted at this time was a huge sérac in the midst of the upper snow-field. A mighty leaning tower of ice, it was poised in a precarious attitude in readiness to fall and to scatter itself in fragments over the lower slopes. Though often thereafter a subject of discussion, we could never agree as to when and where it would go. As a matter of fact, but for a large piece that came down at the height of one of the storms, the pinnacle remained substantially unchanged during the whole period of our stay.

It was unanimously agreed that no attempt be made on the mountain except under the most favorable conditions. Neither time nor provisions pressed us now and no reason existed for shunning delay. It was best to work up to the attack gradually and meanwhile to redouble our investigations for alternative routes. We could not bring ourselves to believe that there was only one way up a mountain of such bulk.

In pursuance of these designs, and for the further reason that the north peak of the Palisade had been

GLACIAL GATHERING BASINS NEAR MOUNT SIR SANDFORD

Looking east and south from Belvedere Peak

MOUNT SIR SANDFORD FROM MOUNT CITADEL

THE GRANITE PEAKS FROM PALISADE STATION

selected by the writer long before as an important survey station, we set out to ascend it at 11.45 on June 15th. It was an ideal day with a steely clear sky, and cameras appeared in full force. The staple feature of the ascent consisted in forcing one's way up steep scrub-covered slopes where progress would have been difficult indeed without the paths opened by goats. We got to the top at 4 P.M. The view was glorious and the cameras kept busy during the whole hour that we tarried there. Sir Sandford was singularly majestic, being disclosed in its narrowest dimensions.[2] We noted three snowslides during the trip: two from the Palisade itself and one large one from the Ravelin when its whole north veneer peeled off. Rather curiously, they were attended with very little sound. In returning, a route was taken directly down the westerly face of our peak to Silvertip névé in order to avoid the annoying tangle of evergreen scrub. After we got well started, a cliff-belt cut our path, but a way was finally found over the smooth wall of a couloir whose bottom consisted of slushy snow just on the point of sliding. Once on the névé we set our course for camp down the middle of the glacier and we arrived at 7.30 P.M., voting the trip a most excellent training climb.

The day had been lovely, but during the afternoon a mackerel sky formed and the wind veered from the north to the southwest—disturbing signs for the morrow. Sir Sandford was not to be thought of, for we absolutely required two fine days together—one to convince us that the weather was really settled and the next for the climb itself. If we could have foreseen what was in store, we would certainly have attacked Sir Sandford instead of the Palisade, for this humble desideratum was not to be fulfilled for weeks. We were far from anticipating twenty-one successive days of storm.

June 16th was ushered in with a hazy sky and a blustering gale, but as no storm seemed imminent an easy trip was in order and we chose Citadel Mountain. This was in line with our policy respecting new possibilities for Sir Sandford, since it undoubtedly commanded a view of its southerly side. We were off at 9 A.M., and made directly for the main ice-fall west of the Ravelin, for the route was to repeat in part that of 1909 when the Minaret was first visited. A measurement of the ice-fall by aneroid gave a height of seven hundred feet, agreeing well with earlier measurements, and with the time (fifty minutes) consumed in its ascent on easy snow. Crevasses at the top caused some delay but we were able to make the lowest rocks of the west spur of Vidette Mountain for lunch at 1.50 P.M., even in the teeth of the gale.

Keeping on directly towards the peak, we reached the top at 4.30 over the tolerably steep northeasterly ridge that connects with Vidette Mountain. As expected, the mountain afforded an excellent view-point and a complete panorama was exposed. Sir Sandford's summit ridge was presented end-on but though heavily corniced, it did not appear very appalling. The slope leading thither from above the upper buttress rises at only about 35°. Is there anywhere a mountain of such actual difficulty that looks equally placable from so many points of view? The valley of the main stream of Gold River lay at our feet to the east but the pass at its head was mostly hidden by Citadel's jagged south peak. To the west, the view of the névés was especially fine. Mount Citadel is 9580 feet high.

We built a small stoneman and started back at 5.30. To many, the hours that we utilized for alpine work will seem unorthodox in the extreme, but it must be remem-

bered that at this season and latitude one can read until half-past nine o'clock by natural light and that the very finest effects are to be seen on the mountains after three o'clock in the afternoon. On the flanks of the Ravelin we found a perfect garden of magnificent salmon-pink saxifrages, growing in clumps a foot in diameter without another green thing in sight. Thus does nature adorn even her most desolate places. Camp was reached at 8 P.M.

The following day was one of good omen—with azure blue sky and fuzzy cumuli. Although the wind was still strong high up, it seemed worth while to prepare for Sir Sandford on the morrow and therefore boots were greased, clothing was overhauled, bread baked, and firewood gathered so that we might get away with the least possible delay. Turning in at eight, we slumbered peacefully until some one discovered that it was the eminently proper hour of 2.30 A.M. We aroused ourselves at once and kindling the fire started off a half-hour afterwards.

Day stood "tiptoe on the misty mountain tops" and we had no need for the lantern. As we surmounted the first rise of the glacier thirty minutes later, the noble apex of Sir Sandford came into view above the nearer slopes. The very tip was tinged with a delicate pink but upon its shoulders the dusky shadows of cornice and crevasse gleamed with pale opalescent green. How infinitely cold and remote the summit looked! Behind us woolly clouds were scurrying off into the sunrise, edged with golden yellow. A brisk breeze evidently prevailed aloft—the one cause for misgiving in the entire prospect.

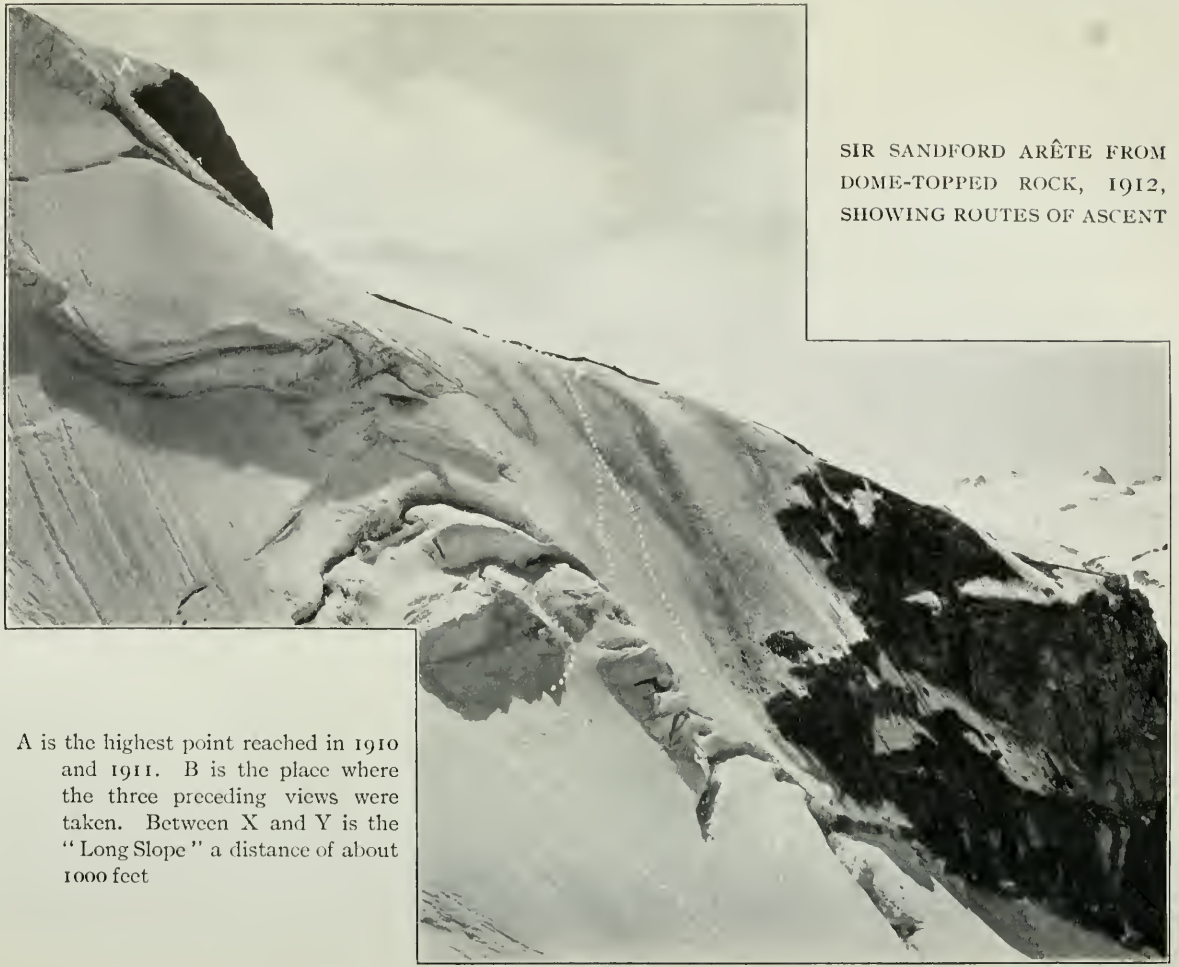
The walking was excellent over the hard ice, and at four we were crossing the glacial plateau below the Ravelin. Forty-five minutes later we came to the

bottom of the slope in the alcove behind this mountain. One may consider this place as the actual base of Sir Sandford, though it is about 2100 feet above camp. Only exceptional conditions will allow the postponement of roping beyond here and we halted for the purpose. The sun was just appearing over the mountains at our backs and the sky was of the deepest Italian blue, but an ominous wind struck us powerfully from time to time. Coats and jersies were therefore made ready notwithstanding the extra clothing donned previously.

The slope is uncrevassed early in the season except for the interlocking *bergschrunds* already mentioned which persist here from year to year. We passed them easily near the ice-fall. Turning then directly towards Sir Sandford we mounted rapidly until the *schrund* below the "long slope" was attained at 7 A.M. We had risen about 1500 feet during the two and a quarter hours just passed. As on our last visit, it looked easier to cross to the broken left edge of the slant and to pick out a route there among the bosses and cliffs of ice. The snow was firm, yet steps could be kicked without difficulty. It was only necessary to keep a sharp lookout for crevasses and cavities owing to the presence of live ice. Few détours were required and we gained altitude steadily until we reached a point below an ice cliff as shown in the illustration. Here we must needs traverse out onto the long slope itself. The operation was a delicate one for Holway in the lead but the rest of us were firmly planted on the slope with excellent axe- and foot-holds so that the margin of safety was ample.[3]

When the leader had anchored on the slope, I moved up to number two and secured myself. The second man then repeated the tactics of the first and so the maneuver was completed. The rest of the way to the

MAKING A TRAVERSE TO THE "LONG SLOPE"



SIR SANDFORD ARÊTE FROM DOME-TOPPED ROCK, 1912, SHOWING ROUTES OF ASCENT

A is the highest point reached in 1910 and 1911. B is the place where the three preceding views were taken. Between X and Y is the "Long Slope" a distance of about 1000 feet

arête was straightforward climbing over ice well coated with snow. The view downwards to the base of the mountain along the smooth unbroken sweep was not alluring and one preferred to dwell upon the part ahead, even though heavily-nailed boot heels formed its most prominent feature. Only one moved at a time, while the others glued themselves as best they could to the dazzling whiteness. Nine times or more the sixty-foot rope stretched itself along that slant before we reached the arête at 8 A.M. By various determinations this is estimated as being about 4130 feet above camp or at an altitude of 9856 feet. It is designated Arête Station on the map.

We decided to halt for a little refreshment after the five hours of almost continuous work, but it did not prove to be unalloyed pleasure. The ridge was exposed to the full fury of the gale and no protection was anywhere to be found. One could scarcely stand in the gusts that came now this way and now that. The ledges were humming in the blasts, and sand and small pebbles were being blown out of the crevices constantly. There was little satisfaction in prolonging our stay under such conditions, so after a quarter of an hour, we again roped up in the same order as before. The crisis was now at hand. Was there sufficient snow on the ice-slope beside the small buttress or not? Without it, slight hope remained of making the summit in such a wind. We plodded slowly upwards over gradually steepening snow. Now Holway was at the rock. He reached above it with his axe. Alas, the prong rebounded; it was all ice just as before. Nothing daunted he commenced cutting steps. A crevice beneath the rock was soon discovered through which the rope could be threaded for extra security.

For the next hour, a constant stream of chips flowed

down. The ice was of the hardest—in reality nothing but a stagnant part of the glacier whose frontal cliff was just out of sight to the left. For safety, steps large enough for the whole foot were required, since the declivity was of the kind that pushes the leg outwards when one undertakes to step up. For this reason, a good slice of the slope above the foothold had to be removed each time before he could venture to advance. Add to this the need to chip hand-holds to serve as quick grips when the gusts swooped down from above and one may gain some idea of our difficulties.

After an hour of comparatively insignificant progress, the line reversed and the writer went to the front. As the ladder lengthened, the protection afforded by the buttress decreased and frequently I was compelled to lie flat against the slope clinging to the hand-holds for fear of being blown out of the steps. The gale was freshening rather than diminishing and the second man had been forced to abandon the rocky hold owing to the height gained on the ice. There were no signs of easier or safer conditions—it was perfectly clear that steps must be cut for the entire distance to the arête. We all agreed that to continue meant incurring unjustifiable risk so the word was given to retreat. It was then eleven o'clock and we could wait on the rocks for a slackening of the wind.

We backed down to the arête and looked again though unsuccessfully for some route on the south face. The rock is soft and disintegrates into a coarse sand without producing any large fragments. Few cracks are to be found and such as there are weather away on each side into rounded surfaces without leaving holds or projections. Whenever ledges are formed they soon fill up with the sand so that one wades in the loose material above his boot tops. Altogether the forma-

tion is about as unfavorable for the climber as can be imagined.

Since our visit of the previous season, a large segment of the hanging glacier beside the little buttress had fallen, and we had already noticed the debris scattered far out on the surface of the trunk stream of Sir Sandford glacier. There was a chance that the rough opening thus left might offer a pathway, so we traversed to a point whence we could look into it, but the ice-slope was clearly easier. Back to the old place once more! Holway was in my highest steps and we were all lined up to advance but still the gusts swept downwards violently. It was three o'clock. Manifestly we could not cover the long way to the top and still get back in season. Darkness was no time to be skirmishing around at such a height on a mountain of this caliber. To go back was the only prudent course and there was no escaping it. Our feelings may be easily imagined as we silently, step by step, dug our toes and axes into the "long slope" for the sixth time. It was a bitter, disheartening disappointment, for in spite of the early morning warning we would not have been human if we had not secretly hoped in some way to prevail. The only chance for success now was to wait for calm weather and then to make successive trips to the ice-slope until the glassy ladder was completed. Unfortunately, however, even this possibility was destined to be denied us. We got into camp at 7.30 P.M., after an absence of sixteen and one-half hours. The men had arrived with plenty of food and a splendid supper awaited us.

June 19th nobody felt very energetic. It was a beautiful day though the wind continued with unabated strength. In the afternoon we repaired to the toe of Sir Sandford glacier with a view to commencing a

survey of the surroundings. I finally selected suitable stations that were in sight of each other and commanded the forefoot. At Station II. a pole was erected and a large green arrow for reference was painted on the sloping rock nearby. The station itself was similarly designated beneath the pole and a photographic panorama was exposed. It is doubtful whether the marks will last, for the spring snowslides apparently sweep down in the vicinity. The men descended to Devil's Club Camp during the afternoon preparatory to returning up the river to Beavermouth for the balance of our supplies.

While we were considering our next move we resolved to carry out a few minor expeditions in connection with the regional survey. Accordingly on the 20th we set out at eight o'clock to occupy the prominent hump or shoulder that rises from the long southwesterly arête of the Blackfriars descending to Silvertip Pass. It was as beautiful a morning as one could wish and we wended our way rapidly across the rough surface of the glacier. Many times we turned to look at Sir Sandford, for there was an almost uncanny fascination about the magnificent pile. One had the feeling that one had never seen all of it and that from each successive view-point some new feature would be revealed.

At the junction of the Silvertip glacier we roped, for the winter snow yet buried the crevasses of the ice-fall. Beyond the crest of this, the glacier stretches away in a flat gently-rising expanse for a mile or more, now completely snow covered. A previous visit in July had revealed an essentially continuous ice plateau cut only occasionally by long and narrow crevasses. It would be quite natural for a party having once viewed this, or a similar glacier in its "dry" condition, to discard the rope when traversing it subsequently on compacted

winter snow, but there is a likely menace in such places that I have never seen referred to in alpine literature—that is, moulins. As is well known, these funnels often occur in lines down a glacier owing to the opening of successive crevasses farther upstream that "capture" the drainage and there was a suggestion of such a formation here. A party, knowing the otherwise harmless nature of the locality but in ignorance of the moulins, might easily happen to ascend unroped towards a series of these orifices concealed by snow, with serious results. The maxim "always rope on a snow-covered glacier" cannot be too strictly observed.

An hour and a half from camp brought us to the beginning of the steepest portion of Silvertip glacier. The best route lies close along the south margin of the ice-fall where fine views of the séracs are obtained. Having passed these, the slope relaxes again, and a broad, undulating snow-field extends over the remaining distance to the pass. In this many large knolls and gaping chasms were conspicuous. Everywhere we saw the parallel, wavy corrugations that are believed to result from the nival drainage. We had come as far as Silvertip Pass (8500 feet) the previous year, but owing to the breadth of the saddle and to the steepness of the slopes on either side the view was limited. Time was then lacking for a farther ascent. On the present occasion we continued upwards to the right over snow, easy as to gradient but tiresome on account of its soft semi-crusted condition. Frequently some one went in to the waist. Nevertheless we mounted steadily and opened up striking prospects to the south and west. The arête, a narrow rim of rock bordering a magnificent precipice that fell a thousand feet or more without a break into the farther basin, was hit somewhat to the left of the summit and over this we made our way to the top.

Here a truly astonishing view of the splendid sheer lines of the Blackfriars and of the Austerity–Adamant group presented itself—undoubtedly one of the finest displays of beetling cliffs yet discovered in the Selkirks. To convey any adequate conception of the panorama from this lookout is hopeless, and it must suffice to mention only its salient features. Below us to the west two valleys impinged at a narrow cleft-like pass which clearly marked the water-parting of the range. Upwards from this a spiny ridge mounted towards us. It did not, however, connect with the major arête that we had just traversed but cut directly into and beneath the névé on that side, forming a cleaver that almost exactly halved the effluent ice. The two resulting segments plunged down in shattered streams some distance farther, the one to the north falling over a cliff below which the material reconstructed itself into a new tongue. The southerly one descended in an ice cascade somewhat less steeply. As we saw later, a route into its valley would be practicable along the lateral moraine below Silvertip Pass which therefore is a true pass for mountaineers. To the southwest an almost continuous glacier mantle clothed the slopes as far as the present Goldstream Mountain, the outpost of the Sir Sandford Range in this direction. Here obviously was a station of importance and we noted carefully the best way of reaching it. Thence easterly the whole region even to the horizon was a sea of snow, interrupted but scarcely broken by the ridges and peaks. The eye sought in vain for a sign of the verdant world of less exalted altitudes but not until the valley of the West Branch towards the northeast was encountered could the forest be seen. Unfortunately, the high wind was rapidly blowing in great clouds and banks of smoke from the south which interfered with the full

THE GRANITE PEAKS FROM BELVEDERE PEAK

Mt. Silvertip Silvertip Pass Belvedere Pk. Blackfriars

MOUNT GUARDSMAN AND SIR SANDFORD FROM BELVEDERE PEAK; ROUTE LINE SHOWN

LOOKING UP SILVERTIP GLACIER ACROSS THE SIR SANDFORD

Direction is opposite to the upper view

grandeur of the view. Notwithstanding, a complete panorama was exposed for mapping purposes, and then we went back over the same route arriving in camp at a quarter past six. The station has been named Belvedere Peak (9830 feet).

The next day heavy yellow smoke all but obscured the peaks across the valley and its odor was distinctly perceptible. The precarious climate of the region needs little excuse to start precipitation and almost always such a smoky condition is sufficient. It proved to be so in this instance. Rain, with a thunder accompaniment, commenced to fall in the middle of the morning and it continued steadily all day. A twelve by six foot fly-canvas had been provided and this was stretched in such a way as to form a roof near the campfire. In some unaccountable manner it affected the draft so as to cause whatever smoke there was to collect under it and no amount of adjusting had any effect. Despite this annoyance, however, the happy inspiration which prompted its inclusion in the outfit was thanked many times during the following days, for without it the continuous stormy weather would have been unbearable. The downpour persisted until the following evening when signs of clearing made their appearance.

Though our collective and individual judgments with respect to the hopelessness of Sir Sandford's easterly faces and arêtes remained unshaken, curiosity as regards the portions concealed behind the southeasterly ridge began to manifest itself, and to set this at rest and at the same time to secure photographs that had been unsuccessful owing to smoke the previous year, we resolved to climb to The Footstool once more, cross the crest-line and, if possible, descend the glacier beyond and examine the south face of the mountain. Accord-

ingly on June 23d as the weather seemed promising, we turned out at 4 A.M., starting off three-quarters of an hour later with sunshine on peak and glacier. The route was obvious, following substantially that used in the descent from The Footstool as previously described, viz., along the northerly margin of this arm of Sir Sandford glacier.

However, no sooner had we gotten well started than a few wisps of high cirrus multiplied rapidly and wove themselves into a network of haze that spread completely over the sky. The sun became dim and presently a strange pall of white vapor developed about the Adamant group, arching over the summits like an umbrella but spreading out flatly above the glaciers and névés. Other peaks soon followed suit, producing many odd and impressive effects. Sir Sandford had been among the first to don a robe and overhead, as we trudged up the hard snow, a blank roof of cloud extended.

Three hours out, we halted on the last rocks where Mount Guardsman's arête disappears in snow. The gently undulating appearance of the mists had disarmed apprehensions of any uncomfortable consequences and we were quite taken aback when a chilly wind smote us here. However, nothing could postpone breakfast so we stamped about on the small rocky platform that the six inches of new snow had spared, commiserating ourselves for our luck and devouring rye-crisp and raisins intermittently. To go on or not to go on was the question. Towards the Columbia valley we looked down upon a thick even mat of cloud through which summits projected here and there like islands. Billowing vapors were gathering everywhere. Clearly the weather was desperate. However, just as we were preparing to go back, an opening disclosed blue sky and it was decided

to trudge on. In a moment a strangely warm bank of mist enveloped us, and in the protection of the ridge it seemed as though the gale had slackened. When we got to the top, however, it was blowing as hard as ever, but we could see far off towards the south where the mountains looked black and stormy. The Dawson and Hermit ranges showed up over a wide-stretched layer of woolly cloud. Towards the Rockies in the other direction, a similar condition was disclosed but here the cloud level concealed all the lesser mountains and sorted the loftier ones into their proper relative heights. Mount Columbia and its neighboring giants stood forth grandly, touched with sunlight here and there. Some distance to the west of Columbia an almost equally lofty apex appeared which cannot be located satisfactorily on any of the maps.

We descended the shale slopes on the south side of the ridge until the brink of a precipice halted us at 10.15 A.M. For getting lower, a complicated and difficult ice-fall formed the only route, and since this would have consumed so much time as to leave little for the strenuous work on Sir Sandford that obviously lay beyond, no one evinced any overpowering desire to attempt it, especially under the existing weather conditions. Accordingly after taking a panorama and noting that a possible camp ground existed below the tongue of the glacier, we returned to the ridge. After ascending the snow dome and tarrying there for a brief period, we turned our footsteps campwards. A curious heat wave struck us on the slopes of the glacier basin below our breakfast place. Not long after a fine avalanche shot down from one of the hanging glaciers of Sir Sandford. The report was not very loud although clouds of ice-dust rolled above it as it rushed along. Camp was regained at half-past three but no new light on the

Sir Sandford problem resulted. The altitude of The Footstool has been calculated to be 10,410 feet.

Thus far the weather, though by no means of the best and often decidedly bad, had not been persistently malicious, but from now on came a procession of storms reft one from another by the filmiest of fine weather partitions.

June 24th. Showers sprinkled us until late in the afternoon when it cleared sufficiently to allow the setting out of a line of stones across the glacier to exhibit the surface flow of the ice. In the evening we endeavored to observe Polaris for latitude but the transit did not prove adapted to this kind of work.

The following morning was beautifully clear during the early hours. Presently, however, cumulus began to form until about two o'clock there was a heavy mat of clouds over all the sky. We went down to the foot of the glacier where I selected Station III. on an exposure of *roche moutonné* and occupied it with transit and camera. On the east face of the reddish-brown rock a vertical guide arrow was painted in green. The station mark was designated by a circle and above it a white cotton signal was erected. The tantalizingly clear sunset might have raised the spirits of any one not hardened to the vagaries of Selkirk weather, but to an experienced eye the small fuzzy clouds making and dissolving about the crest of the Adamant Range were of greater portent. Such clouds look beautiful in the cheerful afterglow, but really they are the flying banners of hope's sinking ships.

June 26th. Cloudy followed by rain after 10.30. The men returned from their week's trip to Beavermouth for additional supplies just in time to escape a wetting. They had met a bear hunter on the river going back with the fruits of his season's trapping, con-

sisting of twenty-seven black and brown bearskins. He reported that most of the animals were low down along the valley bottoms and that hunters who had trapped the headwaters of the streams got none. As a distraction from the steady downpour of the rain, two of the party buried themselves in a pocket chess-board for the rest of the day.

June 27th, 28th, and 29th. Conditions remained the same. In the intervals when the tempest was gathering its forces for renewed attacks, we managed to take readings on the line of stones and to perform the preliminary measurements of the base-line for the large triangulation. I paced the neighboring moraines and streams and constructed signal targets of poles, wire, and cotton cloth for later use. A flock of goats on Azimuth Mountain furnished us considerable amusement at various times. There were seven of them in all and on one occasion a yearling got separated from the others. His consternation and perplexity were ludicrous to behold, as he darted about this way and that in his efforts to rejoin them. After a long détour across a distant part of the mountain he was finally successful. At another time a kid in following its dam attempted to climb a smooth rock-face with too much exuberance. He slipped and rolled down for about a rod landing against an older goat that stood next in line. This one at once proceeded to punish the rash youngster but the mother took offense at such interference and feinted to charge the offender. A pitched battle appeared imminent, but owing to their rather spectacular position, the matter was amicably adjusted. The kid seemed to have taken the lesson to heart, for thereafter he followed the dam's footsteps with care.

June 30th. An hour of warm sunshine early in the day tempted me to occupy Station I. and complete

the work at that point, but I had no sooner gotten the camera into position than a drizzle compelled a retreat under the bowlder. In some respects this storm was unusual for, instead of blowing in from the west or south like its predecessors, it came up the valley from the east. Moreover it appeared to be largely a local product, gathering among the crags of Mount Stockmer. In that vicinity a large mass of mist slowly revolved and increased itself in the process like a snowball. It grew darker and darker and then shot out smaller clouds from beneath that advanced up the valley. Presently the nearer peaks began to smoke in sympathy and within a half-hour from its first appearance rain was falling. However, its duration was equally brief and I managed to complete the painting of the station in such a way that the reference point would be available from the surrounding elevations. I returned again in the afternoon and measured the retreat of the ice since the previous year. In the evening the storm repeated itself but with greater emphasis. A strong wind drove floods of mist up the valley that turned the setting sun into a silver ball and finally blotted it out completely. In the gathering darkness rain poured down once more.

July 1st. There were showers all the morning accompanied by a high wind and low clouds hurrying northward across the mountains. In the afternoon while engaged in my usual rainy-day task of pacing the moraines, I saw a beautiful double rainbow just over camp. It was not this, however, that put the day in the "red letter" category but an incident that occurred at dusk as we sat about the camp-fire. Across the valley on Azimuth Mountain one of the yearling goats was browsing in a desultory manner which indicated unmistakably his intention of passing the night nearby.

Such assurance was too much for the hunter of the party in spite of the lowering sky, and snatching up his rifle he started off with an energy that boded ill for whatever he might encounter. At last there was to be some excitement and we all went up on the moraine to watch the progress of events. During the next hour we caught occasional glimpses of X., now struggling up through a copse of alders, again scaling some outcrop of cliff. He seemed to be a good way from his quarry but doubtless it was his intention to make a détour and shoot down from above. For a while the affair looked pretty much like the proverbial needle in the haystack. One goat on a broad mountainside of confused crags and bushes did not offer a very certain destination. However, the goat was apparently a fatalist for he scarcely moved from the place where he was first seen. After quietly grazing for a while he selected a protected spot behind a rock and lay down. X. had been lost to view for some time but suddenly the animal jumped to his feet and looked upwards. Then came a faint report and he disappeared. There was a commotion among the alders which soon parted to disclose X. carefully picking his way down. Presently he got to the goat and we saw the carcass falling from cliff to cliff, to stop only on the talus below. This was a great piece of luck and we were all correspondingly elated, for what is a greater luxury than fresh meat after bacon has been on the menu continuously for a fortnight? Darkness fell and with it came the worst storm of the day. It was not until nine o'clock that X. appeared, dripping wet but bearing in triumph the hind quarters which he had succeeded in carrying over the rough moraines through fog and night. For more than a week thereafter we feasted on goat, utilizing a convenient snow-bank for cold storage. The memory of

these sumptuous repasts is one of the few bright spots among those weeks of storm.

July 2d, 3d, and 4th. We were storm-bound in camp without the slightest chance for any accomplishment. The elements raged with scarcely an intermission until a climax was reached on the night of the 3d when hail and sleet battered the tent, freezing to roof and walls. Later came snow to the depth of an inch or two. The canvas bent inwards under the load and commenced to leak, but fortunately without very serious consequences. It was indeed a winter landscape that appeared through the tent door the following morning. For us the "glorious Fourth" was mostly a blizzard. The stately evergreens were nodding back and forth under the cutting blasts, snowflakes were swirling around, and the prospect was about as discouraging as it could be. With appropriate irony the best barometer stood higher than it had any time previously at the camp and marvelous to tell, the three other instruments added unanimous testimony to the same effect! Back in the forest in the thickest of the storm a lone bird warbled cheerily. Assuredly it was a day of surprises.

Upon turning out for breakfast, the scene was desolate enough. The gale was blowing fiercely, driving one storm after another roaring over the mountains. As the morning advanced there were occasional breaks in the clouds with short periods of sunshine. Now and then some huge shape would break out of the mists, solid white from base to summit and, catching the brilliant beams, would sparkle magnificently against its setting of angry gray. At nightfall the wind moderated and we hoped that the disturbance had exhausted itself.

July 5th. Clear again at last! Just to take the kinks out of our muscles it was necessary to go somewhere, so we walked up to the Silvertip névé. As

SIR SANDFORD FROM ALPINA DOME

A STORM FORMING IN THE VALLEY

Photograph by E. W. D. Holway

SUN SETTING BEHIND THUNDER-CLOUDS

Views from Sandford Camp

the weather appeared to be sincere in its reform, we made up our minds to try Sir Sandford, and before long returned to camp for the necessary preparations. Three o'clock the next morning found us carefully scanning the heavens for some hopeful sign, but except for a faint streak of light behind the Adamant Range, there were dark clouds everywhere and presently the rain began. Was it *ever* going to clear off?

It might naturally be supposed that the gamut of possibilities with respect to storms had already been run during the previous days, but this one introduced thunder and lightning variations of no mean severity. Rousing reverberations rolled back and forth between the mountains, punctuated with flashes of remarkable brilliancy even when seen through tent walls and, for five hours, heaven's flood-gates stayed open. The customary low clouds floated up through the valley, while others rushed in from the west higher up and increased the precipitation. Of course Sir Sandford was out of the question and all our preparations went for nothing.

July 7th, 8th, and 9th. It is best to pass over these dismal discouraging days without further mention. They were even worse than those just preceding for we scarcely saw the sun at all and everything was continuously wet. We secured an instrumental reading on the line of stones and some time was agreeably spent in working out the results. On the 8th a remeasurement of the base-line was also carried out. The men returned from the depot at the boat with a fresh stock of provisions of which we were in need. Stormy weather is most efficient in causing supplies to disappear, for every one feels disposed to experiment with new and delectable dishes. Fortunately we had an abundance of everything so that we could safely indulge in this source of amusement.

The morning of the 10th looked promising with numerous patches of clear sky and much less wind. An optimist might even have considered the afternoon program in the same light: from one until two—rain, from two until three—clear, from three until four—rain, from four until six—clear, from six until seven-thirty—rain, from seven-thirty on—clear. As a matter of fact there did seem to be indications of improvement, for the last storm dusted the lower mountains with snow and left a perfect sky, dotted with quiet clouds. Long streamers of mist floated in a motionless line below Gibraltar and our hopes commenced to rise along with the barometer. But when we looked out at three o'clock the next morning the wind had returned and fluffs of cottony cloud fringed the crests of the Adamant Range. We gave up all thoughts of Sir Sandford and turned in again. The morning was sunshiny and Butters and I climbed the sharp little peak on the ridge behind camp while Holway undertook a more strenuous trip alone—the complete encircling of the Ravelin. The storms were now confined to single clouds instead of to large masses of broad extent and hail replaced the rain. Matters were undoubtedly improving.

On July 12th we finally got away for Sir Sandford at four o'clock. The minimum registered 32° and the air was calm. Only once before, on the occasion of our first assault in 1910, had we been favored with equally propitious conditions. The glacier was frozen tight with a quarter of an inch of ice in the water-filled crevasses. On the lower plateau the snow was crisp and hard and we walked up the slopes without roping. Holway's tracks of the day before indicated a safe route through the crevasses and on the steeper slant leading up to the knob they saved the cutting of steps that otherwise would have been necessary because

of the frozen crust. In the interval since our last attempt, the glacier had been comparatively active, doubtless in part at least owing to the rain, and the *bergschrund* at the top was all but impassable. We encountered the first new snow on the slope just above, where bare ice is usually to be found. Here we roped and it fell to me to take the lead.

At the *bergschrund* below the "long slope" new snow had drifted deeply, covering what was presumably a wide opening, and owing to its dry and powdery character extreme caution was needful in the passage. Beyond we kept well into the hollow beneath the sheer cliff of hanging glacier in order to give the situation a careful examination with a view to traversing along the base of the wall to the rocks towards the north. The huge bulge of ice was emitting subdued creaking or growling sounds in spite of the cold which we felt keenly, but no doubt the crossing would be safe enough if a party could hasten over snow or the glacier were quiescent. On this occasion, however, the surface was icy and each step must needs be chipped out—a slow process—with the glacier ready to shed a thousand tons without warning or any chance of escape. The plan was obviously too dangerous and we turned to our former route with one accord. Just ahead a dark object was seen rolling and bounding down the declivity from above. What *could* have gotten up into this frigid place so soon after the storm? Our surprise may be imagined upon discovering that it was a tiny chipmunk. Presently it regained its feet and ran at full speed across the very place below the cliffs where we had hoped to go. We could not but envy its daring and agility. Doubtless the animal had been dropped by an eagle, for these are numerous in the region and we saw them constantly.

We plodded doggedly upwards through atrocious snow. Fine and dry, without cohesion, it afforded the worst possible footing. As the angle steepened, conditions became even dangerous, and when we at length attained the large crevasse from which we had previously turned out onto the "long slope," matters reached a climax. The axes for the most part sank in without resistance up to the heads and steps continually gave way no matter how carefully they were packed down. In shallower places the picks struck ice which showed the nature of the underlying surface. The declivity was close to 50° by clinometer and we had never experienced such rotten snow. Unquestionably it was too dangerous to render further persistence excusable and the only thing to do was to go down and try elsewhere. Descending for some distance, we turned directly towards the ice-fall again and attempted to go straight up into the cavity at the side where the angle seemed a few degrees less, Holway taking the lead. However, conditions were no better and there was nothing left to do but to go back.

Though we were becoming hardened to reverses it was none the less a keen disappointment to suffer yet another repulse by Sir Sandford, after the long weeks of waiting. That it should have occurred on one of the most perfect days which had ever favored us, did not make it any easier to bear. There was scarcely any wind and though a long fine line of cirrus had spanned the heavens earlier, it had now disappeared, leaving the sky an intense blue. The day was young and as we plowed downwards the question of how best to take advantage of it arose. It was finally decided to go up to the knob and after breakfasting there to cross Sir Sandford glacier to the pass at the head of Silvertip névé, returning thence over the névé

to camp. This excursion would give opportunity to examine a route to the peak across the snow-fields towards the southwest, would afford detailed information with respect to the sources of the glacier, and would take us entirely around the nunatak ridge of the Palisade.

After once more negotiating the *bergschrund* that here slanted down at a steep angle, we reached the knob (8550 feet) at 10.15. It was warm and comfortable on the rocks and we rested for about half an hour. Continuing thence down the westerly face of the ridge over sliding stones we soon got onto the glacier and set our course for the lowest part of the broad snowy col at the southerly end of the Palisade. Hereabouts the Sir Sandford glacier presents an even flat surface bounded by sloping walls of névé that form an amphitheater on three sides. In the middle of the level portion the barometer indicated an altitude of 7700 feet.

On the farther side we clambered directly up some small steep cliffs which parted the ice-fall and then waded up easy snow-slopes to the ridge, crossing several goat tracks. The descent was found to be equally simple on the western side, so we traversed to the nearest rocks of the Palisade in order to carefully examine Sir Sandford from this new view-point. At length we pushed on through soft snow to the second col where we arrived at 4.30. The saddle was so broad that it afforded no view into the farther valley, but upon scrambling up the rocks to the west, we caught a glimpse of some grassy upland which promised to form a suitable camping place. Descending then directly to Silvertip névé, we hurried down its three miles of spotless, almost uncrevassed snow, and arrived in camp about seven o'clock.

NOTES, CHAPTER XVII

[1] The following time-table of the writer's various descents of the Columbia by canoe may be of interest as showing the uniformity of its current at this season.

	1908	1909	1910	1911	1912
Beavermouth to:					
4-Mile Cabin	28 m.	24 m.	27 m.		30 m.
8-Mile Cabin	1 h. 10 m.		1 h. 10 m.	1 h. 9 m.	1 h. 20 m.
Snagtown	1 h. 37 m.	1 h. 36 m.	1 h. 38 m.	1 h. 38 m.	1 h. 50 m.
Gold River	3 h.	3 h. 30 m.	3 h. 15 m.	3 h. 20 m.	3 h. 5 m.

(Short halts are mainly responsible for the major variations.)

[2] See frontispiece.

[3] A word may be appropriate here with reference to the photographs which were taken by the writer. It is well understood among mountaineers that situations which are really difficult can but rarely be recorded in the camera, for the very elements that impose extreme caution necessarily enforce upon all undivided attention to the matter in hand. In this case, however, the writer was posed in a position like that of the man in the foreground, having the rope and his left arm about the axe driven in nearly to its head. It was possible, therefore, to make use of the right hand without relinquishing this hold. Accordingly before Holway took the crucial steps around the corner, the camera was pulled out of the *rücksack*, focussed, and set. Then each picture was taken with one hand while the other arm encircled the axe, the film being wound between exposures by transferring the instrument to the left hand and winding with the right without removing the arm from the axe.

CHAPTER XVIII

AN EXPEDITION TO THE HEADWATERS OF GOLD STREAM

Goldstream Mountain, Mount Redan, and Moberly Pass

IT was now needful to settle upon a program for the remainder of our stay at Sandford Camp. Clearly the mountain would not be in condition until a period of continuously warm weather had consolidated the new snow, and in the meantime, therefore, there was opportunity to execute the exploratory portion of our plans. The best chance for pushing farther into the heart of the range appeared to lie towards the southwest where the extensive névés offered reasonably easy travelling. At their westerly extremity, about eight miles away, rose the isolated mountain, seen before, which would undoubtedly afford a comprehensive and well-situated view-point for studying the topography of the neighborhood. Accordingly we resolved to place a camp in the intervening valley and to spend a week exploring the vicinity. While the necessary preparations were being made on the 13th, I took advantage of the magnificent weather to occupy Azimuth Peak with transit and camera. At the same time, Holway, the indefatigable, climbed the nameless mountain between the east peak of The Gothics and Gibraltar by himself. From my station I saw the whole easterly face of Mount Adamant shed its veneer of new snow.

Next day the tent was struck, packs were made up, and we started off about nine o'clock. Snow glasses having been improvised for the men, they helped us with the loads as far as the pass. Owing to the fresh snow, the march over our previous route was tedious enough and we did not reach the saddle until noon. The party lunched here and then the men went back while we continued towards our destination. The descent lay over gently sloping névé, marked by goat trails in every direction, to a brow of moraine. From here the whole smiling valley was disclosed as suddenly as if thrown on a screen by a lantern. Exclamations of pleasure burst from each at the entrancing prospect. From our feet a slope, richly carpeted with grass and flowers, fell away steeply to the valley bottom where a foaming stream flowed through meadows and groves of evergreens. Its principal source was a fairly large alpine glacier at the left, but it was also supplied from a continuous many-tongued ice-cloak that covered the opposite slope like a breastplate and gave it the appearance of a crystal wall. Lower down the stream gradually swung northward through dense forests and disappeared behind an adjacent buttress. The bright green alps, the glittering ice, and an azure sky all combined to form a most charming picture.

We made a rapid descent to the glacier along a leaping brook, wading through gardens of yellow erythroniums. So numerous were they that the mountainside appeared to be shrouded in a golden veil. It was a veritable paradise for the goats and we saw a small flock in the distance lying on the grass. Below the glacier an unusually fine example of moraine formation occurred. The succeeding stages in the retreat of the ice were marked by distinct ridges of angular blocks arranged crescentically one behind another in an ascend-

ing series. The spaces behind them had been filled up with outwash material, forming terraces or steps, across which the streams wandered to pour in cascades over the retaining walls of moraine below. We noted perhaps half a dozen such ridges and terraces in all. The lateral moraines, although not so numerous, were equally well developed, particularly along the base of the northerly wall where a continuous ribbon extended into the amphitheater for about a mile. There was also a much crevassed medial.

Crossing the stream at one of these terraces just below the ice tongue (altitude 5975 feet by aneroid), we followed a contour along the south side of the valley and rounded a shoulder into a smaller glacier-walled alcove that branched off towards the south in the direction we expected to go. As we were scanning the heathery slopes ahead, through the glasses, for a suitable camp site, we discovered a caribou feeding near the ice. Though fresh tracks of the animals are often to be noticed along the streams we had never caught a glimpse of one before. Excepting bears and, of course, goats, the same is true with respect to the other large game of the Selkirks, for so thick are the forests that warning of the traveller's approach is always given to them long before he is aware of their proximity. For this reason it is rather difficult to estimate their abundance in the range, but considering the comparatively limited extent of feeding-ground afforded by the narrow valleys, one may safely state that in general their numbers are only moderately large. Bears, both grizzly and black, are, however, not infrequently seen.

Continuing across a rock-slide, we advanced a short distance and set up the tent at an elevation of about 5925 feet on a sloping bank of heather. Dry level ground was, as usual, conspicuous by its absence, and

firewood was none too plentiful, but as our stay was to be brief, we could well afford to put up with less than the customary desiderata. Later on, it proved rather a treat to be able to look out through the tent door from one's sleeping-bag and enjoy a fine view of Mount Redan's snowy shoulders shimmering under the light of a full moon; nor was even the midnight discovery that one had commenced to slide down the mountain sufficient to neutralize it.

Next morning the sun rose fair and we were off for our peak at seven o'clock. Climbing commenced in earnest beyond a waste of flat stones from which the glacier had but recently retreated. Though purely clear, the air was hot and enervating, and we paused many times for breath on the steep, flower-strewn slopes. Presently these gave place to snow, but the going was no better. Two hours from camp the snow ended on a narrow rim of rock and we found ourselves in a small col looking over a precipice into another valley—which later turned out to be the north branch of Gold Stream. Glaciers streamed down everywhere, and, with the precipice, effectually cut us off from our objective which was in plain view beyond them to the south-west. The only thing we could do was to follow the rocks to the south, in the hope that it would be possible to transfer to the ice at about the same level and to continue thence directly towards our goal. But we found that the cliffs were too steep for this, and after being continually forced upward for an hour, came out on a subsidiary summit almost as far away as before. However, the peak, since called Triangle station, was such an excellent view-point for the neighboring névés that our exasperation was forgotten temporarily in photographing and observing the many interesting features.

