

COMPILATION

OF

NARRATIVES OF EXPLORATIONS IN ALASKA.



ALASKA
F

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900.

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UNIVERSITY OF ALASKA

contracts still further, especially between the promontories of East and West Foreland, the tides increase in velocity and violence of action until they attain a speed of 8 or 9 knots, with an average vertical rise and fall of 24 to 26 feet.

The northeastern extremity of this vast inlet or gulf which Cook entered with the expectation of finding a northwest passage, and being disappointed, applied to it the name of "Turnagain," equals in tidal phenomena the Bay of Fundy. The flood comes in in a huge "bore," with thundering noise and astonishing rapidity, and a traveler advancing with it in a canoe experiences the peculiar sensation of seeing one high bank of clay and gravel after another apparently sinking before him as he is lifted up and carried over by the inpouring tide. From the mountains surrounding this branch of the inlet innumerable avalanches sweep down their rocky and wooded slopes, demolishing large sections of forest and piling up rocky débris to such an extent as to cause frequent and total changes in the aspect of the country, while the outlines of the coast undergo equally perceptible modifications from the action of the tides.

What the country north of Cook Inlet is like no civilized man can tell, as in all the years of occupation of the coast by the Caucasian race it has remained a sealed book. The Indians tell us that the rivers lead into lakes and that the lakes are connected by rivers with other lakes again, until finally the waters flow into the basins of the Tanana and the Yukon; but conflicting with this intermingling of the waters are stories of mountains of immense altitude visible for hundreds of miles. The natives living north of this terra incognita give, however, a similar description, which may be accepted until reliable explorers are enabled to penetrate this region.

On the western side of Cook Inlet the main Alaskan chain of mountains, called by Dall the Chigmit Range, rises abruptly from the sea in steep ridges and peaks, the highest of the latter being the Redoubt and the Ilyamna mountains, both volcanic and emitting smoke. Only at two points along this coast within the inlet does lowland intervene between the mountains and the shores; at Toyonok and at Kustatan, both of which localities have been utilized by the natives for establishing settlements. Up to the height of about 1,000 feet all these mountains are densely wooded. From Kamyshak Gulf, situated between Mount Isaac and Cape Douglas, a portage is made over a slight depression in the ridge to the basin of the great Lake Ilyamna, but on the southwestern shore of the bay the mountains rise again to a considerable height, culminating in the four peaks to the westward of Cape Douglas. The last-named cape is one of the most prominent and boldest in shape of the many Alaskan promontories, jutting out as it does at a right angle for a distance of several miles into the sea, with a sudden descent of over 1,000 feet into the waves of Cook Inlet.

The same chain of mountains extends down the south coast of the peninsula, varying in height between 5,000 and 8,000 feet, with peaks much eroded by glacial and meteorological action. The numerous glaciers existing throughout the upper regions of this mountain chain do not anywhere approach the sea coast, as is the case with Mt. Saint Elias and the Chugatch Alps, these formations being found only at high altitudes, generally facing westward and southward.

Two distinct and continuous lines of "watermark" can be observed along the whole of this chain, one at an altitude of 1,000 feet, the other perhaps 500 or 600 feet above. Both of these lines show the effects of the wash of the ocean for ages, together with many petrifications of mollusks and other marine life. The natural conclusion forced upon the observer is that the whole peninsula of Alaska has undergone two successive periods of elevation from volcanic action, and that this region would afford a highly interesting field of research to geologists. It is a significant fact that no glacial action is observable below the upper sea-level.

The immediate sea coast here is cut up into innumerable fiords and coves, and lined with rocky islets.

The term "mountain chain" applied above to the elevated portion of the peninsula does not, perhaps, quite describe a very peculiar formation. The mountains or mountain groups are interrupted from time to time by depressions, but these do not at all bear the character of mountain passes, as they consist of low, marshy plains, extending entirely across the peninsula, varying very much in width. A similar formation can be found on the coast of Prince William Sound, where outlying spurs of the main chain are frequently divided in the same way. The impression

created in the mind of the beholder is not that of a continuous alpine chain, but rather of a series of islands, such as the Aleutians, raised by successive volcanic action until the straits between them are left dry. These depressions serve as the portage routes across the peninsula. A careful observer could easily recognize distinct islands in the mountain groups of Morshovia and of Belkovsky, connected with each other and with the Pavlosk volcanic group only by low, swampy isthmuses. Again, the mountain groups opposite the Shumagin Islands, containing the Veniaminof and other volcanoes, loom up, entirely isolated by similar depressions, north and south. Between Moller and Zakharof bays the portage is made in half an hour from the waters of the North Pacific to those of Bering Sea.

Other swampy passages lead through from the Bays Chigmik and Kishulik to the north coast of the peninsula. Nearly all these isolated mountain sections bear a peculiar resemblance to the outward shape of the island of Oonimak, the first of the Aleutian chain that is actually separated from the peninsula, though only by a strait too shallow to be navigable. That an elevation of this region has taken place is confirmed by abundant evidence, and altogether it does not seem at all improbable that what now resembles from a distance a long mountain range was, once a chain of islands.

At Cape Atushagwik the coast of the peninsula approaches nearest to that of Kadiak Island, the width of the strait here being only a little over 18 miles.

In the vicinity of Katmai both coal and petroleum have been found, but not abundant in quantity or excelling in quality.

The volcanic group of the Pavlosk Mountains stands, as already mentioned, entirely isolated with its two craters, of which one is still active, while the other is reported to have been extinct since the year 1786. From this region also samples of coal of inferior quality have been procured. South of Pavlof Bay another volcano rears its jagged crown, separated both north and south from the mountains.

