

## MOUNT SAINT ELIAS REVISITED.<sup>1</sup>



THE National Geographic Society, in connection with the United States Geological Survey, sent a small exploring party to Mount St. Elias, Alaska, in the summer of 1890.<sup>2</sup> The country visited during that expedition proved to be so interesting that a second expedition to the same region was decided on. The object of the second expedition was the extension of the surveys previously begun, and the ascent of Mount St. Elias. Like the first, it was placed in my charge. My party consisted of six camp hands, but did not include any scientific assistants. The camp hands were Thomas P. Stamy, J. H. Crumbach, Thomas White, Neil McCarty, Frank G. Warner, and Will C. Moore. The first three were also members of the expedition of 1890. The necessary preparations for camp life were made at Seattle, Washington, late in May, 1891. We sailed from Port Townsend early on the morning of May 30, on the United States revenue steamer *Bear*, in command of Captain M. A. Healy, and after a pleasant voyage reached Yakutat, Alaska, on June 4. Arrangements were made there with the Rev. Karl J. Hendricksen, in charge of the Swedish Mission, to meet us on our return at the head of Yakutat Bay on September 25, with a boat and some provisions which we left at the Mission.

The weather on June 5 being thick and stormy, the *Bear* remained at her anchorage until early the next morning, when she started toward Icy Bay, fifty miles west of Yakutat, the locality chosen for beginning our work. At nine o'clock we were about a mile off shore at the place designated on the charts as Icy Bay, although, as previously known, no bay now exists there. The weather was calm. Scarcely a ripple disturbed the surface of the sea, but the usual ocean swell was breaking in long lines of foam on the low sandy beach. A boat was lowered, and Lieutenant D. H. Jarvis went shoreward to examine the surf and choose a place for landing. He returned in about an hour, and reported that landing seemed practicable at a point which we found afterward was about a mile east of the principal mouth of the Yahtse River. Owing to the unfavorable

condition of the surf, except at high tide, the landing of our party with its stores, instruments, etc., was not completed until early on the morning of June 8. As our landing was accompanied by a sad accident, in which the lives of six brave men were lost, I shall pass briefly over the painful incident. The boats that took us ashore were in command of Lieutenants G. McConnell, H. M. Broadbent, D. H. Jarvis, and L. L. Robinson. Three of the boats capsized, one of which was in charge of Lieutenant Robinson, and from that boat only one man reached shore alive. Lieutenant Robinson, four of his boat's crew, and Will C. Moore of my party were drowned. I cannot speak too highly of the kindness we received from Captain Healy and from the officers associated with him, or of the bravery with which the lieutenants I have mentioned, and the men under their command, faced imminent danger and suffered no small hardships in order to facilitate the work of our expedition. Lieutenant Robinson's body was recovered by his comrades and taken to Sitka for interment. The remainder of the men lost were buried near where their bodies were washed ashore.

The *Bear* steamed away to the southwest about three o'clock in the morning of June 8, leaving my party to begin the work which was to occupy us for several months. Our first effort after landing was to remove our "outfit" from the low sand-bar, where it was liable to be washed away should a high tide be accompanied by a shoreward-blowing gale, to a place of safety in the edge of the forest to the eastward. There we established a camp in a delightful spot, about a mile from the sea, and on the border of an open meadow, which was white with strawberry blossoms. West of the Yahtse, and beyond a plateau of broken ice ten or fifteen miles broad, formed by a lobe of the Malaspina glacier, rises a range of "hills," as we called them, in contrast with the greater mountains near at hand, which present abrupt precipices between three and four thousand feet high, to the south. Their northern slopes are more gentle, and are deeply buried beneath snow-fields which contribute to swell the flood of the great Guyot glacier. This splendid range has been named the Robinson Hills, in memory of Lieutenant L. L. Robinson. Our general line of march from Icy Bay was almost due north. For about five miles we traversed broad, barren openings through the forest, formed by the flood-plains of swift glacial streams. The conditions of travel were very favorable, except where the streams were too swift and too deep

<sup>1</sup> The pictures in this article have been drawn from photographs taken by the expedition.

<sup>2</sup> A brief account of the expedition of 1890 appeared in *THE CENTURY MAGAZINE* for April, 1891, and more fully in the *National Geographic Magazine* for May, 1891.

to wade, or the sand in their bottoms so soft that it approached the condition of quicksand. Once while returning from a camp at the Chaix Hills to Icy Bay, not being able to find logs with which to make a raft, we had to swim one swift icy stream, and wade another that was considerably more than waist deep. A plunge into ice-water on a chilly, rainy day is far from pleasant, but can be endured if one takes it boldly. To wade slowly out from shore until deep water is reached is a torture that few can withstand. The best way is to take a heroic plunge where the bank is steep, and make the change from air to water as nearly instantaneous as possible.

From a camp at the foot of the Malaspina glacier we cut a trail, about four miles long, through the exceedingly dense vegetation growing on the moraines which cover the outer margin of the ice-sheet. This vegetation is a continuation of the forest covering the flat lands to the south, and extends without a break up over the steep face of the glacier, and thence inland in many places to a distance of from four to five miles. North of the belt of vegetation covering the border of the glacier, we crossed twelve or fifteen miles of exceedingly rough moraine-covered ice and reached the Chaix Hills, which we climbed. Their southern slope is bare of vegetation except at the base, and is buttressed by many sharp ridges, too steep to climb, which unite to form pinnacles above. Joining the pinnacles are graceful curves formed by the exceedingly sharp crest. Their topographic forms alone are sufficient to show the geologist that they have resulted from a very recent uplift. We are told that the architects of India placed outstanding pavilions from which to view the beauties of their "dreams in marble"; so in Alaska, on an infinitely grander scale, the Chaix Hills, situated ten miles in front of the vast southward-facing precipice of the St. Elias range, afford a point of observation that can not be surpassed.