It returned, however, when we started on, for the precipice continued around the south side of the peak and repulsed us at each attempt to descend. As a climax, the east arête, after enticing us downwards for some distance, suddenly came to an end in a smooth perpendicular wall. There was nothing for it but to climb back and descend as we had come. However, in cutting directly across the north face to the ridge of our approach, a way was discovered down the slope on this side and, although it was in dubious condition by reason of quantities of soft snow overlaying steep, polished slabs, careful work eventually brought us to the névé. It was most annoying to have wasted a large part of a beautiful morning on a pigmy peak, but such incidents are unavoidable in pioneer work when prior reconnaissance is impracticable.

Crossing a diminutive col in the east ridge, we gained the large snow-field on the south and plodded across this towards our goal. The way was now clear, but the air was strangely close and the sun beat down unmercifully, so that hours seemed to pass before we actually got onto the lowest rocks of the mountain. A trickle of water here induced us to call a halt for lunch. A little later, the obvious snow arête, mounting steeply above the north precipice in an airy curve, brought us to the summit (9350 feet) at 2.15, where all recollections of earlier annoyances vanished in the presence of the splendid panorama. The station was admirably adapted to topographical work, for, owing to its situation in the point of the V between the north and east forks of a considerable stream, it commanded not only portions of these but of the main river as well, which meandering through a heavily timbered valley among swamps and beaver meadows could be traced towards the west-southwest for many

miles.[1] Then swinging more to the west, it was lost to sight. Unquestionably the river was tributary to the Columbia on its southerly flowing course beyond the Big Bend and as a result the divide of the range lay well behind us. This discovery was of especial value since we could now correlate the various branching valleys and pick out the main water-parting of the system for a long distance. The stream could scarcely be other than the Gold Stream whose lower course had been the scene of the mining excitement in 1865. Accordingly it seemed appropriate to christen our station Goldstream Mountain.

To the west, numerous, sharp, well-timbered ridges, seldom reaching far above snow-line, succeeded each other in a diminishing series towards the broad valley of the Columbia. In the distance beyond, the long array of rounding snowy summits of the Gold Range was plainly in view, stretching far to the north and south.

Northwesterly, the continuation of the Selkirks presented a characteristic complex of sharp, glacier-bearing summits, varying chiefly in a lessened altitude from the more familiar portions of the chain. At two points, however, elevations of not less than ten thousand feet stood out; one a knob of four peaks since plotted as situated near the headwaters of Big Mouth and French creeks for which the name Mount Argonaut is suggested, the other apparently forming a long, even-crested wall along the westerly bank of Windy River. Immediately beneath us on this side flowed the north fork of Gold Stream, taking its source in part from the westerly glaciers near Mount Austerity. Below these, we looked through the narrow pass previously seen from

[1] This part was undoubtedly traversed by Green in 1865. See page 20.

the shoulder above Silvertip glacier. But the dominant feature in this locality was the Adamant group. Towering over everything else, its chocolate-hued phalanx of savage cliffs and pinnacles presented a most impressive spectacle. The range runs northwesterly without a break as far as the opening of the valley of Windy River—a distance of perhaps eight miles—so that adding the length to Mount Stockmer in the other direction we have sixteen miles for its total extent.

Continuing easterly, Sir Sandford was supreme, soaring in a clean sweep of two thousand feet above his nearest neighbors. The intervening space was completely filled with glaciers, snow-fields, and rocky ridges. In fact, the locality was a veritable nursery of glaciers. Directly to the east, these sloped away into a dark depression where we knew that Gold River's main stream had its source. This depression was clearly prolonged into the valley of Gold Stream at our feet, and, therefore, most probably formed the pass that had taken Moberly across the range in 1871. We at once selected it as the goal of our next excursion.

Turning to the southeast and south, the range continued in a hopeless maze of snowy, jagged peaks, among which we recognized Mounts Iconoclast and Sorcerer. A few miles to the west of the latter a throng of striking summits claimed our admiration, outtopping everything in their immediate vicinity. We guessed that their location was not far from the headwaters of the north fork of the Illecillewaet River and agreed that had there been a lack of other inducements for exploring that section of the range, these fine mountains would certainly have supplied it.

Westerly again towards the Columbia came forested ridges, drained in this quarter by Downie Creek. Curiously enough, the streams of Downie Creek and Gold

Stream flow through roughly parallel channels on either side of a remarkably long ridge. This appears to be widest at the west but rapidly narrows in the opposite direction until at its nearest approach to Goldstream Mountain the rivers are separated by less than five miles. The ridge, or more properly range, culminates in a handsome, rocky spire which soars above the valleys from the midst of a complicated system of lesser spurs and buttresses. Eldorado Mountain is suggested as an appropriate name.

Flooded with gorgeous afternoon sunlight, this limitless expanse of splendid alpine country imbued one with a sense of infinite majesty and repose. Yet there was a thrill of exhilaration, too, in the thought that "we were the first that ever burst into that silent sea." Never before had human eye embraced this multitude of mountains in a single sweep nor human foot trodden these spotless snows. The exquisite composition of glacier, precipice, and crag existed for us alone—an absolutely unique and peculiarly precious reward. On every side there was nothing but wilderness—wilderness primeval, unexplored, unmapped, and virtually unnamed, save where we ourselves had christened.

Having brought labors with barometer, compass, and camera to a close, we studied the panorama through the glasses, picking out possible future excursions and tracing the contours of cliff and arête. All too soon came the time to descend and reluctantly we adjusted *rücksack* and rope at about 4.30. We went back exactly as we had come as far as the col, but then we worked down the steep, yet easy, glacier and arrived in camp at seven o'clock.

The following day we crossed the ridge to the south, though the lowest col (8000 feet), traversed the smooth

VALLEY OF NORTH FORK OF GOLD STREAM FROM SILVERTIP PASS

LOOKING DOWN THE EAST BRANCH OF WINDY RIVER FROM MOUNT REDAN

Photograph by E. W. D. Holway

THE DISCHARGE OF ICE FROM GOLDSTREAM NÉVÉ

SIR SANDFORD GLACIER, SOUTH; CITADEL MOUNTAIN AT RIGHT

Photographs by E. W. D. Holway

névé beyond and descended its easterly effluent to the supposed Moberly Pass. On the way we halted on the brow of a cliff overlooking the pass, the valley to the southwest, and the splendid cataract down which the névé discharges its surplus ice. The defile was a long, sparsely-timbered saddle of open meadows and groves of evergreens. With occasional lingering snow-drifts that nourished pools and rushing brooks, the place had a pleasant parklike aspect. Below Mount Citadel a beautiful glacier, the southerly extension of the Sir Sandford, swept downwards towards the pass and for a brief period our way lay beside it. At the tongue, the aneroid indicated an altitude of 6250 feet. Evidences of recent retreat were apparent on every side. As we followed the stream downward along cascades and falls the questions arose, Which way does it turn, east or west? Have we crossed the divide or not? Interest and expectancy were keen as we neared the pass. Not until we got to the very bottom, however, was the matter clear. There we saw that the stream curved abruptly to the east, forming the source of Gold River and placing Citadel, Sir Sandford, and Sir Sandford glacier entirely on that side of the divide. A little farther to the west, we located the actual water-parting (5825 feet) where another glacial brook ran down onto the pass from the same side and then swung sharply west. In this direction, the valley dropped away suddenly and the stream became a raging torrent. Through the lattice of the trees we had a capital view of the magnificent ice-fall seen earlier in the day from above. The glacier, seemingly tumbling out of the sky, throws itself over a precipice for more than 1600 feet. At the bottom it is reconstructed in two tongues on either side of a rocky cleaver, and the whole forms one of the finest examples of glacial activity to be found in the range.

After carefully studying our surroundings, we felt no doubt but that this was indeed Moberly Pass.[1] It was the most direct connection between any of the branches of Gold River and Gold Stream below timberline and, as Moberly had reported, it appeared obvious that a tunnel would be necessary for a railroad owing to the precipitance of the westerly approach. The pass was similar to Rogers Pass in size and extent, though without as many lofty peaks in view about it, Mount Sir Sandford being concealed by the ice-fall in that direction. The most prominent eminences were a buttress of Mount Citadel and a nameless peak of about the same height to the southeast. On the south side, extensive névés occupy an upland plateau from which several tongues protrude and all but reach the pass. Only the largest of these, however, is visible from below. It is a rather significant fact that all the branches of Gold Stream and Gold River correspond almost exactly at the various passes without any interlacing of their courses.

Shadows falling on the pass warned us to curtail further investigations, attractive though they would have been, for a whole range intervened between us and our evening meal. Accordingly, striking upwards through the woods, we regained our morning's route. Not long after, we climbed into sunshine, which suffusing the entourage of glacier and peak with a golden radiance, brought out a picture of surpassing loveliness. Camp was attained just after seven. It took four hours to reach Moberly Pass and three to come back, the difference being due to time spent in making observations and photographs.

There was nothing further to be accomplished from

[1] The fact has been confirmed by Mr. Moberly himself in a recent communication to the author.

our position, so on July 17th we carried the outfit back to Sandford Camp, ascending Mount Redan on the way. Although we had already discussed the climb, it was by no means definitely assigned to the day's program when we started. However, after working the packs to Redan Pass and enjoying an hour's blissful rest there, the undertaking took on quite a different aspect and we felt that we could not afford to let the opportunity slip. Accordingly, descending Silvertip névé for a short distance, we unshouldered our burdens at four o'clock and commenced to kick steps up the steep slope at a point previously chosen. The going was not of the best, and several huge *bergschrunds* enforced caution for a time, but nevertheless we covered the 1600 feet to the summit in three-quarters of an hour, elevation 9570 feet.

It was wonderfully clear, for a northerly wind had been blowing, a rare occurrence in the Selkirks. Fortunate, indeed, it seemed when we looked off to the south where a long band of smoke stretched completely across the sky. In several places enormous plumes like those of a volcano in eruption indicated the locality of the fires. Sir Sandford, lighted by the level rays of the setting sun, had never appeared to better advantage. Our "long slope" presented itself end-on and in the photographs obtained, the angle measures a full 60°. *Bergschrunds* even at this distance could be seen to have opened, dark ice stood forth on many a slope, and several sections of the sky-line cornice had fallen. Mount Austerity, with its surrounding névés, was also capitally displayed and so favorably impressed were we with a certain line of ascent that we resolved to try it if occasion served.

In reading descriptions of summit views among the Selkirks and elsewhere, one not infrequently comes

across complaints at their want of picturesque effect, or (especially in the case of the higher eminences) of their general monotony of appearance. This very likely is due to the fact that they are seldom seen early or late enough in the day. During the hours before and after mid-day, which most often find climbers at their goals, the noon-time glare is at its height, heat haze is densest, and shadows are least conspicuous. Naturally, no relief appears to best advantage under such conditions and the main impression gained is one of flat blinding vastness. But let the climber time his visit for about 4 P.M., or later, and he will be astonished at the delicacy of color, the infinite detail of form, and the entrancing chiaroscuro then displayed on precipice, glacier, and snow. Of this description was our panorama from Redan and we lingered as long as prudence would allow. The descent took us a few minutes longer than the climb, but at 6.30 we were resuming our packs. The rest of the march was easy and eight o'clock found us enjoying the comforts of our principal camp once more. We were well satisfied at successfully completing a trip that yielded results of the very greatest importance in the mapping of the region.

CHAPTER XIX

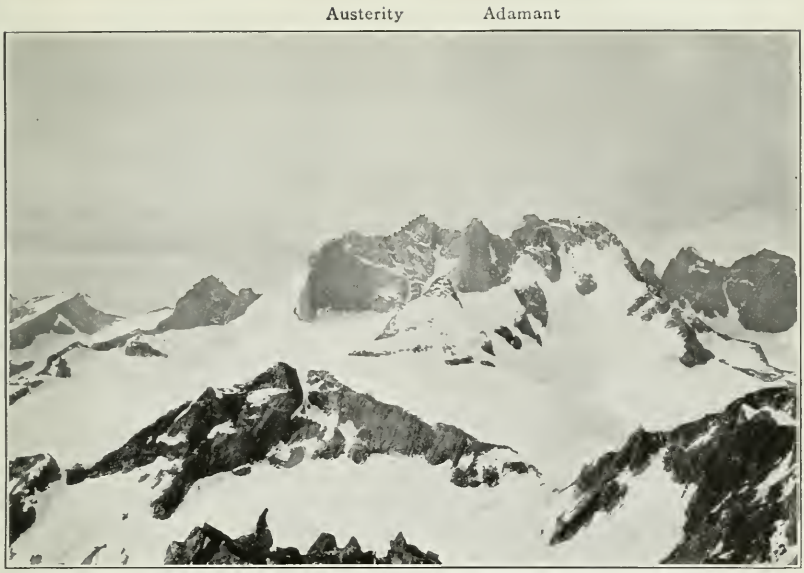
THE ASCENT OF MOUNT AUSTERITY, 1911

Completion of the Survey and the Return to the Railroad—Other Alpinists Assail Mount Sir Sandford

THE weather had been unusually warm and sultry for some time, and on the morning of the 18th signs of a change were not wanting. Though the wind was northerly at an early hour, it worked into the southwest as the day advanced and, towards nightfall, the expected rain began. We had gotten back in the nick of time. However, there was no reason to fear another long siege, for on the 19th conditions considerably improved. Holway, pooh-poohing our scruples, went off and made a solitary climb of Mount Vidette, while Butters and I performed a final measurement of the extended base. We were nearing the end of our supplies, and it was essential to hurry the survey work to a conclusion. That evening about the campfire we consulted as to whether it was best to try Sir Sandford again or to devote our remaining time to an attack on Mount Austerity, for we could not do both. Holway reported that the snow encountered on Vidette was in a deplorable state and that he had only just been able to gain the summit. The mountain is about the same height as the Sir Sandford arête below the small buttress and it seemed very unlikely that matters would be much better there. Moreover, the ice

conditions had grown worse as we had seen from Redan. The upshot of it all was the decision to abandon Sir Sandford and to stake everything on Austerity, since there was no practicable alternative. Preparations, therefore, commenced at once, for we must go on the morrow unless circumstances absolutely forbade.

On July 20th we were up betimes and got away a little after four o'clock. As far as Silvertip Pass, visited exactly a month before, we followed familiar routes, but from this point on, all was *terra nova*. The atmosphere was permeated with a light haze that gave a grayish cast to the sky, and from the pass at 7.40 the mountains in the distance looked dull and gloomy. However, it was a satisfaction to have a windless day for once and this circumstance went far towards making up for other deficiencies. Beyond the pass, an outcropping cliff-belt forced a brief descent, but by traversing along its base on avalanched snow we finally turned the obstruction and, after a breathless space of kicking nicks in the hard, steep surface, reached a tiny col high up in the ridge dropping to Windy River Pass. Naturally we had felt considerable anxiety as to the availability of this gap for passage, for if it failed us, there was slight hope of reaching even the foot of any of the big peaks that day. From the top, however, we were elated to discover that there would be no difficulty, for, owing to the drifting of the snow, the *schrund*, that elsewhere along the cliffs appeared formidable, here was entirely filled. The glacier below Mount Adamant was easy and we could see nothing to prevent the execution of our design. On former climbs we had noticed a peculiar snowy shelf that wound upwards around the cliffs in a smooth white spiral, like a scarf, apparently connecting the snow-fields of the amphitheater with the top of the buttress. Owing to



VIEW FROM MOUNT REDAN SHOWING ROUTES TO AUSTERITY AND BELVEDERE PEAK

Photograph by E. W. D. Holway

MOUNTS SORCERER AND HOLWAY FROM GOLDSTREAM MOUNTAIN

THE ADAMANT GROUP AND MOUNT SIR SANDFORD FROM TRIANGLE STATION

Looking northeasterly across the Selkirk watershed

the curve, however, we had not been able to observe the nature of the junction with the rocks or to gain any idea of their character. Our present situation revealed scarcely more, but we could see that the shelf was practicable and that nothing short of an actual trial could determine the suitability of the rocks.

After a short halt, at 8.15 we ran down the snow to the glacier, crossing many goat tracks, though what the animals could gain in this desolate amphitheater, walled on three sides by tremendous cliffs and on the other by ice-falls, was not apparent. In an hour we crossed the snow and made about one thousand feet on the shelf. Even thus early in the day the surface was soft and our laborious progress soon brought home the fact that nearly half an ordinary day had elapsed since breakfast. Accordingly we sat down in the snow for refreshments. The shelf cut upwards across the westerly face of the mountain, bordered by a smooth cliff on the right and a drop of equal steepness, though of greater depth, into a glacial basin on the left. We did not tarry long, for the success or failure of the day seemed to depend upon what the next hour had in store.

As we mounted higher, the snow got decidedly worse. After every few steps, its thin crust would give way, letting one into the loose powdery mass above the knees. The angle steepened as well and one instinctively began to estimate the chances for starting a slide over the brink which was ever swinging inward on the left. Near the rocks, very careful work was needed in treading out standing places, for the axes furnished no hold whatever, sinking without resistance up to their heads in the mealy snow. Despite the sound nature of the rock, every shelf and cranny was cluttered with fragments, so the transfer imposed extreme caution on the

leader, lest he dislodge anything upon those below who could not get out of the way. As usual, however, Holway was equal to the situation and after he had secured firm anchorage on the ledges, we followed, moving one at a time. We now had opportunity to study conditions ahead. The slope looked favorable, that is, there were no insuperable obstacles in view, so we turned to our task with renewed energy. It was very slow work. While Holway was prospecting the route, we sheltered ourselves in convenient recesses in order to be out of the way of the small cascades of stones which the sagging of the rope would start, now and then, in spite of every precaution. In the shadow, the stones were cemented down with ice which thus performed the rather unusual function of increasing the safety of the way, but it was not wholly pleasant to contemplate the return passage later on. The rocks were not high and a short three-quarters of an hour brought us to the arête.

We found ourselves upon the rim of a basin from which glaciers descended towards the Columbia. Off in the distance gleamed the extended cordon of the Rockies, dimmed with haze but none the less extremely grand. Across the amphitheater to the right Austerity was in full view, shrouded in steep snow for the most part, but breaking into cliffs towards the north. In the opposite direction, a rocky arête sloped down to a col separated from us by a cliff-girt tower in the face of which our ridge merged. The best way to reach the col seemed to be to traverse the steep snow-slopes along the side of the tower. We were above the *bergschrund* and this looked promising. However, no sooner had we ascended a few hundred feet and gotten well out on the slope than Holway struck ice, hard and blue. Was it all an ice-slope? We went higher and tried and then

lower, but at each level found only ice thinly plastered with snow. There was no question of anything but retreat, so we retired to the arête for further reconnaissance. The only other possibility was to descend into the cirque, cross the floor along the base of the tower, and then attempt to strike directly upwards for the col where the snow seemed to be thicker. While negotiating a steep bit of snow in looking for a good point to cross the *schrund*, Butters's feet suddenly shot out from under him on the uncertain surface and he started for lower ground. The taut rope to the third man brought him up short, however, and absolutely no harm was done.

A better bridge previously hidden was now discovered behind us, and accordingly we retraced our steps to it. Owing to the thinness of the new snow, the crossing was delicate, but we completed it safely and then plodded on towards the col. The second crossing of the *bergschrund* presented a much more serious problem. It was situated some distance up the acclivity, opened widely, and displayed an overhanging upper lip, eight feet at least, above the lower. In addition to this, a huge cavern yawned immediately beneath the most favorable point of assault. But such places always afford the greatest delight to Holway who never feels entirely happy unless a climb includes something of the sort. After he had chosen a suitable place, Butters anchored just behind and I did likewise, half the rope-length down the slope. Fortunately, the snow here afforded excellent holds, so that we felt no anxiety on this score. When all was in readiness, Holway, who was lowered forward on the rope by Butters, dug out a solid foothold on the opposite side of the chasm, and then gingerly jumped over. In order to give more rope if needed I now went up to the lip beside Butters and

drove in my axe. Holway thereupon commenced to dig niches in the bulging snow and, sprawling on the wall like a spider, with arms and feet outstretched, he planted Butters's axe in the upper slope and agilely worked himself up. When it came our turn to repeat the maneuver, we voted it an exceedingly skillful feat of icemanship.

We now took a diagonal upward course where the snow, though not of the best, was still sufficiently deep to bury the ice, and got to the col just a half-hour after noon. The altitude was 10,490 feet. We had only risen 1350 feet in the three hours and ten minutes since breakfast, including the time wasted in prospecting the ice-slope. We took off the rope and devoted ourselves to a most welcome luncheon of rye-crisp, pemmican, raisins, prunes, and chocolate, supplemented with refreshing drafts from a tiny pool. It was the first water we had seen since 5 A.M. and we agreed that icicles broken from the walls of the *bergschrund* as we passed had not supplied a satisfactory substitute. We were directly on the edge of the tall cliff that walls the south side of the group and the outlook was superb, notwithstanding the smoke which had now thickened noticeably. Immediately opposite, the two towers of the Blackfriars presented a similar expanse of smooth precipice veined in an intricate pattern with bands of white quartz and feldspar. Within a radius of a mile hereabouts are gathered some of the most astonishing escarpments in the range owing to the presence of granite. The group is an important center of elevation as well, for included within the same limit are no less than seven summits all above 10,500 feet and averaging considerably in excess of this figure. Its prominence is conspicuous even in the Rockies many miles away, for Habel unmistakably described it from there as "a

long ridge, its flank studded with pinnacles and small towers, like a Gothic cathedral" stating that it was apparently one of the highest elevations in the range.

However, not for long did the allurements of the view distract us from matters of more immediate concern. The stronghold was by no means yet won, for the summit ridge behind us bade fair to afford absorbing work even to the utmost pinnacle. Moreover the way must be forced on the ridge itself, since steep ice and snow, overlying the tilted slabs of the west face, limited the possibilities for traverses on that side, while the relentless cliffs that plunged down into the amphitheater we had crossed earlier in the day on the right, offered slight hope of any similar opportunities there. The arête itself communicated no very definite impression one way or the other. It looked perfectly capable of blocking us, yet on the other hand it might prove unexpectedly easy. As such ridges go, it was wide, well broken, and only moderately steep.

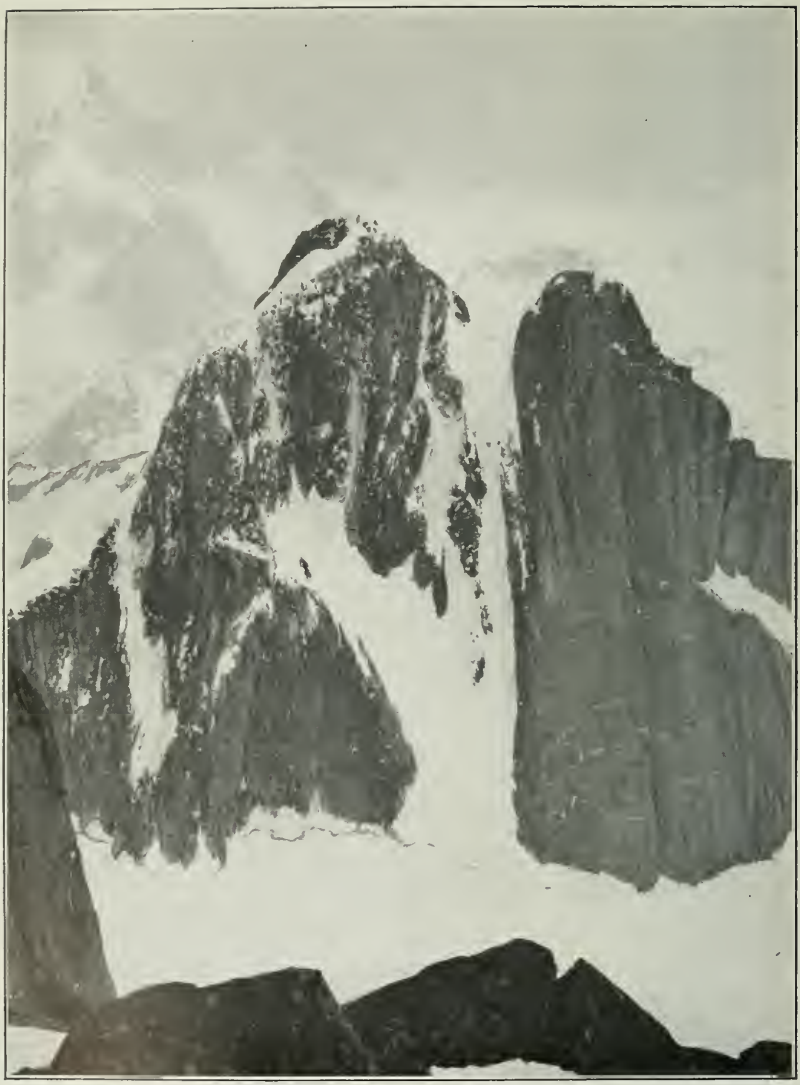
After perhaps half an hour we roped up again and started on towards the peak. Holway had resigned his place at the head of the line and it fell to my lot to take the lead. After floundering through some big drifts of new snow, where I unexpectedly stepped through into vacancy, real work commenced again on the rocks of the arête. Owing to its structure, the stone was not finely broken up, but incipient degradation took the form of huge chunks with steep smooth faces oftentimes separated but a little from the living rock whence they had been quarried. The cracks thus formed furnished an easy means of advance. In other places the work of destruction was more nearly completed, clefts wide enough to admit the body being left. In these, the "back and knee" method served our purposes. Where the rocks had already started on

their way to lower levels, sloping reëntrant corners occurred which had to be swarmed up by taking full advantage of such rugosities as the cleavage afforded. At one place an ice-axe firmly driven into a crack furnished the key to the problem and it was left behind for use on the descent in the belief that snow and ice work were over. Unfortunately, this soon proved to be a mistake and the implement was sorely missed.

As we made altitude, the arête narrowed. The smooth slabs of the western face approached nearer and nearer to the actual ridge until finally the latter formed the only path. Neither the slope of the slabs nor that of the arête was severe, but lest there should be a lack of obstacles, the mountain had accumulated a large pile of snow right on the very crest and this now confronted the leader. It was too deep to clear away, too soft to walk on without support, yet too vacuous in substance to enable an axe to get a hold. An ugly gully opened into the precipice below it on the right while a most excellent toboggan slide of a thousand feet or more was afforded by the thinly coated slabs to the left. Yet the snow must be passed, for the top was almost won. Urging my companions to keep the best hold they could with one axe and to be careful to avoid jerks in paying out the rope, I took the other and, using it as a tight-rope walker does his balancing pole, commenced a cautious advance, patting down each step in the yielding mass with a cat-like tread. Presently I found that a sheet of ice sheathed the rock beneath the snow and this had to be carefully cut away at every foothold. However, it only served to delay us—for as a matter of fact the course was awkward rather than really difficult—and at 2.10 P.M. a "Whoopee" of triumph proclaimed that Austerity was ours.

Except for a few slivers of rock just large enough to

THE BLACKFRIARS FROM AZIMUTH MOUNTAIN; BELVEDERE PEAK AT LEFT



THE BLACKFRIARS FROM SUMMIT OF MOUNT AUSTERITY

Photograph by E. W. D. Holway

serve as seats for the party, the summit was covered up with new snow, so we built no stoneman but left our record in an aluminum box under one of the stones.

The question of the relative rank of our mountain in the group was most absorbing, for the eminences were so closely packed together and so nearly of the same height that no distant estimate could be trusted. A clinometer was not necessary to tell us that we were decidedly higher than the Blackfriars and only a slightly less distance above our former standpoint on the loftiest crag of The Gothics, but in the case of the second peak to the east of us on the same escarpment we must needs have recourse to the instrument. Careful observations with this indicated that it outtopped us by a very few feet, but as regards all others in the vicinity save Sir Sandford, we were undoubtedly supreme. This was a cheering discovery, for besides being our most interesting climb, the peak would rank as our loftiest first ascent. The altitude by triangulation, a mean of three rays, is 10,960 feet.

The outlook, though wonderfully grand, was considerably reduced by the smoke and some of our lesser climbs have left much more enduring impressions. Still, towards the north and west across the Columbia valley, the air was fairly clear and we obtained a good idea of that section. Wide snow-fields, divided into three or more gathering basins by offshoots of the range towards the river, send down dissipators in this direction. Their beautiful ice-falls framed between steep forest-clad slopes must present lovely vistas from the Columbia valley. The river itself is so deeply entrenched through this part of its course as to be almost entirely hidden from the mountains.

After securing a round of angles with the compass, we started back at 3.15 in the same order as

before. The descent of the arête took only five minutes less than the ascent and there were no halts in either case. The work is simply straightforward rock-climbing without any sensational features. The most that can be said of it is that the formation is sufficiently irregular to furnish almost constant employment for the hands. But holds are firm and cracks numerous so that there is nothing to distract one from the solid pleasure of the course.

After leaving the col, it seemed best to back down the slope leading to the *bergschrund*, for from above its steepness appeared to better advantage. Holway remarked that he now understood why in coming up his knee kept hitting the slope ahead as he kicked out each step, an operation which had proved so absorbing that he really had not noticed the angle. The upper lip of the *schrund* was found to overhang, so it was beaten down with the axe sufficiently to permit a direct descent. Even then the passage was more troublesome than one might think. But neither this nor the second crossing occupied much of our thought, for the dangerous rock slope beyond was the true *bête noire* of the expedition, and when we looked down upon it a little later our apprehension seemed justified. The sun shone full upon it, as for hours past, and mud and slush replaced the ice. The most we could do was to send as many rocks as possible down the slope in the hope that they would sweep off the loosest material, and for a time little could be heard but the metallic ring of the missiles as they rattled glacierwards from ledge to ledge. The small fry splashed into the snow, but a few of the larger chunks rebounded through fountains of spray and disappeared over the brink. We simply crawled along, testing every step and every hand-hold in advance. Thus we finally reached the bottom where our next

concern was to get onto the snow. Bad enough earlier, it was now simply atrocious. The leader, however, held securely by his companions on the rocks, lunged into the slithery mass and carefully plowed out a track and standing place. Then they advanced stealthily one by one until the transfer was completed. The worst now being over we jumped, plunged, and stumbled down to the breakfast place which we gained at 6.04 P.M.

The sun was getting low and we yet had a long tricky march before us, so we made all possible haste. Crossing the little col (6.50 P.M.) we arrived at Silvertip Pass just before 7.30. The sunset was glowing a wondrous vivid crimson on the mountains roundabout. Peak, battlement, and crag, kindled here and there into ruddy flame, with long violet shadows behind, stood forth like some giant stage-setting arranged for a Titans' play. Without a halt we pushed ahead into the somber twilight, following our morning's faint track. But presently in the failing light, it vanished and we found ourselves in a strange quarter of the glacier. Could we ever work out a new way without a lantern? It began to look dubious. However, in mountaineering necessity is the mother of accomplishment and under its spur prodigies in the way of impossibilities have been overcome. Breaking into a run, we dodged hither and yon across dome, hollow, and crevasse wherever a lead appeared, until finally much to our delight we brought up among features that were more familiar. It was a thrilling dash. As we descended the long slopes leading to the level reach of "dry" glacier, the séracs at the left loomed up like monstrous ghosts. We were glad presently to find ourselves at the bottom with nothing but a couple of miles of rough, bare ice and a long stretch of moraine between us and camp.

In the gathering darkness we picked our way through these obstructions and got to the tents at 9.10 P.M. where our men had a bountiful repast in waiting. We had been on the march for sixteen hours, covering something like twelve miles in all over continuous glaciers and snow. The ascent from camp was about 5200 feet.

The outcome amply justified our judgment in not attempting Sir Sandford, for there is no doubt but that snow conditions would have been equally bad in that direction, and as the slopes are more severe, we could almost certainly have accomplished nothing new. The continuing softness of the snow, notwithstanding the period of warm weather, seemed to be due to the way in which it had fallen. Instead of one continuous layer there were several, separated by sheets of icy crust. This unusual condition is explainable on the supposition that owing to the wide variations in temperature during the storms, snow kept alternating with rain on the upper slopes. Most probably this is the truth, for frequently we noticed that the storms left no new snow on the high rocks, while in other cases it extended far down towards the valleys.

In view of the fact that Austerity was not visible from Azimuth Peak, it was necessary to select an auxiliary station in order to include it in the triangulation, so on July 21st I spent a good deal of time scrambling along the lower slopes toward Sir Sandford for the purpose of locating such a point. I was finally successful, and in the afternoon returned with one of the men for the observations. The weather was threatening a thunder-squall, but there were not many readings to take so I hoped to complete them before it broke. However, no sooner had one set of angles been secured than rain commenced, and carelessly throwing a

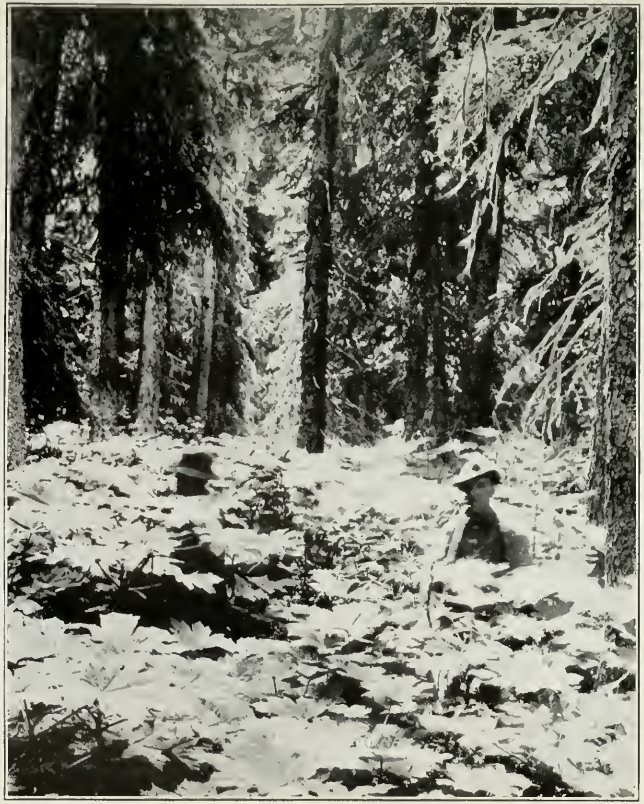
rücksack over the instrument for protection from the wet, I repaired to the shelter of a ledge. Unhappily, in the midst of the storm a heavy gust swooped down without warning and, striking the *rücksack* like a sail, blew the transit bodily off the rock. We rushed out at once to learn the extent of the damage and found that luckily nothing was broken but that the telescope and horizontal circle were a little bent. I thought at first that the accident had cost us the entire survey, for one of the extended base-line stations (Palisade) was yet to be occupied, but upon resetting the transit and rereading the same azimuths as before, they turned out to be unchanged. The vertical angles, however, indicated a discrepancy, owing to the bend in the telescope, but this was calculated later and allowed for, so in the end it was most fortunately found possible to complete the work, although the escape was a narrow one.

On July 22d, the last day that even a nearly invisible remnant of provisions would allow at Sandford Camp, rain again kept us under canvas. Had we postponed the final readings in the survey too long? It was an anxious time, for back we must go on the morrow without fail. In the evening to our great satisfaction signs of clearing appeared and at four o'clock the next morning Holway and I tumbled out. Most generously he had volunteered to come with me to save time in securing the angles. Everything was favorable and we made good speed to Palisade station, the last as well as the first climb of the year from Sandford Camp. Three rounds of angles were read to the principal features in order to obtain the greatest possible accuracy of which the instrument was capable. Then we returned to camp at eleven o'clock.

An hour later the last strap was buckled and the

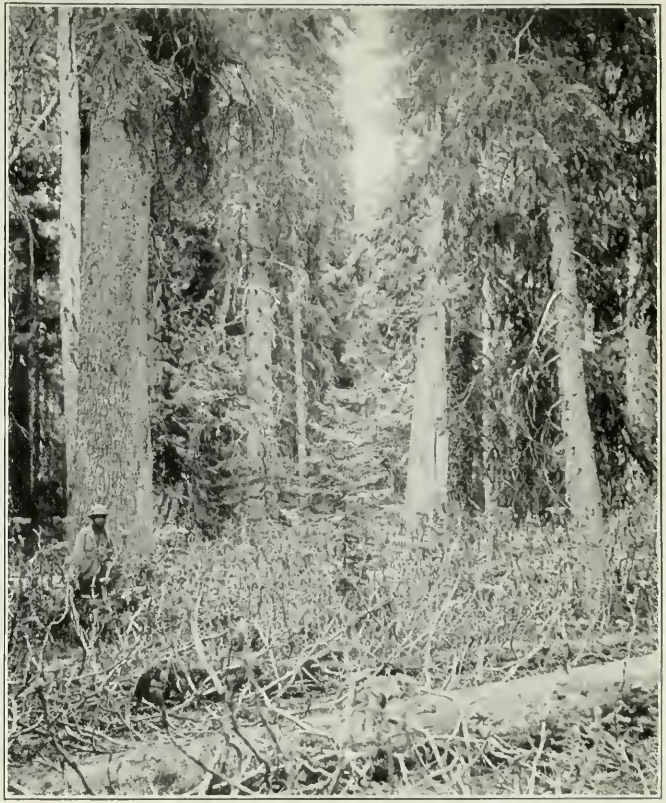
entire party bade farewell to what was left of Sandford Camp, not without regret in spite of the many desolate days of rain that had been our lot. We found a great change in the forest since our coming—devil's club was now in full bloom, ferns were shoulder high, and everything that could in any way obstruct the march was ready to do its utmost. The heat was fearful and one plunged along with perspiration dripping from every pore and flooding smarting eyes. Frequently the blazes were covered by new growth which caused us to lose track and patience together but the men were never at a loss for long. Stumbling over long-stemmed alders growing just above the ground, staggering over slippery logs and stones, tumbling into pitfalls concealed by ferns and weeds, progress was not unlike a nocturnal hurdle race. However, we succeeded in reaching Taurus Camp before sunset and here we spent the night without sugar or flour.

The next afternoon we got to the boat where a celebration for our safe deliverance from all the insidious traps of the jungle was at once decreed. We now had baking-powder, sugar, flour, powdered milk, coffee, and other luxuries in abundance and there was no need for further frugality. It was indeed a glorious and delectable repast that we had there sitting beside the cool, ever-hastening river. Truly the city-bound of mankind can have no just appreciation of the civilization of which they are a part! Loading our craft and pushing off at 1.30, it took just fifty minutes to gain the Columbia. As before we crossed to Bush River, for the return was again to be made by way of the Columbia trail. In order to get as far as possible by nightfall the men helped us with the light packs for a time but at four o'clock near the old fording place they turned back. The air was frightfully hot even in the shade and the



DEVIL'S CLUB FULLY DEVELOPED AT SAME PLACE

Photograph by F. K. Butters



DEVIL'S CLUB IN BUD, SHOWING SNAKY, SPINE-COVERED STEMS

SIR SANDFORD FROM THE SUMMIT OF MOUNT AUSTERITY

TOP OF MOUNT ADAMANT FROM SAME

Photographs by E. W. D. Holway

mosquitoes beset us in millions. Still, we kept doggedly on and just before six came to the crossing of Succour Creek. The place had been burned over long ago and the ground was hard and dusty, but it did not seem wise to pass good water at this late hour so we decided to camp. Our tormentors were most diabolically vindictive as we made our preparations for the night and prospects for peaceful slumber appeared far from rosy. However, before we turned in, every hole in tent and curtain was carefully sewn up and the sod cloth was weighted with stones. Then a universal slaughter of the insects inside took place and as a reward we passed one of the most comfortable nights on the trip. In the early evening it was particularly satisfying to sit behind the curtain and watch a dozen or more dragon-flies darting about this way and that, snapping up the wretched little pests with the greatest of zest. However, it was somewhat discouraging to consider what an untold multitude of dragon-flies would be needed to diminish in any sensible degree the forces of our common enemy. One wonders why dragon-flies are not more numerous hereabouts, for these were almost the only ones we had ever noticed.

On the 25th we were off at 6.15 to take full advantage of the cool of the morning. Two hours and a half brought us to the first of the series of little lakes that mark the summit of this minor divide. Upon reaching the largest a few minutes later, we refreshed ourselves by a plunge in the placid water. Continuing at ten o'clock, the next halt was called at noon for lunch and we tarried about two hours and a half. The trail beyond this point is constantly crossed by delicious streams, and good camping places occur as often as once an hour. At 6.15, after twelve hours of marching, we pitched the tent for the night at Blackwater crossing. Here a stiff

squall broke upon us and dead trees began to drop in the forest all around. Across the creek, half a dozen huge gray boles went crashing down. This led us to look to our own security and we kept one eye on two or three big fellows near by during the worst blasts. The stately spruces swaying backward and forward in dignified response to the gusts were inspiring to behold. In all I counted about a score of falls. While driving stakes for the tent, the hoof of a horse was unearthed and later we learned that the animal had been killed on that very spot by a falling tree. Next morning we arrived at Donald in two and three-quarter hours, reaching Golden that afternoon by train after an absence of forty-six days.

This terminated our exploratory work for the year in the environs of Mount Sir Sandford. However, as we soon heard that another expedition was in the field with the mountain as its goal, it may be appropriate to digress for a moment in order to finish the story of the attempts on the peak begun in an earlier chapter. It will be recalled that the following were there dealt with: (1) Shaw's and Heacock's expedition of 1906, (2) Jacobs's and Heacock's of 1907, (3) that of P. A. Carson, 1907, and (4) that of the Shaw brothers, 1908.

Not until 1910 was the siege renewed by parties other than our own. That summer, however, the fifth organized for the fray. It consisted of Messrs. S. H. Baker, J. P. Forde, A. M. Gordon, and P. D. McTavish, all members of the Alpine Club of Canada. Sir Sandford had by now developed a reputation for difficulty among the mountaineering fraternity, and therefore it is not surprising to find men of experience in alpine work among its assailants. Adopting the cross-country route, they advanced as far as Gold River, but here, owing to the high stage of water and to various mishaps,

particularly the loss of a large part of their provisions in the rapid stream, they were compelled to beat a retreat while still a half-dozen miles from the mountain.

The next to enter the lists was Mr. G. W. Culver of Winnipeg, in 1911, and it was of his venture that rumors reached us. As a published account of the trip has been summarized on a previous page,[1] it will suffice here merely to mention that in two very sporting attempts, Mr. Culver and his guides[2] were unable to get higher than about 10,600 feet on the formidable east ridge, a most creditable performance under the harassing conditions in which they worked.

Thus during the years 1906 to 1911 inclusive, saving only 1909, Mount Sir Sandford was the Mecca for no less than six different bands of aspiring pilgrims. They all followed substantially the same route leading to the south and east sides of the peak but only two actually came to grips with the mountain, the others succumbing to the perfection of its preliminary defenses. Altogether, no less than sixteen alpinists, not counting guides, have sought the honor of treading Sir Sandford's summit snows—a record that is believed to be without a parallel in the annals of Canadian mountaineering.

[1] Page 159.

[2] These Swiss guides were the first of their craft to enter this portion of the Selkirks.

CHAPTER XX

THE NORTH FORK OF THE ILLECILLEWAET RIVER, 1911

Ascents of Mounts Sorcerer and Holway—Additional Topographical Work

AFTER spending some days in Golden in overseeing certain necessary repairs to the paraphernalia, I went on to Glacier whither Messrs. Holway and Butters had preceded me. We had previously discussed the advantages of making an expedition up the north branch of the Illecillewaet River and had instituted inquiries with a view to undertaking the trip, but owing to our inability to obtain any reliable information, we had not seen our way clear to its execution. Now, however, we had strong grounds for believing that the mountains seen from Goldstream Mountain were accessible from this direction and if such proved to be the case, by occupying some of the prominent summits we could extend the area just surveyed in the environs of the Sir Sandford Range and possibly include a good deal of entirely new territory. Accordingly, it seemed well worth while to go up the North Fork valley and we at once set about preparations for the trip.

The existence of a quondam wagon-road raised the question of employing horses, but in the end, uncertainty with regard to the condition of the three bridges and trail, as well as to the amount of time that the expedition would consume, led to the decision to engage

our former porters and to resort to the well-tried method of relaying. Our conclusion was somewhat influenced by the report of P. A. Carson, Dominion Land Surveyor, who had traversed the "road" in 1906 and 1907 and had described it as "fearfully and wonderfully made," but this proved to be overdrawn, although, no doubt, careful engineering had been employed in its construction. That so little can be learned in advance about a section of the Selkirks which has been developed to the extent of thirty miles of road, a dozen log cabins and several deeply-driven mining shafts, and through which scores of persons must have travelled, bears witness in a rather striking manner to the truly primeval character of the range. Incidentally it is also typical of the great losses which geographical science has suffered through the heedlessness or indolence of trappers and prospectors in every clime. These pioneers frequently perform journeys that far surpass the explorations about which so much is heard, and did they but take the trouble to observe and record their routes geography would be much the richer.