In the neighborhood of Belkovsky and Morshovia several volcanic peaks can be observed, but they have not been active within historic times.

On rounding the southern extremity of the peninsula and turning northward and eastward a total change in the aspect of the coast can be observed. Low, sandy reaches and slightly elevated moorlands cover the wide interval between the mountains and the shores of Bering Sea, interrupted here and there by lake-fed streams and rivers. In the vicinity of Ougachik the volcanic character of the country disappears entirely, the rock formation being altogether of granite and quartz, and pumice stone and chalk are only washed up by the sea. All along the coast from here we encounter gray granite, hornblende, serpentine, porphyry, and sandstone, but all along, at an altitude of about 300 feet above sea level, parallel strata containing fossil bivalves appear on the faces of bluffs. As we advance northward the interval between mountains and seacoast widens, until in the vicinity of Lakes Walker and Iyamna swampy plateaus nearly 100 miles in width are found, dotted with many lakes.

Proceeding northward along the coast of the mainland the first deep indentation of the shore line is Bristol Bay, into which the waters of Lake Iyamna flow through the Kvichak River. From the southern extremity of the Alaska peninsula to this point Port Moller affords the only harbor for shipping, though three rivers, the Sulina, the Igagik, and the Naknek, flow into Bering Sea from the mountains in the east. In the vicinity of the mouths of the last two streams the shore is high and rocky, but only few traces of volcanic action can be discovered. North of Lake Iyamna high mountains of the main Alaskan range protrude between that sheet of water and the Nushegak River, its spurs approaching nearest the coast immediately behind the Nushegak post and settlement. Other spurs of the same range of mountains and isolated groups of hills appear at long distances from each other on the coast of Bering Sea, the intervals being filled up apparently with alluvial, swampy soil, not altogether level, but gently rolling. The earliest intelligent observer of this region, the Russian missionary Veniaminof, described the conformation of this section of the country as follows:

Slight elevations can be found along the whole extent of the American coast of Bering Sea; they are in nearly all cases connected with the mountains in the interior. If the observer ascends to a height the country appears to

MILITARY RECONNOISSANCE IN ALASKA.

By Lieut. HENRY T. ALLEN, Second United States Cavalry.

INTRODUCTION.

Lieut. Henry T. Allen, when ordered by the Secretary of War, through the commanding officer of the Department of the Columbia, to proceed to make a reconnoissance of the Copper River and the Tanana River valleys, Alaska, was an officer of the Second United States Cavalry and aid-de-camp on the staff of the commanding general. Lieutenant Allen was appointed acting assistant quartermaster, acting commissary of subsistence, and acting ordnance officer of the expedition. His associates were Sergt. Cady Robertson, Troop E, Second United States Cavalry, and Private Fred. W. Fickett, United States Signal Corps.

His instructions were to proceed by a February steamer to Sitka, Alaska. Here he was ordered to engage passage by the steamer *Leo* or other conveyance to Nuchek, the nearest practical harbor, to the mouth of the Copper River. He was specially enjoined to make his researches thorough and endeavor to complete, as far as practicable, all desired information in each portion of the country traversed as he advanced into the interior, in order that his work might be resumed if deemed necessary at some future time, provided that by untoward circumstances he should be compelled to abandon the expedition. He was further instructed to reach the mouth of Copper River at least by March, so as to ascend the river on the ice. In all other things Lieutenant Allen was left to his own discretion and judgment. He was especially enjoined to exercise careful and strict economy in his expenditures.

It may be noted, by reference to Lieutenant Allen's maps, that the rivers and other geographical features actually seen are drawn in full. Previously unmapped information from other sources is indicated by dotted lines. The reduction of sextant observations, which depended on a best grade Howard movement watch, was not as satisfactory as he had hoped to obtain. Having had the benefit of a trip to Alaska before starting on this reconnoissance, he became convinced of the impracticability of carrying a box chronometer.

Lieutenant Allen renders a fit tribute to his assistants, Sergt. Cady Robertson and Private Fred. W. Fickett. The prospectors, Peter Johnson and John Bremner, whom he subsequently added to the party, also rendered most excellent service.

The photography of Copper River other than that obtained from Lieutenant Abercrombie expresses in a poor manner the result of much patience and perseverance under the most trying circumstances. The plates were necessarily intrusted to natives to be carried to the mouth of the river. Their curiosity led the Indians to open the box containing them, thus exposing the plates to the light and totally injuring all but a few that had been developed. The loss of the psychrometer by theft of the natives on the upper waters of the Tanana and the injury they inflicted on the aneroid barometer accounts for the absence of records from these instruments after the middle of June.

Much has been written with respect to the Alaskan country in general, its coast resources, peoples and their customs, but the following report is restricted almost entirely to the interior, and especially to the vast extent of country drained by the Copper, Tanana, and Koyukuk rivers, nearly all of which is unknown. To those unacquainted with the extent of our Alaskan possessions the distances recorded during the explorations would seem exaggerated. Observa-

best known to himself, Zagóskin determined not to attempt the summer portage, but wait until winter; hence his return to St. Michael in the meantime.

On the 4th day of December, with 5 sleds and 27 dogs, he again started for Unalaklik, which he reached in time to start for the Yukon on the 16th. Heavy snows caused the failure of this attempt, but another on the 30th was successful, and on January 10, 1843, he was at a settlement on the Yukon (Hogotlinda), latitude $64^{\circ} 19'$. Five days later he was at Nulato, where he remained until February 25, when, in accordance with his instructions, he left the place to explore in the direction of Kotzebue Sound. To accomplish this he began the ascent of the Koyukuk River (Yunaka). At its junction with the Yukon he found a settlement of considerable size, called by the natives Tokakat.