The Chaix Hills rise through a sea of ice, the limits of which can not be determined from their summits. Looking east, and south, there is nothing in sight but an apparently limitless plateau of ice, forming the Malaspina glacier. To the north there is a belt of irregular hilly ground covered by snow-fields and glaciers, and bristling with peaks, which are barren and naked during the summer season. Looking over these, the entire southern slope of Mount St. Elias is in full view. A seemingly level field of ice, forming the Libbey glacier, stretches up to the immediate base of the vast precipice leading to the top of the range. The elevation of the actual base of the mountain is about 2000 feet. The precipitous slope rising above it is 16,000 feet high. The snow breaking away

near the top of the mountain rushes down in great avalanches to its very base, and is precipitated upon the surface of the glacier below. Mount St. Elias terminates at the top in a massive pyramid, from the base of which, as seen from the south, a prominent shoulder rises on each side. The eastern shoulder has an elevation of 14,600 feet at its extremity; it then falls off abruptly, and the range terminates about six miles to the east of the main summit. The west shoulder is 16,400 feet high, and beyond it to the west there is a steep descent in the crest line, but the range is continued indefinitely toward the northwest, and bristles with magnificent peaks and sharp crests as far as the eye can reach. Northeast from the Chaix Hills, across a portion of the Malaspina glacier, are the Samovar Hills, which are also, at least in part, formed of stratified moraine deposits, and, like the Chaix Hills, have been sculptured into a multitude of picturesque tent-like forms. Beyond the Samovar Hills rise the sharp peaks of the Hitchcock range, and the white pinnacles and domes of Mount Cook and Mount Irving. They are among the most attractive mountains in the entire Mount St. Elias region. Between Mounts Irving and St. Elias is the Augusta range, on which rise Mounts Augusta, Malaspina, Jeannette, Newton, and several other prominent snow-clad peaks. Far away to the southeast, beyond the Malaspina glacier, is a host of marvelous mountains, lessening in perspective, until the commanding summit of Mount Fairweather terminates the magnificent panorama. On perfectly clear days, when there is not a vapor wreath anywhere about the mountains, it is difficult to realize their full magnificence, owing to the absence of shadows and an apparent flattening of the rugged slopes. On such rare, perfect days there frequently comes a change. The cold winds from the vast ice-fields north of the mountains are beaten back by warm, moist winds from the south, and cloud-wreaths appear in horizontal bands far below the gleaming summits. Under such conditions the mountains lose their flatness, and buttresses and amphitheatres appear where before were expressionless walls. The mountains seem to awaken, and to become aware of their own dignity and sublimity. Usually the first sign of a coming change, when the weather is clear, is a small cloud-banner on the extreme summit of St. Elias. This signal is a warning that can be seen for a hundred and fifty miles in every direction and should not be ignored. Soon other peaks repeat the alarm, like bale-fires in time of invasion, and Mounts Augusta, Cook, and far-away Fairweather fling out their beacons to show that a storm is nigh.

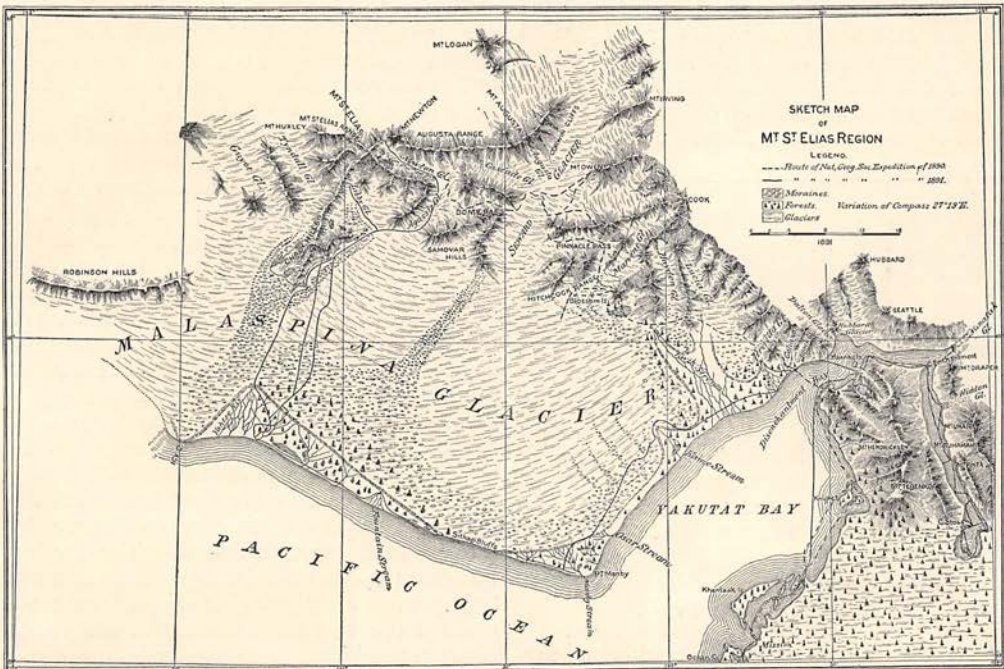
Repairing to a cache that had been left on the border of the clearing southeast of the

Chaix Hills, we made a camp on the glacier, having the luxury, however, of a thin layer of broken slate beneath our blankets; and on the next day, July 8, advanced about five miles northward, when we again encamped on a thin moraine composed of black slate, and the day following brought up the remainder of our supplies. On July 10 we had breakfast at midnight, and began a weary tramp through soft snow to the Samovar Hills. Strange mirage effects appeared on the vast ice-fields when the sun arose. A white mist gathered about us when the warm sunlight touched the glacier, but we traveled on, guiding our course by compass. The light shining through the mist made white halos of remarkable beauty, which lessened the monotony of traveling through the fog. The snow became very soft and every step was wearisome, but still we pressed on, hour after hour, as there was no halting-place. We finally reached the extreme west end of the Samovar Hills, and pitched our tents on a little hillock of mosses and flowers, from which the snow had recently retreated. At our camping-place the Agassiz glacier emerges from a deep cañon about three miles broad, and descending a steep slope, which is a continuation of the precipitous southern face of the Samovar Hills, forms a splendid ice-fall that bristles with pinnacles and ice-blades separated by deep blue crevasses. Late in the afternoon of July 12 we worked our way, with the sled lightly loaded, up the border of the ice-fall near camp, and, after reaching its summit and threading the maze of crevasses just above, gained the center of the glacier. The snow ahead seeming smooth and unobstructed, we left the sled and returned to camp, where each man shouldered a heavy pack and started up the ice-fall once more, while I remained in camp, having enough to occupy my attention during the next day in the neighboring hills. The plan was for the men to advance with the sled as far up the Agassiz glacier as they could during the cold hours of the night when the snow was hard; then to make a cache and return the next day.