During the first week in August the weather was unsettled. Often our hopes would rise upon seeing a sunny morning, but just as often they would be dashed by hard showers later on. Finally one day in desperation we bade it defiance and started off up the Asulkan valley in order to relieve the strain of enforced inactivity as well as to introduce a friend, whose time was limited, to the charms of the immediate neighborhood. We lunched on the pass at one o'clock and then commenced to scramble up the slopes to the west. The Dawson Range looked cold and cheerless, but it seemed good to be on the move once more. Presently we came out on the snowy ridge overlooking Fish Creek. Snow and hail were falling and clouds were stealthily creeping

up from the lower valleys. The weather was hopeless. Still it would never do to give in and admit that the Selkirks could offer no solace for such unkind manifestations, so it was suggested that we try a different way back for the sake of variety. This proved to be a happy inspiration, since the splintered ridges of Leda, Castor, and Pollux are well calculated to make a party of storm-bound mountaineers forget for a time the trials of compulsory luxury.

At 4.30 we came down upon the little pool in Sapphire col that gleamed like a brilliant specimen of its namesake amidst the gloomy surroundings. Then after refreshing ourselves we went down onto the Swanzy glacier and crossed the Lily Pass to the Rampart, time forbidding the attractive traverse of the Dome. From the top of the Rampart interesting scrambling, partly along the arête and partly on the western face, finally brought us to the shoulders of Mount Afton at seven. In the lowest depression between these two peaks there is another crystal pool—this one entirely rock-bound. Continuing to Mount Abbot across the diminutive Afton glacier, with its very muddy drainage stream, we made the summit at 7.45 having just enough light to pick out the homeward trail. Rain now commenced to fall as only Selkirk rain can and the rest of our progress was exceedingly moist indeed. At 9.05 we arrived at the hotel in a soaking condition but none the less pleased with the excursion as a "filler" for an off day. The trip had consumed about ten and one-half hours.

This, apparently, was the culmination of the storm, for on the 9th there was a marked improvement, and the next day, our men having put in an appearance, we went on to Albert Canyon (2227 feet) by train in the afternoon. The drop of nearly 1900 feet from Glacier into the midsummer heat of the lower valley (78° F.)

made heavy alpine apparel feel quite out of place. The village is situated in the valley of the Illecillewaet River about a mile below the confluence of its north and east branches. Wooded mountain spurs and rugged cliffs, with which the meadows and farms form a pleasing contrast, surround it on all sides. Nearby there are warm mineral springs that are said to be beneficial for certain ailments although at present they are in an undeveloped state. The village also boasts of a store where simple staples are obtainable.

After having made up our packs which, even after a careful selection of material, ranged between forty-seven and seventy-five pounds, we moved up the trail into the forest to camp. The next morning we got under way at 6.40, crossing almost immediately the east fork of the river on a rickety timbered bridge. The former road was largely overgrown with ferns, alders, and cow-parsnip, but an easy foot-path remained in the middle. The traveller soon enters the gorgelike mouth of the north fork valley with bold crags on either hand and the river foaming below. The way follows the east bank for about four miles from the village, transferring then and keeping to the west side for some five miles more. This portion of the valley is densely wooded and nothing of the mountains is seen except Corbin Peak directly ahead. As the peak is neared, the valley swings to the north. The second crossing occurs at a narrow ravine with steep rocky walls on each side. Here the path was blasted directly out of the ledge for a short distance. The bridge was in good repair and from it, looking upstream, we caught a fine glimpse of Fang rock, pointing skywards in the distance like a huge black finger.

We reached this point at eleven o'clock and, finding the ruins of several log cabins just beyond, halted for

lunch (3000 feet). Hard showers detained us here until we began to consider the possibility of camping for the night, but shortly after three o'clock it cleared off and the advance was continued. About half a mile beyond the cabin, the river is joined by a branch from the west which, judging by its size, must drain a valley of some importance. It is believed from views had later, that it leads towards the south fork of Downie Creek. The path hereabouts, gouged into the grassy hillside high above the torrent, winds in and out, increasing its altitude gradually but decidedly. Not far beyond, the stream plunged over a fall for fully twenty feet. On both sides the blue-gray limestone, so common in the valley, was clearly seen. A little more than an hour from the cabin, we passed a singularly picturesque waterfall that dashed down over the ledges opposite us in a fine braided sheet of spray for several hundred feet. The valley gradually opened out and presently on rounding a turn a very pretty prospect of lofty summits was disclosed towards the north. At half-past five we camped in the trail, altitude 3580 feet.

Hitherto the higher peaks had been screened for the most part by nearer shoulders and we had begun to wonder where they were, but only a short advance on the morning of the 12th served to bring into view an imposing array of cliffs and glaciers on the westerly side of the valley. Presently (8.30) we reached a wide clearing where another group of cabins bore silent witness to more prosperous days. The largest was quite pretentious with shakes for a roof and the word "Hotel" in rustic lettering over the door; but innumerable porcupines were the only lodgers. The "O" of the sign had come off and some wag with a truly frontier sense of humor had replaced it with a

round tin hand-basin. Judging from its battered perforations, it had also supplied a convenient mark for revolver practice. This place is known locally as "The Farms," and hereabouts it must have been that Moberly abandoned his advance in 1865, for the "decided turn" in the valley appears just beyond.

From here to the Illecillewaet Pass the way was of constant interest. Towards the northwest a bold knot of fantastic peaks formed the sky-line, while on the opposite side to the east, Mount Sorcerer was seen. Quantities of cow-parsnip, growing to the height of one's head, overran and almost obliterated the path in many places. About two hours and a half beyond "The Farms" another large branch flows into the main torrent from the west, and up its narrow valley a grand glacial amphitheater, surrounded by precipitous walls and occupied by wide confluent ice streams could be descried through the trees. We later placed this as being at the base of Mount Moloch, though the mountain itself was not disclosed. Between the forks to the northwest, rose a smooth, bare, stately cone of the dark gray limestone. Its outline was unusually even, being broken by not so much as the smallest cliff from base to summit. This mountain constituted the north portal of the amphitheater. The south portal near us was formed by a very different type of massif—sheer precipices ending in a straight, upward slanting, snow-lined crest that articulated with another from a different direction to make a sharp apex. The lower slopes were swept completely bare of forest save for a single fine specimen of evergreen that some prank of nature had spared from destruction. This mountain is now known as Mount Graham. Just below the meeting of the streams a fine box canyon occurs.

About four o'clock, the forest thinned out and the

open country near the pass came into view with the trail mounting the final slant in a steady grade. It was a welcome sight, for even the greatest enthusiast begins to quarrel with his pack at the end of the day. Notwithstanding the easy appearance of the ascent, it took more than an hour to cover it, for the angle was steeper and the distance farther than it looked. However, the numerous fresh bear signs, combined with a keen interest as to what lay beyond the sky-line, afforded additional inspiration to the advance and we got to the top at 5 P.M.

Packs were thrown down and we hastened forward to select a camp site, for the summit (5760 feet) was rolling meadowland fully half a mile long. There was little wood about and even the ubiquitous alders disdained the defile for some reason. We finally settled upon a place at the southerly entrance to the pass near a copse of young fir trees. Above us to the west lay a small snow-field which sent down two tongues from which streams flowed in opposite directions to the Illecillewaet River and Downie Creek, respectively. There was no snow on the pass itself, however, though we noticed some in the valley bottom lower down. Along the easterly side smooth green slopes swept upward to the sky-line over which, here and there, the ridges of Mount Sorcerer peeped out. Numerous waterfalls filled the air with a rushing murmur and the shrill whistles of the marmots were constantly heard. It is an ideal abode for these animals, with plenty of grass and flowering plants and they flourish in great numbers hereabouts. There was a colony of seven at one place near camp and farther off we saw ten together on the rocks.

August 13th we crossed the pass and followed the road at grade across the mountainside to the Waverly

mine which was perched on a very steep slope fifteen hundred feet or more above Downie Creek. There were two substantial buildings and a complicated system of trails that zigzagged back and forth between the two shafts at different levels. The ore was a rich galena, but apparently no work had been done since 1898. Across the valley the mountains showed the characteristically jagged architecture of the Selkirks, though only one of them looked to be above ten thousand feet. This, later named in honor of Professor Holway, at once caught our eye, but it was some distance off and no good way of reaching it appeared. Clouds were gathering and we returned to camp just in time to escape a shower. Despite the fact that the storm was visible in both directions for miles, the barograph recorded no fall.

The following day we climbed to a small peak on the south shoulder of Mount Sorcerer, 3700 feet above the pass, in order to obtain a view of our surroundings. Although the weather was still against us, the photographs secured later proved of value for the map.[1]

On the 15th we set forth at 6.30 for Mount Sorcerer, for this appeared to be the highest summit in the vicinity and would undoubtedly constitute a most valuable station. We adopted a diagonal upward course from camp toward the peak, aiming to cross below the small glacier at the foot of the southwest face and to reach thus the westerly arête. We got to the glacier in an easy hour and a half, but, instead of taking to the ridge beyond, we followed the northerly moraine and then crossing a bit of the ice struck directly up the face. At first this presented simple walking and scrambling over detritus, but higher up the angle increased and the ledges gave place to steep ribs and couloirs. The weather hitherto had been neutral, but now back to-

wards the west a storm was plainly brewing and it was necessary to make all speed if the view was not to be lost. We were only about five hundred feet below the top, so without stopping to rope, we selected different couloirs for safety from loose stones and started up. Frost and sun had done their work only too well. The ribs, nothing but thin walls, were cracked and seamed in every direction. One could see right through in places and the whole structure appeared ready to collapse. It was unquestionably a treacherous formation. At every opportunity I edged towards the arête in the hope of finding better going there but, upon arriving, this was not fulfilled. The gullies gouged directly into the ridge giving rise to a saw-tooth formation, bridged here and there with drifts of soft snow which could only be crossed on the very crest. Doubtless we ought to have kept together and roped, but no hint of such conditions was visible from below and we were unwilling to let the day go for nothing if we could help it. Having once gotten separated, it was impossible to meet without descending, and anyway we were out of ear-shot of each other owing to the partitions.

By mistrusting each hold and moving with extreme care, I finally gained the base of the bastion that forms the west peak, where I saw Holway's steps leading up the snow towards a chimney. His gully had brought him out in exactly the right place, although from the face below one could not tell where the actual summit was. Presently I saw him peering placidly down from above, and I received a most courteous offer to lower the rope, coupled with an intimation that he had been on top for a half-hour or more. But the offer was contemptuously rejected and, I fear, without the expression of a proper appreciation for such kindly solicitude. My intricate contortions in the chimney,

however, doubtless afforded sufficient recompense. I got to the top (10,410 feet) at ten minutes past eleven and found it covered with a dome of snow. A few rods to the east lay another bastion of rocks that looked fully as high, but as the large survey cairn occupied our summit and the connecting ridge was a repellent mass of soft loose snow overlying ice, we did not deem it worth while to risk the traverse. A dual-topped configuration seems to be a common characteristic in the Selkirks, for fully ten peaks can be called to mind where the summit ridge rises into twin peaklets of almost exactly the same altitude.

One glance sufficed to indicate that we had made no mistake as to the topographical importance of our viewpoint, for we looked directly down the valleys of four out of the five largest rivers that drain the Northern Selkirks: Mountain Creek, Illecillawaet River (north branch), Downie Creek, and Gold River (south branch). All of these streams take some of their supply from the glaciers of the mountain.[2] Unfortunately, the distant prospect was largely obscured owing to the clouds that settled down about the summit just before our arrival. A long even ridge covered with snow-fields and glaciers descends towards Mount Iconoclast which showed up finely across the deep valley of Mountain Creek. In this direction, however, the country did not look very attractive for one missed the pure undulating névés and sharp craggy peaks. It was rather a broad upland region of bare rocky walls. Glaciers there were, as we knew from previous views, but they were mostly hidden by the ridges themselves. Nor was the prospect towards the Sir Sandford Range to the north up to the usual standard of magnificence.

Not until one turned to the westerly quadrants did one's eye meet the rugged, confused crestlines, and

boldly-cut profiles that form the key-note of Selkirk architecture. For twenty miles on the westerly sides of the North Fork and Downie Creek a continuous wall of peaks extends. Numerous lateral spurs project towards these valleys forming transverse troughs in each of which a glacier stretches downwards. The range culminates in two peaks about six miles apart, Mount Moloch and Mount Holway. The latter is a handsome snowy pile and we had seen it previously from the vicinity of the Waverly mine. Now from our greater altitude a promising approach was in view, and we at once selected it as a most desirable excursion.

Great black clouds were driving in from the west at about our level, and others were forming and dissolving around the summit itself, but occasionally the sun would strike through and we waited in the shelter of the rocks hoping that it would eventually clear off. However, after nearly four hours, conditions became worse. Big thunder-storms could be seen over in the Gold Range directly to windward and it seemed advisable to start down. While we were on the difficult part of the face the advance-guard arrived attended with thick snow flurries and snapping electrical discharges from the rocks. But the disturbance soon passed and we completed the remainder of the descent without incident, regaining camp at seven o'clock. The total going time was nine hours. The average of the up and down readings of the aneroid corrected by barograph at camp was 4650 feet.[3]

After a day of idleness that would have been luxurious but for the sultry heat of the atmosphere and the resulting activities of flies of all kinds, we set out for Mount Holway on the 17th with unexceptionable weather. Various delays detained us until 6.30 o'clock, but, as we did not anticipate any very serious obstacles,

MOUNT SORCERER, FROM NEAR MOUNT HOLWAY, SHOWING SIDE ASCENDED

MOUNT HOLWAY FROM THE EAST

LOOKING SOUTH FROM MOUNT HOLWAY TOWARDS MOUNT MOLOCH

MOUNT SERENITY AND RANGE FROM SAME

this occasioned no concern. Our plan was to cross the pass and to follow the slope to the west, keeping as high as possible until we reached the glacier that flowed towards us from the direction of the mountain and appeared to form the principal source of this branch of Downie Creek.

From across the valley this route had looked like perfectly plain sailing, but when we began to round the turn towards the glacier, we encountered no end of tangled forest growing densely on a steeply slanting series of ridges that cut diagonally upwards across the line of march. Several times on parting the bushes, we found ourselves directly on the brink of a cliff dropping down for several hundred feet. Then a breathless scramble up smooth, wet, mossy, ledges would ensue, and just as one was about to congratulate himself upon passing the obstruction he would find that the formation was repeated and that the maneuver must be gone through again. But it is better to pass over such petty annoyances, for, though harassing at the time, in retrospect they dwindle into insignificance as against the substantial joys and accomplishments of the whole day.

We reached the moraine near the toe of the glacier at 8.30 after some descent. The altitude of the lowest ice was estimated at 5650 feet or about one hundred feet below the level of the pass. It was small and in a homely moribund condition, but it afforded us an eminently suitable route towards our goal. As we walked up the snow, first Austerity and then Sir Sandford rose majestically over the mountains at our backs. Although in fact they were a score of miles away, they seemed singularly near at hand. At ten o'clock, on the summit of a small col (8000 feet), we turned to the south, and after a brief ascent found ourselves on a

névé that sloped gently down towards the farther valley. At the left was a low ridge that separated us from the glaciers to the west of camp, while on the right a rocky buttress still shut off the view towards our peak. We at once hastened thither for our hopes hung upon what was to be found behind.

Moments such as this or when one is taking the last steps before reaching an unknown pass, or descending an unknown glacier whose end is ever hidden by some brink below, are the spice of alpine pioneering. They teem with expectancy and excitement, for no one can tell what lies beyond. Even prior reconnaissance from a distance can only assure that the way is favorable superficially, since an invisible crevasse or an insignificant cliff a dozen feet high may entirely bar one from his goal. The keen delights of new peaks, new passes, and new glaciers bear but little relation to the size or magnificence of the mountains themselves. They rest upon the simple fact that there is no map, no guide-book, no guide, to indicate the route and make the trip a settled affair performable according to a schedule. For this reason the first ascent of a peak that would not be noticed among a galaxy of giants may afford its conqueror a satisfaction far superior to that resulting from the climb of a well-known mountain of double its altitude. Moreover, a new ascent entails something beyond mere physical fitness and endurance. It calls into play the intellectual faculties as well and not without the expenditure of a certain amount of skill and resourcefulness on the part of the climber himself will final success be won.

But to return to Mount Holway. Upon rounding the rocks, we beheld a smooth reach of snow extending for perhaps a mile to the base of the peak and then sweeping up to its very crest in a steep but almost

unbroken slant. Closer scrutiny revealed the presence of a considerable *bergschrund* along the sky-line, yet with this reservation the peak was obviously ours. A drift led upwards in a graceful curve to a hump below and to the south of the peak where some cliffs jutted out, but just here it looked favorable for crossing.

A short hour later we found ourselves at this point. As *bergschrunds* go in these mountains the one before us was formidable. The upper lip was fully a dozen feet above us and the opening over half as much in width. It extended for quite a distance along the slope to the right, bridged in but a few places and then treacherously with loose new snow. To the left towards the cliffs it gaped even more widely, then turned an abrupt sensational corner, and was lost to sight. For its whole extent it was sharply defined and of unusually even width, like a moat below a castle wall.

We carefully edged along the lip to the right but without finding a place more promising than where we first reached it. Returning thither, Holway decided upon a direct attack. The rope was adjusted and Butters and I took up such positions as would afford the best anchorage. However, it was not a wholly satisfactory locality, for the scope of action was limited closely by a branch *schrund* of uncertain trend on the one hand and by the brink of a steeper portion of the slope behind us. Nevertheless, we were presently fixed as firmly as possible with the axes driven well in and the rope caught around them. Then the work commenced. A tongue of ice projected towards the wall and leaning forward from the end of this, Holway managed by dint of much prodding to locate a solid section in a rude shelf on the farther side. He next stepped delicately over and began to excavate a staircase in the exceedingly steep snow. But it is impossible to describe the vari-

ous phases of the undertaking. It was hard enough on the spot to comprehend just what was done. We could see a vigorous kicking with first this foot and then that while he clung to the snow with hands outstretched like a fly on a wall. Then with feet firmly placed, an arm would punch in, higher up, as far as the elbow, when, perhaps, rising a step, he would repeat these tactics. Finally the axe was driven into the face near the top and with a perfectly incomprehensible movement he mounted past it, got a knee on the edge, and in an instant was flat on the surface above wriggling to his feet. When it is considered that a full half-hour by the watch was consumed some idea of the difficulty may be gained. No gloves were used and hands and arms were in the snow almost continuously during this time. A party is indeed privileged to have the benefit of such skill, and it is a pleasure to record our warm recognition of its indispensability here as on many other occasions.

This was the last obstacle and after lunching on the rocks that we reached a short distance beyond, we clambered up over loose stones to the summit, arriving at 12.45, six hours from camp excluding halts. It had occurred to us that possibly the top might have been reached from the other side, but we found not the slightest evidence of any previous visitors.

It was a panorama of superlative grandeur that burst upon us. Scarcely ever before had we been favored with an atmosphere of such clear and brilliant transparency. Not a breath was stirring, and the noble ranges on every hand stood forth in rugged might, unsoftened by the least trace of haze or smoke. To add to our elation, we discovered that our peak belonged to the very group of mountains which we had noted from Goldstream Mountain as a desirable topographical

station, and in fact occupied an advantageous situation in its midst.

Set off well to the west of the main line of elevation, it was possible to embrace the whole length of the range for seventy-five miles in a single sweep. All the mountains about Glacier and as far south as the Battle Range could be readily made out, while Iconoclast, Sorcerer, Sir Sandford, Austerity, etc., caught the eye as it swung in the other direction until, in the extreme northwest, the gradually diminishing number of prominent summits suggested the neighborhood of the Big Bend. But in another respect the view was singular for one from an elevation so lofty—the great chain of the Rockies and the deep trench of the Columbia between, were scarcely to be distinguished. These features, which the climber in the Selkirks expects to find as a part of every summit view, were replaced by an unlooked-for disclosure of a new group of beautifully glacier-scarred ridges to the west near at hand, with interesting glimpses of the more distant Gold Range on either side. It was something of a surprise to note so many glaciers in the latter of which a few were of considerable size. The absence of the Rockies did not in the least detract from the effect of a "sea of mountains," a characteristic which, perhaps, is the dominant one in the views from these Canadian ranges, for jagged crests surrounded us, and extended to the far horizon on every side—a perfectly indescribable wilderness of domes, spires, and pinnacles weighted down with glaciers and snow. An advocate of the "uplifted and dissected peneplain" hypothesis could scarcely desire a more instructive landscape for study.

After renewing our acquaintance with old friends, the new range claimed our attention. Rising directly across the deep basin of Downie Creek towards the

southwest, it formed the westerly wall for some distance in a north and south direction. Then, swinging around to the east, it appeared to join the Illecillewaet Range which completed the basin on that side in a roughly parallel course. Almost opposite us, the group culminated in a lofty scallop-crested wall from which one large and many small glaciers streamed valleywards in beautiful ice cascades. Glistening in the afternoon sunlight with fleecy clouds drifting lazily overhead, it presented a serene alpine picture and, accordingly, Serenity is suggested for its name. Mount Serenity, which apparently did not quite equal Mount Holway in height, would naturally be applied to the most prominent summit commanding the trunk glacier.[4] The link connecting the Serenity and Illecillewaet ranges was somewhat lower than either and took the form of a broadly rounded ridge, frosted with continuous snow-fields which sloped up to a low dome some eight miles from our belvedere.[5] The dome was cut off from the Serenity Range by a narrow timber-line pass which is presumed to connect with Carnes Creek. The Illecillewaet Range to the south presented an interesting line of jagged summits, dominated by the forbidding snowless horn already seen from Sorcerer. This I have named Mount Moloch and it has since been triangulated by the Dominion Survey at 10,198 feet.

Northwesterly were the depressions of the lower courses of Downie Creek and Gold Stream where the mountains did not in many cases surpass the snow-line. The most prominent peak is the isolated rocky spire situated on the long ridge between these rivers, the same which we had seen to good advantage from Goldstream Mountain.

After taking numberless photographs of which a set

of eleven forms a nearly complete panorama, we started back at 3.30 P. M. following the same route. The troublesome *schrund* delayed us for a quarter of an hour, but from then on we made good speed, and arrived in camp at seven o'clock. As we crossed the pass a glorious alpen-glow tinted the splintered crags of Sorcerer with a fine purplish red and spread its mantle of enchantment over the peaks far down the valley. On turning to view the sunset behind us, however, we saw clouds of smoke filtering in over the mountains and congratulated ourselves upon completing the expedition in the nick of time. It was an easy and pleasant trip with a reward out of all proportion. Though the peak was over five miles distant from our starting-point, there were only some 4200 feet of climbing and the rope was not needed below the *bergschrund*. The mountain will form a most excellent station for the surveyor and for the alpinist an expedition long to be remembered. It is 10,002 feet high by the Survey.

A few days later a visit was made to the grassy saddle connecting the south branch of Gold River with Downie Creek. We followed the road to Waverly mine and then scrambled up a steep smooth gully in the limestone until the thinning out of the trees near timber-line permitted a traverse to the north along the mountain-side. This afforded a rather rough line of march, but fine views across the valley constantly rewarded us. The aneroid gave the elevation of the pass as 6670 feet, and except for the steep descent into the latter valley it should be practicable for horses. The bottom-lands along Gold River appeared unusually open and grassy for a long distance.

Having accomplished our principal objects by these excursions and the weather being unsettled, we started back on the 19th. We halted at the mouth of the

tributary valley leading to Mount Moloch with the intention of exploring its splendid glacial amphitheater, but sixteen hours of rain with a falling barometer forced us to abandon the project and we pushed on to Albert Canyon the next day, reaching it in the evening. Our men, going light, had made the trip from the pass to the railroad in eight hours—a distance of about twenty-five miles. With such easy going it is surprising that so few people have visited this most interesting alpine region.[6] After a seven-hour wait in the cramped little station, an early morning train took us back to Glacier where we arrived as dawn was breaking over the Sir Donald Range.

Not many days had passed before I began to scheme for another attack upon Sir Sandford. From local residents I heard much of the "perfect" weather that customarily prevailed during September, and after the atrocious conditions of June, July, and August, it did seem likely that for this month Jupiter Pluvius would relent. Moreover, I then thought that 1911 would be my last opportunity to settle the score with the peak, and having still ample facilities for continuing the siege in the way of tents and provisions, I could not bear to contemplate turning my back upon it for good, and leaving it as a prize for some later comer to carry off, possibly by the very trail we had perfected so laboriously. That this was not a groundless apprehension was suggested by the expedition of Mr. Culver (already referred to) which was even then in the field. Inasmuch as Messrs. Holway and Butters had other engagements and could not go, it was my plan to take two guides and make a quick trip by our usual route. However, as it turned out, the weather remained obdurate throughout the month, snow even falling at Glacier, so all thoughts of the excursion had to be abandoned and the season

closed without any further invasion of the monarch's enchanted precincts. Despite the fact that twenty-six out of the fifty-eight days occupied by our two expeditions were rainy, we gained all our ends except the fascinating, sharp white apex of Sir Sandford. A full account of the scientific and topographical work accomplished will be found in the Appendices.

NOTES, CHAPTER XX

[1] In a bottle on the top we found the record, "E. Newton Harvey, Phila., Pa., Aug. 19, 1908." Mr. Harvey was a member of Dr. Shaw's party that season and he informs me that he made the trip up the valley with a friend hoping to approach Sir Sandford from this direction.

[2] It may be of value to list briefly the principal passes connecting these trunk valleys:

To the north, across the valley of Gold River, we had a good view of the pass leading into the southeasterly branch of Gold Stream. It is a snow-line pass, but without glaciers on either side, and is probably passable for horses, though the lower approaches were not clearly seen.

Between Mountain Creek and what is probably the south branch of Six Mile Creek a high pass was seen south of Mount Iconoclast. The approach from Mountain Creek is steep, though snowless.

Between Mountain Creek and the south branch of Gold River there are two passes, the more northerly being a broad open pass. Both are above snow-line and probably have glaciers on the north.

Between Downie Creek and Gold Stream there is a high pass at the westerly turn of the former. The Gold Stream side supports a small glacier.

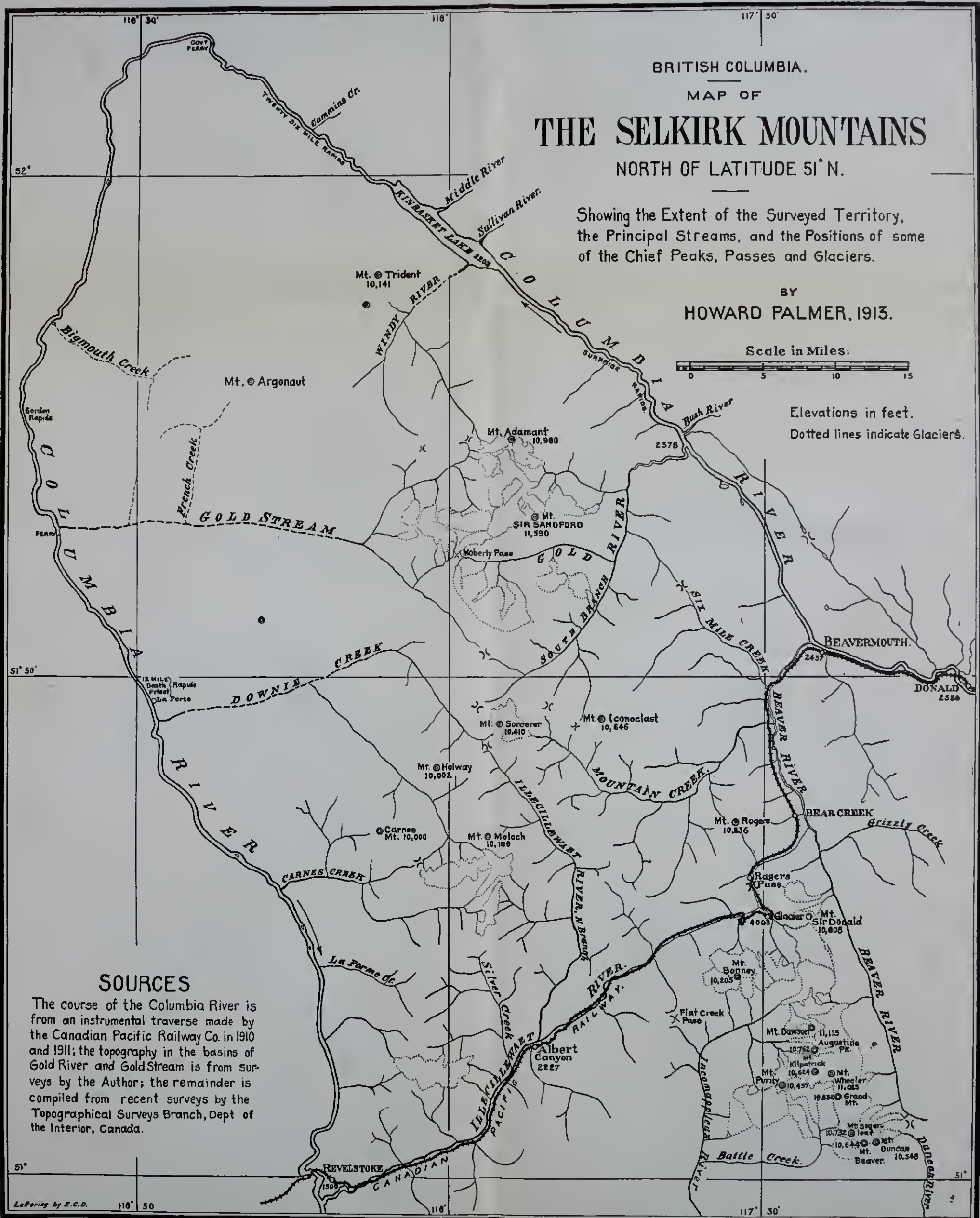
[3] I am informed by Prof. Heinrich Petersen of Philadelphia that he effected the ascent of Mount Sorcerer in the early part of August, 1904, alone. He had been travelling through some of the remoter districts with Dr. Charles H. Shaw's party and made this flying excursion up the North Fork valley mainly bent on botanizing. From the summit he saw Mount Sir Sandford, which he had already observed from Mount Copperstain in the Prairie Hills, and was surprised at its apparent proximity. He also noted the four valleys radiating in different directions like the spokes of a wheel, and he dubbed the mountain, "The Big Bend Hub." The route followed was entirely by way of the west arête, the glacier not being touched. It is probable that this was the first ascent of Mount Sorcerer. The next seems to be that of P. A. Carson, made early in July, 1909, in the course of his survey, when a cairn was erected on the summit. (See *Ann. Rep. Top. Sur. Branch, 1909–1910*, Appendix 13, p. 53.) In August this same year, Professor

Petersen again visited the locality with three companions, ascending the small peak on the northwest ridge overlooking the pass to Gold River. Stormy weather, coupled with a shortage of provisions, soon drove them back, however.

[4] It appears that this peak had been climbed from the west early in June, 1910, by Mr. M. P. Bridgland of the Dominion Survey and named by him Carnes Mountain. (See *Ann. Rep. Top. Sur. Branch for 1910–1911*, Appendix 15, p. 65.) It has subsequently been measured at 10,000 feet and therefore must present an impressive sight when seen from the Columbia River, since it is only some seven miles distant and rises 8500 feet above it.

[5] I have received the following interesting information, with regard to what is very likely the first crossing of this nameless snow-field, from Mr. Reuben T. Shaw: "In 1909, my brother [Dr. Charles H. Shaw] accomplished his aim of exploring Downie Creek. He took two stronger members of the party with him, went up Carnes Creek, and found at its head a great névé from which glaciers drained into Downie Creek, Carnes Creek, and the Illecillewaet. For several days he explored around this névé and finally decided to try to cross it and to go down into the north fork of the Illecillewaet. It took them the entire day steadily marching to cross the snow and ice alone. They used the rope frequently, and, after getting off the snow-field at dusk, they had to let themselves down over various steep places before they could find a place that was level enough to stretch out to sleep. Even then they tied themselves to small trees to make certain of no accident in rolling over in the night. They succeeded, however, in getting down into the valley of the Illecillewaet, and after finding the trail which led them towards Albert Canyon, rejoined our party about two days later than expected."

[6] Since this was written at least three parties of mountaineers have visited the valley. In the early summer of 1912 Prof. C. B. Sissons and one companion were repulsed in an attempt on Mount Moloch via the south face. Later on, Mr. P. A. W. Wallace and two companions tried the same peak by the south arête but without success. The story of their five-day expedition is well told in an illustrated paper, "Up the Waverly Road" published in *Rod and Gun in Canada* for March, 1913. In July, 1913, Professor Sissons returned to the assault with Professor Holway and two Swiss guides, but for a week the clouds and rain were so heavy that they could not see even to reconnoiter the peak, and finally they had to retreat.


BRITISH COLUMBIA.
MAP OF
THE SELKIRK MOUNTAINS
NORTH OF LATITUDE 51° N.
Showing the Extent of the Surveyed Territory, the Principal Streams, and the Positions of some of the Chief Peaks, Passes and Glaciers.
BY
HOWARD PALMER, 1913.
Scale in Miles:
0 5 10 15
Elevations in feet.
Dotted lines indicate Glaciers.
SOURCES
The course of the Columbia River is from an instrumental traverse made by the Canadian Pacific Railway Co. in 1910 and 1911; the topography in the basins of Gold River and Gold Stream is from surveys by the Author; the remainder is compiled from recent surveys by the Topographical Surveys Branch, Dept of the Interior, Canada.
Lettering by Z.C.D.
118° 30'
118°
117° 30'
52°
51° 50'
51°
118° 50
GOV'T FERRY
Cummins Cr.
TWENTY SIX MILE RAPIDS
Middle River
KINBASKET LAKE 2203
Sullivan River.
Mt. Trident 10,141
WINDY RIVER
COLUMBIA
SURPRISE RAPIDS
Bush River
2378
Bigmouth Creek
Mt. Argonaut
Gordon Rapids
Mt. Adamant 10,980
French Creek
GOLD STREAM
FERRY
Mt. Sir Sandford 11,590
Moberly Pass
GOLD RIVER
SOUTH BRANCH
SIX MILE CREEK
RIVER
BEAVERMOUTH.
2437
DONALD 2588
DOWNIE CREEK
12 MILE Death Rapids
Priest
La Porte
Mt. Sorcerer 10,410
Mt. Iconoclast 10,646
BEAVER RIVER
Mt. Holway 10,002
ILLECILLEWAET
MOUNTAIN CREEK
BEAR CREEK
Grizzly Creek
Carnes Mt. 10,000
Mt. Moloch 10,188
Mt. Rogers 10,536
CARNES CREEK
RIVER, N. Branch
Rogers Pass
Glacier
4093
Mt. Sir Donald 10,808
La Forme Cr.
Silver Creek
Mt. Bonney 10,205
RIVER.
RAILWAY.
Flat Creek Pass
Mt. Dawson 11,115
Augustine Pk.
10,762
Mt. Kilpatrick 10,624
Mt. Wheeler 11,023
Mt. Purity 10,457
10,836 Grand Mt.
Albert Canyon 2227
PACIFIC
Incomappleux River
Battle Creek.
Mt. Sugar Loaf 10,732
10,644 Mt. Beaver
Mt. Duncan 10,548
Duncan River
REVELSTOKE
1506
CANADIAN

CHAPTER XXI

THE CONQUEST OF MOUNT SIR SANDFORD, 1912

THE winter of 1911 and 1912 was of unusual mildness in British Columbia. At first the snowfall did not depart much from the average, but as time passed, less and less came down until, when spring arrived, the total at Glacier was considerably under the customary thirty-five feet. The seasons merged into each other without the sudden changes that result in snowslides and floods, while the winter accumulation diminished rapidly under a succession of bright, warm days. News of these auspicious conditions came to the writer and fanned his smouldering resentment against Sir Sandford for the despicable treatment of the past two years. After the extraordinarily bad weather of 1911, it seemed most probable that the pendulum had now swung to the other extreme and that the continuance of the settled period might reasonably be counted on for some time to come. Accordingly I opened communication with my erstwhile companions. This elicited the expression of a like exasperation with the peak, but did not disclose any encouraging prospects that another joint trip could actually be undertaken.

Nevertheless, I decided to persevere and to this end engaged two of the Swiss guides, imported by the railway, to come with me. The men had visited the mountain the year before in Mr. G. W. Culver's party and were

anxious to try again. Inasmuch as the expedition was to differ from those already described in being limited to mountaineering alone, the reasons which had previously militated against employing them no longer applied. Most of the exploration practicable from Sandford Camp had already been accomplished, and although I contemplated some local survey work, I expected to return soon after the completion of the main ascension. The way to the mountain was now clear, the time necessary for the undertaking reasonably definite, and complication of commissariat lacking. The innovation therefore became possible as well as desirable. Happily, at the last moment, Professor Holway found himself in a position to go, so I had the pleasure of sharing this culminating success with the companion of many another.

As before, we determined upon an early start, and June 10th saw us at Golden. The town was in a high pitch of excitement quite in contrast to its usual placid state. All through the Rockies a constantly thickening smoke-haze had dimmed the outlines of the peaks and now we discovered the actual location of the fires. Across the Columbia to the west a great pall of smoke was rising skywards from one center of destruction, while towards the north, not half a dozen miles away, another was raging fiercely. We learned that but for a fortunate change of wind the day before the town would probably have been destroyed. Ladders on roofs and lines of hose laid through the hotel corridors gave a vivid reality to the peril. Ashes and brands fell during the afternoon, while in the evening a red glow on the smoke clouds and occasional blazes were plainly to be seen.

Our arrangements being soon completed, we went on to Glacier the next day to await the appearance of

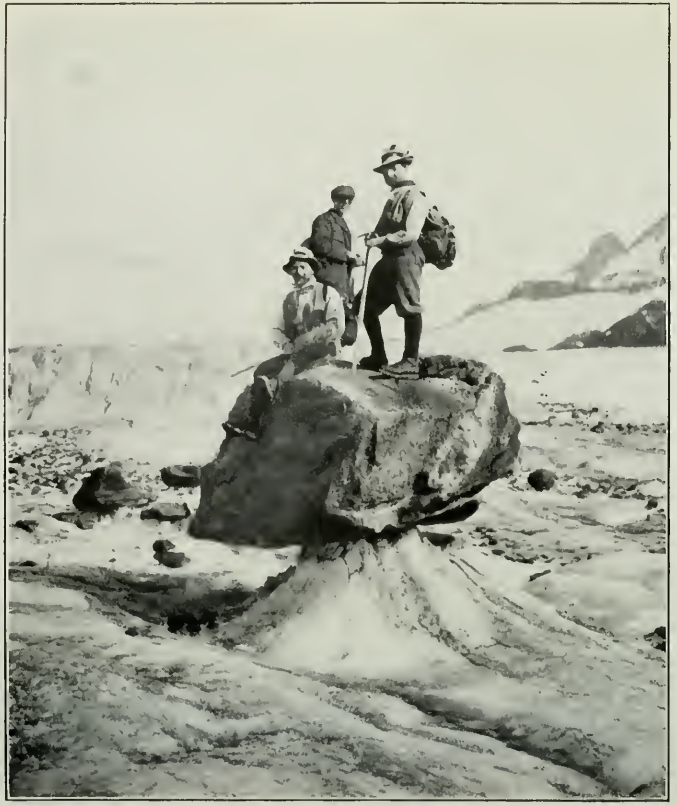
the guides. A strong southwest wind had sprung up and the flames were rushing off before it with renewed vigor, throwing aloft vast seething plumes of heavy brown and yellow smoke which entirely obscured the sun for a time. Between Six Mile Creek station and Beavermouth, yet a third fire was in full swing, leaving a blackened trail of destruction in its wake. We noted the unusually low stage of water in all the streams and could well believe the report that practically no rain had fallen for months. A regrettable contretemps it seemed that the very factors upon which we relied for favorable conditions above snow-line should be responsible for conflagration and disaster below. As the train wound its slow way up the Beaver grade, we observed that Sir Donald was flying a cloud banner over the valley, and accordingly it was without surprise that we awoke on the morrow at Glacier House in a characteristic Selkirk drizzle. So critical is the balance between precipitation and fair weather in the range that almost invariably the presence of smoke is sufficient to bring on rain. Fortunately the storm continued for several days quenching the worst of the fires and dispelling the smoke.

We tarried at Glacier for four days in the endeavor to obtain some definite news about the guides by telegraph, but the only information forthcoming was to the effect that a Swiss party, about a dozen strong, had left Montreal and was somewhere in the 2500 miles intervening. Although rather vague, this still promised well, since our men as old residents could hardly fail to be among the number. For a year or more a rumor had been current that a colony of Swiss guides would settle in Golden, and this was undoubtedly its confirmation. Finally, upon receiving word of their arrival, we returned thither June 15th.

By reason of its bearing on the future development of British Columbia, the coming of this little band of emigrants from the Alps of the Old World to the Alps of the New is worthy of more than passing notice. Although the province has long had the benefit of expert exploitation in all the well-recognized lines of commercial activity, the opening up of its limitless resources as a mountain playground has received far less attention than the intrinsic importance of the subject deserves. British Columbia is essentially a country of mountains, and of these a large proportion is alpine, not alpine in a technical sense merely, but alpine from a mountaineer's point of view. In the light of the great development of similar features in Switzerland and neighboring countries whereby enormous revenues accrue to the inhabitants, it seems plain that such action here would be followed eventually by a financial return of no less importance. The ink which is spilled in painting the agricultural possibilities of the province in unnaturally glowing colors to the exclusion of its preëminent scenic attractions might better be saved.

From the beginning, however, the Canadian Pacific Railway has had this matter in view, and much of the progress in making the country above snow-line accessible has been due to its efforts. The first p operly accredited Swiss guide to visit the Selkirks was Peter Sarbach whom Dr. H. B. Dixon brought with him from Switzerland in 1897. Two years later, 1899, witnessed the beginning of the company's policy of which the coming of the Swiss colony is the latest development. In that year two guides, Edouard Feuz and Christian Häsler of Interlaken were stationed at Glacier to be available to any one desirous of making the more difficult ascents possible from this headquarters. The following

AFTERNOON LIGHT ON SIR SANDFORD



ON THE WAY TO MOUNT ADAMANT

GUIDES ARRIVING AT SANDFORD CAMP

Photograph by E. W. D. Holway

season their number was increased to four where it has since remained with few variations, but with differing personnel each year. The men are distributed among the different hotels in both the Rockies and Selkirks according to the demand for their services. At the close of each season they have generally returned to their homes for the winter but occasionally one or another has remained throughout the whole year. Edouard Feuz is the veteran of all, for he was in the Selkirks every season from 1899 to 1910 inclusive, and took part in the majority of first ascents made during this interval. His sons have since followed his example at different times until now there are three engaged in the work. The experiment proved so successful that the company has erected a group of houses in the style of Swiss chalets near Golden, and to these the party was bound. All lovers of the mountains will wish them prosperity to the end that competent guidance for the splendid icy fastnesses of the country may be permanently secured.

When we alighted from the train at Golden the colony was gathered on the platform and presently Rudolph Aemmer, one of our men to be, came over to greet us. The other, Edward Feuz, Jr., had not yet arrived, but he was looked for on an approaching train. Later we all met to discuss the expedition and finally matters were satisfactorily arranged for a start on June 17th. Naturally we were anxious to get away at once in order not to lose the benefit of the really remarkably fine weather that prevailed, but under the circumstances it could scarcely be expected of the guides. Their houses were not yet furnished, their outfits were still buried in the trunks, and last, but not least, they were to celebrate a wedding among their number that evening. The ceremony was solemnized in the hall of

the principal hotel and, as the first Swiss wedding in the locality, aroused a good deal of interest on the part of the townspeople of whom a large company assembled in response to the general invitation extended. The high contracting parties were Christian Häsler, son of the Häsler above named, and Rosa M. Feuz.

Everything being in readiness on the day set for departure, our whole party, six strong, left on the morning train. Besides the principals and guides, it included Sam Brown and Peter Bergenham as packers and canoe men. For the first stage of the journey the expedition divided, Brown and the guides proceeding over the Columbia trail from Donald on foot while the others dropped down the Columbia from Beavermouth as in former years. We arrived at the mouth of Gold River the same night, setting up camp on a sandy bar. By this arrangement we gained a day, since the guides and Brown would consume that much longer on the trail. The time was utilized in triangulating Mount Sir Sandford and other peaks from the plugs of a new railway location, plans of which had been placed in my hands through the courtesy of one of the company's engineers. The line was easily picked up and constituted an excellent base 3700 feet long. An extensive area of level swamp meadows borders the Columbia in this vicinity, offering unusual opportunities for instituting topographical work.