March 4 he was at the junction of the Koteelkakat with the Koyukuk (56 miles by the river from the Yukon and his highest point on the Koyukuk). From this point he endeavored to reach an arm of Kotzebue Sound by following up the Koteelkakat, probably 30 or 40 miles, thence across the country to his destination. The natives he had employed, after having gone a great part of the distance, refused to advance farther through fear of the Mahlemutes, so Zagóskin was compelled to return via the Koyukuk without having accomplished all his mission. The highest point reached by him in the direction of the Koteelkakat is in latitude $65^{\circ} 35'$, about 20 miles north of its mouth.

The above is the gist of an abstract from Lieutenant Zagóskin's journal, by S. I. Zelónai, a member of St. Petersburg Geographical Society, afterwards minister of roads for Russia.

The following account of his explorations is given in the History of Alaska, by H. H. Bancroft, 1885:

In 1842, Lieutenant Zagóskin, of the imperial navy, set forth for Norton Sound and Mikhillovsk (St. Michael) purposing to make an inland exploration of the northern territory. His work was confined chiefly to the middle course of the Kuskokwim and the lower course of the Yukon, especially the Koyukuk, which he followed to its headwaters, and to the divide which separates it from the streams running into Kotzebue Sound. At Nulato he was assisted by Derzhabin (Derabin?) in building a new fort. Zagóskin's exploration was performed conscientiously and well. Whenever we find mistakes we may ascribe them to his imperfect instruments and to local obstacles.

That Zagóskin went to the headwaters of the Koteelkakat I do not doubt, but I have failed to find any authority for the statement that he reached those of the Koyukuk.

Dall is the authority for the following, which is additional proof of the want of accurate knowledge of the size of the Koyukuk:

The Koyukuk River enters from the north, and is a large stream, formed by the fusion of the Kuthlatino and Kutelno rivers from the west, and the Koteelkakat from the east. Its length, including tributaries, is estimated at 100 miles. Other rivers, rising near it, fall into Kotzebue and Norton sounds.

He too was probably, at the time of writing, under the impression that Zagóskin had reached its headwaters.

The officers and employees of the Western Union Telegraph expedition made many explorations in western Alaska shortly after the transfer of the Territory in 1868 (see Dall's works). Some of the American fur traders established a post at the junction of the Koteelkakat and Koyukuk to intercept the furs that would be delivered at Nulato. The competition that existed between rival trading companies caused the fur trade to become so unremunerative that finally the Alaska Commercial Company was left alone in charge of the business. The rivalry no longer existing, the post on the Koyukuk was abandoned and has so remained since.

The engineer of the steamboat *Yukon*, a Canadian, informed me that he had been to the Koyukuk in winter via the trail from Nukluckyet. I afterwards learned that not only he but Mr. Mayo, a fur trader, had been to the small village on the Konootena, a tributary of the Koyukuk, but no farther. It is hardly probable that any white man had, prior to our journey, seen that portion of the Koyukuk above the abandoned trading station.

Captain Raymond, as early as 1869, heard of the trail from near Nukluckyet (Fort Adams) to the Koyukuk. He describes from native reports as follows:

From the headwaters of the Koteelkakat River, the eastern branch of the Koyukuk River, which empties into the Yukon a few miles above Nulato, the natives are said to make a portage to the headwaters of the Quisnon, and

There were two ways of reaching the Koyukuk River that were feasible: one up the Tozikakat in canoes to near its head, thence by a short portage to the Konootena, a tributary of Koyukuk, and down it to that river; the other by descending the Yukon about six miles, thence by portage nearly north by east across the Yukon Mountains of the present charts to the Konootena River, and by descending it as above. When the journey is made during winter, a still different trail is used, starting due north from Nuklukyet, If the Tozikakat route be traveled it can be reached in canoes via the Yukon, or by a portage to it from Nuklukyet, the canoes being carried. While at Nuklukyet I sent out a party of natives to hunt bear on the Tozikakat, and they reached it in the latter manner.

Inasmuch as the Kóyukuks themselves had used the second-named route, I decided upon it. One of the barges that had formed part of the tow of the steamboat *Yukon* was left in charge of Mr. Cochrein, to be taken as far as Nowikakat, and in this transportation was obtained to the point of departure on the Yukon River, 6 miles below. I now had 7 natives and 5 dogs packed with food, the average pack of the native being 50 pounds, that of the dog 25. Fickett and myself were in light marching order, carrying only our instruments and weapons. The bedding for both of us consisted of a piece of water-proof linen, the remnant of a sleeping-bag used on the Copper River, and a single blanket.

The description of the hordes of mosquitoes described by Lieutenant Schwatka as existing on the Lower Yukon is not only applicable to those of that part of the Territory, but also to those of the country north of it, even to beyond the Arctic Circle.

Our start for the Koyukuk was just at the zenith of the "sand fly" season. Why this gnat, which exists where there is not now nor ever was any sand, should be so called, I can only attribute to the astuteness of the pioneers. Some consider them a worse pest than the mosquitoes. There are at least two varieties, differing very much in size.

The party left the Yukon, at the mouth of a very small stream, at 3 p. m. July 28, and in a very short time was ascending to a high ridge, which it endeavored to follow. We were supposed to follow a trail, but if any existed, in many places and for long distances it was more than we could detect, though having already had considerable experience in such matters. A trail on the plains means quite a different thing from some of the so-called trails of Alaska. The trail from the Copper to the Tanana is in many places well worn, due perhaps to the travel of the moose as well as the natives over it, but the moss over which most of this route lay showed no breaks, save an occasional displacement due to the passing of the party of Koyukuns who were preceding us. There were many blueberries and a few salmon berries along the way. After a journey of 10 miles we went into camp where a small quantity of timber and water could be obtained. We depended for guides on the Koyukuns, whose efforts seemed to be directed toward following along the high ridges. Upon these the timber is dwarfed and scarce and water obtainable only in small pools. On the highest ridges no vegetation of any description exists.