The men regained the sled in safety, and, after packing their loads upon it, began the weary tramp; but they had scarcely gone a hundred yards when Stamy and White, who were in the lead, felt the snow give way, and fell about twenty feet into a crevasse. The snow covering the crevasse had previously fallen in, leaving a thin, unbroken dome, but had caught in the fissure and formed a kind of bridge on which the men alighted; except for this they would have gone down to unknown depths. The snow that fell in with them fortunately prevented their moving until McCarty, with great promptness and presence of mind, lowered a rope, and they were assisted to the

surface. This accident came nearer being serious than any other we had while on the ice, and served as a warning. After its occurrence we did not begin our night marches until an hour or two past midnight, when the twilight had increased in brightness sufficiently to make traveling safe. On our return, in passing the same ice-fall, we had another accident similar to the one just described. We were marching in single file, and, feeling perhaps over-confident after living for weeks on the glaciers, did not attach ourselves to a life-line, as was our custom in marching over snow which might conceal dangerous crevasses. I was in the lead, and just after passing safely over a snow-covered crevasse heard an exclamation from White, who followed a few steps in my rear, and on looking back saw that he had disappeared, leaving only a hole in the snow to indicate the direction of his departure. Returning quickly, I looked down the hole but saw only the walls of a blue crevasse; a curve in the opening had carried my companion out of sight. He replied to my shout, however, and with the aid of a line was soon on the surface again, uninjured. On the night when Stamy and White came so near losing their lives, several efforts were made by the men to continue their march, but crevasses thinly covered with snow were found to bar their way in every direction but the one by which they arrived. At last they abandoned the attempt to advance, and returned to camp. Early the following day we all returned to the sled, and by skirting along the side of the glacier, and in places climbing along the steep, snow-covered hillside, managed to get around the difficult tract and make a long march ahead.

The Agassiz glacier above the fall at the Samovar Hills is remarkably smooth, and but little crevassed, except along its immediate borders. Its principal tributary is the Newton glacier, which occupies an exceedingly wild valley between the east end of the St. Elias range and the west end of the Augusta range. These two ranges overlap *en échelon*, and each is exceedingly steep and rugged. The walls overlooking the glacier on either side are seldom less than 10,000 feet high, while the peaks that bristle along their crests rise to elevations of from 12,000 to 14,000 feet. At the foot of the ice-fall over which the Newton glacier descends and becomes a part of the Agassiz glacier, the elevation is 3000 feet above the sea. The amphitheater where the glacier has its principal source, between Mount St. Elias and Mount Newton, has an elevation of a little over 8000 feet. The glacier makes this descent of about 5000 feet principally at four localities where ice-falls occur. Between the falls the slope is quite gentle, and in some places the grade is reversed; that is, the ice rises bodily to some extent when pass-



SKETCH MAP OF THE MOUNT SAINT ELIAS REGION, PREPARED BY THE U. S. GEOLOGICAL SURVEY.

ing over obstructions. We made two camps on the broad, undulating surface of the Agassiz glacier, each of them at the margin of a lake of the most wonderful blue. At the higher of these camps we abandoned our sled, which had done good service, and resumed "packing" our outfit. The first ice-fall above was passed by scaling the steep rock-cliff where it emerges from beneath the ice on the west. The actual vertical descent is about five hundred feet. The ice in plunging over the precipice is broken into tables and columns of great beauty. This fall differs in character from the fall in the Agassiz glacier at the end of the Samovar Hills, owing to the fact that it is well above the snow-line and in the *névé* region. The columns on the steepest part of the fall are not thin spires and blades of ice, as in similar situations lower down, but prisms and pilasters of homogeneous snow, which breaks like granular marble and is without structure, excepting lines of horizontal stratification. Above the fall the glacier is broken from side to side into rudely rectangular tables, and as these are carried over the steep descent they become separated, and frequently stand as isolated columns a hundred feet high, supporting massive capitals. The architectural resemblances of these columns, all of the purest white with deep blue chasms between, are often very striking, especially in the twilight of the short summer nights, when they appear like the ruins of marble temples. Above the first fall we traversed a great area where the crevasses were

long and wide, and separated level-topped tables of snow as large as blocks of city houses, many of which were tilted in various directions. We then came to a second fall, less grand than the first, but more difficult to scale, owing to the fact that we could not climb the cliff at the side, but had to work our way up through partially filled crevasses in the fall itself, and to cut steps in the sides of vertical snow-cliffs. Once, after an hour of hard work in cutting steps up an overhanging snow-cliff and gaining the top, we found ourselves on a broad table separated from its neighbors on all sides by profound crevasses, and had to retreat and try another way. At length we gained the snow-slope on the mountain-side overlooking the broken region below, and found an open way, although exposed to avalanches, up to Rope Cliff, which had given us some trouble the year before. Knowing the conditions at Rope Cliff, however, it did not cause delay. One of us climbed the rock-face and fastened a rope around a large stone at the top, which made future ascents and descents easy. Fragments of the rope left at this place the year before were found. This was the only trace of our former trail that we saw; all else had been obliterated by the deep snows of winter.

About two miles above Rope Cliff we entered a region of huge crevasses, near the place where we had to cut steps up a precipice of snow the year previous. The breaks in the snow were not only numerous, but broad and

deep, extending clear across the glacier. On the south there was a big wall of snow parallel with the course of the glacier, and connecting with the cliffs above in such a manner that we could not pass around it. We encamped on a table of snow surrounded on all sides by cre-



DRAWN BY JOHN A. FRASER.

A CAÑON IN THE CHAI HILLS.

vasses, but inclined so that we could cross to a neighboring table, and there spent the night. An examination of the broken snow ahead from the upturned edge of a fallen snow-block of great dimensions failed to show any practicable way to advance. From our elevated station we could see entirely across the glacier, but, in attempting to pick out a way through the maze of crevasses, always came to a yawning blue gulf or to an impassable wall of snow. At last, almost in desperation, we decided to cut steps up the great wall that ran parallel with the glacier, trusting that the surface above would be connected with the less broken region above the fall. This cliff of snow, which we called White Cliff, was the upper side of a great crevasse, the lower lip of which had fallen and partially filled the gulf at its base. To reach its foot we had to cut steps down a cliff of snow about fifty feet high, and work our way across a partially filled crevasse of profound depth to a table of snow forming a terrace on the opposite side. From this terrace we could cross another small crevasse on broken, angular snow-blocks which partially filled it, and gain the base of the cliff. Above us rose a wall of snow 200 feet high, with an overhanging cornice-like ridge midway up, which projected five or six feet from the face of the cliff and was eight feet thick. McCarty and Stamy were with me, and we began to cut steps, taking advantage of a diagonal crack in the cliff which assisted considerably in the task. All the way up to the cornice we had to hold on by alpenstocks while we used our ice-axes. Reaching the cornice, an opening was cut through it, McCarty and Stamy doing the

greater part of the work. Once above the cornice, the slope was less steep, and McCarty, by using two alpenstocks, was able to ascend the rest of the way without using an ice-ax. Placing an alpenstock firmly in the snow at the top, and making a rope fast to it, our packs were hauled up and we were all soon at the top.