The temperature on June 18th was remarkably high, rising from a minimum of 38° at night to a solar maximum of 144° during the day, being 84° in the shade. The heat seemed almost unbearable as we worked on the signal targets and transit observations, for scarcely a breath of air was stirring. The men said later that it was the most oppressive weather they had ever experienced in British Columbia. All this was not

without its effect upon the heights as the rapidly rising river bore witness. At nightfall Bergenham went off in the boat to bring the absentees across the Columbia, but late in the evening he returned without them. This caused us some uneasiness for the trail was a good one and the time allowance ample according to our previous experience. It was not until nearly noon on the 19th that they finally put in an appearance, having found the thirty-four-mile walk through the lifeless air of the forest, with their heavy mountaineering equipment, a rather trying experience for the first trip of the year.

After luncheon, however, we decided to advance, for the work would not be severe until the head of navigation was reached. Accordingly, having been ferried to the west bank of Gold River, we set out directly up the valley across the meadows, while the men poled the canoe up the longer course of the stream. About six o'clock we joined forces on a bar, and camped on account of the fast-rising river. We had gained some two miles on our way.

Next morning we were off at seven o'clock to take advantage of the cool of the day and low water. The alpine wing of the party broke through the dense alder thickets as the nautical division paddled, poled, and pushed the heavily laden canoe against the torrential flood. All sorts of obstructions combined to render this work arduous in the extreme: snags, logs, bars, shallows, and mosquitoes, to mention but a few. Frequently the men had to wade waist deep in the icy water.

Hereabouts it was that Topsy first brought herself into prominence, and as her canine experiences will claim subsequent mention in these pages, the formalities of introduction may be disposed of here. Topsy was an Airdale belonging to Brown. She was only a year old but her attachment to her master was

out of all proportion. It seemed to be the most consuming passion of her being and kept manifesting itself in all sorts of annoying ways. In the first place she had managed to include herself in the party despite all remonstrances, by keeping out of sight until it was too late to send her back. Now, having been forced to accompany the shore party so as to be out of the boatmen's way, she could not bear the separation, and at each glimpse of her master in the water made frantic efforts to join him. These we had thwarted successfully until it became necessary for us to await the men's arrival on an open bar well out in the stream. They were working by a critical place and while absorbed in following their battle with the waters, the dog eluded us and plunged directly in. Caught instantly by the powerful current, her destruction seemed certain, for just below the flood swept in full strength against a deeply undermined portion of the bank. The poor animal struggled valiantly but in vain and presently disappeared in the turmoil. Previous disgust now gave way to sympathy on every hand. "Die dumme Hundin, aber siehe vie sie schwimmt! Sie wird wohl furchtlos sterben!" were heard, as well as remarks of similar purport in English. Not long after the boatmen joined us and we fell to discussing the prospects for further advance with the canoe, watching all the while, though without hope, for some sign of the dog. Our astonishment may be imagined when we finally detected a small brownish body scuttling through the alders in the distance. It was none other than Topsy! We called. A joyous bark answered and soon she came up dripping wet and shivering pitifully after her long icy bath. From stumpy wagging tail to quivering nose she was the personification of supreme canine delight.

It is needless to describe in detail the remainder of

the march to Sandford Camp. The night of June 20th we spent at the Forks after caching the canoe and half of the supplies at our old starting-point of 1910. The river was too high to make an attempt to reach our landing of 1911 about a mile farther inland worth while. On the 21st we advanced as far as Taurus Camp and on the 22d to Devil's Club Camp, the weather remaining unchanged. At the former place the thermometer registered 86° in the shade at 3 P.M. The stream was a raging flood and carried an amazing amount of water. At Devil's Club Camp we tarried half a day in order to allow the men an opportunity to build a safe and lasting bridge over the rock chasm.

It was a hot climb up to Sandford Camp the next morning through a murky atmosphere and myriads of mosquitoes, but we soon revived in the fresh cool wind from the heights. There was little snow about this time so it did not take long to set up the tents. After lunch we all walked out on the glacier to inspect Sir Sandford. Near the farther margin we found a grassy bank whence a good view was to be had and we ensconced ourselves here for a careful study with powerful glasses.

It was plain at once that there was less snow on the peak than ever before in our experience. Its condition looked more appropriate for September than for June. The steep upper slopes were icy, crevasses numerous, and *bergschrunds* pronounced. Evidently our former route up the side of the large buttress would serve only as a last resort, owing to the amount of step-cutting necessary. But the traverse beneath the hanging glacier to the dome-topped rock at the left now looked promising, since the danger from falling ice appeared considerably less than in former years. After securing a few photographs we returned to camp and set about

preparations for the climb for we determined to try our luck the very next day, lest the settled weather should desert us. Repairing to our sleeping-bags while it was yet scarcely twilight we endeavored to snatch a few hours of slumber, but what with mosquitoes and thoughts of the morrow, which could not be entirely suppressed, the attempt was hardly more than a formality.

At midnight the sound of the axe aroused us and we turned out to find a splendid cloudless sky. The unusual warmth of the night for the altitude (min. 52° F.) and a gusty breeze from the glacier were the only signs at all equivocal, but under the circumstances they lacked any sinister significance. Breakfast proved to be a cheerful affair in the light of a brightly blazing fire and we consumed a hearty repast. At 1 A.M. our silent line of shadowy figures might have been seen wending its way along the stony margin of the glacier by the twinkling lights of candle lanterns. At the most favorable place, we took to the ice itself and headed out towards the center in order to obtain the easiest possible going in the dusky half-light. After about two hours we halted at the junction of the tributary glacier to leave the lanterns and to put on the rope. The guides, with Feuz in the lead, tied themselves on first, so that they could change places easily in dividing the labor of cutting and trampling steps; I came next and then Holway. The rope was one hundred feet long and we spaced ourselves at even distances, wearing it continuously except at halts, throughout the climb. The palest tints of dawn were now playing delicately over the great uplift ahead, defining an inspiring vision of alpine splendor. From the frigid grip of the tributary glacier that swept down towards us and formed a stately approach like the staircase of

some gorgeous temple, the mighty complex of ridges, buttresses, and precipices—a truly formidable pile—rose higher and higher, until at last it culminated in the broadly obtuse but none the less sharply defined summit which seemed infinitely beyond the reach of mortal man. However, Mount Sir Sandford was a prize without price and we proposed before the advent of another day to leave no stone unturned to prove the fallacy of its seeming inaccessibility and to show that mortal man could, as a matter of fact, reach and tread its haughty crest.

Continuing without any real delay, we retraversed our familiar route over the glacial plateau behind the Ravelin, up the slope leading to the snowy shelf, and then along the shelf itself. The passage of the interlocking *bergschrunds* was exciting work, for we found little snow to aid us and a zigzag staircase had to be chopped out in the steep ice. The temperature had evidently not fallen below the freezing point since water was running everywhere. As a result, the snow on the shelf afforded heavy going until it got thick enough to support us well above its watery underlayers. Even then, one or another would occasionally plunge in above his knees, delaying the line while he extricated himself. In this fashion we plodded along until at 5.05 A.M. we found a suitable halting place at the foot of the large buttress. Here we enjoyed a second breakfast. The barometer showed a rise of about 3000 feet from camp, making the altitude approximately 8700 feet. After tarrying for nearly half an hour the guides changed positions on the rope and then we continued upwards towards the hanging glacier. As we progressed, the traverse to the dome-topped rock, which had been hidden previously, came into view and looked perfectly practicable. Other conditions as well con-

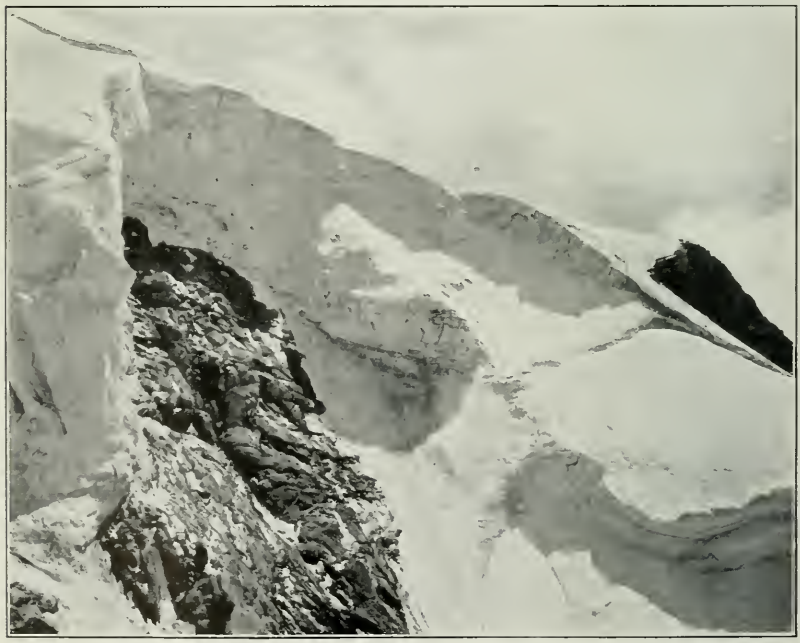
firmed us in the opinion that this was the best route to adopt. Close inspection of the ice cliffs indicated that the glacier was not discharging avalanches with any frequency. The cleavage surfaces appeared to be rounding rather than freshly cut, and although here and there moderately large fragments almost ready to fall could be picked out, there was an entire absence of the soft but incessant crackling sounds from beneath the glacier which had been so audible on our last visit and had then prompted us to discard the route. Moreover, slight changes had occurred in the frosty walls during the intervening year, showing that the ice had resumed a state of essential stability after the great fall in the winter of 1910 and 1911, previously mentioned. Our last doubt vanished when we paused by the large crevasse below the "long slope," for from here we could clearly see its glazed condition. Even if the *schrund* that guarded it were passable, it would take hours of arduous step-cutting to reach the arête, and hours more to scale the small buttress, possibly six or eight in all, as the height was about one thousand feet.

This was not to be thought of, so without discussion we effected a passage over the crevasse and headed for the threatening cliffs. Aemmer kept up the slope to the right as long as possible in order to avoid the channel worn out by falling fragments, but at last there was nothing for it except to break cover and cross the line of fire to the farther rocks. Now the snow under foot became hard and rough from the impact of tumbling masses and almost every step had to be cut. The only sound was the continuous pick, pick of the axe as Aemmer bent to his task. Mere scratches were all that could be afforded, but these Feuz enlarged whenever it seemed necessary.

"Keep one eye up there," he exclaimed, turning to

SIR SANDFORD FROM REDAN, SHOWING ROUTE OF ASCENT (dotted) AND ROUTE OF FORMER ATTEMPTS (broken line)

Photograph by E. W. D. Holway



THE GLACIER TONGUE UNDER WHICH WE CLIMBED, SEEN FROM ARÊTE STATION

THE SAME LOOKING IN THE OPPOSITE DIRECTION FROM "DOME-TOPPED ROCK." CLIFFS ABOUT 200 FEET THICK

me for an instant and nodding toward the crystal wall. I needed no prompting, for my eyes had been glued to the cliffs for some time. One piece in particular, about the size of a hogshead, chained my attention since it projected somewhat and seemed on the verge of dropping off. If it had we could hardly have escaped the thousand pieces into which the rocks would have shattered it. Luckily the slant was gentle, somewhere about 30 or 35°, so that there was little distraction on this account. Lower down, however, the declivity steepened into a giddy drop over the line of ice cliffs which edged the shelf. Incentive to maintain a solid footing, therefore, was not lacking.

With shortened rope we crowded close upon each other's heels, ready at a second's warning to seize such chance for safety as the exigency might present. We seemed to crawl along. Actually, however, we must have advanced about as fast as a man would mount a long steep ladder. Now we are at the rocks. They are round and smooth from the grinding of the ice but the foothold is sufficient. Aemmer loosens a few cakes of ice from the crevices and is up in a twinkling. The hard part is over. Not so the danger, for ice blocks are scattered all about on the ledges. We others swarm up as best we can, yet not without such scratching of boot nails and whanging of ice-axes against the rocks as to call forth echoes from the grim, greenish cliffs. Next ensues a rough-and-tumble run along a rocky shelf to its outer extremity where safety awaits. As expected, it turned out to be the broad top of the domed buttress and by common consent a brief respite was decreed.

It was 6.30 o'clock and the altitude figured at 9600 feet, almost three-fifths of the way up. There was a rise of some two thousand feet to come. We congratu-

lated one another on such good progress and took what satisfaction we could in the fact that all known difficulties now lay below. The sun, well up in the heavens, shone brilliantly on the magnificent landscape about us, but, as yet, barely grazed this side of the mountain itself. Evidently we were in for another hot, clear day. Against the rugged spur which formed our eerie perch, the vast mass of the upper ice-field cleft itself in twain as it urged its sluggish way valleyward, leaving a gently rising wedge of rock exposed. The tongues thus formed on both sides ended in vertical escarpments, having a thickness of perhaps two hundred feet each. One of these it was that had prompted our recent praiseworthy haste. The spur itself, however, did not appear to be subject to falls of ice, and, accordingly, we now determined to ascend it and to effect a passage thence to the ice-field somewhere behind the dangerous cliffs.

Putting ourselves in motion once more, we succeeded in accomplishing this without difficulty. The ice, though broken, was not steep and only a little axe work was required to land us safely on the broad expanse of undulating snow that covers the summit ice-field in a mantle of solid white. It seemed to stretch upwards and outwards interminably, for glittering battlements and leaning towers of ice on the sky-line cut off the view overhead and neither rock nor ridge suggested a boundary anywhere else. But the route, as we knew from previous inspection, led to the right in a long gently ascending traverse, so no time was lost in turning our steps in this direction.

For the most part, this portion of the way proved to be merely a straightforward, though fatiguing, walk through soft snow. At two points, however, we encountered rather large crevasses that held us up temporarily. The first ran directly down from the

upper area of broken ice to the hanging glacier beneath us, being well opened and without a bridge. It was too wide to reach across with an axe, so Feuz, after selecting a soft-looking place on the farther side, executed a neat flying leap and landed safely on all fours. The rest of us then followed his example, not without a secret misgiving, I fear, as to the procedure to be employed in getting back later, for the side we had just left was considerably higher. However, comforting ourselves with the thought that in mountaineering, "sufficient unto the hour is the difficulty thereof," we continued. The second crevasse, being higher up, was still fitted out with bridges so that no violent gymnastics were needed in this case. The motion was rather that of an Indian brave on the warpath shadowing an enemy, or of a cat walking through wet grass.

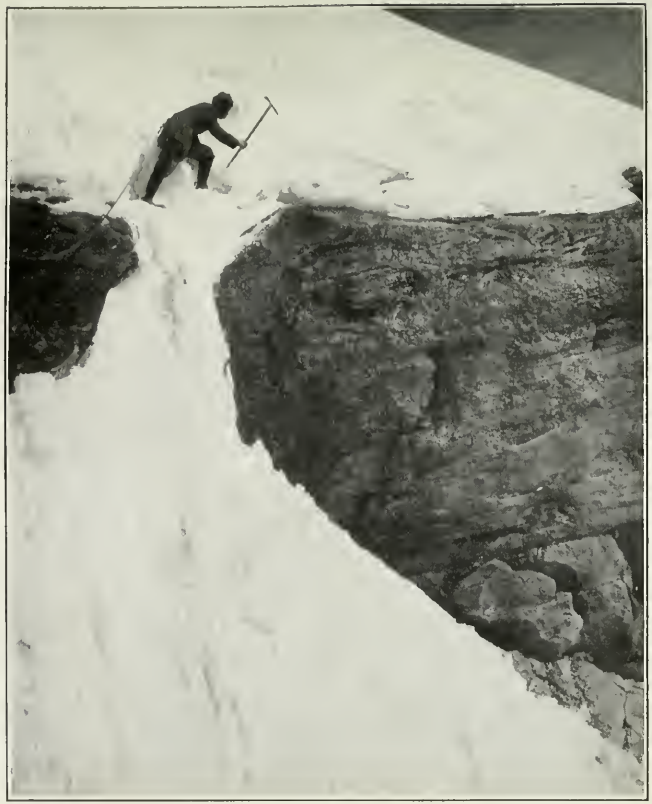
In this neighborhood, we began to open up views of various familiar features of the mountain. Just beneath us was the top of the small buttress that had so often been the goal of vain efforts in the past. Its steep ice-slope was now practically bare of snow, and we could see to good advantage by what a narrow margin wind and cold had triumphed over us. Above and farther back, the frosty brow of Sir Sandford's ponderous southerly buttress peeped out, with the final arête, sharp-cut against the glowing sky, swinging ever upwards from the crest.

Altering our line of march thither, it was not until nine o'clock that we actually plowed over the edge onto the broad flat top of the buttress and came face to face with the immense panorama to the south. Naturally, our first concern was the nature of the remainder of the way to the summit, but one glance thither sufficed to dispel apprehension. True, the ridge was badly corniced in both directions, but it did

not look at all difficult and not one of us had a suspicion of the actual obstacles in store. Accordingly, we at once took off the rope and devoted ourselves to the pleasant diversion of assimilating both mental and physical refreshment simultaneously.

Of the highly delectable nature of the latter, it is needless to speak. Of the view, however, something must be said, for it turned out to be the finest of the day. Seldom have I beheld such a perfect sea of mountains, moulded into every conceivable form and adorned in every conceivable pattern with everlasting snow. Though, owing to Sir Sandford's isolation and supremacy in height, the panorama lacked effective foreground and so suffered somewhat in picturesqueness, yet these very circumstances intensified the feeling of almost overpowering vastness and savage grandeur which it inspired. The atmosphere was filled with a thin haze through which the more distant peaks loomed dimly. Nevertheless, we recognized most of our old acquaintances: Mount Rogers, Mount Sir Donald, Mount Moloch, and Mount Holway. Mount Iconoclast, a pointed summit with handsome glaciers streaming from its northern face, looked most imposing and now, perhaps, may be ranked as the finest virgin peak left in the Northern Selkirks. Of especial magnificence were the extensive plateaux of névé which form such a characteristic feature of the immediate vicinity of Sir Sandford and serve to set off the monarch to unequalled advantage. Oddly enough, we had no good views of the Rockies during the day, although Assiniboine and a few of the well-known southern peaks were seen at one time or another.

A short half-hour had passed all too quickly when we set out towards the lower or south peak over gently ascending snow. Prospects for success appeared excel-



AEMMER AT WORK IN THE DANGEROUS COULOIR

ON THE SUMMIT RIDGE OF SIR SANDFORD AT 9 A.M.

Photograph by E. W. D. Holway

AEMMER BENEATH THE CORNICE NEAR THE TOP OF MOUNT SIR SANDFORD

lent and our spirits were correspondingly high. But, alas, we reckoned without Sir Sandford, for as we moved along the ridge, what was our surprise to see an unravelling and readjustment of its parts commence which revealed only too soon the deception of the previous view. Instead of an easy walk along broad-backed cornices, we now perceived that the arête was like a long irregular wall, that it was piled up high on the top with snow which overhung for a great distance on the north and sloped down steeply to the edge on the south, and that our only possible route lay along this very slope. At first all went well, but as we progressed, the tilt steepened and the condition of the snow grew worse. Soft and slushy from its full exposure to the glaring sunlight, it not only afforded the scantiest of holds, but at the same time exhibited a decided tendency to slip off the substratum of hard ice upon which it rested. Aemmer was constantly forced to dig away the snow and cut footholds directly in the ice itself. Not entirely pleasant was it to watch the fragments thus loosened start down the slope, disturbing more snow as they gained headway, until finally far below, a full-sized avalanche poured over the cliffs.

Under such impediments, a party's progress is like that of a garden snail, yet in time even this becomes surprisingly effective. The turns of the scalloped parapet kept falling behind us, but still the summit remained pertinaciously hidden. At length when nearing a rocky jutting promontory buttressed by high cliffs below, we felt certain that its disclosure could no longer be postponed. A moment more and Aemmer was on the knob, peering around the edge of slanting snow that formed our sky-line. Not a word of encouragement did he vouchsafe, however, but instead commenced a lively interchange of Swiss patois with Feuz who at once

moved up and joined him in an intense study of what lay behind. Standing room being limited, Aemmer presently cut himself a niche in the ice higher up which allowed me to advance. "There is a nasty place here," said Feuz, when I arrived, and nasty enough it looked.

I found myself on a projecting rock at a point where the ridge made an abrupt bend at right angles for twenty feet or more, before resuming its course. It was as if, after having been cut vertically, the further section had been shoved bodily sidewise along the cut for this distance, leaving the rock and snow sliced cleanly off but without any actual break in the continuity. Above this sheer face, an ugly-looking cornice depended. From the top a large mass of soggy, melting snow had just fallen, and water was dripping down like a shower bath. Clearly there was no way up there. On our own level, along the line of junction between snow and rock, the two came together so nearly flush that all chance of passage seemed utterly hopeless, while immediately beneath us a cautious look revealed smooth, ice-coated rocks ending in a tremendous snowy slope which shot the eye directly into the valley, a mile below, in one breathless jump—all most impressive, but scarcely calculated to afford much assistance to the matter in hand.

I freely confess that I was nonplussed. The whole situation looked almost prohibitively dangerous, for there were no real holds or anchorages whatever, even if some way around the *mauvais pas* could be devised. Aemmer, however, mindful of their defeat on the mountain the previous year, was not to be deterred by such considerations, and while Holway and I were establishing ourselves on the rocky knob, he commenced of his own accord to hack away at the ice along the base of the snow wall in an absolutely fearless manner

with Feuz paying out the rope from the ice step near us. We held our breath as we watched him, for, to all intents and purposes, he was on the brink of eternity. If another piece of that cornice should fall. . . .

As for ourselves, we were safe enough sitting there on the rock, even though holds were conspicuously absent and our feet dangled in empty space, for the rope had been taken off in order to give Aemmer the necessary length. Time seemed to stand still, but after what must have been about fifteen minutes, he got out from beneath the cornice and came to the less perilous locality, where the ridge resumed its original course. Meanwhile I had managed to extract my camera from the *rücksack*, and I now took several photographs of him as he worked, an operation in itself not entirely easy under the circumstances.

At length, nearly all of the one hundred foot rope was out and it was time for the next man to follow, so moving up to Feuz, I tied myself onto the end. Aemmer now had fairly good footing on the sloping rock but still lacked axe- or hand-hold to serve as a quick grip in case of need. Nevertheless, the most hazardous part, the actual construction of the path, was over. The evil spell of the place was broken to that extent. Surely, after such a gallant exhibition of pluck and skill in the making of a way, it would be ungracious to balance the pros and cons of safety too nicely, so I started off, Aemmer cautiously taking in the rope as it slacked. Of the next few moments I have but a vague recollection. I know that the first steps were extremely difficult to negotiate owing to a soft, bulging boss of snow beneath which one had to duck sideways making at the same time a long stretch into a small ice step full of water beyond. After this, came a stride onto an outward-sloping bit of smooth rock for which the

balance could only be maintained by thrusting one's hands straight into the snow. Then the wall eased off, allowing one to stand upright and to face forward once more. The ensuing steps were on the slushy outward-rounding rim of rock, a matter of careful balance merely, and not many minutes elapsed before I stood beside Aemmer on the rocks. While passing beneath the cornice, I heard a vicious swish just behind me which they said was due to about a bucketful of falling snow—a somewhat thrilling escape.

Having taken off the rope, the next step was to throw it back across the gully for the use of the others. Fortunately, Aemmer accomplished this on the second cast and then Holway worked over. The following attempts, however, did not succeed until the eighth cast, for so little surplus rope remained and so awkwardly was Aemmer placed, that it was extremely difficult to land it within Feuz's reach. When he finally joined us, we found that more than an hour had been consumed in gaining this one hundred foot advance.

But the summit was not far away, because we could see a bit of its cornice above the arête ahead, so roping up at once, we started towards it. All of a sudden, we looked down upon the ridge that rises gently from the pointed easterly gable, and I knew that the culmination of the four-year siege was at hand. Aemmer now redoubled his precautions, for evidently the actual top was on the cornice that jutted out a goodly distance into space on north and east and he desired to get as near as possible without leaving *terra firma.*

Finally he came to a halt and driving in his axe, said: "Here is the top." It was a moment of glad triumph, of course, yet there was no enthusiasm, no congratulation, no shaking of hands, scarcely a spoken word.

THE SUMMIT OF MOUNT SIR SANDFORD

PANORAMIC VIEW FROM SUMMIT OF MOUNT SIR SANDFORD

Neither our position, nor the knowledge of what lay in store below was provocative of such demonstration. No doubt apprehension might have been forgotten for the time being, had our surroundings looked like the top of anything. But they did not. About half the horizon was hidden by the snowy crest that extended for a rod or more above and beyond us, and the tremendous overwhelming sensation of standing on the very highest point of the Selkirks in all that great panorama was lacking. Nor was there time or space for lining up so that some one might venture out on the extreme apex in safety. Our situation may be compared to the upper corner of a steep roof with one slope carried up beyond the ridge-pole so as to overhang the other, the whole being tilted slightly upwards at one end. The overhang would correspond to the cornice along the arête; the projecting eaves, to the cornice descending in the other direction. We were standing in a horizontal line as near to the crest as we could get without trespassing upon the overhang. Below, the slope swept down to the valley at about 45° without visible interruption—a smooth sheet of snow. Only intuition would suggest the precipices to one who did not know. There was not a bit of rock within reach; there was no place to sit down; it was eleven o'clock; nothing urged us to remain, everything urged us to go; so after complying with the customary formality of burying a tin box, containing our record, in the snow, we simply turned in our tracks and started back, Feuz now being in the lead. At the first patch of rocks Aemmer piled up a few fragments into a small, insecure cairn.

Arriving at the difficult corner, owing to the impossibility of throwing the rope back uphill, we crossed without unroping, using the most exquisite care and moving only one at a time. Although, before starting,

we succeeded in dislodging part of the cornice by hitting it with stones, this traverse in our tracks of the morning was the most delicate and dangerous operation of the day. It proved to be much more serious than before, for the whole party was on the rack at once and had anything happened to one, all would have had to suffer the consequences. Since the situation differed from that presented at the approach, a few additional lines of description may perhaps be permitted. On the right, a porous bank of melting snow was piled up on the rock wall leaving exposed nothing but a narrow strip of outward-sloping stone along its base. This Aemmer had previously cleared of ice to the width of perhaps a foot, forming thus a meager pathway, whose outer edge to the left was the precipice. In negotiating this strip of rock, the snow bank was too soft to afford any hold and consequently there was none. Everything depended upon balance alone and this in turn upon the absolute solidity of each step. The rocky ledge ended at the vertical face of snow, before mentioned, and across this the steps were in ice with a few cut hand-holds. After Feuz got by and upon the rock knob where we had perched earlier in the day, the worst was over, for the others then had at least the moral support of the rope. Although the place teemed with possibilities for catastrophe, it seems to me that it transgressed but little, if any, the line where skill, coolness, and absolute faith in one's companions can assure safety. It is questionable whether a party lacking any of these elements is warranted in engaging in serious mountaineering at all; but having them, almost anything within the bounds of possibility can be accomplished and accomplished safely.

Our one concern now was to get down as quickly as we could, for in that warm, intense sunshine we had no

business to be lingering on high with slushy slopes and pendulous ice cliffs below. The slithery snow prompted us to treat the steps with tender consideration until we regained the *rücksacks*. Here a number of photographs were secured, but no one suggested a real halt.

The descent to the rock cleaver was a combination of artless plunges on easy slopes and gingerly negotiated passages on icy slants. The wide crevasse without a bridge yielded to a skillful spring by Feuz using Aemmer's knee as a take-off. We arrived at the rock at 1.25 P.M., and unroped for a short stay. I immediately adjusted my camera for a few pictures of the cliffs, but to my alarm, several pieces of ice fell off and rattled down over our line of steps in plain view below. Presently another small fall occurred. Evidently the sun was already playing havoc with this face of the peak. There was nothing for it but to keep on and pass the place at once. Reassuming the rope, we descended the rocks, and walked across the ledges towards the cliffs to gain the point where our step-ladder commenced. It was a thrilling moment as we entered the danger zone, for the ice tongue looked quite appalling in the glaring sunlight and the lumps of ice about had a most stimulating effect upon the imagination. We were rejoiced to find that the steps had melted little, so comparatively rapid progress was possible without further cutting. Except in a few places we were able to face forward and thus to make better time. Fifteen or twenty minutes took us out of the line of fire and onto the thick snow, where relief from the nervous strain found expression in gay but duly restrained charges down its yielding surface. The breakfast place was regained at 1.50 P.M., twenty-five minutes after quitting the rock and the worst was over.

But the remainder of the way possessed its hindrances, for here ablation was at its height. On the icy brow of the glacier leading down to the two *bergschrunds*, the steps had entirely disappeared, and Feuz had to hew out another descending stairway directly below a scattering of large stones that were poised on the ice in readiness to shoot down without warning. However, by keeping a sharp lookout, we passed the place in safety and soon got to the bottom of the steep declivity after which there was nothing but ordinary glaciers to engage us. At half-past four, after an absence of fifteen and one-half hours, we were enjoying the comestibles and congratulations of camp.

Thus fell the haughty monarch of the Selkirks, the last of the big unclimbed peaks of the Canadian Alps within fair working range of the Canadian Pacific Railroad. I hope that I have made it clear that the character of the work on the mountain is dependent upon the amount and condition of the snow. The route lies almost entirely over glaciers, and when, on the critical slopes, the snow is thick and well attached to the ice, no special difficulty need be apprehended. The dangerous passage beneath the ice cliff may then be avoided advantageously by returning to the west arête. On the other hand, in years when a scanty snowfall is combined with hot weather, the greater part of the 5000-foot ascent to the summit arête will be glare ice, even if none of the lower *bergschrunds* prove impassable. Had we been a month later in 1912, there is little doubt but that this state of affairs would have confronted us. Likewise conditions at the couloir in the final arête depend upon the amount of snow and upon the vagaries of cornice formation. It is not improbable that on another occasion this place would be relatively easy.

CHAPTER XXII

THE ASCENSION OF MOUNT ADAMANT AND THE COMPLETION OF TOPOGRAPHICAL WORK IN THE VICINITY

AFTER a night of that sound, death-like slumber which only the mountaineer can know, we turned out on June 25th refreshed and eager for whatever the day might have in store. A shocking consumption of supplies entirely repaired the ravages of the preceding day, and ruddy, throbbing countenances were the only evidences that the peerless primate of the range had at last submitted to the yoke of iron-shod boot. However, the weather looked doubtful even for survey work near at hand, so in the end it was decided to indulge in a day of rest. At the scandalous hour of ten o'clock a pair of silent, sleepy guides appeared for breakfast, but on account of their noble work, the cook was charitable. At noon, Holway very kindly went out onto the glacier and established a line of stones for exhibiting the surface flow of the ice in accordance with my signals from the transit. The range-line of the previous year was adopted with the hope of showing a different rate under different temperature conditions, but not even this praiseworthy object availed to conciliate the weather and just as the last station was set, a business-like rain squall swooped down from the Palisade, wetting him to the skin as he hastened back to camp.

It was now necessary to decide upon our further program, for provisions were limited and the men must return to the boat for more in the event that we were to prolong our stay as much as a week. If we were not to remain for so long, then it was best for all to go out together. Calling the guides into consultation, we finally arranged to close the purely mountaineering program with one more climb and then, after a day of rest and preparation, to divide the party. Although we had never permitted ourselves to plan beyond the downfall of Sir Sandford with any confidence, we had often cast longing eyes on Mount Adamant. Unquestionably ranking next to Sir Sandford in the neighborhood, its capture now would form a most fitting and desirable climax to our work. The mountain is situated at the focal point of three great ridges, each defended by immense granite precipices. Owing to its remoteness from our previous routes, and to intervening spurs which cut off all view of its approaches from the valleys, we had never selected a line of ascent. Our climbs to Mount Austerity and Pioneer Peak on two of these ridges, however, had convinced us that the way must be sought on the south face and therefore we decided to direct our steps thither.

In order to allow plenty of opportunity for reconnaissance, we set the start for 2 A. M. the next day, but at the appointed hour a severe thunder-storm broke upon us with brilliant lightning and sharp crackling reports. After one look at the wild black sky no one had the temerity to suggest departure so we retreated to the recesses of our sleeping-bags in deep disgust. About five o'clock, however, happening to awake in response to some obscure suggestion, I perceived that matters had taken a decided turn for the better. To the east the sun was struggling to pierce a mat of torn vapory

clouds, and in other directions clear blue sky prevailed. By no means could we afford to waste such a day, so jumping into my clothes I aroused the rest of the camp.

Having placed everything in readiness the night before, we were able to make short work of breakfast and to get under way at 6.30 A.M. Although we could not definitely entertain the hope of capturing Adamant after such a late start, we determined to go as far as the ridge of Azimuth Mountain and to consider the possibilities from there. Descending directly to the chaos of moraine which mantles the glacier hereabouts, we crossed as soon as possible and then struck upwards over the clean ice near the center. The air had an invigorating freshness about it that gave life to our steps and made everybody cheerful. In the bright, level rays of the early sunlight, the somber ridges ahead took on a transient flush of kindliness that intensified strongly the matutinal opalescent hue of the ice under foot. At our backs to the left, Sir Sandford shot his ponderous, yet gracefully ethereal, mass aloft into the blue—a unique paradox of inspiring beauty and ferocious rugged grandeur. Exclamations of pleasure broke from the guides, "He is de king, ein wunderschöner berg, the finest peak outside of the Oberland," said they with somewhat questionable modesty.

Passing up the easy ice-fall of Silvertip glacier, we kept straight onwards across the even plateau above until we reached the base of the upper cascade at its left margin. Quitting the ice here, we turned directly up the grassy slopes of Azimuth Mountain, aiming for the tiny col just west of the highest peak. After a hot scramble of about one thousand feet, at 8.30, we gained the crest (altitude 8000 feet) and composed ourselves for a careful study of Mount Adamant's impressive proportions.

As I had discovered in 1909, when I first ascended Azimuth Mountain, it formed an unexcelled natural observatory for all the encircling ranges and the entire basin of Sir Sandford glacier. One can scarcely overemphasize the grandeur and magnificence of the view and it is not too much to predict that some day it will become deservedly famous.

Besides Adamant, the guides included the Blackfriars in their examination, for we might have to content ourselves with an attempt on these nearer and almost equally alluring towers of lesser caliber owing to the lateness of the day. Adamant obviously would afford a first-class climb but of some duration. For perhaps a half-hour, while Holway and I devoted ourselves to photography and the view, the guides discussed each feature of the mountains in low tones. Then I inquired what their verdict was. "Well," said Feuz, "it will take an hour to the base of the couloir [referring to the immense snow gully which grooved the entire façade of the peak facing us] and about three to get up. Then two hours down and another back here—seven in all." This estimate increased by a half would bring us back to camp before dark, yet, if the truth be told, he did not exhibit much enthusiasm, for he added, "What 's the matter with those peaks over there?" pointing to the Blackfriars, "those are fine mountains." I answered that I was perfectly willing to do either and as Holway expressed a like sentiment, it resulted that the matter was still undecided when we set out along the ridge a few moments later. But the parting of the ways was still some distance ahead and we compared the alternatives as we moved along.

While glissading down a steep little forty-foot parapet of drifted snow an incident occurred which is perhaps worth mentioning as showing how the chance of

mishap is always lurking in even the petty details of alpine work. The party was unroped and each was proceeding for himself. Feuz had led off with a fine plunge that spurted the snow spray high in the air on either side. In following his example, I was just coming to a halt at the bottom surrounded by the loose mass of soft snow plowed up by the slide, when it suddenly solidified about one of my legs, gripping it as if in a plaster cast up to above the knee. Fortunately, my momentum was slight else it surely would have snapped the bone. As it happened, I was stopped instantly and was swung around into a most awkward position with the member pinned fast to the slope above me. Only by a cautious digging with my ice-axe was I able to loosen the congealed snow and extricate myself. Hastening then after the others, I joined them as they were tying on the rope.

We were now on the floor of the collecting basin of Adamant glacier, and as we moved off it became apparent that the leader purposed to choose the mountain of this name as our goal. The order was Feuz, Aemmer, myself, and Holway. The glacier intervening between us and the base of the couloir proved simple enough, though cleft with several deep fissures which forced us to do some doubling back and forth. However, at 11.05 A.M. we found ourselves at the outer margin of the tapering fan of avalanched snow that spread out on the glacier below the couloir. The altitude was approximately 9000 feet.

Here we halted for refreshment, the guides announcing that they were going to strip themselves to fighting trim and advising us to make away with an ample luncheon. During the repast several small snowslides passed down the deep groove in the couloir and spread out over the fan with a suggestive sibilant hiss. Plainly

the snow on this face was in critical condition as a result of the rain and its southerly exposure. Since we should have to depend upon snow alone for a route up through the smooth basal cliffs, it was not without misgiving that we studied the narrowing white ribbon which indented the dark mass overhead.

The guides proved to be as good as their word and presently when we got under way, *rücksacks*, coats, and provisions remained behind on the snow. Holway and myself, however, still carried ours on account of the cameras, to part us from which on a climb, only the very best of reasons can avail. Difficulties commenced at once in the shape of the largest and most intricate *bergschrund* that it has ever been my lot to encounter in the Selkirks. Its upper lip was a perfectly vertical wall from which at the point of our first approach the glacier had sagged down and away for a distance of perhaps twenty feet. This, of course, was hopeless, so we descended and moved cautiously over to the left where the direction of the fissure more nearly coincided with that of the slope, and it appeared narrower. But even this change of front was not easily effected for the lower lip was compound in structure, being pierced in various directions by many lesser cavities, all more or less concealed under a jumble of frozen lumps. However, we finally arrived at the desired place and found that there was a ledge on the opposite wall just below our level. This Aemmer succeeded in gaining by dint of exceedingly delicate and skillful maneuvering, after which he dug out a horizontal line of steps that led him onto the steep snow-slope of the mountain. Luckily the rope was just long enough to permit his reaching a safe holding place, before the next man had to move. At an earlier hour, there would have been less difficulty and less cause for apprehension

AUSTERITY, TURRET PEAK, AND ADAMANT FROM BELVEDERE PEAK

Turret Peak

MOUNT ADAMANT, SHOWING COULOIR BY WHICH ASCENT WAS MADE

here, but in the intense brilliance of the noonday sun the crossing was attended with a larger share of both than was entirely pleasant. As each gained the ledge, those ahead moved up the slope so that when the last man was over, we formed a ladder-like line on its steep, soft surface. Huge steps were required for safety and only one moved at a time, the others anchoring to their axes driven deep into the snow. If such conditions were to prevail for the rest of the way to the top, evidently we should have to turn back, for the risk was verging upon the unjustifiable. But it was Aemmer's plan to go straight up to the point where the snow abutted against the cliff in order to take advantage of the icy or hardened condition usually to be found at such localities and to avail himself of any opportunities that the rocks themselves might afford.

When we arrived the going improved enough to warrant farther advance. In many places the snow was already in shadow and we were protected from any chance missiles by the cliffs themselves. However, it was a rough, irregular pathway and far from an easy one to travel. Most of the steps had to be cut in the icy margin of the snow which frequently did not actually impinge against the rock but left a gap several feet wide—a kind of incipient *bergschrund* with dark and mysterious interior. Now, we would trip across this knife-like edge in the manner of tight-rope walkers, keeping our balance with the axe against the rock. Again we would descend into the cleft and use the frozen parapet as a hand-rail. When we got high enough, Aemmer traversed out to the ledges that projected through the snow near the center of the couloir and these facilitated the advance considerably.

We encountered no really serious obstacle until we got to the narrow neck of the couloir that is plainly

distinguishable in the illustration. Here snow and cliffs steepened simultaneously, both having been smoothed off to a conspicuous degree by the impact of numberless avalanches, for everything that falls on this side of the mountain perforce passes through this neck. Even as we worked a large mass of snow startled us as it plunged down the drainage channel a few feet away. It had been the original plan to cross to the east side of the couloir at this point but the deep glassy groove absolutely forbade. It was perhaps fortunate for the morale of the party that its leaders were mostly out of sight while negotiating the dubious courses of the day. So irregular was the route that often each member would be entirely hidden from the others for minutes at a time. This was true here. I was at the base of a big slab of rock when a curt "Halt" reached me from an unseen locality on the other side. Then a stream of chips and lumps of ice commenced to slither down the couloir and I knew that we had arrived somewhere. Possibly ten minutes passed before the rope began to be taken in and I was invited to advance around the corner. When I had complied, I found a very steep flight of steps cut in the ice with Feuz poised above on a most uninviting excrescence of smooth rock. Away up beyond, Aemmer was chopping industriously at another reach of ice and Feuz suggested that I wait where I was until he had finished. As I could neither advance nor retreat, the suggestion was not without pertinence; but it would have been a pleasanter place, had there been less need of dodging the hail of pieces sent down. We had come to a kind of branch couloir and once past the ice, there seemed to be a chance of taking to the ledges, a welcome alternative, as it is my impression that on several short stages the ice slanted up at an angle between 60° and 70°.

The remainder of the climb I am unable to describe in detail and, in any case, it is scarcely necessary, for the route is obvious and could probably be varied little with advantage. Moving one at a time as we did for practically the whole way up and down, we cleared the ice and then assailed the steep broken rib that leads up to the central one of the three peaks. Rock climbing of all varieties now engaged us. There were rounded ledges to be scaled directly in the courses of waterfalls, cracks to be swarmed up by jamb-holds, chimneys to be squeezed through, and slabs to be surmounted on all fours by friction. It was mostly face-climbing and, as I remember it, we kept to the vicinity of the couloir pretty closely. We did not get onto the arête at all, nor did we even see over into the basin to the west. Fortunately the rock was unusually sound and anxiety from this source was absent.

As the afternoon waned, the climb seemed to stretch out interminably, for every moment of it held work requiring the nicest care. Though we allowed ourselves not the least rest after leaving the *bergschrund* we appeared to gain altitude very slowly, perhaps owing to the absence of any near-by peaks on which to gauge our progress. Cliff after cliff was surmounted but always another appeared in its place. We began to feel rather worried, for unless matters improved pretty soon we could not complete the trip and get off the mountain before nightfall. Moreover, the brilliant heavens of the morning were now overcast with a pearly gray veil which took on a dark, forbidding cast above the distant mountains and boded ill as regards the weather. However, our perseverance was destined to be rewarded, and when we almost despaired of success, the rock suddenly eased off into a small platform on the brink of the great southwesterly precipice

whence the triple summit was in full view. As I swung over the edge of the platform Feuz had already unroped and was rapidly forcing his way across an upward slanting gallery that cut athwart this precipice below the middle peak in order to investigate its connection with the final crown of snow from which all the summits sprang. Presently a shout of encouragement came back and without more ado we hastened after him. The gallery seemed designed for our purpose in spite of its conspicuous lack of a railing and the generally insecure nature of its floor. But I am sure no one ventured to complain, fully realizing that without it, final triumph could only have been purchased at the prohibitive price of a bivouac. Joining Feuz, a short ascent over snow brought us out onto the broad brow of the westerly peak where the rope was removed for the first time in eight hours.

A glance at the watch showed five o'clock. The 2000-foot couloir had held us down to an average rate of a little more than 350 feet per hour for a short six hours. Our first concern was to discover which of the summits formed the actual apex of the massif and for this Holway produced an Abney level. The sharp east peak looked higher but the instrument indicated an elevation the same as our own. However, a platform of snow to the northwest clearly outtopped us and this we agreed was the loftiest point. It lay but a few steps away so we all walked thither at one time or another. This settled, only enough time could be spared to secure a few photographs and to build a small cairn, for, in the face of the gathering storm, minutes were precious.