We left camp the following morning in such a thick fog that a man could barely be seen at a distance of 20 yards. This fog continued all day, accompanied part of the while by rain, all of it by a strong wind from west-southwest. We halted at 1 p. m. to eat some hard bread, no wood being procurable for cooking. Here we found that we had wandered from our course to the westward. After eating we endeavored to correct our mistake, and at the end of a two hours' march in the fog were at the head of a tributary of the Tozikakat that bore east. The country, except where there is no soil, as along the highest ridges, is covered with a heavy growth of vegetation, such as mosses, lichens, etc. Within a radius of 3 feet I counted eleven different varieties of plants. The rock of the barren ridges is largely fragmentary and granitic, with occasional pieces of nearly pure quartz. Our general course during the early day was, as near as the fog would allow me to determine, north $\frac{1}{2}^{\circ}$ west; from noon to the tributary, north-northeast. A few minutes after sighting the Tozikakat tributary on our right we came in view of one of the Melozikakat on our left and were, of course, on the divide between them. This we followed in a northeast by north direction around to northwest by north, and went into camp on

murder occurring farther down the river some years ago, and many of them would have been delighted at the prospect of disposing of him had they dared. One night he was heir-terally dragged home in a helpless state of intoxication by an Indian whose brother had been killed by a son of énikoff. The Indian seeing him so utterly helpless and so completely in his power, struck him on the head with an ax, considering the deed justifiable in revenge for the death of his brother.

At the time of his death Kogénikoff was living with Dandy's mother, whom he frequently beat, much to the displeasure of Dandy, who also considered this in the accumulative charges against his stepfather.

Five miles below Nulato we stopped at a village on the left bank, where I employed the services of the half-breed Demoósky to pack over the trail to the Unalaklik. At 3 o'clock we passed Kháltat's village, on an island in the middle of the river. This is always used as a stopping place in the winter by traders going to and returning from St. Michael, a fact that caused our action in paddling by to seem highly discourteous to Kháltat. We halted for the night at 7.35 at a small village on the right bank, having experienced the cleansing effects of a rain the entire afternoon. This camp is 65 miles below Nulato, and is the place where a native acquainted with the trail was obtained to pilot us over the summer portage, the one we traveled, and one which is very little used. Four miles below camp we halted the following morning at an Indian village for "water boots" (seal-skin boots). This is a village on Raymond's chart known as Yakutskalitnik, and consists of 6 to 8 houses. Here I met the messenger I had sent from Nulato about July 25, returning from St. Michael. He had made the journey as Indians usually do, satisfied that time is not an important element in any of their actions. We learned at this village that the natives around Anvik had broken into the store and carried away all the supplies and ammunition left by the trader, Mr. Fredericksen, in charge of his wife. Our hosts inquired what would be done with the transgressors, with whom they evidently sympathized. I here learned that it had been planned by the people all along the river to take possession of all the stores at the several posts. Demoósky said the natives above wanted to do the same, and that probably fear alone prevented. This man is something of a leader among them, and probably does more than any man on the river, unless it be his ally and fellow interpreter, Antoosky, to encourage them in their rebellion against the traders.

Six miles below Yakutskalitnik we reached the mouth of a small clear stream, the Autokakat, which we ascended 3 miles to the point of departure of the summer trail to the Unalaklik. Here we made a large fire and dried our effects, preparatory to packing them, as much as the then falling rain would permit. We left the Autokakat River at noon, and traveled five and a half hours over the softest footing until we made camp for the night. Our course for several miles was northwest $\frac{1}{2}^{\circ}$ west, then it turned more to the northward, so that our camp on high ground was northwest $\frac{1}{2}^{\circ}$ north from the mouth of the Autokakat.

The morning of August 24 was clear, and the trail, which presents no appreciable contrast to that from Nuklukyet north, lay along a high ridge convex to westward. The mosquitoes and gnats form a lively factor in the inconvenience of trail work in this part of the territory also. At 9 o'clock we halted on summit of high ridge between two tributaries of the Autokakat, one of which we had crossed the preceding day. From this place the trail turns the tributary by making an extended detour.

The principal tributary of the Autokakat bears considerably to west of the trail we followed. The latter part of the day's march was very severe. We had passed to where the ridges have given place to very high hills, which necessitated continual ascending and descending. Just before halting for the night we crossed in quick succession three tributaries of a Unalaklik tributary, the cross section of the largest of which would be represented by 16 by 3 feet.

We had traveled from 7 in the morning until 8.30 at night, including stops, yet I do not think the horizontal distance covered would exceed 14 miles. The following morning on awaking we found a heavy frost resting on all the vegetation, which presented a beautiful picture in the bright sunshine. From a high ridge about 3 miles from camp we first sighted salt water, the only time in my life when such a sight gave me a "home-like" feeling. To our right was the principal tributary of the Unalaklik.

Second. There is no employment for any large number of people in any capacity whatsoever; all values are speculative, and there is no fixed standard for labor.

Third. There is not now in existence, or likely to be within twelve months, any adequate or efficient means of supplying the people now in Alaska and Northwest Territory.

Fourth. From reliable information I am fully satisfied that not 7 per cent of all the people who have entered this country during the past year have earned their living up to the present time, and hundreds are scattered along the river destitute of food, clothing, and money.