Other great crevasses occurred above White Cliff, but they were in the bordering snow-field and not in the glacier proper, and ran in the direction we wished to travel. By following the broad surface between two of the great gorges we advanced to the point where we had our highest camp the year previous, and then began the ascent of the last ice-fall in the Newton glacier. This fall was higher than any previously encountered, but not so steep, and the blocks of snow were larger. The ascent to the amphitheater above is over 1000 feet. The day we made the climb we reached the foot of the fall about six in the morning, and found the snow soft and traveling difficult. The day was hot, and the elevation being considerable our task proved a fatiguing one. At length we reached the vast amphitheater in which the Newton glacier has its source, and pitched our tent as far within the entrance as safety from avalanches would permit. This proved to be our highest camp, its elevation being a little over 8000 feet.

During the ascent of the Newton glacier the weather had become more unsettled than in the earlier part of the season, which was due in great measure to our increased elevation. While enjoying fair weather near the coast, we did not appreciate the fact that every cloud which wrapped its soft sunlit folds about the higher mountains was accompanied by a local snow-storm. We soon learned, however, that not every cloud has a silver lining. Mist and rain delayed our progress and made our camps on the snow wretchedly uncomfortable, yet they added variety and beauty to the wonderful scenery of the snow-covered mountains, and brought out a world of beauty that would never be suspected if the air always retained its transparency and the sun always shone with blinding intensity. As we ascended the Newton glacier, and gained the summit of one ice-fall after another, the panorama of mighty snow-covered peaks and broad, crevassed glaciers became more and more unfolded, and more and more magnificent. The view eastward down the glacier is one of the most impressive pictures that even Alaskan mountains can furnish. The cliffs of the St. Elias range on the south, and of the Augusta range on the north, rise near at hand to great heights, and are as rugged and angular as it is possible for mountains to be. The snow-covered slopes are utterly bare of vegetation; not even a

lichen tints the isolated outcrops of rock. Looking eastward between the two lines of precipices towering over a mile in height, and rising above into pinnacles and crests, the eye follows the descending slope of the glacier, which expands as new ice-streams pour in flood after flood of ice. The surface of the glacier appears rugged in the foreground, but is softened in the distance until only the broadest of the blue gashes that break its surface are visible. Five or six miles

the clustered domes and pinnacles of Mount Cook and Mount Irving, two sister peaks of equal grandeur. Beyond these, glimpses may be had at certain stations of Mount Vancouver, and of still other shining summits which are not named, and perhaps were never before seen by human eyes.

The view down the glacier is a winter landscape. In the full noontide the scene is of dazzling whiteness, except where cliffs cast their



DRAWN BY A. CASTAIGNE

CUTTING STEPS AT WHITE CLIFF.

ENGRAVED BY J. W. EVANS.

away is a heavily snow-covered group of hills, a spur of the Augusta range, which deflects the glacier to the south and causes it to disappear beyond a rugged headland of rocks and snow. Rising above the foot-hills that turn the frozen current are magnificent peaks, the like of which are seldom seen, and are utterly unknown to all who have not ventured into the frozen solitudes of lofty mountains. Mount Malaspina and Mount Augusta, cathedrals more sublime than ever human architect dreamed of, limit the view on the northeast. To the right of these, and forming the background of the picture, rise

shadows or clouds screen the sunlight. The snow-fields and the snow-curtained precipices, when in shadow, have a delicate blue tint that seems almost a phosphorescence. Except on rare occasions, the only colors are white and many shades of blue, with dark relief here and there where the cliffs are too precipitous to retain a covering. Sometimes the sunlight, shining through delicate clouds of ice-spicules, spreads a halo of brilliant colors around some shining summit, or, striking the surface of a snow-field at the proper angle, spreads over it a web of rainbow tints as delicate and change-



DRAWN BY JOHN A. FRASER.

MOUNT SAINT ELIAS FROM THE NEWTON GLACIER.

able as the pearly lining of a sea-shell. The sheen on the surface of the frosted snow suggests the fancy that there the spirits of the Alpine flowers have their paradise.

Beautiful as were the every-day scenes about our camps in the snow, there came at length one rare evening when the mountains assumed a superlative grandeur. We had retired to our tent early in the evening, but on looking out a few hours afterward to see if the conditions were favorable for making a night march, I was surprised to see the change that had taken place in the usually pale-blue night landscape. The sun had long since gone down behind the great peaks to the northwest, but an afterglow of unusual brightness was shining through the deep clefts in the Augusta range, and illuminating a few mountain-slopes here and there which chanced to be so placed as to catch the level shafts of rosy light. The contrast between the peaks and snow-fields of delicate blue faintly illuminated by the light of the moon, and the massive mountains of flame, made one of the most striking scenes that can be imagined. The boldness and strength of the picture, the wonderful detail of every illuminated precipice and glittering ice-field, in contrast with the uncertain, shadowy forms of half-revealed pinnacles and spires, together with the absence of light in the sky and the absolute stillness of the mighty encampment of snowy mountains, was something so strange and unreal that it bordered on the supernatural.

But the great mountains are not always beautiful or always inspiring. When the clouds thickened about us and enshrouded our lonely tent,

which always seemed lost in the vast wilderness of snow and ice, and when the snow fell in fine crystals hour after hour and day after day with unvarying monotony, burying our tent and blotting out the trail which was our only connection with the land of verdure and flowers in the region below, our life was dreary enough. Camp-fires, the ingleside of tent life, were impossible, as we were over 6000 feet above the timber-line, and fully 30 miles distant from the nearest trees. During storms there was nothing to be seen from our tent but the white snow immediately around us, and the vapor- and snow-filled air above. The only evidence of the near presence of lofty mountains was the frequent crash and prolonged, rumbling roar of avalanches, which shook the glacier beneath and seemed to threaten us with annihilation. We occupied our camp at the entrance of the amphitheater at the head of the Newton glacier for twelve days, and during that time, owing to the prevalence of clouds and snow-storms, were able to advance only once.