Oddly enough, the view was quite fine for a radius of four or five miles. The tempest was brewing in the higher altitudes and such clouds as took form kept

THE BLACKFRIARS FROM THE SOUTH

AUSTERITY FROM SUMMIT OF ADAMANT

Photograph by E. W. D. Holway

ON THE NÉVÉ OF ADAMANT GLACIER

BLACKFRIARS FROM TOP OF ADAMANT

Photographs by E W D. Holway

either above the mountain tops or deep down in the valleys. Even Sir Sandford was untouched. But a vague murky darkness filled the sky and threw a monochromatic shade over the landscape which largely deprived the pictures of interest save as topographical records. Mount Austerity, our triumph of the previous year, stood out impressively towards the west, the apotheosis of stern, forbidding grandeur. One of the steepest ice-slopes I have ever seen clasped its northern buttress. To the south, the Blackfriars, a daring pair of blunt domes from this view-point, towered above their smooth ghastly precipices in a stately pile. Although their crests were so far beneath us as to be thrown into forcible relief against the distant névés behind, they will form a fine prize for some capable mountaineer. In other directions the panorama was less engaging owing to the peculiar state of the atmosphere. Under normal conditions it would be glorious, for in Adamant the main axis of elevation of the Selkirk Range makes its nearest approach to the great trench occupied by the Columbia, and I am convinced that all the giants of the Rockies from distant Mount Assiniboine to far beyond Mount Columbia would be visible, not to mention their limitless array of lesser satellites. Unfortunately, on the three occasions when we have visited the summits of the granite range, an evil genius has interfered, either with smoke, haze, clouds, or what not, to prevent our obtaining the full extent of the view. A very handsome glacier fills the large basin immediately to the north of Adamant and Austerity. It is the product of four or more separate confluents and flows through a deep valley directly towards the Columbia River from which its tongue cannot be distant more than three or four miles. I thought that I caught a glimpse of the river in the distance, and if

this is true Mount Adamant must present a majestic aspect indeed from there, for the difference in elevation is about 8600 feet.

All this was grasped in much less time than it takes to tell it, and when twenty-minutes, the most that we could possibly allow, had elapsed we started back, Aemmer first, Holway and myself next, Feuz last. Our aim now was to achieve the greatest speed consistent with safety. All the fine points of "form" were absolutely ignored. We plunged down across the loose fragments of the gallery without stopping to test their firmness but giving ourselves the benefit of the doubt and trusting to the rope. Necessity scattered mutual courtesy to the winds and tugs and jerks upon the line were constant. It was each man for himself, and if he needed slack, he had to call for it.

Presently when the real difficulties were reached, of course this procedure had to be modified, but even then the gymnastics were of the most rough-and-tumble character. Smooth reaches, after the first man got to the bottom, were slid over instead of being climbed down. Recessed corners were negotiated by trusting only to friction and the rope. In every possible way seconds were clipped. The time spent by the leader in selecting the way was utilized by the third man in assisting the last who, naturally, had the hardest rôle to fill. All this meant bruised shins and bleeding fingers, but the storm and night were gathering fast and it would be a serious matter to be benighted on the windward face of the peak at an altitude exceeding ten thousand feet without shelter or means of warmth. If the light would only last long enough to get us off the rocks, we tacitly took it for granted that our troubles would be over, for rather curiously, we had

little misgiving about a dark passage across the glaciers and hillsides that cut us off from camp.

But the work was exceedingly tantalizing because, of course, no true haste was possible. The obstacles were too real and too manifold. It was like going down a huge flight of stairs, the risers of which, seamed and irregular, kept appearing beneath one in the shape of ten-foot walls that often involved expert trapeze work to overcome. At several points, Feuz as last man had to loop the rope over a belay and let himself down. Moreover, besides the increased difficulty which attends the descent of steep rocks as compared with their ascent, we had soon to contend with slippery wet holds. Rain and sleet commenced to drive in before a stiff breeze from the south in a thoroughly disheartening manner. However, the tension of continuous intricate activity minute by minute completely absorbed our attention and forbade any heed to aught the weather might be preparing to do. At the slightest sign of hesitation on my part even to better examine the holds, Feuz would break forth with a "Go on, go on, we 've got to get out of this," and on we went. The slow clambering was cold work for the guides in their shirt sleeves. Holway and I fared much better with coats and extra apparel.

Happily, the net result of this unremitting application was progress better than any one had dared to expect, and when once the icy staircase lay behind us, silent misgivings began to change into hope. But the ice was an awkward and anxious bit. The rain had softened the overlying snow so as to deprive it almost entirely of holding power, and Aemmer found plenty of work for his axe in making the place even reasonably passable. I recall one trying moment at the bottom where it was necessary to take a backward step around

a corner of rock to an unseen niche of ice for which one's balance could only be maintained by such hold as the hands plunged deep into the snow would afford. After this, the way was more straightforward on the edge of the snow below the rocks, although even here we had to back slowly along on all fours in several instances.

Twilight overtook us as we left the rocks for good and started down the ladder of snow leading to the *bergschrund*. Clinging to the axe with one hand and to the uncertain pulpy snow with the other while one groped around with one's leg for the invisible rungs below, was eminently calculated to excite the imagination of the most stolid, especially when now and then one of the steps would cave away. The exclamations thus provoked and the muffled thump, thump of the axes constituted the only sounds, for wind and rain had slackened temporarily until the storm could collect its forces anew. We moved as vague shadows through the gloom of the pitiless cliffs—our only light the dull reflection from the distant western sky. Snow under such conditions has a strange eerie appearance, the diffused light blending all inequalities into a solid pallid expanse. Only by his sense of feeling can one tell in which direction it slopes. Minor depressions such as footsteps are obliterated and unless one's vision possesses something of an owl-like quality he had best have a care how he ventures at unseemly hours upon a treacherous snowy surface.

The *bergschrund* in reality proved a pleasant disappointment. Even in the uncertain dusk it did not seem very appalling. But I suspect that this was due to the fact that the natural relief at approaching the end of a series of dreaded obstacles blunted our susceptibilities, for I thought I detected a note of anxiety

in Aemmer's voice as he urged me to "swim" across the snow bridge *pronus* and not to touch anything outside of certain prescribed limits. However this may be, it did not take us long thereafter to reach the little black pile on the snow which had meant safety and comfort to us during the last hour or two. We arrived in the nick of time. It was really dark now and the rain poured down with fiendish vehemence. Had the light failed a quarter of an hour earlier, this story would be of a different tenor. We hastily devoured a handful of raisins apiece, a few bars of chocolate, and some crumbs of rye-crisp, flavoring the repast with the contents of a small flask that some one had providentially brought along. Then shouldering our packs, we pushed on.

The hour was only nine, yet to all appearances it might have been midnight. Around about us great dim shapes loomed up through the rain-fog, breathing forth cloud plumes from each turret and crag. Occasionally thunder muttered in the distance or rattled near at hand in short staccato crashes like musketry. Up in the murkiness overhead lightning was thrilling intermittently in brilliant, blurred sheets. There was something grand and awful about being in the very home of the storm, brushing shoulders as it were with the elemental forces themselves. Under circumstances of less exigency, to hobnob thus would doubtless be most inspiring, but to our little band, staggering along over the uneven half-crusted snow, weary in limb and battered by a chilling blast, it represented the consummation of adversity.

Our tracks of the morning had long since disappeared and when one recalled the large crevasses and steep glacial slants yet in store, new doubts could scarcely be suppressed. But just here the guides rose to the emergency most commendably. With the least pos-

sible hesitation they led us across the dusky, blank whiteness in almost the very steps of our approach, for now and then one could recognize a snow bridge or some cavernous hole. We doubled around a huge fissure on the steep, snowy declivity beneath the Blackfriars and then splashed down through the slush of the glacier's gentler slopes. Hereabouts we must have varied from our former route, since a good deal of careful punching with the axes was needed to avoid concealed pitfalls. However, the rain was exhausting itself and really one could see surprisingly well on the snow, so it did not seem long before we were stumbling across the deep furrows of the flat névé-floor towards our observation crag on Azimuth ridge. This part of the way was a toilsome grind, particularly on the final upward slant. Even a gentle acclivity at the finish of an arduous day is trying, for then all one's muscles seem to rebel in unison. To speed our steps we discussed the fine things we would do when we got to the ridge. First, we would take off the rope, an unspeakable aggravation for many an hour past. Then we would rest for a time in the lee of the rocks and dispose of the remaining food. A tiny tin of marmalade was to form the *pièce de résistance* and each had some particularly delectable method of consuming his share. After this we would descend to a stream, since, in spite of the generally moist nature of our surroundings, water in drinkable form was not to be had.

But alas for fond plannings. (How pathetic they seem in retrospect.) Having gotten to the crag, no shelter could be found nor could we see amongst the dark-colored rocks. Visions of the rough hillside below, where one might break his neck in less than a twinkling, flashed through our minds. Was an absolutely unrelenting fate pursuing us that we should be

held up here for the remainder of the night? The rain had now ceased and after all it was rather pleasant to loll on the wet rocks munching such morsels of food as ingenuity could extricate from the *rücksacks*. A thousand feet down, the great white way of Silvertip glacier led alluringly towards camp, apparently but a stone's throw away. Yet we stood about as good a chance of making a safe descent to it over the wet grass, as the proverbial blind man did of succeeding in his search of a dark room for a black cat that was not there.

However, by an extraordinary stroke of good fortune we were spared the need of a trial. Just as the cold was making us distinctly uncomfortable, the clouds parted in the south, and to our joy, we beheld a big yellow moon sailing serenely through a clear sky. There was only a glimpse to be sure, for presently it dodged behind a watery bank of mist, but the effect on us was electrical. That fine warm supper going to waste at camp might be ours after all. Hurriedly gathering up our belongings and adjusting the rope we resumed the way. Although dark bastions of cumulus were drifting across the heavens, constantly widening openings between gave sufficient light to distinguish the footing, and before long we were bathed in the unobstructed radiance itself. What a climax to a day already crowded with bewildering surprises! It seemed incredible that these snowy névés now glowing with soft iridescence could be the bleak frozen deserts of an hour before.

It is superfluous to detail the rest of the return journey. The friendly luminary finally went down behind the mountains but not until it had seen us through the Silvertip ice-fall and into the familiar waste of moraine near camp. Here we arrived at 1.00 A.M.,

safe and sound, after an absence of eighteen and one-half hours. Here also the curtain may be drawn upon what we all felt was a long and strenuous day.

In describing an expedition such as this, one finds himself on the horns of a dilemma. If much stress is laid upon the details of the work, the reader is apt to gain an exaggerated idea of the dangers and difficulties encountered. On the other hand, if the account is drawn with a lighter touch, he may well wonder what it is all about and why any one ever troubled to put such insipid matter into print. In either case the probability that the writer will be misunderstood looms large, if indeed it does not become a certainty. Moreover, in the popular mind, mountaineering is believed to be inspired largely by the excitement of risking one's neck, and to be successful in direct proportion as this supposed end is attained. To such readers an elaborate description invariably means hair-raising peril in every sentence and more often than not they will put down the book firm in the belief that mountain climbers are nothing but monomaniacs at large. Without entering into a disquisition on the pleasures and benefits of the sport, it may, nevertheless, be insisted that this attitude is absolutely false. To the true mountaineer the attraction bears no relation whatever to the amount of risk as such; no more is the degree of riskiness to be gauged by the extent of lineal description. Briefly, the fascination consists in pitting one's wits and skill against the obstacles offered by the mountain and this encounter it is that one seeks to portray. That danger oftentimes shadows one's steps may be admitted; but it is far less than is popularly supposed and mostly defies specific description. Accordingly, in the case of Mount Adamant, one should not infer that the climb is hazardous or unusually difficult. Our trials were due rather

to the storm than to the intrinsic perversity of the mountain, and without a pressing need for haste, the expedition would be shorn of its most unpleasant attributes.

On June 27th, the weather resumed its misbehavior. Storm after storm rushed down upon us, flashing forth bright artillery and battering the tent with furious volleys of rain and hail. Nature was indeed in a gloomy mood. Even a little wren felt the need of raising its spirits by warbling a fragmentary song in the midst of the turmoil. Within-doors, however, everything was serene, for had we not in three days successfully sacked two of the most impregnable citadels in the Selkirks and erased them from the list of unclimbed peaks for all time? The guides compared Adamant to the Schreckhorn which Tyndall branded as "the grimmest fiend of the Oberland." They agreed in describing the former as a more trying climb, since the ascent of the couloir consumed nearly six hours, while that of the Schreckhorn is often done in two less. With respect to Sir Sandford, Feuz remarked that he knew of no other peak where so many ice-falls have to be gone under. However, one cannot but suggest, *cum grano salis*, here, for such comparisons are the bane of mountaineering.

On this day it was that Topsy again took a conspicuous place in camp life. Although she had had a pretty hard time on the rough climb to Sandford Camp, and had lost much of her puppyish animation under various stresses of adversity such as rolling on porcupine quills and later actually engaging one of the creatures in mortal combat, these events sink to insignificance in the face of the litter of eleven puppies with which she presented herself on this date. Brown had to make away with four, but he declared he was going to carry

home the others in a bag and name the best one Sandford. In spite of the mosquitoes, the pups throve famously and Topsy was voted to be a worthy mascot of the expedition.

On June 28th Holway and the guides took their departure with Bergenham, as planned, regardless of the threatening weather. By making an early start, they reached the boat in the afternoon and after being ferried across the Columbia, set their faces toward civilization *via* the Columbia trail. By a remarkable *tour de force* Professor Holway succeeded in regaining the railway the next day after covering in eighteen hours, actual marching time, a distance of not less than forty-five miles. The first third of the way was made through the rough going of a Selkirk forest with a pack and consumed a little less than eight hours. The residue, thirty odd miles on the government trail, was covered in something over ten. Bergenham returned to camp on July 1st with additional supplies.

My purpose in remaining at Sandford Camp was to perfect the triangulation commenced the year before. I desired to establish a new station that would command the fourteen pinnacles of the granite range and would thus give me the benefit of three separate rays to each for both position and altitude. Moreover I was anxious to ascend the peak which the Geographic Board of Canada had done me the honor to designate with my name, and to secure thence additional observations to tie in my primary stations with the stations set on the railway location in the Columbia valley. Unfortunately, however, the weather went hopelessly bad and I was unable to do more than to make final readings on the glacier and to complete sets of new readings from the old stations (primary and secondary) and from one new secondary.

MOUNT PALMER FROM THE NORTH

WORKING UP THE COLUMBIA RIVER

A BYE-CHANNEL OF THE SAME

Both secondary stations were occupied June 29th. Lazy clouds on the summits forced me to spend the whole day in waiting, for usually but one of the desired peaks would be free at a time. The next day nothing could be done owing to the mists. July 1st the fog banks gradually rose and as it looked like a clearing, I set out for Azimuth Mountain in the forenoon. After another long period of waiting, I finally completed the work there. The prevalence of the misty clouds about the peaks was extraordinary, apparently a purely local phenomenon, for the sun shone brightly above and promised momentarily to dissipate them. It was all base deception, however, for the next day the weather became more impossible than ever, and from four to eight o'clock camp was clasped in the cold embrace of fog. The following five days were simply detestable, with rain pouring down in torrents and clammy dripping mist choking the valley. One of the men remarked in a tone of profound disgust, "And they call this 'Sunny B. C.' Bah! A man 's got to carry a slicker, a linen duster, and a fur overcoat wherever he goes," an observation which may be commended to the consideration of all prospective mountaineers hereabouts as coming from a resident who ought to know. *Verb. sap. sat.*

The one bright feature of these dreary days was the shooting of a goat. Again the affair occurred within full view of camp. This time, however, the victim had warning of his danger, but nevertheless failed to make good use of it. The animal got into a reëntrant angle of some steep cliffs from which there was no escape except as he had come and when finally he did start back he was dropped in his tracks. This is the only occasion upon which I have ever seen a goat foiled by steep rocks. It was a difficult business getting the meat down, and in fact, only a little could be brought,

but that little proved to be ambrosia and nectar of a most superior kind. Indeed, without its aid in supplementing our stock of provisions, we must needs have departed without completing the survey work. Even so, it was a pretty close call.

When the seventh came, only one day more could be spared. The sky was heavily overcast but as it did not actually rain I performed, with the aid of the men, the final reading on the glacier stones. In the evening prospects looked desperate for the morrow, and hope was at a low ebb. It would indeed be provocative of teeth-gnashings and other similar manifestations of calamity if we had languished in this forsaken spot during all these dreary days for naught. However, as it turned out, probably owing to some oversight by the "god of the machine," the day dawned fair, and I set out joyously for Palisade station, carrying both transit and camera for the final round of angles. Arriving at the top at 10.30, I immediately commenced work, but before I had finished, up came the clouds once more. Nevertheless, I completed three sets of readings satisfactorily and got down the worst of the climb before trouble began. Fortune was certainly kind that day for exactly at the moment when the deluge descended I found myself near a large glacier-table and under its protecting eaves I weathered the squall.

Next morning we shook the mud of Sandford Camp from our boots for good and merrily started for home. Even before we reached Devil's Club Camp a shower gave us a sprinkling, but the regulation down-pour held off until later, so we were able to attain a moderate degree of dryness at lunch camp. During the latter half of the day, however, the skies wept profusely and our bivouac by the boat that evening was very moist indeed. The marching time amounted to about nine

hours. The storm was unique in our experience. During the whole week the center of disturbance seemed to lie in the Columbia valley, for each day the clouds, under the impulse of an easterly wind, strove manfully to push their way upwards from there, while above six thousand feet on the heights the prevailing air current was from the southwest. According as one or the other wind was victorious, camp was in cloud or under lowering skies. The mist banks from the valley invariably brought rain.

The trip up the river may be disposed of briefly. On the 10th the rain ceased and with the aid of a favorable wind we gained about ten miles, reaching the upper end of Eight Mile Channel. For a long distance by rowing and poling we worked up a narrow tortuous stream, one of the byways of the main river. Occasionally log-jams had to be chopped out and in two cases freshly built beaver dams forced us to portage. Without the aid of the lakelets thus formed (one dam was four feet high), we probably would have been turned back, for the river was at a low stage owing to the cloudy weather on the mountains. The next day, after a night of rain, it cleared off. The last nine miles to Beavermouth proved to be the crux of the trip. The Columbia was very swift and we experienced several narrow escapes from upset in fighting past bad corners. The men labored unremittingly, getting into the water whenever it was shallow enough and sometimes lifting the boat bodily over obstructions. Five hours of such work brought us to Beavermouth where the party separated.

With this expedition the record of our Selkirk campaigns may be brought to a close. Supported only by such necessities as could be carried upon men's shoulders, we have wandered through the main range

from the fastnesses of Battle valley to the remote Mount Austerity; we have fought our ways up most of the important peaks that had already been climbed and have effected the first conquests of more than fifteen others, including the redoubtable Sir Sandford, monarch of all. The veil of primeval obscurity has been torn from this obstinate mountain and its surroundings, the region has been mapped and the chief peaks, glaciers, and streams named. If the work has not always proved easy, the rewards have been out of all proportion and the memory of these days among the Selkirks will be a perpetual refreshment and delight.

APPENDICES

APPENDIX A

THE VEGETATION OF THE SELKIRK MOUNTAINS

By F. K. Butters, F.R.G.S., Assistant Professor of Botany, University of Minnesota

The vegetation of the Selkirk Range appeals to all who visit the region. The heavy forests of the valleys and lower slopes are notable even as seen from the car window, but one must travel through them on foot to appreciate their dense and almost impenetrable luxuriance. The vegetation is everywhere boreal in character. Coniferous forests fill the valleys and extend up the lower mountain-slopes. The connected forests reach an altitude of 5500–6000 feet and above this are alp-lands, often interspersed in their lower portions with small groves and groups of evergreens. In these alpine meadows, on the newer moraines, and on the rocky peaks which jut out from among the snow-fields, is developed the true alpine flora of the region.

Despite the great luxuriance of plant growth in the lower altitudes, the whole number of species in the Selkirk flora is very limited. If we exclude the bounding valleys and consider only the region within the range, the number of recorded Selkirk species is about four hundred, and it appears safe to say that the total number of plant species growing without cultivation within this area is less than five hundred. This is a remarkably limited flora, considering the great diversity of habitat within the territory in question.

Somewhat over forty per cent. of the recorded species are west-American plants not occurring east of the Rocky Mountain region. Of these a little less than three-fourths are of wide-spread distribution through the Rocky Mountains and the territory farther west, ranging in some cases from Alaska to New Mexico and California. Very few Rocky Mountain species reach their western limits in the Selkirk Range, as nearly all which reach thus far occur also in the Gold and Cascade ranges. About one-fourth of the west-American plants of the Selkirks occur in the ranges farther west and reach their eastern limits here, and in the similarly situated mountain ranges of Idaho and Western Montana, or at least in the western edge of the immediately adjacent Rocky Mountains. To this element of the flora should be added a few plants like the western skunk-cabbage,[1] and the little Solomon's-seal, *Kruhsea streptopoides*, which have a similar American range but occur also on the Asiatic side of the Pacific. This far western element of the flora, though comprising only about one-eighth of the whole, contains several of the most characteristic plants of the region, such as the two hemlocks[2] and the cedar[3] among the trees, the white-flowered rhododendron,[4] the creeping raspberry,[5] and the very abundant *Lutkea pectinata*.

About twenty per cent. of the Selkirk plants are North American species which occur more or less widely distributed east of the Rocky Mountains. Many of them grow across the northern part of the continent from ocean to ocean, and reach as far south as Lake Superior and the mountains of New England. Some are of even wider range, while a few like the peculiar maiden-hair,[6] the devil's-

[1] *Lysichiton kamtschatcense.*

[2] *Tsuga heterophylla* and *Ts. mertensiana.*

[3] *Thuja plicata.*

[4] *Rhododendron albiflorum.*

[5] *Rubus pedatus.*

[6] *Adiantum pedatum var. aleuticum;* this fern which grows abundantly on talcose schist in the Selkirks occurs on serpentine and similar rocks in Newfoundland and the Gaspé peninsula.

club,[1] and the yellow-flowered dryas,[2] are very local in their occurrence east of the Rocky Mountains.

About one-third of the Selkirk plants are boreal species occurring in similar districts throughout the Northern Hemisphere. The most remarkable fact noted among this group of plants is the great similarity, amounting often to complete identity, between Selkirk and Scandinavian forms of many of the species. Conditions appear to be so similar in these two regions that when the same species inhabits both it usually occurs in identical form, even though in other places, and under other conditions it may vary considerably.

The similarity of the Selkirk flora to the alpine and subalpine flora of western British Columbia is very marked. As noted in the discussion of the west-American element of the flora, most of the species of this region occur also in the coastal ranges, and very few species from farther east reach their western limits in the Selkirks. As a result the vegetation, say in the vicinity of Glacier, is more like that at similar altitudes in Vancouver Island or on Mount Rainier, than like that at Banff, only one hundred miles farther east. This is due to the great similarity of climatic conditions between the Selkirk Range and the mountains farther west, and also probably to the general similarity of soil conditions in all these ranges, which are in marked contrast to the prevalent calcareous soils of the Rocky Mountains. Thus, many of the plants which are common in the adjacent Rocky Mountains are rare and very local in the Selkirks. Wherever calcareous soils are present, however, as in the ranges about the head of Downie Creek, in the Cougar valley near Glacier, and in much of the region about Mount Sir Sandford, these plants are conspicuously present.[3] In

[1] *Fatsia horrida;* occurs from the Pacific Coast to the western valleys of the Rocky Mountains, and on Isle Royale, Lake Superior.

[2] *Dryas Drummondii;* rare in the Selkirks and local on limestone, abundant in the Rocky Mountains, abundant on calcareous river gravels of the Gaspé peninsula.

[3] See Butters, F. K., "Some Peculiar Cases of Plant Distribution in the Selkirk Mountains, British Columbia," *Minnesota Botanical Studies*, vol. iv., part 3, 1914.

such places occur three species of anemone,[1] the golden-flowered saxifrage,[2] the composite, *Crepis nana*, looking like a very diminutive dandelion, two species of dryas,[3] one with white the other with yellow flowers, dwarf willows[4] about an inch tall, gentians,[5] a host of little mustards,[6] and other plants which are elsewhere very rare in the Selkirk Range.

The vegetation of the low valleys which bound the Selkirks varies considerably with their varying climates. That of the Columbia valley west of the range is essentially like the forests of the Pacific Coast. The comparatively warm winters of this region and its fairly large rainfall produce conditions similar to those west of the Cascade Range, and allow a similar type of vegetation to develop. Though there has been considerable destruction of these forests by logging operations and by fire, there still remain areas of forests with huge Douglas firs and cedars reminding one of the coast districts.

The Columbia valley to the northeast of the Selkirks is much colder, especially in winter, and somewhat dryer. Its winter temperatures are considerably more severe than those which obtain several thousand feet higher, within the range. In this valley there are few of the Pacific Coast plants, many species of the Rocky Mountain region, and a general resemblance to the vegetation of the pine–spruce–fir forests of eastern Canada. Farther south, between the Purcell Range and the Rocky Mountains, the Upper Columbia–Upper Kootenay valley becomes much dryer, and a sage-brush country ensues similar to parts of Montana and Wyoming.

The Beaver valley between the Selkirk Range proper and

[1] *Anemone multifida, A. parviflora,* and *A. Drummondii.*

[2] *Saxifraga aizoides.*

[3] *Dryas octopetala* and *D. Drummondii.*

[4] *Salix nivalis* and *S. arctica.*

[5] *Gentiana amarella var. acuta.*

[6] *Arabis Lyallii, Cardamine bellidifolia, Draba deflexa, D. crassifolia, D. nivalis, etc.*

the north end of the Purcell Range has much the same vegetation as other low valleys penetrating into the mountains.

In general, within the Selkirk Range, the valleys and mountain sides up to about five thousand feet are covered with exceedingly dense coniferous forests, and these extend upward another thousand feet though with somewhat less luxuriance. The common species of trees here are Douglas fir,[1] western hemlock,[2] cedar,[3] Engelmann's spruce,[4] and western white pine.[5] All of these grow to great size. Specimens 120 to 150 feet tall with trunks four or six feet in diameter are not uncommon, and even larger trees occur occasionally.

In ascending the mountains the Douglas fir is the first of these trees to disappear. It requires high summer temperatures and a fairly long growing season. On the western side of the range the excessively heavy snows, lying on the ground until May or June, and the cool rainy summers, limit it to the lowest altitudes. Thus in the Illecillewaet valley it scarcely occurs above Albert Canyon which has an elevation of only 2200 feet. On the east side of the range the lighter snowfall, and warmer, dryer summers are more favorable to this tree and it is abundant up to 4000 feet and occurs on warm slopes at even higher altitudes.

The cedar is common in the lower valleys and reaches large size on warm hillsides up to an elevation of nearly 5000 feet. The white pine is rather scattered, and is seldom seen much above 4000 feet. The western hemlock is one of the most abundant trees below 3500 feet. Above that altitude it is gradually replaced by the alpine hemlock,[6] though

[1] *Pseudotsuga taxifolia.* [2] *Tsuga heterophylla.*
[3] *Thuja plicata.* [4] *Picea Engelmanni.* [5] *Pinus monticola.*
[6] *Tsuga mertensiana* (Bong.) Sarg. = *Ts. pattoniana* (Murray) Sénéclauze, not *Ts. mertensiana* of Carrière and many other authors= *Ts. heterophylla* (Raf.) Sarg. There has been much confusion in the nomenclature of these two hemlocks. As C. S. Sargent pointed out in his *Silva of North America* (vol. xii., p. 75, 1898), there is no doubt that the alpine hemlock is the tree originally collected near Sitka and described by Bongard as *Pinus mertensiana.*

occasional large specimens of the former species occur up nearly to timber-line. The spruce reaches its largest size below 4500 feet but extends upward to the limits of the forests. Above 3000 feet, and thence to tree-line, the subalpine fir[1] is very abundant, and its tall slim spires are everywhere conspicuous. The white-stemmed pine[2] is nowhere a common tree, but occurs on exposed slopes above 4000 feet, often reaching its largest size near timber-line where other species are becoming reduced in size. It seems to be unable to withstand the shade of other trees, and occurs usually on broken slopes, often in places which are somewhat exposed to avalanches which its extreme toughness enables it to resist better than most of the trees of the region.

The only common deciduous tree of the Selkirk forests is the western balsam poplar[3] often called locally "cottonwood," which grows frequently along streams and often reaches large size.

Within the forests, except in the most heavily shaded localities, the undergrowth is very thick, offering many obstacles to the traveller. Where the trees are densest there is usually a ground mat of dwarf dogwood,[4] creeping herbaceous raspberry,[5] and numerous other herbaceous flowering plants[6] and ferns.[7] In places with a little more sunlight, the white-flowered rhododendron[8] is abundant, and in openings in the forest there is usually a thicket-like mixture of young evergreens, rhododendrons, blueberry bushes,[9] currants,[10] and thimbleberry[11] interspersed with ferns and

[1] *Abies lasiocarpa.* [2] *Pinus albicaulis.*

[3] *Populus trichocarpa.* [4] *Cornus canadensis.* [5] *Rubus pedatus.*

[6] The most abundant are the saxifragaceous, *Tiarella unifoliata*, and the beautiful liliaceous, *Clintonia uniflora.* Practically all of the woodland plants have white flowers.

[7] The most abundant are *Phegopteris dryopteris* and *Aspidium spinulosum;* somewhat less common is *Athyrium cyclosorum;* the latter two often grow very large.

[8] *Rhododendron albiflorum.*

[9] *Vaccinium membranaceum* and *V. ovalifolium.*

[10] *Ribes laxiflorum* and *R. lacustre.*

[11] *Rubus parviflorus;* its large white flowers entirely belie its name.

many herbaceous plants. Prominent among the latter are those previously mentioned, together with several species of arnica,[1] valerian[2] with its fragrant white flowers and vile-smelling roots, the stately green hellebore,[3] and several species of saxifrage.[4] In moist openings along streams these thickets usually include elderberries,[5] willow,[6] and alder,[7] with a rank herbaceous growth of cow-parsnip,[8] nettles,[9] and ferns. In such places they are particularly dense and ill-smelling, and are often nearly impassable. On moist slopes and in ravines, even where the shade is dense, the devil's-club[10] adds its spine-encrusted stems and beautiful, but profanity-inducing foliage, to the general mixture.

The only extensive areas below 6000 feet which are not covered with forests are swampy meadows along streams, slopes which are frequently avalanche-swept, areas which have been deforested by fire, glacier tongues, new moraines, and the bare rocky ground recently uncovered by retreating glaciers.

Meadows occur only in a few of the wider valleys. On account of the generally steep drainage of Selkirk valleys they are not frequent within the higher parts of the range. Where they do occur, they appear often to owe their origin to the work of beavers, which, by damming the streams, have caused repeated overflows and so have prevented the forest from occupying the bottom lands. They are generally wet to the point of swampiness, and are occupied chiefly with grasses and sedges often interspersed with bushes of willow and dogwood[11] and with groves of balsam poplar.

Avalanche-swept slopes are kept free from forest trees,

[1] *Arnica Macounii*, *A. latifolia*, *A. subplumosa*, and *A. Chamissonis;* the last three are also common in alpine situations.

[2] *Valeriana sitchensis.* [3] *Veratrum viride.*

[4] *Saxifraga nootkana*, common at all altitudes above 3000 feet, and varying greatly; *S. Lyallii* in moist ground; *S. mertensiana*, and *S. punctata*, somewhat rare.

[5] *Sambucus racemosa* and *S. melanocarpa.*

[6] *Salix sitchensis.* [7] *Alnus sitchensis.*

[8] *Heracleum lanatum.* [9] *Urtica Lyallii.*

[10] *Fatsia horrida.* [11] *Cornus stolonifera.*

but wherever enough soil is left they develop the dense "alder-slides" which add so much to the difficulty of travelling in the Selkirks. The alders,[1] growing to almost tree-like size, are borne down by the repeated snowslides, and by the weight of the winter snow, until their trunks and larger branches extend down the slope and almost parallel to it, while the younger branches turn up, and are often ten feet or more from the ground. In the midst of the alders is often a rank growth of ferns and herbaceous plants. Walking through such a thicket is a treadmill-like process which resembles nothing so much as mounting an interminable and exasperatingly elastic ladder.

On account of the prevailingly wet climate, burned areas are not common in the central part of the Selkirk Range—are, indeed, very rare, except along the railway. They first grow up to an herbaceous covering consisting largely of fire-weed,[2] everlasting,[3] white-flowered hawk-weed,[4] bracken,[5] willows, and various grasses and sedges, conspicuous among which are the tassels of *Carex Mertensii*. In one or two seasons birds and other animals bring in various shrubs with fleshy fruits, the two common blueberries, the red raspberry,[6] the white-flowered raspberry or thimbleberry,[7] the two elders, two species of mountain ash,[8] currants, etc. These soon develop into thickets, which in late summer are favorite haunts of black bears. Among these thickets young trees start, largely of the species which previously occupied the ground, though birches and the balsam poplar are often somewhat abundant. Aspen[9] is rare in the central parts of the range, and in these central parts a fire seems never to be followed by a temporary deciduous forest of birch and aspen as often happens in eastern Canada. The lodge-pole pine,[10] which so frequently occupies burned areas in the

[1] *Alnus sitchensis.*
[2] *Epilobium angustifolium.*
[3] *Anaphalis margaritacea.*
[4] *Hieraceum albiflorum.*
[5] *Pteridium aquilinum var. lanuginosum.*
[6] *Rubus strigosus.*
[7] *Rubus parviflorus.*
[8] *Sorbus occidentalis* and *S. sitchensis.*
[9] *Populus tremuloides.*
[10] *Pinus contorta var. Murrayana.*

Rocky Mountains, occurs to a limited extent in some of the dryer eastern valleys of the Selkirks, but is entirely absent from the interior of the range.

Burned areas return to the original forest condition more or less rapidly according to the extent of the area affected, and the thoroughness of the destruction,—especially whether the humus of the forest floor is entirely destroyed or not. So thoroughly, however, are the seeds of the coniferous trees distributed throughout this region, that it is very unusual to find a burned district of moderately long standing in which coniferous seedlings are not abundant.

Glacier tongues are, of course, entirely without vegetation, and the same is true of the newest and most unstable moraines. Somewhat older moraines and the bare ground newly uncovered by retreating glaciers have a rather sparse herbaceous vegetation consisting in most cases of *Epilobium latifolium*, monkey-flowers both red and yellow,[1] saxifrage,[2] everlasting, etc. Among these plants small alders spring up, and there is usually a belt of alder thicket which develops about twenty years after the ice leaves a given point and reaches full size some twenty or thirty years later. These alder thickets resemble those previously described, except that the bushes are more erect. Whether the alders will occupy such an area permanently, or whether they will be replaced eventually by conifers, depends largely upon local snow conditions, especially the frequency and extent of snowslides from the adjacent ice. In any case the growth of conifers is slow in such a position owing to the cold wind which usually blows from the ice throughout the summer. In almost all instances the areas uncovered during the past three centuries,—*i. e.*, since the maximum development of the glaciers in modern times—have a vegetation easily distinguished from that of the older forests.

The truly alpine vegetation of the Selkirks begins at timber-line. Continuous forest usually ceases at about 5500 feet in the valleys, and about 6000 feet on the mountain-

[1] *Mimulus Lewisii* and *M. Langsdorfii*.

[2] The commonest is *Saxifraga nootkana*.

sides. As the late C. H. Shaw so well pointed out,[1] this, the true timber-line of the region, is conditioned largely by the depth of snow, and the time when it disappears in the spring. Above this timber-line there ensues a park-like region with groves and groups of trees upon ridges and exposed points where the snow does not accumulate, while flat surfaces and hollows are devoid of trees. The actual limit of tree growth is upon wind-swept ridges at 7500 to 8000 feet.

The open spaces above timber-line are the alpine gardens of the mountains. Fields of rhododendron and heather[2] often border the groves. In places where the snow lies longer are great mats of the alpine spiræa[3] and meadows of sedge dotted with aster-like purple daisies,[4] yellow buttercups,[5] red and yellow columbines mingled with other pale yellow ones[6] and various intermediate forms, paint-brushes[7] of various shades of red and even pale yellow, frail pink-white spring beauties,[8] the golden avalanche lily.[9] These and many other flowers make the alpine meadows brilliant through July and the first part of August. Where the snow lies in normal years until the middle of July there is usually a mat of sedge[10] with few other plants intermingled. A week or two later the melting snows disclose only moss, while ground which is snow covered until mid-August is barren of all vegetation. Even with the alpine meadows vegeta-

[1] Shaw, C. H., "The Causes of Timber-line on Mountains; the Rôle of Snow," *Plant World*, xii., pp. 169–181, 1909.

[2] *Cassiope mertensiana*, *Phyllodoce empetriformis*, *P. glanduliflora*, and *P. intermedia; Cassiope tetragona* occurs but is very rare.

[3] *Lutkea pectinata.*

[4] *Erigeron salsuginosus.*

[5] *Ranunculus Eschscholtzii.*

[6] *Aquilegia formosa* and *A. flavescens;* these two forms completely intergrade in this region.

[7] *Castilleja lanceifolia*, *C. purpurascens*, *C. rhexifolia*, and *C. pallida.*

[8] *Claytonia lanceolata.*

[9] *Erythronium grandiflorum;* this plant occurs in open ground at all altitudes, blooming as soon as the snow melts. It is often seen pushing up through several inches of hard icy avalanche snow, whence its common name.

[10] *Carex nigricans.*

tion does not cease. Steep slopes and cliffs cannot hold much snow, and in such situations there are many tiny plants in the crevices of the rocks, and wherever a little soil can accumulate. Besides mosses and lichens there are numerous small flowering plants, some growing even to an elevation of 10,000 feet. There are small grasses,[1] sedges,[2] and rushes,[3] many saxifrages,[4] the curious little romanzoffia,[5] daisy plants an inch or two high,[6] a little hare-bell scarcely an inch high and bearing a single flower larger than all the rest of the plant,[7] veronicas with blue or sometimes white or pink flowers,[8] the shrubby pentstemon[9] with its large lilac-colored flowers, and many others.

[1] The commonest in such situations are *Poa alpina*, *Trisetum spicatum*, and a variety of *Agrostis canina;* the highest altitude recorded for a true grass in the Selkirks is 8500 feet, the species, the rare *Hierochloe alpina*.

[2] *Carex nigricans*, *C. spectabilis*, *C. Preslii*, etc.

[3] *Luzula spicata*, *L. parviflora*, and *Juncus Parryi*.

[4] *Saxifraga rivularis*, *S. adscendens*, *S. cæspitosa*, *S. cernua*, and dwarf specimens of *S. nootkana* are the commonest. Much more local but very abundant under certain soil conditions are *S. oppositifolia*, and *S. bronchialis*. In the Selkirks *S. adscendens* probably reaches higher altitudes than any other vascular plant, having been collected on Mount Selwyn at an elevation of 10,900 feet.

[5] *Romanzoffia sitchensis*, a member of the *Hydrophyllaceæ*, having much the aspect of *Saxifrage rivularis*.

[6] *Erigeron uniflorus*, *E. acris var. debilis*, and *E. aureus*.

[7] *Campanula lasiocarpa*.

[8] *Veronica alpina*, and its variety *Wormskjoldii*.

[9] *Pentstemon fruticosus*.

APPENDIX B

TOPOGRAPHICAL SURVEYS NEAR MOUNT SIR SANDFORD

THE writer commenced topographical work in this region in 1909. The instruments, however, comprised only a prismatic compass and clinometer, a hypsometer, and an aneroid barometer. No base-line was measured, fixed points of the government survey being utilized instead. By making free use of a goodly number of photographs taken from readily identifiable stations, it was found possible to construct a reconnaissance map[1] of the drainage basin of the west branch of Gold River. This was published in the *Geographical Journal*, London, vol. xxxvii., p. 170; (See also p. 319). Opportunity was lacking for carrying out any very precise observations, no attempt being made to obtain the elevations of peaks not actually visited.

In 1910, however, it was planned to lay out a base on the even surface of Sir Sandford glacier and to make observations for altitude as well as for position. By means of a thousand-foot length of piano wire, a line one-third of a mile long was established, and angles were carefully read from each extremity to the surrounding peaks with a prismatic compass and clinometer supported upon an aluminium tripod. Some of these peaks were later occupied as stations and a system of triangulation was adopted. Among them were Sir Sandford arête, Mount Guardsman, the ridge above Palmer glaciers, Alpina Dome, Silvertip Pass, Azimuth Peak, and Pioneer Peak of The Gothics. In each case, except the last, a photographic panorama was secured by substituting the camera for the compass on the tripod, both

[1] The discrepancies in names between this map and the maps in the present volume are to be resolved in favor of the latter. The names now used have been sanctioned by the Geographic Board of Canada.

being carefully leveled. The photographs were to supply intermediate detail. In addition numerous barometric readings were made. When the data came to be worked up, however, it was found that the separate sets of angles did not harmonize satisfactorily, the compass varying as much as two degrees in the instances where two rounds were made from the same point. At about this time, it developed that another expedition could be undertaken, so in the end no effort was made to adjust the discrepancies or to construct a map. The altimetric data are embraced in Appendix G.

1911

This season we prepared for a longer stay at Sandford Camp. Opportunity thus being afforded for scientific work of wider scope, a good deal of attention was devoted to procuring suitable equipment. The final list included a light transit, a pocket barograph, three aneroid barometers, a black-bulb solar thermometer, two ordinary thermometers, and a minimum thermometer. The paramount considerations governing their selection were lightness and compactness, owing to the distance which everything had to be transported on human shoulders over the roughest kind of going.

The general plan contemplated a local instrumental triangulation (founded on a measured base) connecting outlying summit stations from which photographic panoramas would enable still more distant peaks to be laid down. Intervening details would be plotted from the photographs. Altitudes, however, were to be restricted to the points fixed in the local triangulation except when ascertained by barometer. Work of refined accuracy was not to be attempted, but it was hoped that by taking the greatest care and by repeating observations a number of times to secure results of substantial scientific value.

The transit or, more accurately, builder's level, had horizontal and vertical circles, $3\frac{5}{8}$ and $1\frac{9}{16}$ inches in diameter, respectively. The former was calibrated by degrees to 360°, but the latter read only to 70°. Each was fitted

with a vernier reading directly to 5′ and by estimation to 2′ 30″. In rigid adjustment with the cross-hairs of the telescope was attached a very sensitive 3½ inch spirit level. The telescope was ten inches long and had a magnification of nine diameters. A light but perfectly rigid camera tripod was adapted for use as a support. The whole, packed for transportation in its case, weighed only 7½ pounds. The instrument proved satisfactory in use and gave excellent results within the limits of accuracy of reconnaissance work.

The barograph was of French make, the dimensions of the carrying case being 6 x 4 x 1¾ inches, and the weight one pound. The pen made contact with the paper strip every two minutes, one revolution consuming twenty-four hours. A nearly complete series of records was obtained at Sandford Camp during the period of our stay. The time and amount of change in atmospheric pressure occurring during our absence on the peaks were thus ascertained, enabling a proper correction to be applied to the aneroid readings then secured. This instrument also gave satisfactory service.

On June 19th at the upper camp, we commenced the work of establishing a base-line. There was no level ground to be had so we were forced to content ourselves with a 270.04-foot line at a slope of 8° 12′ 30″. Choosing an immense limestone bowlder embedded in the crest of the lateral moraine not far away as a suitable mark for one end, the line was measured thence along the moraine by a surveyor's 100-ft. tape, in sections, to another selected point where a signal was erected. The entire operation was performed three times with painstaking care, the average value (270.04 ft., range .67 ft.) being adopted. Later the stretch of the tape was obtained by comparison with a standard at approximately the same tension. The corrected length of the measured hypotenuse resulting was 272.66 feet. At the above angle this gave a true horizontal length of 269.865 feet. Adding the extension to the top of the bowlder where the actual station point was located, we got 276.062 feet. This we called the "measured base."