The great majority of the people coming into this country have not the faintest conception of what they are going to do to earn a living upon their arrival here, as, after expending what little money they bring with them, they become dazed at finding themselves where there are no industries and no possible means of earning a living or finding gold by their own efforts; and their condition is pitiable when, as winter shuts down, they find themselves cut off from the world, starvation staring them in the face, and no possible hope of getting out or communicating with the outer world.

From all I can learn, the rush to this country will be very great next year, and any step that will prevent people from coming here in their ignorance will be an act of charity.

Yours, very respectfully,

P. H. RAY,

Captain, Eighth Infantry, United States Army.

ADJUTANT-GENERAL UNITED STATES ARMY,

Washington, D. C.

FORT YUKON, ALASKA, *November 3, 1897.*

SIR: As arrangements for a regular mail can not be depended upon, and as I believe the conditions here should be known to the Department and the President, I to-day dispatch a special courier to go through to Juneau, if possible.

Very respectfully,

P. H. RAY,

Captain, Eighth Infantry.

ADJUTANT-GENERAL UNITED STATES ARMY,

Washington, D. C.

FORT YUKON, ALASKA, *November 3, 1897.*

SIR: In view of recent developments and the knowledge that the lawless are banding together along the river for the purpose of robbery, I have again to respectfully renew my suggestion of the Government placing on the river a small light-draft steamer with high power, armed and used to patrol the river and place detachments as the movements of the people demand.

Very respectfully,

P. H. RAY,

Captain, Eighth Infantry.

ADJUTANT-GENERAL UNITED STATES ARMY,

Washington, D. C.

FORT YUKON, ALASKA, *November 15, 1897.*

SIR: Since submitting my last report on routes of transportation in this Territory, I have been able to obtain some information relative to the route from Cook Inlet to the Tanana, which I have the honor to respectfully submit. From reliable prospectors who have been over a part of this route I learn that there is a practicable route from the head of Cook Inlet up the Sushitna; that the right or west fork of that stream breaks through the Alaskan Range by a

low pass, and that the Indians from the Tanana travel this route in the winter to barter with a trader located at the mouth of the Sushitna. From Circle City to the Tanana via the head of Birch Creek is, I am informed by miners who have been over the trail repeatedly, 125 miles. The Indians say that it takes them from fifteen to seventeen days to make the trip from the Tanana to the store at the mouth of the Sushitna, which, at their rate of travel, would make the distance to be about 340 miles by trail, making the total distance from Cook Inlet to Circle City, 445 miles.

I notice that by latitude and longitude it is less than 400 miles. The advantages of this route over that of Juneau and Dyea is apparent, as the distance from Circle City to Juneau is estimated at 1,040 miles, and the route impracticable for winter travel, and mostly through a foreign country. The exodus this winter from the Klondike has brought into Alaska many experienced prospectors. From them I have been enabled to obtain much reliable information relative to the resources of the country. They all agree that from Cook Inlet to the boundary they have found gold in varying quantities in nearly every stream and gulch prospected, but that owing to the high price of provisions they could not afford to pay any attention to any localities that paid less than one ounce to the man per day. The development of the true mineral resources of the Territory will be in exact proportion to the cheapness of the food supply. At present the trader and laborer are bidding against each other for the gold the miner gets or hopes to get, and their prices are not governed by any law except the miners' necessities, consequently the price of food is so manipulated as to take about the output of the country, be it more or less. This is rendered possible only by the fact that every pound of food brought into the country by the cheapest route is controlled absolutely by two commercial companies; the goods brought in by the pass only serve to fix a maximum. This policy keeps the country in a chronic condition of semifamine, and to it is due the fictitious price prevailing in the country, both in food and labor.

The experience of the past summer has fully convinced me that the Yukon River route, as now managed, will be unable to supply the people now along the upper river, even at the present exorbitant rates, so that the whole future of the Territory is dependent upon some route being opened up to the open sea; one that can be operated throughout the year, so as to give stability and permanency to all enterprises looking to the development of the interior of the Territory. A careful study of the situation convinces me that the route I have named is the most practicable and offers more advantages than any other, as it lies entirely in the gold belt, where some valuable mines are already located.

In view of the wasted energy and distress I have witnessed, I again most respectfully recommend that an officer of the Engineer Corps be detailed to make a preliminary survey of this route, and at the same time the possibilities of a terminal on Prince Williams Sound be looked into. I would respectfully suggest that if undertaken the expedition should be dispatched so as to be enabled to leave the seacoast not later than April 1, or before the ice breaks up in the interior, so that the journey may be made with dogs; that it proceed up the Sushitna to the junction of the right or west fork of that river, up that to its head, thence across the divide and down the most available tributary of the Tanana, and down that stream to the Yukon, where I would meet him when the river opens, should the Department so desire. A careful survey of the left bank of the Tanana from the point where the expedition may strike it to the Yukon should be made.

Very respectfully,

P. H. RAY,
Captain, Eighth Infantry.

ADJUTANT-GENERAL UNITED STATES ARMY,

Washington, D. C.

October 13 we found ourselves a short distance above the mouth of the Hootalinqua, and on October 14 we reached White Horse Rapids. On October 16 the head of Lake Bennett was reached. On October 18 the expedition arrived at White Pass. After a walk of 20 miles the expedition boarded the narrow-gauge railroad and proceeded to Skagway.

ACROSS VALDEZ GLACIER.

By Lieut. E. M. BROOKFIELD, Second Infantry, U. S. A.