On the morning of July 24, McCarty, Stamy, and I were early astir, and, having had our breakfast, left the tent at two o'clock and started to climb to the divide between Mount Newton and Mount St. Elias, and as much higher as possible. The morning was clear and cold, but the snow, owing to its extreme dryness, was scarcely firm enough to sustain our weight. On account of the advance of the season, we now had about four hours each night during which the light was not sufficient, even during clear weather, to allow us to travel

over crevassed ice in safety. When we started, the twilight was sufficiently bright to reveal the outlines of the great peaks about us, but every detail in their rugged sides was lost. All within the vast amphitheater was dark and shadowy. On our right rose Mount Newton in almost vertical precipices a mile in height, with great glaciers pouring down like frozen cataracts from unseen regions above. On the left stood the crowning pyramid of Mount St. Elias, its roof-like slope rising nearly two miles in vertical height above the even snow-field we were crossing. The saddle between these two giant summits is the lowest point in the wall of the amphitheater, but even that was 4000 feet above us.

During the earlier portion of our stay in our highest camp, when the weather was warm and

On the morning of July 24, however, all was still. Jack Frost, working stealthily throughout the night, had silenced the music of the rills, and fettered the mighty avalanches with chains of crystal. As we advanced, the soft twilight grew stronger, and just as we reached the base of the icy precipices we were to scale, on looking up, I saw the summit of Mount St. Elias aflame with the first ruddy light of morning,

An Apennine, touched singly by the sun,  
Dyed rose-red by some earliest shaft of dawn,  
While all the other peaks were dark, and slept.

In front of us rose steep cliffs, the height and ruggedness of which appeared to increase as we approached. Across the slope from side to



DRAWN BY A. CASTAIGNE.

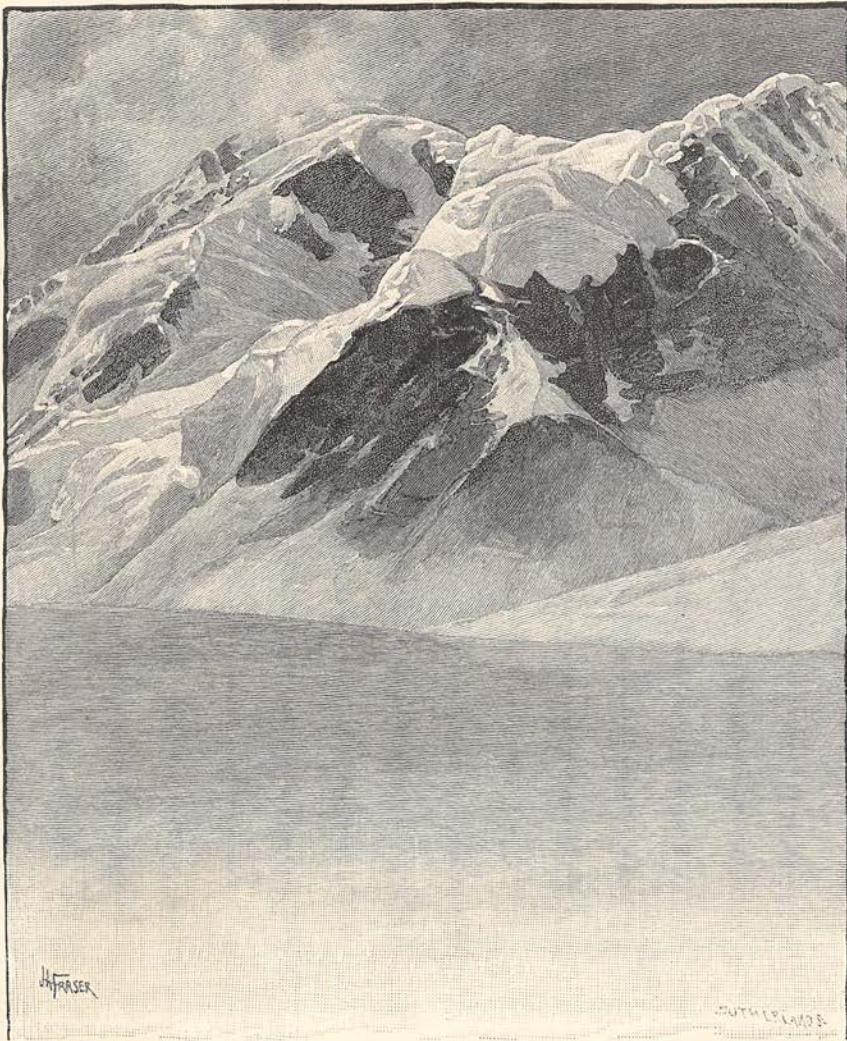
MOUNT NEWTON FROM THE GLACIER.

ENGRAVED BY J. W. EVANS.

the peaks surrounded by clouds or shut out from view by snow-storms, the roar of avalanches was frequent both day and night. Sometimes three great snow-slides would come thundering down the cliff at one time, and pour hundreds of tons of snow and ice into the valley. Avalanches of great size were frequent, both from the slopes of Mount Newton and Mount St. Elias, and from the precipices beneath the saddle. To venture into the valley when the south winds were blowing, and the lower ice-slopes were trickling with water, would have been rash in the extreme.

side ran blue walls of ice, marking the upper sides of crevasses. In several places avalanches had broken away, leaving pinnacles and buttresses of stratified snow, 200 or 300 feet high, ready to topple over in their turn as soon as the sun touched them. Trails of rough, broken snow, below the cliffs, marked the paths avalanches had taken during the day previous. On the right of the slope leading to the divide rose the frowning wall of Mount Newton, and on the left the still greater slope of Mount St. Elias. From each of these we had seen magnificent avalanches descend upon the slope we





DRAWN BY JOHN A. FRASER.

ENGRAVED BY F. W. SUTHERLAND.

A SMALL GLACIER ON THE SIDE OF MOUNT NEWTON.

were to climb, and then, turning, rush down into the valley below. The grooved and ice-sheathed paths of these great snow-slides were plainly visible, and were to be avoided if possible. At first the slope was not so steep but that we could climb by digging in the long spikes with which our shoes were provided, and with the constant aid of our alpenstocks; but soon we came to a broad crevasse which we had to follow for several rods before finding a bridge by which to cross. Owing to the steepness of the slope on which the snow rested, the crevasses were really faults, their upper edges rising high above the lower. This made them especially troublesome in ascending. The bridges spanning the chasms were usually poor, and in crossing them we had to exercise the greatest precautions. In some instances, where

the slivers of ice crossing a crevasse diagonally seemed too weak to hold the weight of a man, should he try to walk across, we would place two alpenstocks from the lower lip out on the central portion of the bridge, and then one of us would crawl out, and lying flat on the bridge, so as to distribute his weight, advance the alpenstock to the other side and so gain the opposite brink. In one place, where the hanging wall of the crevasse offered no ledge or foothold of any kind, we pushed the sharp end of the alpenstock well into it, and one of us, standing on the poles, cut a step in the cliff, and then, making a hand-hold with another alpenstock, cut steps to the top. Some of the way we climbed in the paths of small avalanches that had left rough snow on the slope and saved us the trouble of cutting steps. But for half the

way probably to the divide we had to cut our trail up slopes that were too steep and too smooth to climb. In this way we slowly advanced, varying our course now toward the base of the cliff leading up to Mount Newton, and again toward the great pyramid forming the summit of Mount St. Elias, according as the ascent was more gentle, or the crevasses less difficult, on one side or the other. In two or three instances our progress seemed barred by impassable crevasses, but a search always revealed a bridge or a place where the openings were narrow, and we were able to advance.