Our next aim was to extend this distance by subsidiary triangles to a length suitable for topographical work. The operation was carried out as shown on the accompanying diagram. A quadrilateral, A, C, B, D, as well-proportioned as conditions allowed, was selected, and three readings of each of the eight interior angles included between the diagonals were performed. Professor Butters very kindly assisted me in this work in order to obviate the possibility

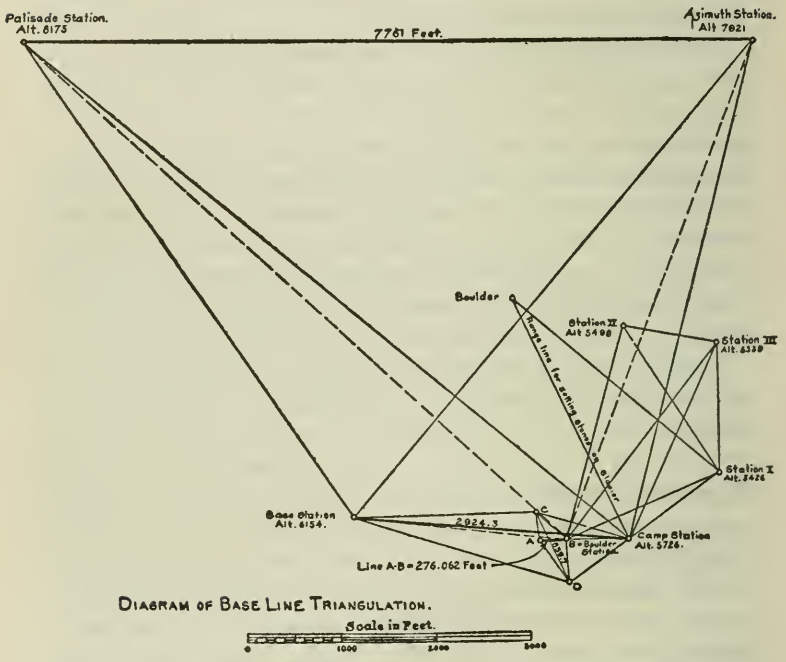


DIAGRAM OF BASE LINE TRIANGULATION.

of misreading the vernier. The means were adopted, the triangles adjusted, and the length of the diagonal transverse to the measured base was obtained. The result was 839.7 feet, the range being 5.13 feet. With this value the larger quadrilateral (Base, C, Camp, D) was solved in the same way, with three readings of each angle and mutual adjustments. The "extended base" from Camp station figured at 2924.3 feet with a range of 6.9 feet. As a check, these com-

putations were worked out by Professor Butters and myself independently. Cotton signal-targets were erected at the extremities of the line, one on the crest of the moraine at camp, the other on a ledge near a waterfall where the true right edge of the glacier first comes into view as seen from Camp station. At the latter, the station-point was marked on a small gray limestone bowlder by a dot and circle in green paint.

Palisade and Azimuth stations had been picked out in previous years as well-placed points for commanding Sir Sandford and the Adamant Range, so cairns, 4 to 5 feet high, having been erected upon them, and observations with the instrument having been made therefrom to the ends of the "extended base," this larger quadrilateral was solved in exactly the manner already described. The result came out at 7761 feet; the range being 43 feet. This value, so far as the primary triangulation is concerned, may be considered as the base.

As a check upon this determination of the distance, 7761 feet, between Palisade and Azimuth stations, a second computation was performed, using the distance between Bowlder and Base stations, 2261 feet, instead of that between Base and Camp stations, 2924.3 feet. Another quadrilateral, indicated by the broken lines, was thus utilized. The result obtained was 7767 feet, with a range of 45 feet. The discrepancy, therefore, was only $\frac{1}{1294}$th part of the whole distance, a substantial agreement.

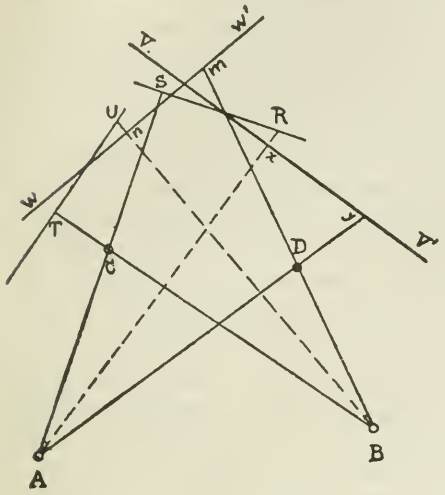
From Azimuth and Palisade stations, and others, the instrumental survey was completed as planned. But since the final altitudes are based upon observations made the following year, no further description of the local work need be attempted at this point. The peaks visited from which photographic panoramas were secured may, however, be mentioned: Palisade, Azimuth, Belvedere, Sandford ridge south, Citadel, Goldstream, and Triangle. These panoramas, together with others from Cornice, Taurus station, Stockmer, and Adamant glacier, obtained in 1909, and those of 1910, listed above, afforded ample orographical

data, embracing in all a hundred separate views. By their means it was found possible to fully realize the original aim of extending the mapped territory over a wide area, and in connection with views obtained later from summits at the headwaters of the north fork of the Illecillewaet, peaks were identified and located over approximately six hundred square miles. In addition, the drainage system of the Northern Selkirks was unraveled and the principal passes connecting the sources of the chief rivers were placed for the first time. The results appear on the map opposite page 302. Naturally, minute accuracy was out of the question with such methods of work, but the points checked well with each other on the whole and the results cannot be far from the truth.

A brief résumé of the method employed in plotting positions of points from photographs may be of interest. It is that given in *The Principles and Practice of Surveying*, by Breed and Hosmer (1908), Vol. II., p. 236, ff. The principle shortly stated, is that the horizontal angle between two points which appear in a photograph, or in several photographs from the same station that overlap to form a continuous panorama, may be determined directly from the prints by geometrical construction, providing the focal distance of the lens which produced them be known and the views were taken with the plate or film in a vertical position. The prints must not be trimmed, for it is necessary to carefully determine the center line, which represents the incidence of the rays of light that passed through the vertical diameter of the lens and so the direction of that view. This line is known as the "principal line"; and may be obtained by bisecting top and bottom. Likewise, angles of elevation or depression above or below the plane of the camera may be found by bisecting each side and drawing in the "horizon line."

The *sine qua non* of the method is that the point to be plotted on the map together with one other point thereon (unless proper orientation be otherwise obtained) appear in at least two views from stations already located on the

drawing. These conditions being fulfilled, the following diagram illustrates the procedure for fixing a new point.



A and B are the camera stations; C is the known point, identifiable in each view; D is the point to be located on the map by means of photographs from A and B. Draw a line through C from A equivalent to the focal distance of the lens in inches. Let A S be a line of this length. At S erect a perpendicular and on it lay off S R, the distance being that of the image of C from the principal line in the photograph from Station A. Connect R with A. Lay off the focal distance from A on this line and erect a perpendicular V V'. This is the picture trace of the photograph. On V V' lay off x y equivalent to the distance which the image of point D lies from the principal line of the print, as scaled thereon. Connect y and A. This is the direction of D from A. Now draw a line B T from B through C equivalent in length to the focal distance. As before erect a perpendicular and lay off on it T U, the distance to point C from the principal line of the photograph taken from station B. Draw the line U B and erect another perpendicular W W' on it at the focal distance from B as before. This is the picture trace of the photograph from B. Lay off the distance n m on the perpendicular, being the horizontal distance of the image of point D from the principal line in the photograph from B. Connect m with B. The intersection of this line with A y is the position of point D on the plan.

The separate photographs of a panorama from a station are connected by this same method of construction (see Breed and Hosmer already cited, page 236).[1]

When it is considered that this geometrical construction must be performed at each station in the survey, and that every point must have two or more lines drawn to locate it, the great labor of the method (in the absence of special semi-automatic instruments) becomes apparent. Moreover, innumerable construction lines complicate and confuse the drawing. To obviate the latter, I adopted the expedient of employing a large square of stiff cardboard for laying off the angles at each station and transferred them thence to the map by protractor. In plotting the lithographed map, no less than 400 to 500 points (800 to 1000 rays) were thus located, 100 photographs being used. Each photograph was carefully bisected at top and bottom and the principal line thus found was scratched upon its glossy surface. The single views subtended an effective angle of about thirty-six degrees, the focus of the lens (Goerz Dagor, Series III., No. 1a.) being 6½ inches. Thus ten exposures were necessary for a complete panorama. Seventeen photographic stations were occupied for the triangulation, excluding three utilized in the map of the tongue of Sir Sandford glacier and single views.

One of the limitations to the general application of the method of photographic surveying lies in the identification of the same point in different photographs. In a bare, gently undulating country, its use might prove entirely impracticable for this reason. To a mountainous region like the Selkirks, however, it is particularly well adapted, and by the curious forms and outlines which the snow assumes, one may frequently identify points in photographs at a great distance. In addition, the mountains are mostly sharp and precipitous at the summits, so that they need not be visited by the surveyor in order to erect dis-

[1] For a full discussion of the subject the reader may be referred to such standard works as *Phototopographic Methods and Instruments* by J. A. Flemer and *Photographic Surveying* by E. Deville.

tinguishing cairns. With a considerable number of photographs, three or even four rays may often be picked out to points as much as fifteen or twenty miles away, confirmation being thus obtained for locations that were overlooked or deemed unnecessary when nearer stations were occupied. If the views are enlarged, they may be employed for still greater refinement of detail. On the present map, intersections of at least three rays were obtained for the controlling points and in several cases (Holway, Sorcerer, and Iconoclast) the mean of four or more was adopted.

With regard to the drafting of the map generally, a few remarks may perhaps be in order. From our high stations, it was of course impossible to see much of the bottoms of the trunk valleys. On the other hand, crests and ridges were especially well revealed. In locating the courses of the streams, therefore, the ridges were first set down and then the streams were drawn in midway between. In the same way some of the more distant glaciers, or those appearing in only one view, were delineated, *i. e.*, the bounding ridges were established and then the outlines of the ice were sketched in. This method was followed on the south side of the Sir Sandford Range, none of the regular stations commanding the recesses occupied by glaciers. I am indebted to photographs kindly supplied by Messrs. P. A. Carson and S. H. Baker for topography here, and on the southeasterly face of the Sonata group. In the case of the Argentine group, however, the larger glaciers were plotted.

1912

Obviously, the crux of the local work about Sir Sandford is the elevation of this mountain, which serves as the datum plane. Since the government survey of 1902, two other determinations of its altitude have been made. The map of P. A. Carson, D.L.S. issued in 1907 designates it as 11,600 feet while M. P. Bridgland, D.L.S. has since measured it at 11,553 feet. During the summers of 1910 and 1911, the Canadian Pacific Railway surveyed a location between Beavermouth and Revelstoke

through the Columbia valley, and having received by its courtesy sufficient information to find the stakes at the outlet of Gold River, I naturally welcomed the opportunity of the trip of 1912 to obtain a value of my own for the altitude of Sir Sandford. At this place the right of way follows a level straight line and I was able to select a portion 3700 feet long from which Sir Sandford, Mount Palmer, and other summits were visible. Although the triangles were not of the best shapes, the results have seemed worth including in an average value. A stake divided the line into lengths of 900 and 2800 feet, and the two large triangles thus indicated were employed. Three rounds of angles were read at the three stations, a fresh setting of the instrument being made for each round. I have, however, discarded the results of the large triangle (3700-foot base) owing to an element of uncertainty arising from working on soggy ground. The mean result on Sir Sandford from the 2800-foot base follows:

Difference of elevation (range 31 ft.)	9151
Curvature and refraction ($\frac{6.7}{12}$ x 10.7 miles^2)	64
Elevation of railroad location	2378
Instrument above reference plane	3
	11,596 ft.

Average of Prior Determinations

Wheeler,	11,634
Carson,	11,600
Bridgland,	11,553
	11,596 ft.

Final average for Sir Sandford (mean of the four values), 11,596 ft.

Since all these determinations were entirely independent, the vertical angles being carried through separate triangulation systems and observed from distances ranging from 27 to less than 10 miles, it is probably permissible to give them equal weights in the computation. Instead of 11,596 feet, however, I have adopted 11,590 feet in order to be on the safe side.

PANORAMA ACROSS THE ADAMANT RANGE FROM MOUNT STOCKMER

Blackfriars Austerity Adamant The Gothics

VIEW SOUTHWEST FROM ARÊTE STATION SHOWING NÉVÉS AND GLACIERS. GOLDSTREAM MOUNTAIN IN CENTRAL DISTANCE, EIGHT MILES OFF

THE ADAMANT RANGE FROM SAME

With regard to Mount Palmer, my result from this base (2800 feet) was 9856 feet. The peak had been measured by the railroad surveyors at 9821 feet. Carson designates it 9870 feet. The average value of these is 9849 feet. From my inland triangulation the figure is 9876 feet. Averaging the latter values, the outcome is 9860 feet in round numbers and this I have adopted as probably nearest the truth.

The work from the headquarters at Sandford Camp this season was confined to additional readings from Palisade and Azimuth stations and from two auxiliary stations on the slopes of Mount Guardsman, the object being to secure at least three rays to all the pinnacles of the granite range. The triangles being well conditioned in this local triangulation, it was felt that the positions and altitudes of the peaks in relation to Mount Sir Sandford would be determined with some degree of accuracy. The principal results appear in the following table:

ELEVATIONS IN THE ADAMANT RANGE

PEAKS	Rays for Position	Rays for Elevation	Ranges, Feet	Elevations, Feet
Adamant	3	4	33	10,980
Adamant, E. Pk.	3	4	48	10,970
Austerity	2	3	33	10,960
Turret Peak	2	3	19	10,910
Gothics (Pioneer Pk.)	2	3	19	10,660
Gothics, E. Pk.	3	4	22	10,610
Blackfriars, E. Pk.	3	4	15	10,580
Blackfriars, W. Pk.	3	4	15	10,490
Spire between Gothics and Adamant	3	3	15	10,407
Pinnacle E. of Gothics	3	3	16	10,250
Belvedere Station	3	4	49	9,834

The auxiliary stations were occupied in order to avoid peaks that concealed others from Palisade or Azimuth. The closed triangles resulting between the auxiliary stations and Palisade and Azimuth solved satisfactorily, although a constant error developed in the azimuths from Auxiliary I. which led to their rejection. Auxiliary II. served every

purpose, being better placed and commanding the same points. The only loss, therefore, was an additional check upon positions. The vertical angles from Auxiliary I. combined with distances scaled from the plotted map afforded values that were included in the final averages. The results are given to single feet in certain cases not because they are considered to possess such a degree of accuracy, but in order to preserve the relative values between elevations nearly the same. Owing to mutual adjustment and to various local factors not of general application (such as correction for curvature and refraction applied to the sights from the Columbia valley but not considered sufficiently important to take into account in the short distances of the local triangulation beneath Sir Sandford) it is difficult to advance a definite estimate of the accuracy to be attributed to the elevations as quoted. It is felt, however, that they are certainly within one hundred feet, and probably within fifty feet, of the truth. If the greatest variants from the averages be excluded, the ranges of values are diminished about one-half.

The painstaking care employed throughout the survey work and computations was not without its reward. Several satisfactory checks occurred which it seems worth while to give as evidence of their trustworthiness.

From the base in the Columbia valley, four points visible from the Palisade–Azimuth line were located, viz.: Sir Sandford, the snow dome on its ridge to the east, Palmer, and the end of the shoulder running northerly from Sentry Mountain. These were plotted upon a scale of one-half mile to an inch. The same points were plotted at the same scale on another sheet as observed from the Palisade-Azimuth line. When the two sheets were superimposed, these points corresponded exactly, except for the shoulder, which from Palisade and Azimuth fell about one-eighth mile south of the position assigned to it from the Columbia valley line, but half-way between the rays, from the extremities of that line, produced. The rounding contour of the shoulder and the absence of a definite point to sight on, may well account

for this slight discrepancy. The outcome of these observations was particularly satisfying, for the Columbia baseline having been measured by an independent traverse and that by an official topographical party, there could be no serious error in my own work. Moreover, I was thus able to tie the Sir Sandford triangulation to known territory.

Another check of interest exists in the plotted positions of Sorcerer, Holway, and Iconoclast. Here any errors in the primary triangulation would be distinctly manifest, for these points are near the extremity of the mapped territory and are fixed by rays from photographs without instrumental control. The distance is between fifteen and twenty miles from the base. As already stated, the positions adopted were means of four or more rays and they checked almost exactly with the same as fixed by Mr. Bridgland in the "railway belt" triangulation. The maximum variation was about .2 of a mile.

With regard to the precision attainable in this phase of photographic surveying, the following statement, quoted from a paper "Photography in Winter and Summer in the Alps,"[1] by Captain W. Abney, may, perhaps, be taken as authoritative: "If you know all about your lens you can, from a small photograph, plot your angles with far greater accuracy than you can take them by a prismatic compass, supposing the camera to be held very nearly, even, if not quite, level; and if the objects be in absolute focus, it will compete well with a theodolite."

The names appearing upon the maps of the Northern Selkirks and of the vicinity of Sir Sandford, herein, (excepting bare triangulation stations) have been approved by the Geographic Board of Canada.

[1] *Alpine Journal*, vol. xvi., May, 1893, p. 372. See also "Stereo-Photo Surveying," by F. V. Thompson, *Geographical Journal*, vol. xxxi., May, 1908, pp. 534–551, with maps and illustrations, and "Stereoscopic Photography Applied to Reconnaissances and Rapid Surveys," by the same author, *R. Engineers' Journal*, vol. viii., 1908, pp. 217–230, with diagrams and illustrations.

APPENDIX C

MEASUREMENTS OF THE SIR SANDFORD GLACIER

"CONSIDERING, then, the glaciers as the outlets of the vast reservoirs of snow of the higher Alps—as icy streams moving downwards and continually supplying their own waste in the lower valleys . . . it is a question of the highest interest to explain the cause of this movement of the ice. The inquiry may not result in any immediately useful application, but its interest is the same as that which belongs to the theories of physical astronomy, or to the cause of any other natural effect which commends itself to our attention by its grandeur, its regularity, and its resistless power."—Principal FORBES, 1842.

The Results of the General Survey

THE importance of this splendid ice stream among the glaciers of the Selkirk Range was recognized upon first visiting the region in 1909, and thereafter its exploration and measurement formed one of our chief objects. From the instrumental surveys and photographic panoramas made in 1911 and 1912, the accompanying outline map has been prepared. Being entirely enclosed by the principal points of the survey, it is thought to be a substantially correct representation of the glacier.

The total area of ice and névé in the system, including the hanging glaciers of Sir Sandford, is approximately ten and one-half square miles. Of this all but about two square miles is embraced within the névé or reservoirs. The total

[1] In this Appendix has been incorporated the writer's paper "Observations on the Sir Sandford Glacier, 1911" which was published in *The Geographical Journal*, London, Vol. xxxix, p. 446 (May 1912) with the map at page 378, and six illustrations.

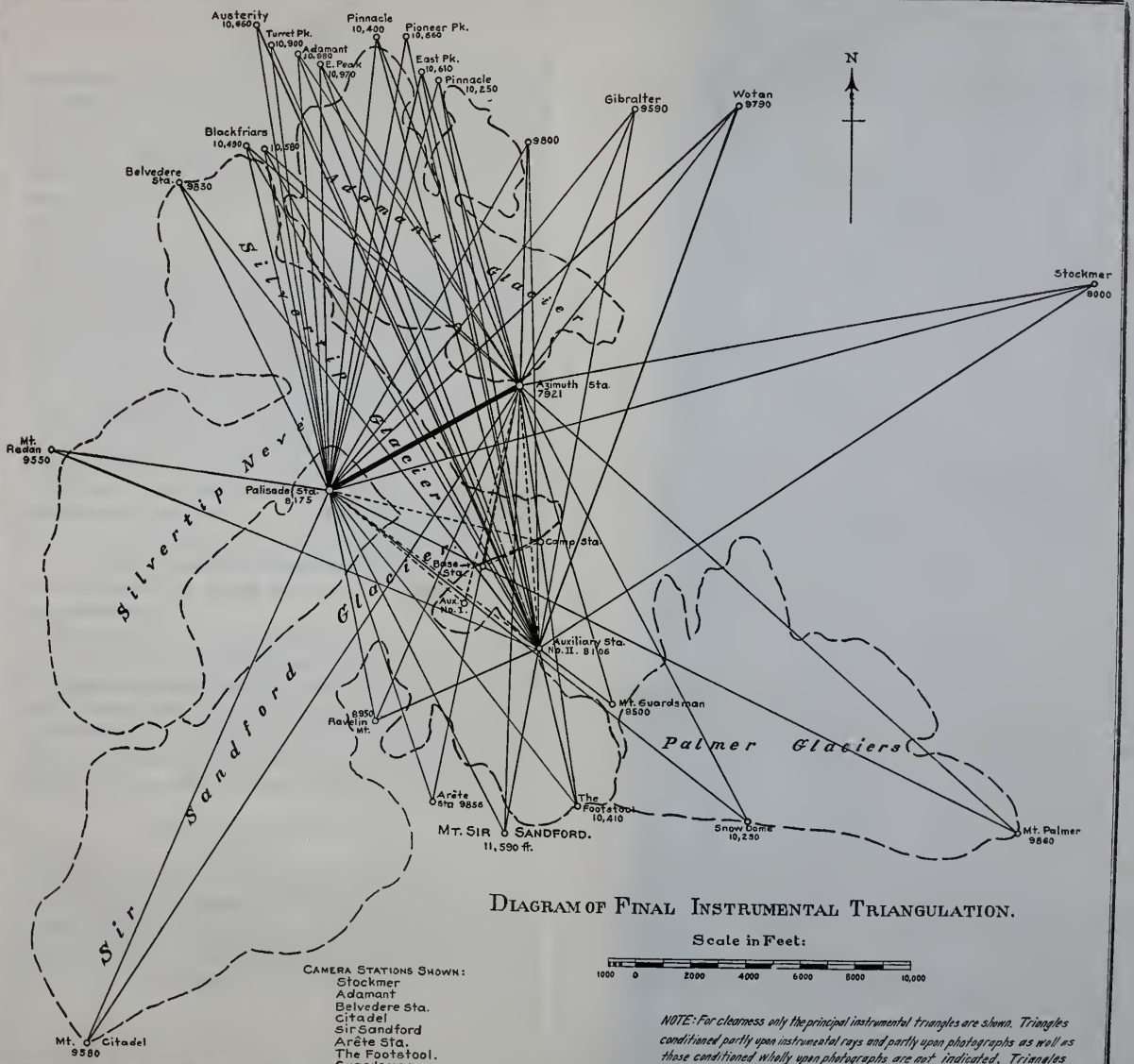


Diagram of Final Instrumental Triangulation.

Scale in Feet:

1000 0 2000 4000 6000 8000 10,000

Camera Stations Shown:
Stockmer
Adamant
Belvedere Sta.
Citadel
Sir Sandford
Arête Sta.
The Footstool.
Guardsman

NOTE: For clearness only the principal instrumental triangles are shown. Triangles conditioned partly upon instrumental rays and partly upon photographs as well as those conditioned wholly upon photographs are not indicated. Triangles drawn with a broken line designate the subsidiary triangulation.

length measured along the median lines of the main streams is twelve and one-half miles, not taking the slopes into account and not including anything beyond the water-parting of the basin. This distance is divided as follows: trunk, five miles; east branch, one and three-quarter miles; Silvertip glacier, three miles; Silvertip névé, two and three-quarter miles.

Trunk Stream. The average slope from Sir Sandford Pass (8150 feet) to the toe (5240 feet) is 582 feet per mile. The steepest descent occurs in the ice-fall beside the Ravelin where the drop is about 700 feet in a distance of one-quarter mile. The névé-line is to be found near the top of the ice-fall at an elevation of approximately 7350 feet. The area of névé in this basin is three and three-quarters square miles. The largest dimensions are: width, one and one-half miles; length, three miles.

East Branch. Except for about one-quarter mile, this is all above the névé-line. The average slope is steep, amounting to 2000 feet per mile from the base of the Footstool (ca. 10,000 feet) to the junction with the trunk (6550 ft.). Its area, counting the upper ice-field of Sir Sandford whence some of its supply is derived, is about one and a half square miles.

Silvertip Glacier. Area, one and three-quarters square miles, of which about one square mile is névé. Average slope, approximately, 780 feet per mile. At the junction with Silvertip névé an ice-fall about 750 feet high occurs.

Silvertip Névé. Area, two and a half square miles, all névé. Average slope 325 feet per mile. There is a fall of about 500 feet at the union with Silvertip glacier.

The Survey of the Forefoot

For the purpose of delimiting the forefoot of the glacier as well as for fixing points from which its future advance or retreat might be determined, the local triangulation was extended thither. Three stations were selected and panoramas exposed from each. No. I. is the largest of a group

of gray limestone bowlders (diam. 15 feet) perched on the inward slope of the east lateral moraine 300 feet below

(NOTE: *The surveyed altitudes on this map have been modified slightly by later work; see "Diagram of Base-Line Triangulation," page 366 ante. The three heights on Silvertip glacier should be diminished by 14 feet.*)

Camp station almost on the route of approach. The altitude is 5726 feet. The bowlder is marked in green paint [P] on this side and with large vertical arrows towards the

glacier. No. II. is on a small jutting ledge across the valley and rather hard to reach. It is almost directly over the lower end of the prominent feldspar vein at the bottom of the slope as seen from No. I. The altitude is 5498 feet. No guide marks could be made here, so a pole with a white cotton flag was erected over the station point, painted in green. No. III. lies on the same side of the valley behind the small canyon and lateral moraine as seen from No. I. It is on an exposure of *roche moutonné* and commands both No. I. and No. II. A cotton signal had to be established here as it was not possible to indicate the station sufficiently well by paint. The altitude is 5339 feet.

From these stations (located and, except No. II., occupied by transit) the points defining the margin of the ice and other prominent features were determined by intersections from the panoramas. Lateral moraines and the courses of small streams were paced. The map presented herewith embodies the results.

The forefoot is rather smaller and less prominent than the number of arms and the area of névé in the reservoirs would lead one to expect. The final slope in 1909 was gentle, sweeping down smoothly for several hundred feet, unbroken by crevasses, to a thin irregular lip. As the ice has retreated, however, the slope has steepened, the angle in 1911 being 25°. The final slant has also developed a few crevasses. (See 1912 view.) In 1909 and 1910 the main drainage emerged from the ice in the vicinity of Station No. II., falling through a cleft in the cliffs with a curious upward spout. The stream then made its way in a braid of channels across the frontal moraine and dashed into a narrow canyon. By the summer of 1911, however, it had abandoned this lateral exit to issue in full volume from the base of the extreme forefoot. It may be inferred that a sub-glacial change of considerable moment was the cause, for the stream had occupied its former bed sufficiently long to erode pronounced niches in the brink of the gorge. The stream is about forty feet wide at its source and is heavily charged with rock flour. About a quarter of a mile lower

down, a second narrower canyon occurs, whose walls rise sheer for fully a hundred feet. There are several tepid mineral springs strongly tinged with iron on the hillside not far below Station No. I. towards the north. The ground morai-e between Station No. III. and the tongue is thin and evenly distributed. Bedrock is uncovered at several places.

Measurements of the Retreat of the Forefoot

1910–1911

For purposes of record, a panorama was taken of the forefoot from Station No. I., July 16, 1910. With this in hand, the rocks numbered 6, 9, 10, 3, 11, 1, and 13 were identified and their distances from the nearest ice measured with a tape in 1911. Subtracting from these the estimated distances of the rocks from the ice in 1910, as shown on the photograph of that year, the intervening retreat was obtained. The results are embodied in the following table:

RECESSION OF THE FOREFOOT, 1910-1911

Rock No.	Measured distance from nearest ice, 1911.	Estimated distance from tongue, 1910.	Mean retreat for 50 weeks.	Average recession for 50 weeks, 1910–1911.
	ft.	ft.	ft.	ft.
6	50	5	45	46
9	47	0	47	
10	33	0	33	
3	28.5	8.5	20	
11	28	0	28	28.6
1	27	5 back of tongue	32	
13	40	10	30	37.3

(These rocks were not marked. Identification depends on the photographs.)

This determination is more trustworthy than might appear, for it will be noticed that three of the rocks were *on* the ice margin in 1910 and the others were so near it that the estimates cannot be far in error.

Ravelin Mt.

TRUNK STREAM OF SIR SANDFORD GLACIER, SHOWING 700-FOOT ICE-FALL

TONGUE OF SAME

SILVERTIP NÉVÉ

THE UPPER THREE MILES OF SIR SANDFORD GLACIER

A small moraine a little distance ahead of the most advanced ice may be distinguished in the 1910 view. This indicates the position of the forefoot in 1909. By measurement with the tape this was found to be twenty-five feet from the position of the ice there shown, which accordingly represents the amount of the retreat for 1909–1910 at this point—a close agreement with the 28.6 feet as shown in the table for 1910–1911.

1911–1912

On July 6th I undertook to measure the retreat of the glacier during the intervening year. Some difficulty was experienced in reaching the plateau of ground moraine below the tongue, for the only way to get there was to cut steps down the frontal ice-slope, the torrent emerging from the glacier in a raging flood dangerous to cross. Owing to changes in the moraine, it proved impossible to identify the stones before used without revisiting Station No. I., a matter of hours, under the unfavorable conditions prevailing. Rock No. 6, however, was unmistakable and the distance from this to the ice was measured at 112 feet. For future use, the following rocks were numbered in green paint: No. 11, No. 40, and No. 60; and these measurements were made: from No. 11 to No. 40 was 52 feet; from No. 40 to the nearest ice was 15 feet; from No. 40 to No. 60 was 63 feet; from No. 60 to the ice was 30 feet. These numbers have no relation to the numbers appearing on the panoramas.

By utilizing the test view exposed from Station No. I. on June 23, 1912, however, it has proved possible to obtain the approximate retreat for the year. There is no difficulty in identifying the rocks in this, and by employing known distances between the several stones and between the stones and the ice, the retreat may be scaled directly from the views. Three of these distances measured by tape in 1911 (not in the above table) are given here for record. No. 6 to No. 5 = 63 feet; No. 3 to No. 2 = 52 feet; No. 12 to ice = 32 feet.

RECESSION OF THE FOREFOOT, 1911–1912

Rock	Distance to Ice, Scaled from Photo of 1912	Distance to Ice, Measured 1911	Retreat for 51 Weeks
	ft.	ft.	ft.
6	(112)*	50	62
9	110	47	63
10	75	33	42
3	100	28.5	71
11	75	28	47
12	70	32	38
			54 ft. (Average for 51 weeks)

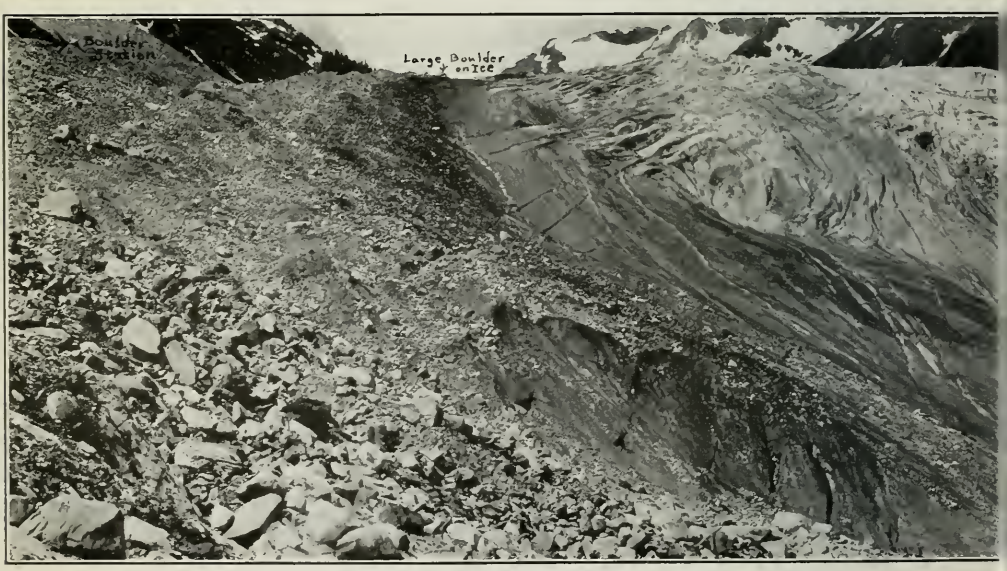
* Measured by tape.

Considering the wide irregularities of the melting at different points along the tongue and the difficulty of actually determining the edge of the ice, to say nothing of the physical difficulty of carrying the tape to it through a fringe of quicksand, the above method of estimating the retreat is probably as good as any other in the case of this glacier. No ice arch has yet been formed, although one appears to be in the process of construction.

Little time was available for work in either season with regard to the position of the ice at an earlier date, but a few observations were made upon the growth of trees. At Camp station two well-defined moraines exist. On the more westerly, overlooking the ice, a spruce seven and one-half inches in circumference was cut down. This showed thirty-seven rings of growth and was the oldest noticed on the ice side of the moraine. It was fully exposed to northerly winds and one of a very few specimens. On the easterly slope of the same moraine, in a more protected place, another spruce showed thirty-one rings. It is safe to say that this moraine is more than fifty years old. On the easterly moraine, overshadowed by the mature evergreen forest of the valley slope, were noted a spruce with sixty-

TAKEN JUI

Note course of stream and falls at th



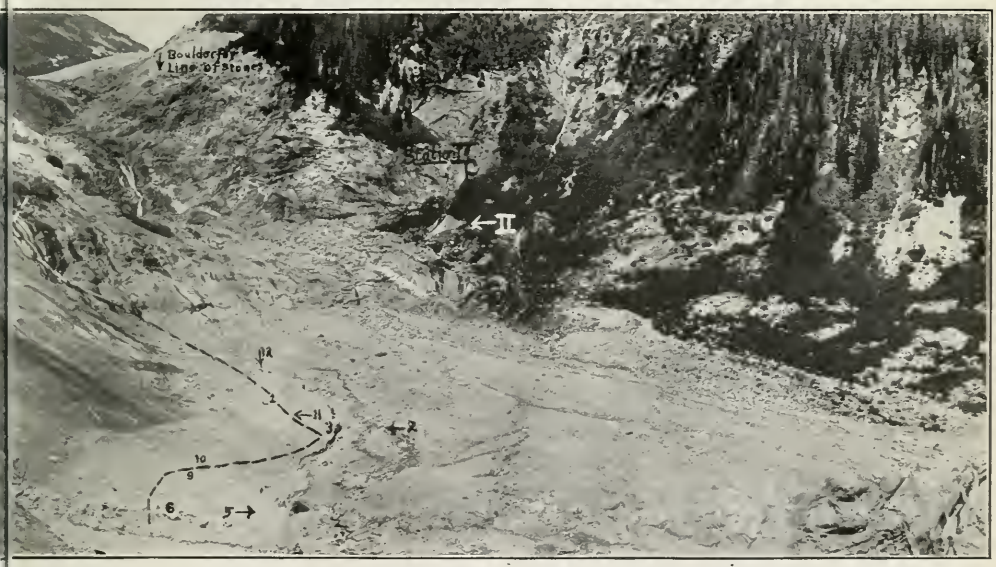
TAKEN JU

Broken line shows position of ice margin seen in the upper view. The retreat is almost one hund
of the large boulder on the glacier, of the boulder ser

ANDFORD GLACIER FROM STATION I.

6, 1910

ght and compare with view below



23, 1912

eet. The stones are numbered alike in both views; lettering indicates positions of Boulder Station, as the mark for the line of stones, and of Station II

three rings and a fir with fifty-three. This would seem to indicate an age of over seventy-five years for the easterly moraine. All these specimens were taken within about a hundred paces of Camp station.

From extended observations in the Selkirks upon the vegetation of moraines, Professor Butters concludes that spruce begins to grow upon them about ten years after the recession of the ice. Hemlock owing to its requirement of humus, and fir on account of its heavy seeds, are much slower in securing a footing.

There is little doubt but that in an earlier age the Sir Sandford glacier reached to the main valley of Gold River, for not only do all the large tributary streams issue from hanging valleys, but the valley of the west branch itself is a hanging one and its spurs are truncated. The torrent, however, has cut a deep canyon in the lip and has now nearly reduced its grade to that of Gold River. A morainic ridge extending from the west wall part way across the main valley near the Columbia, indicates the presence of glaciers here also.

Observations upon the former extension of glaciers, upon their rate of recession and upon the reforesting of moraines are of more than theoretical importance. They furnish some of the chief means for determining changes in climate which are too gradual to be perceptible to direct study. To arrive at any really trustworthy conclusions, however, it is manifestly necessary to continue the observations through a number of years and to include glaciers scattered over a wide area, so that merely local peculiarities or isolated cases may not exert an undue influence in the final result.

Observations Showing the Rate of Surface Flow

1911

To establish a line on the ice, the transit was set up over a stone firmly embedded in the crest of the east lateral

moraine at Camp station, and sighted on the sharp vertical edge of a large bowlder in the stable moraine across the glacier. For marks, dark colored, thin, flat stones having one edge straight, were selected and carried out onto the ice. At suitable points flat-bottomed niches were cut, and in these the stones were set with the straight edges on the vertical hair of the telescope. In choosing such stones, it was aimed to take advantage of their tendency to melt into the ice, and thus to remain *in situ*. Over the moraine-covered section of the glacier the line was painted on favorably situated stones. Twenty points were marked in this fashion on June 24th, vertical angles being read to each.

Four days later (June 28th) the instrument was again set up at Camp station, and the line redetermined on the ice which had meanwhile moved into position. Behind each stone an ice-axe was adjusted at the proper point according to the transit-man's signals. The distance to the fiducial edge of the stone was then taken with the tape. For computing the horizontal distances of the stations from the instrument, a short base was measured thence along the eastern moraine, and readings were taken to each stone from its extremity. These distances, combined with the vertical angles ascertained as above, furnished the data for the profile of the glacier at page 378. On July 8th, fifteen days after the stones were set, measurements to the original line were again read off. The results of all these operations are given in the table on the following page.

In a broad sense, the figures may be taken as harmonizing with the accepted laws of glacial motion, though perhaps they do not form as clear an illustration as might be desired. Very probably a situation farther removed from the disturbing effect of the terminal ice-fall would have been preferable. The essentially uniform increase in the rate of motion from the margin to the maximum at Station 14 appears normal; but the fact that this point occurs nearly at the center of the line raises a difficulty, for we are dealing with a glacier flowing on a broad curve, where the zone of greatest motion is usually to be found near the convex

side. However, it is likely that this complication is more superficial than real, and that if the line were moved back so as to transect a greater amount of ice, and the measure-

MOVEMENT OF STONES ON SIR SANDFORD GLACIER, 1911

Stations	Distance from east margin of glacier	Motion from June 24–28	Average daily motion from June 24–28	Motion from June 28–July 8, 11 days	Average daily motion from June 28–July 8	Motion from June 24–July 8, 15 days	Average daily motion for 15 days	Remarks
				On Moraine or on Moraine-covered Ice.				
	ft.	ins.	ins.	ins.	ins.	ins.	ins.	
Camp	350	0	0	0	0	0	0	On stable moraine, probably not underlain by ice.
1	215	0	0	0	0	0	0	
2	108	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	Close to margin.
4	68	3	0.75					On edges of crevasse. After first measurement they slipped down and could not be replaced accurately.
5	120	2.5	0.63					
6	183	7.0	1.75	14.5	1.31	21.5	1.43	A backward sliding is likely here.
7	274	4.0	1.00	16.5	1.50	20.5	1.36	
				On Clear Ice.				
8	431	13.0	3.25	34.5	3.12	47.5	3.16	
9	515	18.0	4.50	56.0	5.00	74.0	4.93	
10	622	21.0	5.25	53.0	4.81	74.0	4.93	
11	714	22.5	5.63	70.0	6.36	92.5	6.16	
12	780	22.0	5.50	77.5	7.00	99.5	6.63	
13	836	22.0	5.50	71.0	6.45	93.0	6.20	
14	884	29.0	7.25	72.0	6.54	101.0	6.73	Maximum.
15	1000	29.0	7.25	66.0	6.00	95.0	6.33	
16	1053	28.0	7.00	61.75	5.61	89.75	6.00	In more or less broken ice; one on a serac. Glacier cascades over a cliff 100 yards below these stations.
17	1131	22.0	5.50	70.0	6.36	92.0	6.13	
18	1196	22.0	5.50	67.5	6.13	89.5	5.96	
19	1230	19.0	4.75	73.5	6.68	92.5	6.16	
20	1445	12.0	3.00	79.0	7.18	91.0	6.06	
	1600							

Approximate width of glacier on line of measurement, 1600 feet.

ments were continued to its extremity, the ordinary relation would be evident.

The absence of a correspondingly uniform decrease in the rate of motion toward the northerly margin may reasonably be accounted for by the influence of the tributary, by the proximity of the ice-fall, or by both of them. From Station

16 to the margin the ice was considerably crevassed, and beyond number 20 it sloped so rapidly that stations could not easily be brought into the field of the instrument for observation.

The disparities between the columns giving the mean daily rates for four days, for eleven days, and for fifteen days suggest the presence of cross currents and variations in the character of the surface upon which the glacier rests.

The weather during the time that the glacier was under observation was almost continuously cloudy and rainy, with an average minimum temperature of 36.7° F. Accordingly, the table doubtless indicates less than the usual summer activity.

1912

The low temperature prevailing during the period of observation in 1911 led me to hope that a second measurement might be performed under warmer conditions the following season, thus furnishing interesting comparative data. As it happened, however, the mean minimum proved to be 39°, only some 2° warmer than before. The same range-line was utilized and eight stones were set in the ice on June 25th. On July 7th, the final readings were made with the following results:

MOVEMENT OF STONES ON SIR SANDFORD GLACIER, 1912

Stations (All on Clear Ice)	Approximate Distance from East Margin	Motion for 11¾ Days	Average Daily Motion	Results June 28–July 8, 1911, for Comparison		
				Av. Daily Motion of Nearest Station	Dist. from E. Margin	Station
	feet	feet	inches	inches	feet	
1	500	3.20	3.26	5.00	515	9
2	650	3.10	3.15	4.81	622	10
3	775	4.60	4.69	7.00	780	12
4	900	5.70	5.82	6.54	884	14
5	970	5.85	5.96	6.00	1000	15
6	1140	5.875	6.00	6.36	1131	17
7	1260	5.875	6.00	6.68	1230	19
8	1400	6.125	6.25	7.18	1445	20

The weather during this period was even worse than in 1911, rain falling heavily almost every day and the sky being nearly always overcast.

The large bowlder indicated on the map at the edge of the surface moraine in the vicinity of Bowlder station, forms a mark of some prominence. For this reason its position was determined by the transit. On July 8, 1911, it was 1136 feet distant from Bowlder station and 1734 feet distant from Camp station, being 104 feet higher than the former. Its diameter was estimated at about 15 feet, which may preserve it from falling into a crevasse. The bowlder is well seen near the lower central part of the lower view opposite page 239. This photograph was taken on July 12, 1910. It so happens that the transit measurements just given were made on July 13, 1911. Upon plotting the azimuth of the bowlder as obtained from this view, a total motion of 50 feet was read off from the position mapped, in the direction of the line representing the edge of the moraine. In 1912 the bowlder was found to have moved 84 feet since the earlier determination. This is a more reliable figure, depending as it does wholly upon instrumental readings. The distance from Camp station was 1653 feet, from Bowlder station 1060 feet, and from Station I. 2500 feet, being 5 feet higher than in 1911. The mean altitude in this instance came out 5929 feet. The elapsed time was 358 days, giving an average daily rate of 2.81 inches, to July 1, 1912.

The close correspondence between the average maximum rates of motion of the three Selkirk glaciers which have been studied is worthy of note. During a period of ten days in the midsummer of 1906, the Asulkan glacier averaged 6.7 inches per day while the Illecillewaet in 1899 at the same season averaged 6.79 inches for the longer interval of thirty-six days.[1] The Sir Sandford glacier, as noted above, showed a rate of 6.73 inches for 15 days and 6.25 inches in 1912 for nearly 12 days.

[1] *Canadian Alpine Journal*, vol. i., p. 147, "Glacier Observations," by George Vaux, Jr., and William S. Vaux; *Appalachia*, vol. ix., p. 160, "The Great Glacier of the Illecillewaet," by the same authors.

The Sir Sandford is in some respects an awkward glacier to study. It lacks a pronounced demarkation between the forefoot and the northern margin, and the terminal cascade, with the attendant crevassation of the ice for some distance up-stream, introduces difficulties in field work. It is probable that the true tongue extends westerly as far as the end of the medial moraine from Silvertip glacier, although indications point to a substantial stagnancy of the ice at this point. Future workers will doubtless find that a line between Base station and Signal station will offer many advantages for carrying out observations on the ice flow, although even here the uneven surface will prove troublesome.

Sundry Features of the Sir Sandford Glacier

Medial Moraines. Two well-developed medial moraines occur on the glacier. The largest (1½ miles long) lies close to the easter y margin and begins to make itself apparent near the Ravelin. It is chiefly composed of finely comminuted material produced by the ice avalanches from Sir Sandford, but rock fragments and bowlders make up a fair proportion. The rapid disintegration of the latter contributes decidedly to the generally muddy and sandy nature of the moraine. The normal ridge formation, owing to reduced melting, soon develops, but it does not become very pronounced until the neighborhood of Base and Bowlder stations is reached. Here, however, the ridge rises to a height of perhaps twenty feet, and the moraine spreads out to more than double its original width, mingling with the lateral beyond Bowlder station. The ice, as a result of the increased protection, attains a greater thickness and length along this side. Numerous crevasses cut the moraine and a large part of the material becomes englacial. The second medial emerges from the Silvertip glacier on the plateau between Azimuth and Palisade mountains, being entirely submerged for the first half-mile below its probable origin at the spur of Mount Silvertip. It is most interesting (although

not easy) to trace its gradual development upon the ice itself. At first come single blocks at wide intervals, then scattered groups nearer together, and finally below the ice cascade, a well-defined train. Owing to the harder rock of the western peaks, the moraine is almost all fragments with comparatively little sand or mud.