By way of introduction it should be stated that as it had been reported that there was a practicable summer route from Valdez to the Copper River over a glacier to the east, I was ordered to go over this glacier. This accomplished, I was expected to establish a camp on a lake which was said to be near the foot of the glacier on the other side. In pursuance to these instructions, I started on my expedition at 3 o'clock on the morning of May 21, with two enlisted men and several civilian packers. I reached the foot of the trail over the mountain in a little over an hour, a distance of $3\frac{1}{2}$ miles. I took with me five sleds, carrying a load of 300 pounds each. At the foot of the mountain I found a small river, which caused me to consume nearly two hours in crossing. Here I was abandoned by all but three of the civilian packers, as it was found that the crust on the mountain would break through, even under a light load. I went forward with four sleds, loaded with 100 pounds each, and by 10 a. m. the two leading sleds had reached a point on the mountain $2\frac{1}{2}$ miles from the foot. The altitude was found to be 750 feet. Here a cache was made, as it was found impossible to go farther. The mountain was yet covered with from 5 to 20 feet of snow, and as the crust softened travel became very difficult. On returning over the trail I found the other two sleds about halfway down, where they had been abandoned by the packers. That night I camped at the foot of the mountain. On account of the weather being warm and rainy, I decided to return to camp for instructions. The bad weather continued for several days. As the storm cleared on May 26, and colder weather made the formation of a crust probable, I again started with four enlisted men at 8.15 a. m.

My instructions now were to survey the trail as far as the summit of the glacier, and if possible to find out and report upon the character of the country on the other side of the divide. The foot of the mountain was reached at 10 p. m. At this point the trail leads over a level plateau for $3\frac{1}{2}$ miles in a direction nearly east of the camp. At the base of the mountain were found several small encampments of prospectors who were waiting for the snow to leave before starting over the divide. Traveling on the mountain was again found to be difficult, and the cache was not reached until 3.10 a. m. on the 27th. Here the men breakfasted, and with Corporal Heiden and Private Gardner, of the Fourteenth Infantry, and Mr. Pope, I continued my journey. It was my intention to reach the summit of the pass, where it was expected that a comprehensive view could be had of the surrounding country. To provide against emergencies three days' provisions were taken, as well as the mens' rifles, while I carried only my instruments and a pair of snowshoes. After several hours of laborious tramping the summit of the pass was reached at noon. All through the morning the men traveled through a storm of rain and sleet, which afterwards changed to snow, and which finally effectually prevented me from seeing anything of the country. However, I decided to keep on until I could find wood and water. At the summit the barometer showed 6,450 feet, and the distance from the foot of the mountain was estimated to be 7 miles. From the summit the trail leads down the glacier by several steep slopes. The slope of the glacier itself was gradual in the upper stretches, and the snowshoes, which up to this time had been useless, were used to excellent advantage. Two large feeders of the main glacier join it from the right, and leave it at about 3 miles east of the summit. The one from the right is very precipitous, and is broken all the way up by perpendicular ledges of blue ice.

While coming up the mountain the soldiers shot a badger and a squirrel, and this game proved a very welcome addition to the limited fare of the party. A number of bear tracks were discovered, but no bear. The end of the glacier was reached at 8 o'clock that evening. Here

the men met with an obstacle that for the time seemed insurmountable. The glacier appeared to be suddenly chopped off between two high, precipitous mountains, which, beyond the limits of the glacier, formed a narrow gorge. No footholds could be obtained, and the descent was finally made through a large crevasse which existed near the right hand end of the glacier. The light baggage which accompanied the men was thrown down ahead of them, while the men slid down the steeper slopes, trusting that the snow which had accumulated in the crevasse was strong enough to bear them. The bottom was finally reached without mishap, after 700 or 800 feet of this kind of descent. The bottom of the gorge was filled with large bowlders, and a considerable stream ran through it from the rapidly melting snow on the glacier. The route followed was not practicable for any kind of travel, but a practicable route is said to exist about a mile and a half from the foot of the glacier.

Following the glacial stream through the gorge, the expedition soon came to a wooded valley about 4 miles long and three-quarters of a mile wide, running northeast, and inclosed by high mountains. No lake was visible, and instead of finding the stream in the valley running east or northeast toward the Copper River, it was found running to the south, thus leading to the conclusion that the divide had not been crossed, and that the large stream flowing through the valley was but a continuation of the river flowing into Port Valdez at its southeastern extremity. Camp was not established until 2 a. m., and the men had been 43 hours without sleep. It rained continuously from May 28 until May 30.

May 29 the expedition started to explore the valley. After traversing it a short distance the members of the expedition were informed that the river was frozen over in the canyon, which latter was reported to be 5 miles long. It was further reported that the ice had broken up in the canyon. Mr. Lewis and I proceeded to the southern end of the valley with the intention of exploring the canyon, but found passage through it impossible. To the west of the canyon was a large mountain about 7,000 feet high, and at the beginning of the canyon was an immense snowslide, which extended almost to the southern extremity of the mountain. The slide had covered the entire valley at that point at one time, crossing the river and extending up the mountain on the east. In fact, the river passed between perpendicular walls of packed snow about 50 feet high even then. The expedition climbed some distance up this snowslide and onto the mountain in the endeavor to get a good view of the canyon. On account of the soft snow this plan was abandoned. The mountains on each side of the canyon appeared to be continuous, as far as the men could see. The compass bearing down the canyon was 200°, and that up the valley 320°. The current in the river between the camp and the canyon was very swift, with several rapids. There were several subdivisions of the stream running through the valley, and all had the same general character; they were very swift, and the water ran over a bed of large bowlders. The whole bottom of the valley was composed of coarse gravel sand, and large bowlders.