At length we could see that only one crevasse intervened between us and the smooth slope leading to the divide. This crossed diagonally downward from the south side of the slope to near the base of Mount Newton. Beyond where it ended on the right there was an exceedingly steep slope, sheathed with ice, that led to the divide. This seemed the only way we could expect to advance. The upper wall of the crevasse rose about fifty feet above its lower edge, and was hung with icicles. At the east end a curtain of ice, starting from the top of the upper wall, arched over and joined the lower brink, leaving a hollow chamber within hung with thousands of icicles. In spite of my anxiety to press on, I could not but admire the beauty of the glittering mass of fluted columns, arranged like the pipes of a great organ and fully exposed to the morning sun at the top, while their tapering ends were lost in the obscurity of the blue gulf below. Each icicle was frosted on one side with snow-flakes that had been blown against it and frozen to its surface. The play of rainbow tints among these millions of flashing crystals and burnished pendants made a scene of unusual beauty, even in a region whose wonders multiply as one advances. The lower lip of the crevasse had been built up with snow blown from the heights above, and formed a sharp-crested drift, along which we worked our way to the north end of the crevasse. I then fastened the end of a life-line about my waist, while Stamy and McCarty, placing an alpenstock deep in the snow and taking a half-turn with the line around it, slowly paid out the slack as I advanced. Where the dome of ice curved down and met the lower edge of the crevasse, there was a little ledge about six inches broad, and where this ended only the overhanging shoulder formed by the dome remained. Once around the shoulder we would be able to reach the ice-slope leading to the divide. Cutting holes through the ice-dome a little below the height of my shoulder, I thrust my left arm through, and thus had a sure hold while cutting steps for my feet. Progressing in this way, I was soon around the curve, out of sight of my companions, and

in a short time gained the foot of the slope leading upward. But I found that the ascent was so steep, and composed of such smooth ice, that it would require several hours of hard work for us to cut a way to the top, and before undertaking such a severe task I concluded to search for a more practicable route. Being no longer engaged in cutting steps, I became aware that I was in a somewhat dangerous position. The dome which I had passed around curved inward just below me, leaving a sheer descent of several hundred feet to the steep slope beneath, which fell away almost perpendicularly into the valley 3000 feet below. Had I fallen, I should have gone to the bottom of the cliffs before stopping, if some yawning crevasse had not received me. I worked my way slowly back to my companions, and we then followed the crevasse in the opposite direction. Near its highest portion there was a narrow space, where the snow blown from above had built up the snow-bank on the lower lip of the crevasse until it touched the top of the cliff of ice formed by the upper wall. The snow had also bridged a deep crevasse that ran at right angles to the main one, thus rendering us double assistance. These bridges were of light snow, and were so thin that we had to exercise great caution in crossing them lest we should break through. McCarty was now in the lead on the line to which we were all fastened, and, slowly making steps up the curtain of snow that descended from the top of the ice-cliff, he made his way upward out of sight of Stamy and myself who waited below. When he had progressed about 100 feet, the length of our line, he planted his alpenstock deep in the snow and shouted for us to come up. With the aid of the line and the steps that had been made, I was soon beside him, and, detaching myself from the line, continued up the slope, leaving the men to coil up the rope and follow.

I was now so near the crest of the divide that only a few yards remained before I should be able to see the country to the north; a vast region which no one had yet beheld. Pressing on, I pictured in fancy the character of the land beyond. Having crossed this same mountain-belt at the head of Lynn Canal, and traversed the country to the north of it, I fancied that I should behold a similar region north of Mount St. Elias. I expected to see a comparatively low, wooded country stretching away to the north, with lakes and rivers and perhaps some signs of human habitation, but I was entirely mistaken. What did meet my eager gaze was a vast snow-covered region, limitless in its expanse, through which hundreds, and perhaps thousands, of barren angular mountain-peaks projected. There was not a stream, not a lake, and not a trace of vegetation of any



DRAWN BY JOHN A. FRASER.

ENGRAVED BY P. AITKEN.

LOOKING UP THE NEWTON GLACIER, MOUNT SAINT ELIAS ON THE LEFT.

The \* on the upper border of the picture is placed over the highest point on the mountain-side reached by the explorers.—EDITOR.

kind in sight. A more desolate or a more utterly lifeless land one never beheld. Vast, smooth snow-surfaces, without crevasses or breaks, so far as I could judge, stretched away to unknown distances, broken only by jagged and angular mountain-peaks. The general elevation of the snow-surface is about 8000 feet, and the mountains piercing it are from 10,000 to 12,000 feet, or more, in altitude above the sea. To the northward I could see every detail in the forbidding landscape for miles and miles. The most distant peaks in view in that direction were thirty or forty miles away. One flat-topped mountain, due north by compass from my station, and an exception in its form to all the other peaks, I have called Mount Bear, in memory of the good ship which took us to Icy Bay. The other peaks were too numerous to name. To the southeast rose Mount Fairweather, plainly distinguishable although 200 miles away. At an equal distance to the northwest are two prominent mountain-ranges, the highest peaks of which appeared as lofty as Mount Fairweather. These must be in the vicinity of Mount Wrangle, but their summits were unclouded and gave no token of volcanic activity. I could look down upon the coast about Yakutat Bay, and distinguish each familiar is-

land and headland. The dark shade on the shore, too distant to reveal its nature, was due to the dense forests on the lowlands between the mountains and the sea. This was the only indication of vegetation in all the vast landscape that lay spread out beneath my feet. The few rocks near at hand, which projected above the snow, were without the familiar tints of mosses and lichens. Even the ravens, which sometimes haunt the higher mountains, were nowhere to be seen. Utter desolation claimed the entire land. The view to the north called to mind the pictures given by Arctic explorers of the borders of the great Greenland ice-sheet, where rocky islands, known as "nunataks," alone break the monotony of the boundless sea of ice. The region before me was a land of nunataks.