Lateral Moraines. These are well-defined, particularly on the east side. At a point some distance below the present tongue, three or more distinct, roughly parallel crests may be counted. The outer ones being covered with vegetation, including a scattering of small trees, it may be inferred that the shrinkage noted elsewhere has been going on for a considerable time; also that there have been periods in the retreat when the ice was stationary or slightly advancing, since such moraines are usually produced by the quicker melting back of the upper layers to form a sloping face down which the superficial moraine slides. The separate ridges gradually coalesce in an up-stream direction until at Base station only one remains. Between this point and the curve near the Ravelin it takes the form of an even straight crest elevated thirty or forty feet above the ice on the one hand and the base of the hillside on the other. At the junction of the easterly tributary, this lateral executes an extraordinary spiral curve of about 180°, like a bent fish-hook. To the casual observer it seems inexplicable why the ice has not taken the shorter course directly across the loop, since the moraine is the only obstruction. It is probable, however, that a rift in the bed-rock directs and maintains the glacier in its actual channel and that its northerly portion is essentially stagnant. As a whole, this moraine is about two miles long. The left lateral is small in comparison. A fragment appears at the union of Silvertip glacier indicating, from its position 100 feet or more up on the side of Azimuth Mountain, a considerably increased thickness of the ice in an earlier stage of glaciation. Along the easterly base of Palisade ridge there is also a strip of lateral moraine, but as a whole it is not very well-developed.

Junction of the Silvertip and Sir Sandford Glaciers. This

locality presents a number of interesting features. The two streams meet nearly at right angles, and the line of contact for fully half the width of the Silvertip is a straight line (see view opposite page 380), indicating almost diagrammatically the resultant of their motions. Beyond this point the greater mass of the Sir Sandford begins to tell, and the line is deflected westerly. The singularly regular and delicate curve in the medial moraine of Silvertip glacier also depicts graphically the forces at work in this vicinity. Several good specimens of glacier tables were noted here. The local surface drainage flows both ways from a divide in two brooks whose courses are parallel and close to the line of junction. One empties into the depression in the corner between the glaciers; the other, a larger stream, into a moulin about as shown on the plan. The streams have sunk their channels five or six feet into the ice, revealing in rather a striking way, a number of small crevasses in the walls, which open perhaps an inch at the surface of the glacier but close gradually downward, until complete union is effected just far enough above the stream to prevent any escape of the water. In 1912 the westerly flowing stream occupied the bottom of a tunnel-like groove with undercut sides. By descending into it the accompanying view was secured. At one point, its course cut across the "blue bands" which were well displayed by the fine dirt which had collected in the delicate parallel channels formed by differential melting. (See view, page 391.) The banding hereabouts is parallel to the Sir Sandford glacier and lies nearly vertically. It is well-developed in the neighborhood of the junction of the two glaciers and about the adjacent ice-falls. The small crevasses noted the previous year were still present.

The comparative insignificance of the true medial moraine originating at the union of these glaciers is worthy of note. Only a few blocks of ground moraine are picked up by the Sir Sandford. Higher on the Silvertip near by, however, a very definite and well-conditioned moraine suddenly emerges from the ice and, swinging about, joins the

THE JUNCTION OF THE SILVERTIP AND SIR SANDFORD GLACIERS

The upper view shows the formation of the small medial moraine and the channel of the drainage brook. The lower, taken from the side of the Sir Sandford glacier, shows bed of lakelet and sudden emergence of medial moraine from Silvertip Glacier

THE DIP OF THE "BLUE BANDS" AS REVEALED BY THE SUNKEN CHANNEL OF A DRAINAGE BROOK

THE CHANNEL, LOOKING TOWARDS THE CORNER BETWEEN THE GLACIERS

The overhang may be partly due to surface shearing of the ice

other after a few hundred feet, giving the whole medial an appearance of greater size than the reality warrants. The various stripes of moraine show to unusual advantage the flow of the ice and the tremendous compression to which it is subjected. It was regretted that time was lacking for making any definite measurements.

The place where the ice streams first meet may best be likened to one of the reëntrant angles formed at the corners of a picture frame made out of quarter-round moulding. From the ground moraine, the ice rounds up steeply and smoothly on each side without crevasses, forming a depression which the aneroid indicated as being eighty feet below the level of the ice farther back on the line of union. The other side of the rough triangle was made up of an unstable pile of lateral moraine. A stream issued from the margin of the Sir Sandford, and flowed into the Silvertip near the junction. A coating of mud on the stones and an ill-defined line on the ice of both glaciers go to show that at times the water rises in the depression to form a lakelet.

A somewhat unusual form of glacier table was exhibited on the side of Silvertip glacier at the depression. A number of large blocks of pure white snow, apparently the remains of a spring avalanche, had withstood the effects of melting, and owing to their greater reflecting power, as compared with the dirty surface of the glacier, had protected the ice beneath them from the sun to such an extent that they were perched up on distinct pedestals some distance above the normal surface level in grotesque attitudes. By the summer of 1912 they had disappeared.

Superficial Drainage. The lower portion of the trunk stream and Silvertip glacier are so constantly intersected by crevasses (mostly narrow) that no well-defined drainage system develops. At the corner near the Ravelin there is a brook which flows along the inner edge of the medial moraine for a short distance. Its temperature late in the afternoon gave a reading of 33° F. Another brook is to be found below the upper ice-fall of Silvertip glacier.

APPENDIX D

OTHER GLACIERS AT THE HEADWATERS OF GOLD RIVER AND GOLD STREAM

NEXT in importance to the Sir Sandford glacier, in the country embraced in our surveys, stands Goldstream névé, and the several ice streams adjacent. At first, it was thought that they formed a part of the Sir Sandford system (see view, page 373). But our trips of 1911 showed that strictly speaking this was not the case, for although a well-defined link unites them, the Goldstream system lies on the westerly side of the watershed of the range. The system comprises eight connected or nearly connected glaciers having a total area of some thirteen square miles. The largest is a nameless set of commensal streams which cover the northerly side of the ridge extending westerly from Citadel Mountain. These include about four square miles. Then comes Goldstream névé proper with about three square miles, next Sir Sandford glacier, south, with nearly two, and finally four others averaging about one square mile apiece. Goldstream névé lies at a mean altitude of some 7900 feet. Its chief discharge is in a southerly direction. A fine ice-fall 1600 feet high descends over the cliffs which hem it in, the glacier being reconstructed in two tongues below. Sir Sandford glacier, south, is a good example of the alpine type. From Sir Sandford Pass, 8150 feet, it descends for two miles in a wide graceful sweep to an altitude of 6250 feet, averaging approximately 950 feet per mile. It forms the principal source of Gold River as Goldstream névé probably does of Gold Stream.

The next groups of glaciers deserving notice are what may be termed the Argentine and the Sonata. Together they occupy about seventeen square miles between the south and main branches of Gold River. The Argentine glaciers cover an area of approximately a dozen square miles; the Sonata about five. The former display the largest single stream, an alpine glacier nearly three and one-half miles long. The other glaciers of this group are broad and flat without any very well-defined tongues.

It is perhaps unnecessary to refer further to individual glaciers in this quarter of the Selkirks. Enough has been said to call attention to the presence of a remarkably large area of ice for so low a mean elevation above sea-level. A glance at the colored map will emphasize the fact still more. Of the 183 square miles included between meridians 117° 45′ and 118° and parallels 51° 30′ and 51° 45′, not less than 30% is submerged beneath ice and snow, and there is good reason to believe that this figure might be increased to 40% with little, if any, exaggeration. The area mentioned is divided among three dozen separate glaciers.

Smaller areas can be chosen in other parts of the main range where the proportion of ice- and snow-covered country is even greater. In a rectangle containing sixty square miles drawn about Grand Mountain as a center the map shows that forty-six square miles, or 76%, is buried beneath ice and snow. A square drawn towards the north, with the line between Citadel and Cornice mountains as a base, would contain very nearly fifty square miles. Here the percentage, estimated as above, would be 85.

APPENDIX E

A LIST OF THE PRINCIPAL KNOWN GLACIERS OF THE SELKIRKS

In the following table is included a list of the largest known glaciers in the range. The dimensions are based upon the government map by Wheeler and upon the author's surveys in the neighborhood of Mount Sir Sandford. The distances are measured along the median lines of the various ice streams to the water-parting of each gathering basin, if the ice or névé reaches so far. This is thought to afford the best basis for comparison. Lengths of tributaries are added in the belief that a truer concept of a glacier's size is thus presented.

	Main Stream	Chief Branches	Total Length	Total Area
	Miles	Miles	Miles	Miles
Sir Sandford Glacier	5	7·5	12·5	10.5
Deville Glacier	6	2	8	5·5
Battle Glaciers	5	2·5	7·5	4·5
Grand Glaciers	4	2	6	7
Beaver Glacier	4·5	0	4·5	2
Geikie Glacier	4	0	4	5·5
Illecillewaet Glacier	3·5	0	3·5	5
Argentine Glacier	3·5	0	3·5	3

APPENDIX F

NOTES UPON ROCK SPECIMENS FROM THE NEIGHBORHOOD OF MOUNT SIR SANDFORD

THE following specimens, taken either *in situ* or from such positions on the surface of glaciers as to leave no doubt of their origin, were submitted to Professor Heinrich Ries of Cornell University, who has kindly examined them, and made the subjoined report. It should be stated that owing to exigencies of packing, only small fragments could be taken in many cases and therefore precise determination was not always practicable.

Rocks from the Massif of Mount Sir Sandford

No. 1. Coarsely granular calcite, possibly a piece of crystalline limestone. The whitish coating is lime carbonate.

No. 1½. Same as No. 1, with band of fine-grained, siliceous limestone.

No. 1¼. Siliceous limestone with a calcite vein. Unnumbered piece is coarsely granular calcite with a dark band of what may be a metamorphosed diabase dike.

Rocks from the Adamant Group

No. 6. Hornblende schist.

No. 7. Looks like fine-grained hornblende granite.

No. 12. Orthoclase.

No. 11. Quartz-feldspar (albite) vein in what may be a hornblende-quartz schist, the latter containing chalcopyrite.

No. 10. Vein quartz with tourmaline.

No. 9. A pegmatite with quartz, orthoclase, and tourmaline.

Rock from Mount Guardsman

No. 5. Muscovite schist, with garnets and needle crystals of what may be colorless cyanite.

I may perhaps add a few random comments. The limestone and granular calcite of which Sir Sandford is composed belong to a very pronounced light gray stratum which (judging from photographs) first appears to the east of the mountain in the principal peak of Mount Stockmer, and in the lower spurs of Mount Sonata opposite Cornice Mountain. Beyond Sir Sandford it runs through the Ravelin and Mount Palisade and, without any prominent outcrop in the Redan ridge, becomes visible again in a mountain nine miles distant to the northwest. Most of these exposures are of limited thickness, but in Sir Sandford itself the limestone is at least a mile through in two directions horizontally, and from 3600 to 4600 feet thick vertically. Whether the mountain is an upturned and uplifted block of a thick stratum or a closed fold in the thinner layer elsewhere exposed, only future investigation can determine. Its remarkably even, geometrical outlines strongly suggest the former hypothesis; its immense mass and abruptly tilted and crumpled strata, the latter. We noticed no other kinds of limestone on any of our excursions in the vicinity, there apparently being an entire absence of the dark slate gray variety so common in the valley of the north fork of the Illecillewaet River. Schistose rocks occur in Mount Guardsman, in the Footstool and the whole easterly end of the Sir Sandford Range (although here also are a few exposures of the Sir Sandford limestone), in Mount Vidette, and even beneath the lowest hanging glaciers of Sir Sandford itself, near the Ravelin.

In the Adamant group appears a considerable area of igneous rock. It commences near Mount Wotan and extends thence westerly for at least five miles along the crest of the range to beyond Mount Austerity, composing all the peaks of the group. It may extend much farther but photographs alone give no certain evidence of the fact. Its southerly limit, so far as direct observations went, was Silvertip Pass. Specimen No. 11 was secured here. Specimens Nos. 9 and 10 were picked up on the northerly margin of Silvertip glacier, coming from the vicinity of the Blackfriars. The dark massifs of the peaks are everywhere veined in most striking patterns with the quartz, feldspar, etc., exhibited in Nos. 9, 10, and 11.

It is of interest to note that excepting Mount Iconoclast the highest elevations along the northeasterly border of the Selkirks, the Adamant group, Sir Sandford, Swiss Peak, and Sir Donald, stand in close alignment. Probably this represents, approximately, the general strike of the rocks.

APPENDIX G

METEOROLOGICAL OBSERVATIONS

1910

Date	Place	Time	Temp.	Atmospheric Pressure—Inches				Weather
			Air ° F.	*No. 1.*	*No. 2.*	*No. 3.*	*No. 4.*	
July								
1	Golden	10:10 A.M.	64	27.00	27.31	27.55	27.42	
	Beavermouth			27.15	27.47	27.55	27.57	
	Bear Creek			25.95	26.20	26.42	26.30	
	Rogers Pass			25.30	25.53	25.73	25.62	
	Glacier House	4:00 P.M.	64	25.45	25.70	25.95	25.76	
	" "	9:10 P.M.	58	25.45	25.70			
2	" "	8:30 A.M.		25.35	25.60	25.90	25.69	
	" "	3:30 P.M.	69	25.22	25.50	25.82	25.61	Hyp.* 204.6 = *25.78*
	" "	9:35 P.M.	50	25.27	25.56	25.90	25.66	
3	" "	5:45 A.M.	58	25.30	25.55	25.88	25.63	
	Beavermouth	7:20 P.M.	53		27.34	27.62	27.42	
4	"	4:00 A.M.	34		27.45	27.90	27.47	
	Mouth Gold River	9:40 A.M.	60		27.35	27.70	27.50	
	Camp above Cabin	5:45 P.M.	55		27.26	27.55	25.38	Clear
5	" " "	5:30 A.M.	48		27.46	27.70	27.54	Cloudy
	Cabin near Forks	3:55 P.M.	63		27.35	27.65	27.48	
	Forks Camp	5:15 P.M.			27.25	27.36	27.34	
	" "	8:12 P.M.	51		27.30	27.35		
6	" "	6:00 A.M.	48		27.28	27.35	27.35	Fair
	Timber Camp	10:00 A.M.	61		26.83	26.90	26.85	
	Taurus "	1:00 P.M.	60		26.60	26.70	26.66	
	Mosquito "	7:00 P.M.			25.90	25.00	26.05	
	" "	9:20 A.M.	51		25.90	25.96	26.02	Rain
7	Devil's-Club Camp	12:30 P.M.	56		25.93	25.97	25.97	
	" " "	8:00 P.M.	48		25.95	26.00	26.08	
	" " "	8:00 A.M.	54		26.03	26.06	26.15	Fair Hyp. 205.35 = *26.17*
8	Sandford Camp	5:30 P.M.	60		24.25	24.34	24.44	
	" "	8:30 P.M.	46		24.30	24.35	24.35	Hyp. 202.2 = *24.54*
	" "	4:10 A.M.	44		24.30	24.32	24.40	Clear
9	Sandford Arête	10:15 A.M.	37		20.51	20.77		
	" "	2:00 P.M.			20.67	20.79	20.80	
	Sandford Camp	6:20 P.M.			24.00	24.13	24.20	
	" "	9:00 P.M.	52		24.05	24.15	(24.16)	Interpolated
	" "	8:30 A.M.	51		24.05	24.17	24.18	Fair
10	" "	4:00 P.M.			24.00			
	Toe Sand. Glacier				24.46			
	Devil's-Club Camp	6:45 P.M.			25.78			
	" " "	8:55 A.M.			25.82			Fine
11	Sandford Camp	1:10 P.M.			24.04			
	" "	8:30 P.M.	51		24.10	24.04	23.95	
	" "	4:00 A.M.	48		24.00	24.00	23.94	Fair
12	Mount Guardsman	7:30 A.M.	46		20.80		20.88	
	Footstool	12:45 P.M.	44		20.00			
	Ridge below Footstool				20.17		20.35	

* Hicks, No. 1,104,662, 7½ inches long, and reading only to two-tenths of a degree F.

METEOROLOGICAL OBSERVATIONS—(*Cont.*)

1910

Date	Place	Time	Temp.	Atmospheric Pressure—Inches				Weather
			Air ° *F*	*No. 1.*	*No. 2.*	*No. 3.*	*No. 4.*	
July								
12	Sandford Camp	4:45 P.M.	62		23.70		23.84	
13	" "	9:00 A.M.	58		23.60	23.83	23.86	Fair
	" "	8:00 P.M.	57		23.70	23.80	23.80	Hyp. 201.3 = *24.09*
14	" "	9:00 A.M.	58		23.80	23.95		Fair
	" "	7:30 P.M.	56		23.83	23.97	23.95	
15	" "	9:00 A.M.	54		23.94	24.05	24.04	Rain
	Alpina Dome	1:30 P.M.	44			21.43	21.45	
	Sandford Camp	9:30 P.M.			24.05	24.14	24.12	
16	" "	8:00 A.M.	55		24.05	24.14		Rain
	" "	9:00 P.M.					24.14	
17	" "	9:00 A.M.	57		23.89	24.00		Rain
	" "	8:00 P.M.	53		23.94	24.02	23.95	
18	" "	3:15 A.M.	46		23.96	24.04	(23.97)	Fair. Interpolated
	" Arête	9:00 A.M.	38			20.70	20.70	
	" Camp	9:00 P.M.	50		24.13	24.24	24.15	
19	" "	10:20 A.M.	56		24.15	24.29	24.25	Fine
	" "	9:00 P.M.	56		24.15	24.22	24.20	
20	" "	7:00 A.M.	52		24.15	24.20	24.22	Fine
	" "	8:30 P.M.	56		23.98	24.10	24.08	
21	" "	4:30 A.M.	54		(23.82)	(23.94)	23.92	Fair. Interpolated
	Pioneer Peak	12:25 P.M.	50				19.85	Hyp. 193.2 = *20.33*
	Sandford Camp	8:30 P.M.	59				23.60	Hyp. 201.4 = *24.14*
	" "	9:00 P.M.	59		23.75	23.83	23.75	
22	" "	9:30 A.M.	48		23.70	23.78	23.70	Hard Storm
	" "	10:20 A.M.	48		23.70	23.80	23.70	Hyp. 201.4 = *24.14*
	" "	8:00 P.M.	46		23.75	23.83		
23	" "	7:00 A.M.	48		23.88	23.95	23.87	Cloudy
	Devil's-Club Camp	10:00 A.M.	52		25.67	25.70	25.64	
	Mosquito Camp	12:15 P.M.	58		25.67	25.71	25.65	
	Taurus Camp	4:00 P.M.	58		26.34	26.37	26.42	
24	" "	8:00 A.M.	52		26.34	26.35	26.35	
	Timber Camp	9:00 A.M.			26.50	26.50		
	Crossing of Trails	12:25 P.M.			27.06	27.06		
	" " "	2:10 P.M.			27.10	27.10		
	Cabin by Forks		58		27.21	27.21		
	Columbia River				27.45	27.36	27.56	
25	" "	8:00 A.M.	45		27.46	27.42		Fine
26	Columbia Trail							Fine
27	Glacier House	7:30 A.M.		25.40		25.61		
31	" "	10:00 A.M.		25.30	25.49	25.50		
Aug.								
1	" "	5:00 P.M.		25.35	25.55	25.57		
2	" "	6:30 P.M.		25.49	25.70	25.70	25.76	Hyp. 205. = *25.99*
3	" "	9:00 A.M.		25.52	25.70	26.09	25.80	
11	" "	9:30 A.M.		25.32	25.50	26.04		
12	" "	11:30 A.M.		25.40	25.59	26.11		
13	" "	8:00 A.M.		25.40	25.60	26.11		
14	" "	8:30 A.M.		25.32	25.49	26.00		Storm
15	" "	12:30 P.M.		25.42	25.60	26.12		
16	" "	6:00 A.M.		25.50	25.65			

NOTE.—The aneroid barometers that supplied the data in this and the following tables were as follows: No. 1 was of brass, $2\frac{5}{8}$ inches in diameter, and was calibrated to 20 inches. The works were dated October 2, 1902. No. 2 was of aluminum, 3 inches in diameter, and calibrated to 17 inches. The works were dated May 26, 1908. Short and Mason were the makers of both instruments. No. 3 was of aluminum, 3 inches in diameter, and read to 18 inches. J. J. Hicks was the maker, and the instrument was numbered 40, and had a patent release. No. 4 was similar to No. 2.

METEOROLOGICAL OBSERVATIONS

1911

Date	Place	Time	Temperature			Barometers		Hypsometer		Weather
			Air.	*Min.*	*Sun.*[1]	*No. 2.*	*No. 3.*	*Green*	*Hicks*	
June 10	Golden					27.32				
	Beavermouth					27.44				
	Mouth Gold River	6:15 P.M.				27.54				Clear
11	" " "	6:30 A.M.	44	40		27.69	27.75			Clear
	Boat left	4:00 P.M.	64			27.52	27.59			
	Forks Camp	6:20 P.M.				27.40	27.45			
12	" "	7:00 A.M.	63	40		27.44	27.45			Fair
	Taurus Camp	3:30 P.M.	70			26.57	26.66			
	" "	9:00 P.M.				26.56	26.65			
13	" "	8:30 A.M.	57	42		26.63	26.62			Fair
	Mosquito Camp	11:45 A.M.				25.90	25.95			
	Devil's-Club Camp	1:45 P.M.	66			25.82	25.86			
	" " "	9:00 P.M.				25.84	25.85			
14	" " "	8:00 A.M.	56	40		25.84	25.79	204.8 *25.88*	205.15 *26.07*	Clear
	Sandford Camp	11:15 A.M.				24.04	24.11			
	" "	3:00 P.M.	64		114			201.6 *24.24*	201.9 *24.39*	
	" "	9:00 P.M.				24.09	24.10			
15	" "	10:00 A.M.		36		24.07	24.10	201.58 *24.23*	201.8 *24.34*	Clear
	Palisade Station	4:00 P.M.				21.75	21.93			
	" "	5:00 P.M.				21.87	21.93			
	Sandford Camp	7:30 P.M.				24.00	24.02			
16	" "	9:00 A.M.		40		23.97	23.97			Fair
	Citadel Mountain	4:30 P.M.	38			20.55	20.76			
	Sandford Camp	8:00 P.M.	50			23.85	23.94			
17	" "	9:00 A.M.	54	40	106	23.93	23.97			Clear
	" "	9:00 P.M.				23.93	23.97			
18	" "	3:00 A.M.	44			24.00		201.6 *24.24*	201.8 *24.34*	Clear
	Sandford Arête	8:00 A.M.				20.36	20.90			
19	" Camp	7:00 A.M.	44			24.01	24.28			Clear
	" "	9:00 P.M.	38			24.16	24.24			
20	" "	7:30 A.M.	38			24.10	24.20			Clear
	Silvertip Col					21.60	21.77			
	Belvedere Station	1:45 P.M.				20.57	20.70			
	Sandford Camp	6:15 P.M.				23.98	24.08			
21	" "	9:00 A.M.	52	35		24.00	24.11			Rain
	" "	3:00 P.M.				24.01	24.08	201.5 *24.19*	201.65 *24.26*	
	" "	9:00 P.M.				24.05	24.10			
22	" "	12:00 M.	50			23.96	24.10			Rain
	" "	8:30 P.M.				24.05	24.14			
23	" "	4:45 A.M.	38	33		24.02	24.33			Fair
	Ridge	11:15 A.M.				20.14	20.64			
	Footstool					19.99	20.33			
	Sandford Camp	3:25 P.M.	46			23.76	24.24			
24	" "	8:30 A.M.	45	39		23.88	24.11			Rain
	" "	9:30 P.M.	45			24.05	24.20			
25	" "	9:30 A.M.	42	39	119	24.10	24.30			Fair
	" "	9:00 P.M.				24.20				
26	" "	10:30 A.M.	43	41		24.07	24.26			Rain
27	" "	9:00 A.M.	50			23.86	24.07			Rain
	" "	8:30 P.M.				23.74	23.98			
28	" "	7:00 A.M.	52	38		23.68	23.94			Rain
	" "	8:30 P.M.				23.75	23.92			
29	" "	9:00 A.M.	53	40		23.79	23.97			Cloudy
	" "	9:00 P.M.	45			23.89	24.05			
30	" "	8:15 A.M.	52	38		23.89	24.06			Rain
	" "	10:00 P.M.				23.96	24.07			

[1] Black bulb.

METEOROLOGICAL OBSERVATIONS—(*Cont.*)

1911

Date	Place	Time	Temperature			Barometers		Hypsometer		Weather
			Air.	*Min.*	*Sun.*	*No. 2.*	*No. 3.*	*Green*	*Hicks*	
July										
1	Sandford Camp		50	38		23.96	24.11	201.58 *24.23*	201.71 *24.31*	Rain
	" "	9:45 P.M.	50			23.91	24.13			
2	" "	10:00 A.M.	45	37		23.96	24.11			Rain
	" "	9:30 P.M.	38			24.00	24.11			
3	" "	8:00 A.M.	50	33		23.90	24.06			Rain
	" "	9:00 P.M.	37			23.95	24.04			
4	" "	9:00 A.M.	40	31		23.95	24.11			Snow
	" "	9:00 P.M.	42			24.21	24.33			
5	" "	6:30 A.M.	43	33	117	24.27	24.32			Clear
	" "	9:00 P.M.	47			24.09	24.22			
6	" "	8:30 A.M.	45	40		23.90	24.14			Severe Storm
	" "	9:00 P.M.	46			23.84	24.04			
7	" "	8:00 A.M.	45	33		23.81	24.03			Rain
	" "	10:00 P.M.	40			23.87	24.02			
8	" "	7:30 A.M.	43	34		23.95	24.12			Fair
	" "	9:00 P.M.	54			23.96	24.12			
9	" "	7:00 A.M.	45	36		23.96	24.14			Rain
	" "	9:00 P.M.	46			24.10	24.26			
10	" "	7:00 A.M.	50	40		24.13	24.30			Rain
	" "	3:00 P.M.	42		115	24.20	24.37			
	" "		40			24.27	24.40			
11	" "	7:00 A.M.	48	34		24.30	24.45			Fair
	" "	8:00 P.M.	44		106	24.34	24.46			
12	" "	4:00 A.M.	38	32		24.42	24.75			Clear
	Ravelin Col	10:15 A.M.					22.30			
	Sandford Camp	7:00 P.M.	46			24.35	24.75			
13	" "	7:00 A.M.	44	36	113	24.39				Clear
	" "	9:00 P.M.	52			24.31	24.40			
14	" "	7:00 A.M.	52	41		24.34	24.45			Clear
	Redan Col						22.45			
	Camp	8:30 P.M.					24.20			
15	"	7:00 A.M.		44			24.23			Clear
	Goldstream Mt.	2:15 P.M.					21.43			
	Camp	7:00 P.M.					24.13			
16	"	8:00 A.M.	64	48			24.07			Clear
	Moberly Pass	3:00 P.M.					24.10			
	Camp	7:10 P.M.					23.96			
17	"	8:00 A.M.	56	46			23.94			Clear
	Redan Col	3:40 P.M.					22.20			
	Redan Mt.	4:45 P.M.					20.99			
	Sandford Camp	7:55 P.M.					24.14			
18	" "	8:00 A.M.	50			24.14	24.14			Clear
	" "	9:00 P.M.				24.05	24.01			
19	" "	8:00 A.M.	45	34	117	24.00	24.06			Fair
	" "	9:00 P.M.	46			24.01	24.05			
20	" "	4:00 A.M.	46	40		24.01	24.35	(Released)		Fine
	Silvertip Col						22.08			
	Mt. Austerity	2:10 P.M.					20.22			
	Sandford Camp	9:10 P.M.	50		120	24.00	24.42			
21	" "	10:30 A.M.				23.95	24.18			Rain
	" "	9:00 P.M.				23.87	24.13			
22	" "	9:00 A.M.	50	40		24.04	24.20			Rain
	" "	9:00 P.M.	48			24.25	24.41			
23	" "		60			24.20	24.49			Fair
	Devil's-Club Camp		68			26.01	26.20			
	Taurus Camp		70			26.69	26.83			
24	" "		50			26.95	26.93			Fair
	Boat, Gold River		73			27.54	27.66			

NOTE.—The thermometer, by Green, was specially made. It was 9 inches long, and read directly to tenths of a degree F. The number was 18,113. The Hicks thermometer was No. 1,104,662, used before.

METEOROLOGICAL OBSERVATIONS—(*Cont.*)

Trip up the North Fork of the Illecillewaet River, 1911

Date	Place	Time	Temperature		Barometers		Weather
			Air.	*Min.*	*No. 2.*	*No. 3.*	
Aug.							
10	Albert Canyon	5:25 P.M.	78		27.47	27.49	Fine
11	Camp	6:40 A.M.	46		27.57	27.52	Rainy
	Cabin near bridge	11:05 A.M.	68		26.80	26.76	
	Camp	5:35 P.M.	58		26.24	26.22	
12	"	8:10 A.M.	47		26.24	26.20	Fair
	" on Pass (Alt. 5760 ft.)	5:00 P.M.	47		23.95	24.00	
13	" " "	8:00 A.M.	46		24.04	24.03	Cloudy
	" " "	8:00 P.M.			24.10	24.10	
14	" " "	8:00 A.M.	46	36	24.09	24.11	Fair
	S. Shoulder, Sorcerer					21.02	
	Camp on Pass	8:15 P.M.	46		24.10	24.07	
15	" " "	6:30 A.M.	47	31	24.14	24.07	Fair
	Mt. Sorcerer	11:00 A.M.				20.30	
	Camp on Pass	9:15 P.M.			24.25	24.20	
16	" " "	7:00 A.M.	43	27	24.26	24.22	Fine
	" " "	8:00 P.M.			24.21	24.19	
17	" " "	5:15 A.M.	44	27	24.22	24.18	Fine
	Mt. Holway	12:45 P.M.				20.68	
	Camp on Pass	9:00 P.M.			24.19	24.14	
18	" " "	7:30 A.M.	68	30	24.19	24.16	Fine
	Gold River Pass	2:25 P.M.	70			23.33	
	Camp on Pass	9:00 P.M.			24.09	24.06	
19	" " "	7:30 A.M.	66		24.00	24.02	Rain
	" on Trail	8:00 P.M.				25.71	
20	" " "	11:00 A.M.				25.78	Rain
	Albert Canyon	7:25 P.M.				27.70	

At Glacier House, 1911

Date	Time	No. 1.	No. 2.	No. 3.	Min.	Weather
July						
30	7:00 A.M.	25.70*	25.74	25.74		Clear
	11:00 P.M.	.70	.74	.74		
31	8:00 A.M.	.65	.70	.70	45	
	10:00 P.M.	.59	.65	.66		
Aug.						
1	8:00 A.M.	.56	.62	.62	46	Showers
	12:00 P.M.	.52	.60	.62		
2	8:00 A.M.	.56	.64	.65	43	Showers
	10:00 P.M.	.58	.62	.62		
3	8:00 A.M.	.61	.65	.66	50	Showers
	10:00 P.M.	.54	.59	.62		
4	12:00 A.M.	.58	.64	.65	54	
	9:00 P.M.	.57	.64	.65		
5	8:00 A.M.	.55	.62	.64	56*	
	11:00 P.M.	.54	.60	.62		
6	7:00 A.M.	.52	.57	.57	50	Rain
7	11:00 A.M.	.48	.54	.54	51	Rain
	11:00 P.M.	.56	.64	.64		
8	8:00 A.M.	.60	.68	.68	48	Rain
	10:00 P.M.	.65	.74	.74		
9	8:00 A.M.	.69	.75	.76	46	Clear
10	11:00 A.M.		.74	.72	40	Clear
"	"	Hypsometer	Green 204.63 = *25.79*			
			Hicks 204.85 = *25.94*			

(Aug. 10–21, NORTH FORK TRIP)

METEOROLOGICAL OBSERVATIONS—(*Cont.*)

Date	Time	No. 1.	No. 2.	No. 3.	Min.	Weather
Aug.						
23	8:00 A.M.		25.84*	25.87	29†	Clear
	10:00 P.M.		.84	.87		
24	12:00 M.		.84	.87	48	Clear
	10:00 P.M.		.69	.74		Aurora
25	7:00 A.M.		.64	.69	50	Showers
	10:00 P.M.	25.60	.66	.76		
26		.66	.72	.78	42	Fair
		.62	.70	.75		
27	12:00 M.	.59	.65	.70	41	Fine
	10:00 P.M.	.49	.54	.63		
28	9:30 A.M.	.52	.57	.64	48	Fair
	11:15 P.M.	.48	.53	.60		
29	8:00 A.M.	.49	.55	.61	53	Rain
	11:15 P.M.	.54	.62	.71		
30	8:15 A.M.	.60	.67	.75	52	Rain
	12:00 P.M.	.52	.60	.69		
31	8:00 A.M.	.52	.60	.69	51	Fair
	11:00 P.M.	.57	.64	.74		
Sept.						
1	9:00 A.M.	25.65	25.72	25.80	51	Fair
2	9:00 A.M.	.62		.76	47	Clear
		.45	.49	.69		Rain
3						Cloudy
4	11:30 A.M.	.59	.65	.83		Rain
	11:00 P.M.	.56	.60	.80		
5	7:45 P.M.	.52	.56	.74	47	Fair
	11:00 P.M.	.55	.60	.80		
6	7:30 A.M.	.65	.70	.86	46	Cloudy
"	"	Hyp. Green 204.486 = *25.72*				
	12:00 M.	.62	.67	.85		
7	8:00 A.M.	.61	.66	.84	44	Cloudy
	11:30 A.M.	.53	.57	.76		
8	8:00 A.M.	.52	.56	.74	50	Fair
	10:30 A.M.	.58	.64	.80		
9	6:45 A.M.	.66	.70	.83	41	Clear
	11:00 A.M.	.56	.62	.80		
10					46	Clear
11					44	Clear
	11:00 P.M.	.50	.55	.72		
12		.54	.56	.70	40	Clear
	10:30 P.M.	.36	.42	.60		
13	8:00 A.M.	.37	.41	.59	45	Rain
		.50	.55	.71		
14	8:00 A.M.	.51	.56	.73	44	Rain
	11:00 P.M.	.25†	.26†	.46†		
15	8:30 A.M.	.30	.32	.50		Cloudy
	10:00 P.M.	.39	.43	.60		
16	8:00 A.M.	.44	.46	.60	40	Rain
	1:00 P.M.	.46	.51	.66		
"	"	Hyp. { Green 204.36 = *25.65* Hicks 204. 6 = *25.78*				
	11:00 P.M.	.48	.59	.76		
17	8:30 A.M.	.64	.70	.86		Showers
	10:30 P.M.	.60	.70	.90		
18	7:30 A.M.	.68	.78	.94*		Showers
	10:30 A.M.	.59	.65	.84		
19	8:00 A.M.	.60	.66	.82		Clear
	10:30 A.M.	.51	.58	.76		
20	4:00 P.M.	.40	.45	.63		Fair
	11:00 P.M.	.30	.36	.56		
21	11:00 A.M.	.34	.40	.57		Fair
	11:00 P.M.	.40	.49	.66		
22	8:00 A.M.	.55	.61	.73	34	Fair
23	8:00 A.M.	.64	.71	.84	36	Fair
	11:00 P.M.	.66	.66	.85		

* = Highest. † = Lowest.

Summary of Temperature at Sandford Camp, 1909–1912

Dates	Average Shade Temperature				Maximum			Minimum	
	Between 6 and 9 A. M. ° F.	No. of Readings	Between 8 and 11 P.M. ° F.	No. of Readings	Shade ° F.	No. of Readings	Solar ° F.	° F.	No. of Readings
1909, June 26–July 2	44.6	(3)	45.5	(4)					
1910, July 9–23	53.4	(9)	53.4	(12)					
1911, June 14–July 23	47.2	(25)	45.5	(18)			120	36.9	(28)
1912, June 23–July 9	48.5	(13)	47.9	(9)	56	(14)		40.6	(16)

Proportion of Rainy and Clear Weather in the Northern Selkirks

Dates	No. of Days	Days Clear or Cloudy	Days Rainy
1909, June 14–July 7	23	14	9
1910, July 4–July 26	23	16	7
1911, { June 10–July 26 / Aug. 10–Aug. 20 }	58	32	26
1912, June 18–July 10	22	12	10

The foregoing tables present the chief observations made with barometer, hypsometer, and thermometer during the seasons of 1910, 1911, and 1912. Since the data were only employed for the final determination of the few heights not covered by the triangulation, a detailed discussion or explanation of the figures in this aspect is superfluous.

However, a word as to the general behavior of some of the instruments may not be amiss. The aneroids, although of medium grade, did not give very good results in determining differences of elevation amounting to more than 1500 feet. Above this limit even the mean of the ascending and descending readings of the three instruments was apt to exceed the surveyed values by as much as 100 feet. When only a single instrument was employed or when for any reason the temperature at the upper station was not secured, the mean results might be even 300 feet in excess. One especial cause for distrust lay in the discrepancies noted in the readings of the same instrument when taken

over the same course under similar conditions on different days.

In each of the three seasons, elevations by the method of differences were carried up the valley from the Columbia and back again, but the results placed Sandford Camp from 200 to 400 feet too high. This kind of progressive leveling, where the horizontal distances covered each day are long as compared with the differences in elevation, seemed to exhibit the aneroids at their greatest disadvantage.

No attempt was made to determine heights by an average of a large number of readings compared with readings at a distant place of known altitude or with readings at sea level, so the errors which developed in the separate aneroids, as shown by the various simultaneous hypsometer readings, played no part in the computations.

In the case of differences less than 1500 feet, a few rather good results were secured. Boulder station measured 101 feet above Camp station, the surveyed value being 4 feet less. Base station read 442 feet as compared with 438 feet by survey. It is safe to say that it is when measuring moderate heights from altitudes otherwise known that the aneroid gives its best service. And thus the barometric elevations on the map at the end of this volume were obtained.

These fragmentary and rather depreciating remarks are intended to emphasize the fact that heights obtained by the aneroid should be scrutinized closely and that the proper use of the instrument is by no means as simple as many travellers suppose.

The hypsometer was employed chiefly as a check upon the aneroids, it being rather heavy for constant use upon the peaks. In one instance, however, Pioneer Peak, it was taken along and contributed to a fairly satisfactory determination of the height. For this reason the figures are given in full on the following page:

MEASUREMENT OF PIONEER PEAK WITH HYPSOMETER AND ANEROID

Aneroid (Hicks, with release)					Hypsometer (Hicks)
Temp.	Up		Down	Temp.	Down
50°	Top (12.25 P.M.) 19.85 = 12,149		(2.35 P.M.) 19.90 = 12,080	50°	193.2° = 10,088
54°	Camp (4.30 A.M.) 23.92 = 7,068		(7.30 P.M.) 23.60 = 7,433	59°	201.4° = 5,609
		5,081	4,647		4,479
	Temp. correction (5081 × .004) =	20	(4647 × .009) =	42	
		5,101	4,689		Corrected for Temp. (4479 × 1.05) = 4702

Average of Aneroid and Hypsometer (down) = 4,695
Ascent by Aneroid 5,101

Average Elevation of Pioneer Peak above Sandford Camp 4,898
Elevation of Sandford Camp 5,726

Altitude of Pioneer Peak ..... 10,624 feet
Altitude of Pioneer Peak by Survey 10,657 feet
Difference ..... 33 feet

NOTE: In the above computation, Professor Airy's tables were used for the barometer and Galton's for the hypsometer. With these, all corrections for the decrease of gravity are, I believe, neglected. Some tables for use with aneroids and some for use with hypsometers contain corrections for decrease of gravity on a vertical acting on a column of mercury, but it seems difficult to justify such a practice. Here again is another reason for a close scrutiny of altitudes obtained by aneroid or hypsometer. It is, of course, manifest that where starting and summit aneroid readings are "checked" simultaneously by the hypsometer, the former instrument might as well be discarded, unless the results from both are averaged in the final computation. To enter tables designed for a mercurial barometer with aneroid readings corrected by the hypsometer and to apply the mercurial barometer corrections thereto, is a step to be carefully guarded against.

The expedition to Pioneer Peak was carried out during a period of diminishing atmospheric pressure and it is largely for this reason that the mean of the descending aneroid and hypsometer readings is averaged with the ascending aneroid reading. The total average fall for the twenty-four hours in which the trip was made was .25 inch as shown by the two stationary aneroids at camp.

A full discussion and description of the use of the hypsometer for altitude measurements, with tables, will be found in the *Alpine Journal*, London, vol. v., pp. 218–230, by F. F. Tuckett. With regard to many of the other methods for determining heights, see "The Measurement of Altitudes," by Henry Gannett, published in *Mazama*, Portland, Oregon, vol. i., No. 2, for October, 1897, pp. 243–264, with tables.

APPENDIX H

RECORDS OF THE CANADIAN METEOROLOGICAL SERVICE

THROUGH the courtesy of the Canadian Meteorological Service, I am enabled to present the following abstracts of the rainfall and snowfall at Revelstoke, Glacier, and Golden for the years 1908–1913. These stations, being nearest the glaciers mentioned in the foregoing pages, naturally afford data of considerable significance with respect to them. The tables have been rearranged to exhibit the results by seasons rather than by calendar years, since the glaciers were necessarily studied in this aspect. Obviously no direct correlation between these figures and our measurements of the Sir Sandford glacier is possible owing to the considerable interval that must elapse before an increase or decrease in precipitation in the reservoir can become apparent in the dissipator. The tables are inserted rather as generally indicative of the relative amounts of snow which prevailed upon the mountains during our expeditions of different years. The table of total precipitation in the summary illustrates graphically the marked increase towards the summit of the range (about 70%) and the even more marked decrease on the eastern side, the storms in their easterly course having deposited most of their moisture upon the mountains.

PRECIPITATION AT REVELSTOKE, GOLDEN AND GLACIER AS RECORDED BY THE CANADIAN METEOROLOGICAL SERVICE.

TABLE OF PRECIPITATION AT REVELSTOKE, B. C. (ALT. 1503 FT.)

1908–1909		1909–1910		1910–1911		1911–1912		1912–1913		MONTHS
Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	
inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	
1.33	00.0	2.32	00.0	0.89	00.0	2.57	00.0	4.13	00.0	July
1.78	00.0	1.36	00.0	1.61	00.0	1.63	00.0	4.03	00.0	August
1.79	00.0	2.88	00.0	2.15	00.0	2.64	00.0	1.49	00.0	September
2.69	02.0	4.49	00.0	6.19	00.0	0.46	00.0	4.96	00.0	October
5.18	04.0	2.77	44.5	3.27	32.0	2.30	28.4	3.18	28.0	November
0.22	22.0	0.00	36.2	1.55	71.6	0.80	35.0	0.40	77.5	December
0.32	58.5	1.67	16.6	0.60	69.5	1.13	40.8	0.00	75.7	January
1.52	51.0	0.40	45.2	0.00	32.7	1.70	16.2	1.59	13.2	February
0.78	08.5	4.03	04.0	2.24	07.4	0.00	07.2	1.13	01.6	March
2.26*	*	4.30	00.0	0.83	00.0	1.93	00.0	0.88	00.0	April
1.49	00.0	0.67	00.0	2.59	00.0	1.86	00.0	2.25	00.0	May
3.29	00.0	2.51	00.0	2.13	00.0	2.29	00.0	1.73	00.0	June
22.65	146.0 12.1 ft.	27.40	146.5 12.2 ft	24.05	213.2 17.7 ft.	19.31	127.6 10.6 ft.	25.77	196.0 16.3 ft.	Totals in inches
37.25		42.05		45.37		32.07		45.37		Total precipitation (inches).
102		104		94		87				Rainy days
46		43		68		51				Snowy days
148		147		162		138				Total
41		40		44		38				Percentage of stormy days

TABLE OF PRECIPITATION AT GOLDEN, B. C. (ALT. 2580 FT.)