There was considerable cottonwood and pine found in the valley, especially near the upper end, where the timber appeared to be excellent. On the lower slopes of the mountains there was also pine. During the stay at this point, from the 29th to the 31st, the men of the expedition managed to get rations from prospectors, and also managed to find several porcupines, which helped them to patch out their food.

On May 31 the expedition divided up into three parties. At that time the glacial stream, which had been followed through the gorge from the glacier, had increased very greatly in volume. A decided thaw had also set in, which rendered travel on the glacier almost impossible without snowshoes. Therefore it was decided that it would be less hazardous if an attempt was made to raft down the river. With this view a good, strong raft was constructed, while in the meantime the remainder of the party was started to explore the country to the north and northeast, through the Copper River. The valley was found to be, in general, three-quarters of a mile wide, and the head of the valley to be 4 miles from camp. Here the expedition separated—Lewis and Fleming going over the foothills to the north, while Corporal Heiden and I attempted to follow the river. Another canyon commenced at the head of the valley, and it was found impossible to follow the river. As it became apparent that the Copper River could not be

reached, the party decided to return, and spent the night at the head of the valley. The barometer reading at this point was 800 feet; thermometer, 65°. Several glacial streams enter into the river in the valley. These streams were increasing rapidly in volume at the time named, and carried a considerable amount of water. The main stream was a raging torrent, which it was impossible to ford, and this prevented me from exploring the country to the east. In every direction were mountains as far as could be seen. One day later Lewis and Fleming returned to camp and reported that there was not a great extent of timber on the left-hand side of the mountain, and that they had gotten through and found the country beyond to be a gradual ascent and easy traveling. They also reported a stream flowing to the northeast, and from their report at this time, as well as from a report of a subsequent journey by Dr. Lewis a long distance down this stream, where it had reached the proportions of a river, I judged this body of water to be the Kotsena, and have so shown it on my map.

The glacier at the head of the Kotsena was crossed by Dr. Lewis, and he reported it very good traveling and a thoroughly practicable route. The country at the head of the Kotsena was reported as being a small plateau covered with moss and large stones, and broken here by small buttes. The valley of the Kotsena was in general about half a mile wide, open, with very little timber, a gradual descent, and the traveling good. The raft being completed on June 3, a start was made down the river. The current was swifter than anticipated, and the raft was whirled and tossed about. Guiding poles were of no use in this swift current. The rapids were safely passed through, however, at the lower end of the valley, but once in the canyon the current would sweep the raft against the rocks, first one side then on the other, when the raft would frequently be almost overturned. The railing which had been constructed on two sides of the raft was thrown off by the rocks almost at the beginning of the journey. The walls of the canyon were very precipitous, and on one side or the other they would generally be perpendicular to a height varying from 100 to 700 or 800 feet. At one place in the canyon the raft was stranded on a sand bar. Later on it struck a large submerged rock in midstream, where, under the strain of the rushing water and the combined weight upon it, the heavy cross logs snapped in two. Half of the raft held together, and after a time the men were successful in getting this portion of it off. Finally, however, the weight was too great, and, as the raft commenced to sink, Heiden jumped to the rocks as the logs were being swept near the right-hand side. Now the remaining portion of the raft turned bottom up, throwing everyone into the water but myself. Pope was carried away from the raft. He succeeded, however, in getting on the raft again, when almost immediately afterwards another rock was encountered, where the raft remained fast. Gardner had already jumped to the rocks on the left, and by his help the members of the expedition were able to get across safely to the rocky beach on that side. All of the men were wet to the skin and chilled with the ice-cold water. We finally extricated ourselves from the canyon by a steep snowslide, which had come down to the water's edge at the lower end of the beach. The height of this slide was 800 feet. The mountain on the left was broken at frequent intervals by draws with perpendicular slides, and we were compelled to go up to the snow line to get around them. When the canyon was finally abandoned the members of the expedition were within a mile of the southern end, where it opened into the head of the wide flat extending all the way to Port Valdez. The total length of the canyon was 4 miles, and its general direction 200°.

After reaching the upper end of the flat the river was found to be divided and subdivided many times, and by fording to the right wherever possible the members of the expedition were eventually able to cross the river. The head of the flat was 14 miles from Port Valdez, and its general features are illustrated on the map. The traveling at first was over a gravelly creek bottom and was very good; but at 5 miles from the canyon heavy timber and swamps commenced, which were hard to get through. Then came foothills covered with soft snow, and subsequently a small lake which is shown on the map. Valdez was reached at 3 p. m. on June 4, after a walk of twenty-three hours without food or sleep. The other members of the party at various times safely returned.

During the months of February, March, and April, 1898, it was estimated that 3,000 people had landed at Port Valdez, Alaska. All of these people were prospectors, who were bound for

the head waters of Copper River and its tributary streams. Of those who had remained in the newly founded town of Valdez, some were merchants, who had opened stores there, while others were prospectors who were waiting until the snow left, when they intended to either prospect along the coast or take the summer trail into the interior. The only practicable winter route across the mountains then discovered led across the large glacier at the head of Port Valdez, Alaska, and this route had been taken by the 2,500 people who had attempted to reach the interior. Up to the middle of April the leading parties had not progressed beyond the summit of the glacier, and there was considerable doubt among them as to the route to be taken to reach the Copper River. It was with the view of quickly determining the proper trail and mapping the route that I undertook the enterprise under the direction of Captain Abercrombie.