The divide which we had reached was a narrow crest at the north end, but broadened to about fifty yards at the south. Along each side were snow-banks facing each other, and inclosing a V-shaped area some ten feet lower than the bordering crests of snow. We excavated a little chamber near the base of one of the steep snow-banks, in which to place a small lamp that we had brought with us, and melted some snow to obtain drinking-water. Owing to the lightness of the snow it required some time to get

water enough to quench our intolerable thirst. This allowed us an opportunity to rest and eat a light lunch, while we studied the strange scene before us.

The day of our climb was unusually beautiful. Not a cloud obscured the sky. In the lower world it must have been an exceedingly warm summer day. In the rarer atmosphere with which we were surrounded the sun's rays poured down with dazzling splendor and scorching intensity. We wore deeply colored glasses to protect our eyes, but our faces, although tanned and weather-beaten by nearly two months' constant exposure, were blistered by the heat. Those of my readers who have not climbed high mountains will be surprised, perhaps, when I say that while our faces were actually blistering beneath the intensity of the sun's heat, our shoes immersed in the light snow were frozen stiff. At noon the temperature in the shade was 16° Fahr. The snow was light and dry, and showed no indications of softening, even at the surface. The white cliffs about us glittered like hoarfrost in the intense light.

Having finished our lunch, we passed on up the steep ridge leading from the divide to the summit of Mount St. Elias. We slowly cut our way up the slope, having a sheer descent of from 5000 to 6000 feet below us all the time. The breaking away of a foothold, or the loss of an alpenstock, might at any time have precipitated us down those fearful cliffs, where not even the crevasses would have stopped us before reaching the bottom of the amphitheater in which our tent was placed, fully a mile in vertical descent below. We were now above the region of avalanches, but an occasional roar came faintly through the rarified air, telling that large bodies of snow had broken away somewhere on the slopes below. With these exceptions the only sounds that broke the stillness were from the blows of our ice-ax and the beating of our own hearts. There is no stillness more profound than the silence of the mountains. As we slowly climbed up above the divide we could see more of the country to the northeast of Mount Newton, but in other directions the great panorama remained the same, or became less distinct. A change in the atmosphere, which obscured distant objects while it slightly lessened the painful intensity of the sunlight on the cliffs about us, told that an atmospheric disturbance was in progress, and that a storm was gathering. We pressed on, although the work of cutting steps at the altitude we had reached was exceedingly laborious, and gained a second outcrop of rock. At four o'clock we had attained an elevation of somewhat more than 14,500 feet, as determined by measurements made with two aneroid barometers. The great snow-slope continued to tower

far above us, and we saw with deep regret that we had not the strength to reach the summit and return to our camp, already 6500 feet below us. Concluding that the only practicable plan would be for us to advance our camp on to the divide between Mount St. Elias and Mount Newton, and from there to attempt to reach the summit, we reluctantly turned back.

The descent began at five o'clock, and we experienced but little difficulty in regaining the divide, but had to be exceedingly careful in crossing the snow-bridge on the ice-slope below. In three places the steps cut during the ascent had been swept away by avalanches. At one locality where the trail went down the face of a steep bluff for about a hundred feet, and then ran diagonally along beneath an overhanging precipice of snow, we found that the cliff had broken away, carrying with it the steps cut on our way up. Below where the cliff had been, the avalanche caused by its fall had cut across a loop in our own trail in two places, but had filled a crevasse that had been troublesome to cross on our way up, and thus proved of some assistance. On reaching the top of the cliff where our steps had been we were at a loss to tell what had become of them, until we noticed the trail of the avalanche below. Had the shadows of evening been a little more dense, our return to camp would have been delayed until the next morning. As it was, however, McCarty scrambled down the slope with a rope fastened about his waist, and cut new steps. As we neared the bottom of the valley the light faded, and we had to find our way as best we could, since it was impossible to see the trail. The slopes were less steep than above, however, and we gained the level floor of the amphitheater without mishap. We reached our tent at ten o'clock, just twenty hours after leaving it. Allowing one hour for the cooking of our breakfast and another for preparing supper, but two hours out of twenty-four remained unaccounted for. The deficiency in the number of hours for sleep was compensated, however, by the fact that it was approaching noon the next day before we awoke.

A heavy cloud gathered about the summit of Mount St. Elias on the afternoon of July 25, and on the following day a snow-storm was in full force and continued until the evening of the next day. At one o'clock in the morning of July 27, I looked out of our tent and found a dense fog filling the valley; but at three o'clock the air was clear, and the absence of cloud banners on the high peaks assured us that the day would be fine. We immediately began preparations for climbing to the divide between Mount Newton and Mount St. Elias. Our plan was to make a cache of rations on the divide, and to advance our camp during the next

favorable day. Owing to the delay at the start, we did not reach the foot of the ice-cliffs leading to the divide until the sun was shining full upon them. We began the ascent, but soon the snow, softened by the sun, began to fall in avalanches, which warned us that it was dangerous to proceed. A great avalanche starting far above us on the side of Mount St. Elias came rushing down the roof-like slope with the speed of an express-train. From the foot of the descending mass, tongue-like protrusions of snow shot out in advance, while all above was one vast rolling cloud of snow-spray. Blue crevasses which seemed wide enough to engulf the falling snow were crossed without making the slightest change in its course. On reaching the upper lip of such a gulf the base of the moving mass would shoot out into the air, and seemingly not curve downward at all until it struck the slope below and rushed on with accelerated speed. The rushing, roaring mass was irresistible. Heavy clouds of spray rolling onward, or blown back by the wind that the avalanche generated, became so dense that all beneath was concealed from view. Only a roar like thunder, and the trembling of the glacier on which we stood, told that many tons of ice and snow were involved in the catastrophe. The rushing monster, starting a mile above, came directly toward us until it poured down upon the border of the slope we were ascending; then, changing its course, it thundered on until it reached the floor of the amphitheater far below. The cloud of spray rolled on down the valley, and hung in the air long after the roar of the avalanche had ceased. When it did drift away we saw the fan-shaped mass of broken snow, in which the avalanche ended, looking like the delta of a stream, extending out half a mile into the valley.