1908–1909		1909–1910		1910–1911		1911–1912		1912–1913	
Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall
inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
1.10	00.0	1.55	00.0	0.22	00.0	1.25	00.0	3.73	00.0
0.37	00.0	1.18	00.0	1.64	00.0	1.28	00.0	3.92	00.0
0.92	00.0	1.54	00.0	1.60	00.0	0.00	00.0	1.02	00.0
1.10	07.0	1.25	00.0	3.16	00.0	1.22	00.0	0.68	00.5
1.37	04.0	1.43	38.0	0.90	17.6	0.00	33.0	0.25	18.5
0.03	11.5	0.00	19.0	0.00	12.5	0.10	12.5	0.00	17.8
0.10	33.5	0.00	11.5	0.00	46.0	0.00	19.5	0.00	40.0
0.09	10.3	0.00	30.8	0.00	19.5	0.00	04.5	0.00	00.0
1.00	01.5	1.40	04.8	0.00	04.8	0.00	01.5	0.00	09.0
0.00	04.0	1.70	00.0	0.00	04.0	0.78	00.0	0.00	00.3
0.55	00.0	0.68	00.0	2.53	00.0	0.73	00.0	0.40	00.0
2.24	00.0	1.97	00.0	1.75	00.0	1.29	00.0	2.51	00,0
8.87	71.8 5.9 ft.	12.70	104.1 8.6 ft.	11.80	104.4 8.7 ft.	6.65	71.0 5.9 ft.	12.51	86.1 7.2 ft.
16.05		23.11		22.24		13.75		21.12	
56		51		44		27			
22		27		35		27			
78		78		79		54			
21		21		21		15			

* No record. The value adopted for the rainfall is the mean of the years 1907–1913 for this month.

The mean annual precipitation at Revelstoke for the years 1898 to 1912 was 42.74 inches (Rainfall = 28.38; Snowfall = 143.6).

TABLE OF PRECIPITATION AT GLACIER HOUSE, B. C. (ALT. 4093 FT.)

MONTHS	1908–1909		1909–1910		1910–1911		1911–1912		1912–1913		Mean Monthly Precipitation, 1894–1912, 18 years		
	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Rain-fall	Snow-fall	Snowfall	Rain-fall	Mean Precipitation
	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches	inches
July	3.32	00.0	2.32	00.0	1.03	00.0	2.87	00.0	4.32	00.0	00.0	2.34	2.34
August	2.40	00.0	1.97	00.0	2.58	02.5	2.55	00.0	8.64	06.0	00.3	2.58	2.61
September	4.71	03.0	5.85	00.0	4.08	00.0	2.23	01.5	2.30	00.0	01.9	4.04	4.23
October	2.70	21.0	2.22	29.0	7.31	19.0	0.52	91.0	2.11	32.0	16.1	2.31	3.92
November	7.64	30.5	0.00	119.0	0.22	75.5	0.00	120.5	0.00	109.5	83.1	0.96	9.27
December	0.00	104.0	0.00	55.0	0.00	98.5	0.00	85.5	0.00	136.5	81.0	0.02	8.12
January	0.00	120.0	0.00	88.5	0.00	129.5	0.00	79.0	0.00	101.0	83.1	0.11	8.42
February	0.00	78.0	0.00	63.0	0.00	45.0	0.00	78.0	0.00	52.5	63.0	0.00	6.30
March	0.00	16.0	0.00	86.5	0.00	78.0	0.00	12.0	0.00	80.5	53.8	0.08	5.46
April	0.00	36.5	1.75	37.5	0.00	41.5	0.45	13.0	0.00	22.0	26.1	0.24	2.85
May	0.33	10.5	1.69	00.0	3.03	05.0	1.67	00.0	0.16	12.0	05.6	0.94	1.50
June	3.05	00.0	3.65	00.0	2.04	00.0	2.48	00.0	2.52	00.0	00.0	2.98	2.98
Totals in inches	24.15	419.5 35 ft.	19.55	478.5 39.9 ft.	20.29	494.5 41.2 ft	12.77	390.5 32.5 ft.	20.05	546.0 45.5 ft.	414.0 34.5 ft.	16.60	58.00
Total precipitation in inches	66.10		67.40		69.74		51.82		74.65		Mean annual Snowfall		Total mean annual precipitation

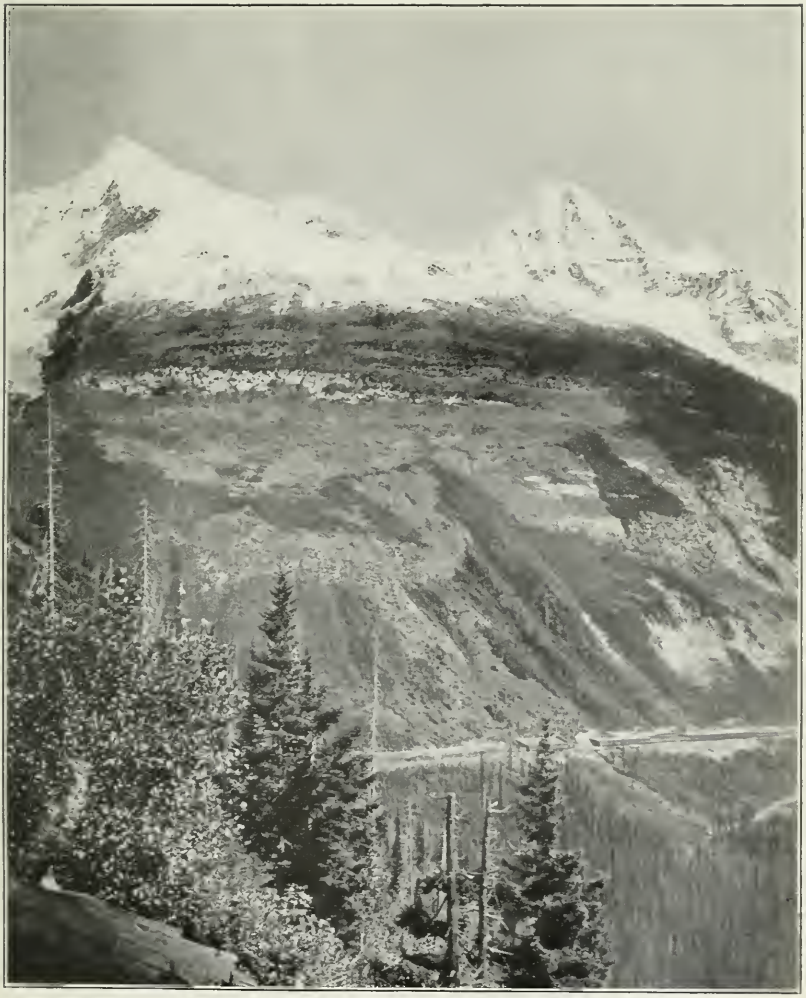
SUMMARY

	Rainfall			Snowfall			Total Precipitation		
	Revelstoke	Glacier	Golden	Revelstoke	Glacier	Golden	Revelstoke	Glacier	Golden
	inches	inches	inches	feet	feet	feet	inches	inches	inches
1908–1909	22.65	24.15	8.87	12.1	35	5.9	37.25	66.10	16.05
1909–1910	24.70	19.55	12.70	12.2	39.9	8.6	42.05	67.40	23.11
1910–1911	24.05	20.29	11.80	17.7	41.2	8.7	45.37	69.74	22.24
1911–1912	19.31	12.77	6.65	10.6	32.5	5.9	32.07	51.82	13.75
1912–1913	25.77	20.05	12.51	16.3	45.5	7.2	45.37	74.65	21.12

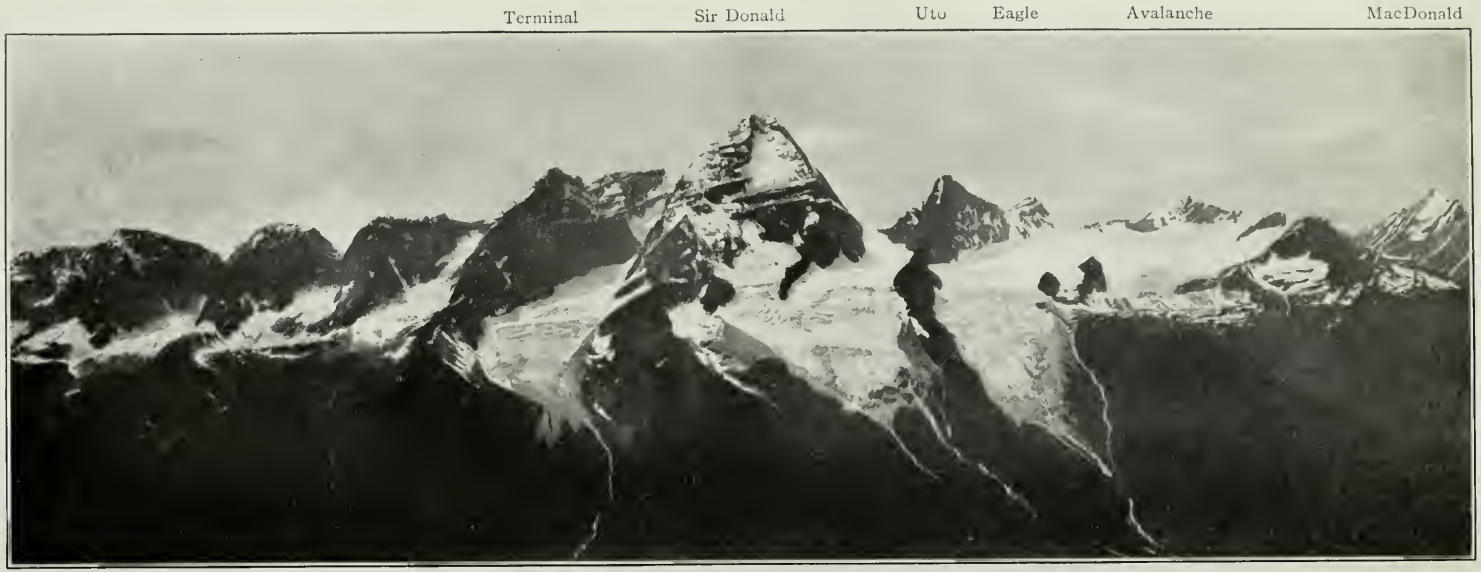
In connection with the tables it may be appropriate to add a few notes with regard to the weather, although it should be borne in mind that for days at a time while the precipitation itself is negligible, cloudy and rainy weather often makes mountaineering out of the question.

It is probably safe to regard the precipitation at Glacier as typical of that of the valleys generally of similar elevation elsewhere in the range. The table shows that June and September have the most rain, while July has the least (disregarding months when snow falls). Our experience points to the conclusion that the best average weather is to be had during the latter half of June, July, and the early part of August. August is, however, subject to the occurrence of severe storms as in 1907 (see page 152), and again in 1912, when an extraordinary rain of 8.64 inches was reported—a fall in this one month of more than one-half of the mean *annual* rainfall as computed for eighteen years.

The season of 1912–1913, as a whole, exhibits a very heavy precipitation, being the maximum for the period embraced in the table and about 25% *greater* than the mean annual record for eighteen years. It is worthy of note that it followed directly upon a season characterized by a precipitation about 10% *less* than that mean. The snowfall of the winter of 1912 and 1913 exceeded the mean for eighteen years by $33\frac{1}{3}\%$, and accordingly there is every reason to believe that Mount Sir Sandford presented, in the season directly after its ascent, conditions *more favorable for assault than at any time during the four years of our siege.* (*Cf.* p. 326.)



MOUNTS EAGLE AND AVALANCHE



THE SIR DONALD RANGE FROM THE PRAIRIE HILLS

Photographs by F. K. Butters

APPENDIX I

NOTES ON THE SIR DONALD RANGE

Mount Sir Donald, Northwest Arête. The pioneer party to demonstrate the feasibility of this route was that of Herr Edward Tewes of Berlin. Accompanied by the guides, Edouard Feuz, Sr., and Christian Bohren, he left the hotel at 4. o'clock on the morning of September 3, 1903. Following the usual path to the mountain, they branched off to the left at the base of the great cliffs of the west face and made directly for the Sir Donald-Uto col, where they arrived at about 7.30 A.M. With but a short halt, they then commenced the climb proper. Many traverses on both faces of the peak were found to be necessary, and much difficulty was experienced with newly fallen snow, but after eight hours of continuous work, they finally succeeded in winning their way to the top (4.15 P.M.). Starting back fifteen minutes later the descent was effected by the usual route, the party arriving at the hotel at 9. o'clock, seventeen hours after their departure. In an interesting and very full account of the trip,[1] Herr Tewes makes the following comment: "The new route can scarcely become popular. The difficulties are so manifold and intense, the climbing from the first to the last moment so expert, that the expedition in every respect can stand side by side with the most arduous expeditions in the Alps."

The second[2] ascent of Mount Sir Donald by the northwest

[1] *Zeitschrift des Deuts. u. Oest. Alpen.*, vol. xxxvi. for 1905, p. 159.

[2] The third ascent was performed by Mr. J. D. Patterson in the summer of 1911 accompanied by Gottfried Feuz and one other guide.

arête was made in 1909 by Messrs. Val. A. Fynn and A. M. Bartleet without guides. The weather conditions were all that could be desired, and the rocks were dry. Setting out from Glacier House at 3.15 A.M., they reached the col at 6.40 A.M. and the summit at 11.25 A.M. On the descent the usual route was taken, the trip occupying four hours and twenty minutes to the hotel (5.20 P.M.). The total going time amounted to twelve hours and a half. Mr. Fynn alludes to the climb as follows: "The rocks are steep, but afford plenty of holds. Some care is required as a number of the boulders are loose; apart from this, the climb is absolutely safe and cannot be considered difficult in favorable conditions."[1]

In these two extracts we have widely divergent opinions regarding the character of this fine arête. The difference between them, however, is perhaps more apparent than real. First ascents almost invariably prove more exacting than later ones, for the uncertainties and anxieties of the undertaking are then at their maximum and therefore add a heavy burden to the physical labor involved, particularly on such an expedition as this where, if a party found itself completely blocked, the difficulty of a return by the same route would be considerably greater. The Tewes party also had to contend with fresh snow on the ledges, a circumstance that would very decidedly prolong the trip and enhance the labor and caution required. On the other hand, Messrs. Fynn and Bartleet had the advantages of dry rocks and a small party, and both being mountaineers of wide experience, they were able to make these factors tell heavily in their favor. In the light of these considerations it is probably going too far to classify the ascent of Sir Donald by this ridge with the best rock courses of the Alps, and we shall come closer to the mark if we characterize it as a safe and highly interesting climb whose difficulties are by no means to be despised by expert mountaineers.

[1] "Ascents in the Canadian Rockies," by Val. A. Fynn, *Canadian Alpine Journal*, vol. ii., No. 2, p. 87.

Terminal Peak. It seems appropriate to record here a brief mention of the first[1] ascent of the mountain, for the minute book at Glacier House from which the data were copied disappeared unaccountably not long ago. The party was composed of Cornelius P. Kitchell of New York

[1] The second ascent was made by a party consisting of Messrs. E. W. D. Holway, F. K. Butters and the writer, August 19, 1909.

It seems desirable to call attention in a short note to the inconsistent altitudes and names that have been attributed to Terminal Peak in various quarters in order to prevent, if possible, their repetition in the future. The name "Terminal" made its first public appearance in relation to the Selkirks upon the government map of the region dated June 15, 1906, and published with Wheeler's volumes entitled, *The Selkirk Range.* It is there applied to the most easterly peak of the Sir Donald Range overlooking Beaver valley. An altitude of 9991 feet is ascribed to it and this figure appears to be in agreement with the contour lines. From the peak so designated, a lofty narrow ridge runs westerly for over half a mile to the small pointed peak overlooking Glacier House which has already been referred to as Green's Peak, but is unnamed on the map. The height of the latter, judging by the contours, is 9700 feet. In Wheeler's report and the accompanying panoramic plates, the height, 9991 of the map is not mentioned, but instead the figure 9773 is used to designate the same peak, with no explanation for the change. Furthermore, the 9773 is applied interchangeably to the lower or westerly (Green's) peak as well, even on the plate where both peaks are shown. Finally a third value 9719 is indicated as an alternative for 9773 in the case of the westerly peak. As a result we have three distinct heights for two peaks, the intermediate value being used interchangeably with the smaller as to Green's Peak and in place of the larger in the case of Terminal Peak proper. Without going further into detail, it may be said that each reference to Terminal Peak and to Green's Peak in the book, map, and plates is inconsistent with one of the others in some particular. From one of the diagrams, however, we may infer that the real intent of the survey was to apply the name "Terminal" to the whole massif south and east of Sir Donald, and to fix the respective heights of the two peaks at 9719 for the former Green's Peak, and at 9773 for the original point 9991 of the map. But on this hypothesis the latter figure must be regarded as erroneous (although correct from the contours) as well as all the references in the book which consistently ignore the peak over Beaver valley and attach the figure 9773 to the peak overlooking Glacier that is really 9719 feet in altitude. The whole question is most involved and must remain so until further data are made available.

City, Allan F. Kitchell, and Edward Feuz, Jr., as guide. Setting out from Glacier House at 8.50 A.M., August 23, 1906, they followed the route already described to the base of the final rocks. Here a treacherous bergschrund halted them but finally the crossing was accomplished and they ascended straight up the face of the mountain, finding some fine climbing on the numerous ledges. They described the quality of the rock as good in comparison with that of the Rockies. The summit was reached at 2.35 P.M. and after securing a round of photographs the return trip was commenced fifty minutes later. Instead of descending as they had come, they climbed down the eastern arête and avoided the bergschrund, thus saving much time. The hotel was regained at 7.30 P.M. They alluded to the climb as most interesting and designated the point reached by mentioning its altitude as 9773 feet.

Uto. The first ascent from the Sir Donald-Uto col was probably that of Mr. Van Santvoord Merle-Smith, of New York, made in the summer of 1911. He was accompanied by Ernest Feuz as guide. Owing to threatening weather, the traverse was not attempted, the party descending as they had come direct to the col. In connection with Uto there is an interesting trip which deserves mention—the traverse around Uto and Eagle *via* the above-mentioned col, the Uto and Eagle glaciers and the col between Eagle and Avalanche. This expedition was successfully carried out September 9, 1911, by a party consisting of Miss E. I. Cummins and Miss A. Finlayson, of the Canadian Alpine Club, with the guides Gottfried and Ernest Feuz.

Eagle Peak presents but one minor difficulty if the usual route, the southwesterly arête, is followed from Avalanche meadow. This is a 50-foot face of smooth rock, inclined at about 45 degrees, which apparently cannot be turned by a traverse. It is, however, surmountable by means of an obvious crack leading up directly from the arête. At the point where the latter abuts against the main peak the route swings to the right until, above the steep cliffs, a prominent couloir, ordinarily filled with snow, points the easiest way

to the summit ridge. The climb occupies between five and six hours, of which the first two will be spent in gaining the ridge. The descent to the hotel will take from two to three hours.

The route to *Avalanche Peak* continues to the left at the meadows in the direction of the small glacier. This is traversed towards the peak. A small *schrund* is crossed and then the climb is made directly up the south face. As stones sometimes fall here, the couloir should be avoided wherever possible. The ascent may be expected to occupy about five hours, but the descent will probably not consume more than three.

Mount Macdonald is very seldom visited. It is a rather long climb and requires an early start. The best route lies along the railway until just beyond the summit of the pass. Here one should strike upwards over the rough, bushy slopes into the deep amphitheater leading to the col north of Mount Avalanche. After crossing the col, an easy glacier on the farther side (much larger than shown on the map) will conduct one to the southerly slopes by which the summit may be gained perhaps most advantageously. It was on the slopes of this amphitheater that occurred the second fatality in the annals of Selkirk mountaineering, Miss Helen Hatch, in 1908, attempting an uncautious glissade upon a patch of snow. The party were near timber-line and climbing proper had not begun.

APPENDIX J

A BRIEF SELKIRK ITINERARY OF THE PARTIES ORGANIZED BY THE LATE DR. CHARLES H. SHAW

By Reuben T. Shaw

The following expeditions were undertaken by my late brother chiefly for the purpose of collecting specimens of the then imperfectly known flora of this section of British Columbia. In each of several seasons as many as 40,000 plants were brought back, sets of which may be found in the leading museums and universities in both the United States and Europe. Although we were interested in getting to the tops of peaks, mountain climbing was entirely subordinate to our study of the vegetation, and while the latter frequently took us above the snow-line, we could never spare the time to accomplish all that we desired. Only about ten days were usually allotted to this part of the program. As we very seldom used guides or animals to help us in transportation, much of the period was consumed in getting within striking distance of peaks that were wild and interesting enough to attract us.

In 1904, four main camps were established in the Canadian Alps. The first was at Emerald Lake, the second at Carbonate Landing, the third in the Prairie Hills on the north fork of the Spillimacheen, the fourth at Rogers Pass. From each of these camps we made side trips of various lengths up to fifty miles or more. It was while we were at the Prairie Hills that we got our first glimpse of what is now called Mount Sir Sandford. From Mount Copperstain,

the big mountain appeared as a great white mass which at once inspired us with the thought of reaching it and climbing it if possible. Later in the summer we questioned a number of guides and trappers at Rogers Pass with reference to this mountain, but we were unable to get any satisfactory answers. However, we made two trips, one up Mountain Creek and the other up the north fork of the Illecillewaet. I did not go on the former and have no report to give as to the results. The trip up the north fork of the Illecillewaet took us to the very head of that stream and a mile or more into the Downie Creek region, but as we had only one day to spend we did not make any ascents in that locality. The various arms of Downie Creek struck us as being well worthy of exploration.

In 1905, the chief camps were at Howser Lake, Revelstoke, Ground-Hog Basin (on Gold Stream), and at Beavermouth. Short trips were made from these camps just as in the previous summer. No definite attempt was made to climb Mount Sir Sandford, but quite a little was accomplished in investigating the country near the headwaters of Downie Creek. A small section of the party left the Ground-Hog Basin Camp and went to Standard Mine (between Carnes and Downie creeks). They were told that the country was impassable from that point, but nevertheless four men and two women made their way over the roughest going for fifteen miles or more through the various branches of Downie Creek. On one of these they found a beautiful little lake which my brother called "Chrome Lake." On the side of the valley where this lake lies, a great glacier hangs in three tiers separated by almost perpendicular cliffs. During the summer the valley is kept in constant reverberation by the cannonading of the stones and pieces of ice down these cliffs. Part of the course which the party took upon leaving this lake was dangerous. Over several stretches of fifty yards or more the stones fell so frequently that they had to keep dodging in spite of the difficult nature of the footing. Before regaining Standard Mine, they found themselves snowed in, and it was two days before they could move.

[The information supplied by Mr. Shaw with regard to the expeditions of 1906, 1908, and 1909, will be found in the text, pages 148, 155, and 302 *n.*]

In selecting the party for 1910 only those were taken who had exhibited especial hardihood and love for the wild woods and mountains, for the "skipper" (as Dr. Shaw was known to the party) planned to go all the way around the bend of the Columbia from Revelstoke to Donald. In June, Dr. Shaw with Dr. Jacobs went down the Columbia by canoe from Beavermouth to Kinbasket Lake, a distance of about forty-five miles. Here they left the canoe and a good supply of provisions, returning to the railroad on foot.

About the middle of July, the party, consisting of four men, five women, and Dr. Shaw's eight-year-old boy, started up the Columbia from Revelstoke. This trip had never been undertaken by women before and by but few men other than trappers and prospectors. For the first forty miles they travelled by steamer, and for the next forty-five by pack-train, but thereafter they went on foot. At the Big Bend they found a man stationed by the government to ferry people across the river. A thirty-mile march from this point brought them to the lake, the canoe, and the provisions.

Every one was happy and with good reason. The scenery was grand, the weather fine, food plenty, and the strenuous trip accomplished except for sixty miles of easy-going through a district whose only drawback comprised a plague of voracious mosquitoes. All wished to stay as long as the provisions would last. Doctors Jacobs and Colton, however, could remain but a short time, so every one wrote letters to his friends and relatives to be taken to the railroad and mailed. In Dr. Shaw's letter to his mother, written on the morning of July 30th, just before the men started out, he says, "We are camping away in the heart of the wilderness on the grandest spot I have ever seen. The mountains, the snow-fields, the glaciers, the woods, and the lake produce a scene far grander than the Lake of Lucerne."

Dr. Shaw took the men up the lake about four miles in the canoe in order to get them past two streams emptying into the lake which could be crossed only with difficulty at this season of the year. The men watched Dr. Shaw start back alone in the canoe, but he was never seen alive again. He was a good swimmer but ice-cold water will bring disaster to the strongest and best. It is probable that the canoe was capsized by a squall which came up suddenly that afternoon, and that the cold water induced either cramps or heart failure before he was able to reach the shore. The canoe was found about eight days afterwards and the body about five weeks later. He was buried at the lake in the heart of the wild woods which he loved so deeply. The heroism shown by the members of his party and his wife is far beyond my power of description. It must suffice to say that they arrived at Donald in safety by way of the Columbia trail.

APPENDIX K

THE FIRST ASCENTS OF MOUNTS BEAVER AND DUNCAN

By E. W. D. Holway, F.R.G.S.

"They endure the greatest Fatigues and traverse the most impassable ways and horrid Precipices, in order to the execution of their designs."—Hennepin, 1698.

Twice the writer had camped in the upper end of the Beaver valley, expecting to try conclusions with these fine peaks, but continuous rain always prevented climbing. The morning of August 22, 1913, showed every sign of settled weather and the two Swiss guides at Glacier House, Ernest Feuz and Christian Häsler, were persuaded to carry packs and to undertake the trip. No time was lost in getting ready, and at 1.00 o'clock we were starting down the old trail from Bear Creek station. About ten miles up Beaver valley, we stopped for the night on the bank of the river. It was planned to make an early start the following morning so as to reach the Beaver Glacier Camp in the evening, but a heavy rain from 4.00 to 6.00 A.M. kept us in the tent and not until the morning of the 24th did we arrive. The balance of that day was spent in preparing soft beds of balsam boughs and in exploring the great tongue of the Beaver glacier.

Breakfast having been cooked in the evening and the alarm watch set, at 2.30 A. M. on the 25th we were following the light of the candle along the valley trail. When we came to the stream from the Duncan glacier, we turned upwards and kept along this until we reached the big north moraine. Preceded by two mountain goats, we walked

LOOKING SOUTH FROM THE PEAK OF MOUNT BEAVER

Showing unexplored country and nameless peaks drained by the Duncan River

Photograph by E. W. D. Holway

THE PEAK OF MOUNT SMART FROM THE NORTHWEST RIDGE

Photograph by A. A. McCoubrey

MOUNT DUNCAN, 6000 FEET ABOVE THE TONGUE OF BEAVER GLACIER

Photograph by E. W. D. Holway

along its crest. Near the upper end, we passed onto the glacier and put on the rope. The ice was much crevassed and, in order to gain the lower rocks of the east face of Mount Duncan, we had to cut steps for fifty feet along the wall of a big *schrund*. Once on the mountain, we unroped and kept straight up until we had passed the great ice cliffs. We then made for the south arête and following that to the top, arrived at 9.10 A.M. A suitable monument having been erected, we started along the summit ridge towards Mount Beaver an hour later. It was almost a knife-edge and in a shockingly bad state of repair. We had hoped to be able to descend from the west peak of Duncan but we found that it overhung and so took the easy slope to the south col. Thence we descended a frozen waterfall and crossed the smooth wet rocks of the southwest face. We encountered several deep gullies in the lower part but finally arrived at the foot of the southeast arête of Mount Beaver. This route can only be followed when the rocks are free from snow, since the holds are merely the friction of the open hand. The rocks, however, are schist, and boot-nails bite well.

Since we planned to return by the glacier north of Mount Duncan, it was suggested that we climb faster and the guides, therefore, set a terrific pace. Instead of the estimated two hours, fifty-five minutes took us to the summit. It was 12.45 and the day absolutely perfect. All the great peaks of the Rockies were sharp and clear, and the beautiful ice world of the Selkirks looked even more wonderful than usual. The Battle Range by no means proved to be the end of the fine mountains; peaks and glaciers innumerable extended to the horizon. Only in the southwest did a dim line of haze suggest the region of the lakes. The first valley opening into the Duncan south of the pass is exceedingly attractive, leading up to the unnamed, unclimbed, glacier-covered peaks of the Battle Range which seem to be higher than Mount Beaver. The third valley also has some large glaciers and lofty peaks.

Another substantial stoneman was erected and, at 1.35,

not knowing how much time our new route would require, we went down to the col and turned north onto the glacier. Rounding Mount Duncan to the narrow ridge of rocks between the glaciers, we descended directly to camp over the hillsides and the moraine of the Beaver glacier. We arrived in time for an icy bath, and dinner before dark. By the government survey, the altitude of Mount Beaver is 10,644 feet; that of Mount Duncan is 10,548 feet.

Next morning we followed the trail about three miles down the river to the first meadows, waded the stream, and packed until 6.00 P.M. towards Grand glaciers through alderslides and all the abominations of a Selkirk mountain side. We camped among big bowlders at the edge of the south moraine, some distance above the tongue, where we found a small grove with plenty of dry wood and a nice little spring. But there was no place for the tent, so each man hunted up a protected nook in which to sleep. The guides were warned to look out for mountain rats, but not having any acquaintance with them, followed the advice only as to their boots. In the morning, Christian's pack-straps were badly eaten and the rice and salt had vanished. The writer occupied a hole between the stones and one big rat persisted in jumping down upon him throughout the night from a point some three feet above, so that when the alarm announced 3.00 A.M. he felt as though he had not slept at all.

As soon as it was light enough, we crossed the glacier to the east side of the 2000-foot ice-fall, where the north branch of Grand glaciers tumbles down from Deville névé. To this we followed Huber's route of 1890, partly on the ice and partly on the rocks. Then passing Mount Wheeler and The Bishops Range, we continued to the west side of the Deville ice-fall. Here we unshouldered our packs in order to search for a way down the cliffs into Glacier Circle. Huber states that he went on the rocks along the edge of the ice but we found it necessary to go higher and further to the west. With our packs it proved to be a "horrid Precipice" indeed. The rocks were wet, smooth, and partly

covered with moss, which slid off when stepped upon, so that the best way to move was with one's back to the wall, reaching down with the ice-axe for secure holds. Impeded by a thick pack, this method proved to be somewhat exciting, but going up, or without packs, the route would not be especially bad. We finally came to a place where it was necessary to get across a thin-looking snow-bridge spanning a deep gully. The rope was unpacked, Christian was tied on, and with a secure hold around a projecting bowlder he was carefully let down. The snow turned out to be solid and we cautiously followed. Presently we left the rocks for good and got onto the glacier. Arriving at the stream, we cut a tree for a bridge and were soon putting up the tent in the beautiful meadows of Glacier Circle.

Next morning we arose again at 3.00 A.M. and daylight found us trying a new route to the Illecillewaet névé by way of the moraine next to Mount Macoun. We found it to be a shorter and much better course than Huber's near Mount Fox. The snow was hard in the early morning and we reached Glacier House in ample time to prepare for lunch.

For completeness, a few notes with regard to the ascents which have been made from the upper Beaver valley may be added. Since the earliest times, the advantages of this means of approach to the southern mountains have been fully appreciated, but owing to the neglect of the authorities, the trail which formerly existed has become practically impassable for horses and difficult for loaded men. In consequence, all but the most persevering travellers have been deterred from exploring the fine mountains of this section by its means.

The earliest mountaineering party on record to visit the upper Beaver valley appears to be that of Messrs. Huber, Topham, and Forster in 1890. Their explorations and ascents are outlined in *The Selkirk Range* by Mr. A. O. Wheeler, pages 283 to 286. The first ascent of Mount Sugarloaf was accomplished by them. The second ascent seems to be that of Mr. P. A. Carson, D.L.S., made in 1907. It is

described by him in the report of the *Topographical Surveys Branch* for 1907–1908, page 81. Camp was pitched in the valley below Grand glaciers. An attempt was first made via the south branch from a bivouac situated at an altitude of 6800 feet, but, after reaching 9000 feet, stormy weather drove the party back. On August 20th they again set forth at daybreak from the bivouac for a second attempt. "This time, however, instead of ascending the glacier, we stuck to the rocky cliffs leading directly to the desired peak. After a steady but by no means difficult climb of six hours, almost entirely over ice and snow, we reached the summit, altitude 10,700 feet. A temporary cairn was erected for station 24, but we could not set the permanent brass bolt on account of the depth of the snow. The descent to our fly-camp was made in four hours with many exciting glissades down almost precipitous snow fields." The report contains an interesting description of the upper portions of the valley.

The third ascent of Mount Sugarloaf was effected by Professor Holway in 1910, immediately following our flying excursion to Grand Mountain. After a trying experience with a pack-train, he decided to resort to shoulder-packing and to advance thus to the head of Beaver valley. Being unable to secure a companion, he set out alone from Bear Creek station on September 10th with a week's provisions. The next night he camped near the foot of Grand glaciers. After spending a day in reconnaissance, he selected a route, and on the 13th attacked Sugarloaf by way of these glaciers. The ascent occupied about eight hours, the descent about four, some time being spent at the summit. Except for crevasses, the trip was easy. The next day Beaver glacier was examined, and on the 15th, by making an early start, Professor Holway succeeded in covering the entire distance to the hotel, thirty-three miles, as he had come. Only one who knows the Beaver valley at first-hand can truly appreciate what this journey meant.[1]

[1] An illustrated paper under the signature of Professor Holway entitled, "Mount Sugarloaf: a Solitary Glacier Climb," was published in the *Canadian Alpine Journal* for 1911, vol. iii., p. 80.

On September 20th, Mr. S. H. Baker of Glacier joined Professor Holway in another trip up the Beaver valley. Forty-five-pound packs were taken and the camp was made near Beaver glacier. However, the weather now broke and all that they could do was to ascend the Duncan glacier to the col (9000 feet) northeast of Mount Duncan. Both glaciers were reported to be of exceptional beauty and interest but exceedingly difficult to negotiate owing to the number of crevasses. After waiting a day in the hope that matters would improve, the return was made on the 29th.

In the season of 1911, a party, consisting of Messrs. A. A. McCoubrey, A. H. Marshall, and others, spent some time in the upper portions of the valley, but bad weather prevented any high ascents.

Considering the small outlay required, no greater return in the way of making accessible some of the finest scenery in the range can be had than in the clearing of the Beaver valley trail.

A Note on the First Ascent of Mount Smart

With the account of the downfall of Mounts Beaver and Duncan, mention has been made in these pages of all but one of the new climbs which have been accomplished in the Southern Selkirks since 1902 from Glacier House as a starting point. It will, therefore, be appropriate to complete the list with a short record of the first ascent of Mount Smart, the particulars of which I owe to the kindness of Mr. A. A. McCoubrey, of Winnipeg.

The mountain is 9517 feet in altitude and lies about three miles to the west of Mount Bonney. At 4:00 A.M., on July 28th, 1912, Mr. McCoubrey accompanied by Gottfried Feuz, Swiss guide, set out for the peak from a camp situated in the upper part of "Smart Creek" valley, about two hours from the railway. The northwesterly arête was followed to the steep crest of the final peak. Here the rotten character of the rock necessitated careful work. The most difficult part of the climb, however, proved to be a critical traverse along the ice at the upper edge of a very steep glacier.

The party descended on the easterly face of the main peak and traversed the two lesser summits to the Bonney glacier. This was then skirted for a short distance and a gradual descent made over the easterly slopes of the valley to the Smart glacier which brought them to camp. The expedition consumed about eleven hours, six on the

ascent and five on the descent. With but two or three possible exceptions, all of the distinctive summits along the watershed of the main chain, south of the railway, as far as the Battle Range have now succumbed to the ambition of pioneer climbers, and henceforth those who covet the exhilaration of a first ascent must go far afield.

APPENDIX L

A LIST OF SELKIRK PEAKS TRIANGULATED AT 10,000 FEET AND ABOVE, WITH THEIR FIRST ASCENTS

THE peaks are arranged according to precedence in altitude and number forty. The altitudes are from the Dominion Topographical Survey and from surveys by the author. Names of travellers are given in alphabetical order; those of guides and porters are printed in italics.

Mount Sir Sandford	11,590 feet	June 24, 1912. E. W. D. Holway, H. Palmer, *Ed. Feuz, Jr.*, *Rudolph Aemmer.*
Mt. Dawson	11,113 "	Aug. 13, 1899. C. E. Fay, H. C. Parker, *C. Häsler*, *Ed. Feuz, Sr.*
Mt. Wheeler	11,023 "	Sept. 11, 1902. Topographical Survey under A. O. Wheeler.
Mt. Selwyn	11,013 "	1890. H. Forster and H. Topham.
Feuz Peak (Mt. Dawson)	10,982 "	July 8, 1908. E. Franzelin.
Mt. Adamant	10,980 "	June 26, 1912. E. W. D. Holway, H. Palmer, *Ed. Feuz, Jr.*, *Rudolph Aemmer.*
Mt. Adamant (East Peak)	10,970 "	(Unclimbed.)
Mt. Austerity	10,960 "	July 20, 1911. F. K. Butters, E. W. D. Holway, H. Palmer.

Turret Peak	10,910 feet	(Unclimbed.)
Grand Mt.	10,832 "	Aug. 18, 1910. E. W. D. Holway, H. Palmer.
Mt. Sir Donald	10,808 "	July 26, 1890. E. Huber, C. Sulzer, *H. Cooper*, p'ter.
Mt. Augustine	10,762 "	July 23, 1909. F. K. Butters, E. W. D. Holway, H. Palmer.
Mt. Sugarloaf	10,732 "	1890. H. Forster, E. Huber, H. Topham.
Mt. Cyprian	10,712 "	Aug. 12, 1908. F. K. Butters, E. W. D. Holway, H. Palmer.
The Gothics (Pioneer Peak)	10,660 "	July 21, 1910. F. K. Butters, E. W. D. Holway, H. Palmer.
Mt. Iconoclast	10,646 "	(Unclimbed.)
Beaver Mt.	10,644 "	Aug. 25, 1913. E. W. D. Holway. *Ernest Feuz, Christian Häsler, Jr.*
Mt. Kilpatrick	10,624 "	July 18, 1909. F. K. Butters, E. W. D. Holway, H. Palmer.
The Gothics (East Peak)	10,610 "	(Unclimbed.)
The Blackfriars (East Peak)	10,580 "	(Unclimbed.)
Mt. Fox	10,572 "	1890. H. Topham.
Mt. Duncan	10,548 "	Aug. 25, 1913. E. W. D. Holway. *Ernest Feuz, Christian Häsler.*
Mt. Rogers	10,536 "	July 30, 1896. P. S. Abbot, G. T. Little, C. S. Thompson.
Swiss Peak	10,515 "	Aug. 29, 1890. H. Sulzer, *Sinclair*, porter.
The Blackfriars (West Peak)	10,490 "	(Unclimbed.)

Mt. Purity	10,457	feet	1890. H. Forster, E. Huber, H. Topham.
Mt. Sorcerer	10,410	"	Aug., 1904. H. Petersen.
The Footstool	10,410	"	July 12, 1910. F. K. Butters, E. W. D. Holway, H. Palmer.
Pinnacle between Mt. Adamant and The Gothics	10,407	"	(Unclimbed.)
Fleming Peak (Mt. Rogers)	10,370	"	Aug., 1904, Miss G. E. Benham, *Ed. Feuz, Sr.*
Pinnacle East of The Gothics	10,250	"	(Unclimbed.)
Grant Peak (Mt. Rogers)	10,216	"	Aug., 1904. Miss G. E. Benham, *Edward Feuz, Sr.*
Mt. Bonney	10,205	"	Aug. 9, 1888, W. S. Green, H. Swanzy.
Mt. Moloch	10,198	"	(Unclimbed.)
Mt. Hermit	10,194	"	Aug. 4, 1904. S. H. Gray, A. M. Gordon, J. C. Herdman, *Ed. Feuz, Sr., Ed. Feuz, Jr.*
Mt. Trident	10,141	"	(Unclimbed.)
Michel Peak (Mt. Dawson)	10,034	"	E. Franzelin, July 8, 1908.
Mt. Holway	10,002	"	Aug. 17, 1911. F. K. Butters, E. W. D. Holway, H. Palmer.
Mt. Carnes [Mt. Serenity]	10,000	"	June, 1910. Topographical Survey under M. P. Bridgland.
Nameless peak in Purity Range west of Kilpatrick	10,000	"	(Unclimbed.)

In addition there are the following unmeasured peaks:

Apex of Battle Range, estimated at 10,500 feet.
Mt. Argonaut, " " 10,300 "
Several peaks in Battle Range, " " 10,000 " (plus).
Windy River Range, " " 10,000 " (plus).
Mountain between Gold Stream and Downie Creek, 10,000 feet.

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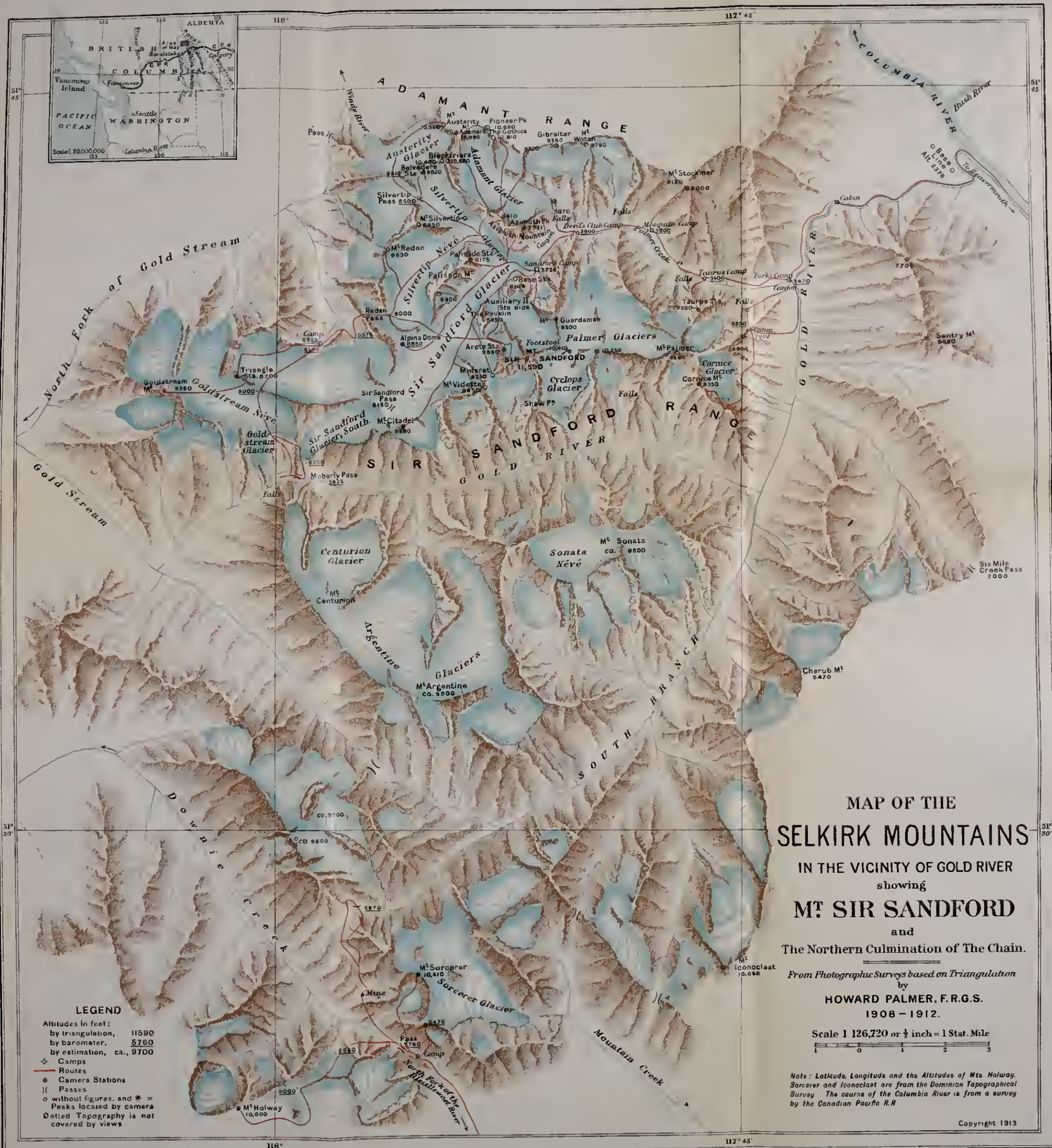

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