With avalanches threatening us from the precipices on either hand, and from the slope up which we wished to ascend, it seemed foolhardy to persist in the attempt to reach the divide that day; so we left our packs in as sheltered a spot as we could find and beat a retreat. The next morning another snow-storm swept over the mountains, and the weather continued stormy for several days.

While Stamy, McCarty, and I were living in the snow, we had a single tent of light cotton cloth, seven feet square at the bottom and five feet high. Our bedding consisted of two sheets of light canvas, used for protecting our blankets, one double woolen blanket, and one light feather-quilt. Our cooking was done over a small coal-oil stove, and our food consisted almost entirely of corn griddle-cakes, bacon or corned beef, and coffee. To live under these conditions at an altitude of 8000 feet, during snow-storms and dense fogs, and

especially when the snow was melting so as to wet our blankets through and through, was very trying. Fearing that if we held on too long we should not have the strength and steadiness of nerve requisite to reach the summit, should the weather permit, I decided, although with great reluctance, to abandon the undertaking and return to Icy Bay. Whether we could advance or not depended on the direction of the wind; should it blow from the north across the broad ice-fields we had seen from the divide, it would bring clear, cold weather, the clouds would vanish from the mountains, and the avalanches be silenced; should it come from the south, it would be warm and moist, the clouds would thicken, and snow-storms and avalanches would render mountain-climbing impossible. The north side of St. Elias is not too steep to climb and offers no insurmountable obstacles, but the climate is very changeable, and clouds and snow-storms are the rule. Reaching the summit depends more upon the chance of getting clear weather at the proper time than on skill in Alpine work.

We began the descent on August 1. The trail leading back had been snowed over and could scarcely be traced; but the fog had lifted, although heavy storm-clouds still enveloped the higher peaks, and we were able to descend without much difficulty. We slowly worked our way through the great crevasses in the fall just below our highest camp, and thence over a comparatively even surface to White Cliff, which we descended with some little difficulty, the steps previously cut having melted away so as to be almost useless. The next day we rejoined the remainder of the party and reached "Sled Camp" on the Agassiz glacier. During our journey down the mountain until reaching the Samovar Hills rain fell almost continuously. At the Samovar Hills we reoccupied our old camp-ground. The flowers were still in bloom, and the air had that delightful fragrance one notices when first venturing into the woods in early spring. The change from the region of eternal snow and ice to an oasis of verdure and of flowers was welcome indeed. From the Samovar Hills we crossed the broad, gently sloping snow-field extending southwest, and made our next camp on a small island in the glacier separated from the northeast end of the Chaix Hills by about two miles of rugged ice. This bright little garden of flowers and ferns we named Moore's Nunatak, in memory of our comrade who was drowned at Icy Bay.

With McCarty and Warner for companions, I again entered the snow-covered region to the north, and made a side trip to the hills intermediate between Mount St. Elias and the Chaix Hills. During this trip, which lasted three days, we had one perfect day of uninterrupted sun-

shine, the beauty of which was enhanced to us by heavy clouds along the mountain-sides, thus furnishing the contrast necessary to bring out the full magnificence of the frozen heights that towered above us. The lakes to the north of the Chaix Hills were still heavily encumbered with ice, and on the hills bare of snow the earliest of spring-flowers were just awakening. It was springtime to us also, after having been in the wintry mountains for several weeks. We enjoyed the warmth of the glad sunshine, the fresh odors that filled the air, and the delicate tints on the flower-covered slopes around us, far more than we did the stern magnificence of the snow-covered precipices of the great mountains. The storms that had recently passed had left the mountains covered with a fresh mantle of brilliant white down to a level of 4000 feet above the sea. The new snow had not yet been torn from the precipices by avalanches, but was clinging to many of the steepest slopes. In the full splendor of a blazing sun the great ranges seemed mountains of light.

Returning to Moore's Nunatak we passed a night, and then rejoined the rest of our party below at our old camp on the south side of the Chaix Hills. A day or two later we crossed the extreme western end of the Malaspina glacier, just at its junction with another vast plateau of ice stretching westward. Where these two ice-fields join there is a depression which marks the subglacial course of the Yahtse River. We encamped near the spot where this strange river emerges in a roaring, rushing torrent of intensely muddy water, and divides into hundreds of branches as it rushes toward the sea. Another short march took us into the dead forest bordering the river on the east, and partially buried by its sediments, and the following day we occupied the site of our first camp at Icy Bay. After reaching Icy Bay we measured a base-line about three miles long on the beach, and from its extremities obtained the angles necessary to determine the height of Mount St. Elias and neighboring peaks. These measurements were repeated many times in order to obtain an accuracy as great as was possible with the method employed. The height

of Mount St. Elias, thus obtained, is 18,100 feet, plus or minus a probable error of less than 100 feet. From this elevation and certain observations made at Port Mulgrave by the United States Coast Survey in 1874, the position of Mount St. Elias is computed to be approximately, lat.  $60^{\circ} 17' 51''$ , long.  $140^{\circ} 55' 30''$ . This result is of considerable interest in connection with the position of the eastern boundary of Alaska.

In the convention between Great Britain and Russia, wherein the boundaries of Alaska are agreed upon, it is stated that the eastern boundary shall begin at the south at Portland Channel, and from there follow the summit of the mountains situated parallel to the coast as far as the intersection of the  $141^{\text{st}}$  degree of west longitude. From that point north, the said degree of longitude shall form the boundary to the frozen ocean. Wherever the mountains parallel to the coast to the east of the  $141^{\text{st}}$  meridian are "more than ten marine leagues from the ocean, the limit between the British possessions and the line of coast which is to belong to Russia, as above mentioned, shall be formed by a line parallel to the windings of the coast, and which shall never exceed the distance of ten marine leagues therefrom." The distance of Mount St. Elias from the nearest point on the coast is 33 statute miles. As 10 marine leagues are equal to  $34\frac{1}{2}$  statute miles, the mountain-peak is a mile and a half south of the boundary, and therefore in United States territory. It is also  $4' 30''$  longitude, or  $2\frac{1}{2}$  miles east of the  $141^{\text{st}}$  meridian. The mountain is thus practically at the intersection of the boundary of southeastern Alaska with the  $141^{\text{st}}$  meridian, and is one of the corner monuments of our national boundary.

Our return from Mount St. Elias was no less interesting than the journey up the mountain, but space has not permitted me to linger over its details. Nor can I give at this time a sketch of our long tramp along the margin of the Malaspina glacier from Icy Bay to Yakutat Bay, or of the exploration of Disenchantment Bay, which was fully as novel and instructive as our life above the snow-line.

*Israel C. Russel.*