Accompanied by Mr. F. C. Schrader, of the United States Geological Survey, on April 26, I started to make a survey of the route mentioned. I left camp at Valdez at 9.30 a. m. We took with us one sled, with a load of about 300 pounds, which consisted of our bedding rolls, a few articles of extra clothing, a shelter tent, snowshoes, an oil stove, a few cooking utensils, and provisions for a two-weeks' trip. Our instruments we carried about us. The average depth of snow at this time was about 6 feet. The sledding was comparatively good, as the trail to the glacier was well worn and the snow had packed from constant travel. The nights, as a rule, had been cold enough to freeze the upper layers of snow into a solid crust. A little earlier in the season this crust was constantly present, and traveling at that time was reported to be excellent. Animals of all kinds were used to great advantage when the trail was frozen. At the time of our arrival at Valdez horses and mules were selling at from \$300 to \$450 apiece. A horse costing \$15 in Seattle would readily bring \$300 here, and, if used for freighting, would earn the latter sum for his owner in three or four days. Mules were more valuable still, and few could be bought at any price. A number of burros were also used, but these were not found to be as serviceable as horses and mules. Dogs had been used very extensively and had given valuable aid. A large-sized, well-fed animal of the Newfoundland or St. Bernard species will pull as large a load as a man and will do fully as much work in a day, and they have the great advantage of being able to work in a soft trail, which would break through under any other animal.

The trail to the foot of the glacier leads in nearly a straight line from the beach at Valdez across the large flat which bounds the bay at the eastern end. This flat is 6 miles wide, and in general about 4 miles across from the beach to the mountain to the east. The rise is very gradual, and at the foot of the glacier we found the elevation to be only 150 feet, while the distance by the trail from the beach was $4\frac{1}{2}$ miles. Arriving at this point at noon, we found there an encampment of from 300 to 400 people. This is at the foot of what is known as the first bench. It has an incline of about 22 degrees with a 50-foot rise, the top of the bench extending for a mile, and the grade is a gradual one to the foot of the second bench.

We reached the top of the first bench by the aid of a block and fall, the use of which was kindly offered to us by the owner, who was then operating it. About 6 men are necessary to drag up a load of 300 pounds even by this means, and we paid for the extra help we received by assisting others. The second bench may be climbed in the same manner as the first, or the sleds may be drawn up a semicircular pass on the side of the glacier. The latter trail, while involving considerable extra labor, was very generally preferred, as it was from 50 to 75 yards away from the side of the mountain to the east, while the lower trail ran along the bottom of a small ravine formed by the side of the mountain and the side of the glacier, and there was great danger in this part of the trail from snowslides. That the apprehension on this score was not unfounded was proved some four days later, when several successive slides covered the whole bottom of the ravine in this vicinity to an average depth of 30 feet.

From the top of the second bench a comparative level of 200 yards brings you to the foot of the third. The latter starts in with three sharp pitches, each with a grade of 15 degrees and a height of about 60 feet. These are also ascended by the aid of a block and fall. At 4.30 p. m. we had reached the top of the second of these pitches, a distance from the beach of about $6\frac{1}{2}$ miles, and there we decided to camp for the night. The wind, which heretofore had been light and from the west, had by this time veered round to the south, and in a short time we had a heavy fall of

wet snow. A southerly wind invariably means wet weather, as the large amount of moisture brought with it from the North Pacific is condensed by the cold of the glaciers and falls as snow or rain, according to the altitude and the season of the year. The storm continued intermittently throughout the night of the 26th, and the next morning the trail was soft and wet and but little progress could be made, and that only by great exertion.

The start on the 27th was not made until 10 o'clock, as the mountains previous to that time had been obscured by fog and falling snow, which rendered topographical work impossible. At 10 o'clock the weather cleared somewhat and we decided to push on, but we were able to make only a mile and a half that morning as the result of three hours' hard pulling. By noon the condition of the trail had become so bad that all work on the glacier was effectually stopped. Soon after this it began to snow vigorously, and as there was a steady southerly wind that gave no promise of an early termination of the storm, we decided to cache our outfit and return to camp at Valdez until the weather cleared sufficiently to enable us to continue our work. We reached our camp in two hours. Learning here that the leading prospectors had found the right trail to the Copper River, it was decided that on our return to the glacier we should leave our outfit at the cache and survey the trail as far as the summit of the pass and then return to the cache, and later explore a glacier to the south with the view of finding a shorter and better trail.

April 28, 29, and 30 the storm continued without intermission. The fall of snow for the four days was over 60 inches.

On May 1 the snow gave place to a warm rain, which settled the snow to nearly its former level and packed it to a considerable extent, so that when the storm lifted later that night the cold weather made it possible to make fair progress over the trail. A start was again made on the morning of May 2. When passing the second bench we found that even the upper trail had been covered to a considerable extent in places by the snowslides of the 29th and 30th, and a number of men were then burrowing in the snow in an endeavor to find their buried caches. The first of these slides occurred on the evening of the 29th. It extended over to the trail on the side of the glacier, and had buried six men who had camped there at the beginning of the storm, together with some twenty-five burros which they employed in freighting. The men were all taken out alive, suffering severe bruises. The burros were less fortunate, ten being killed and the remainder badly used up. The whole of that day, and in fact all during the preceding storm, snowslides were constantly occurring. The mountains being very precipitous and covered with loose boulders, every slide would bring with it a large quantity of rock, causing a roar which, in the case of a large slide, could be heard for 5 or 6 miles.

At the top of the third bench the altitude was found to be 800 feet, and the distance from the foot of the first bench $1\frac{1}{2}$ miles, making an average grade of about 1 in 12 for this distance. From the top of the bench a deep narrow canyon opens out to the right, the general direction of which is N. 25° E., magnetic reading. The canyon has a steep grade and carries a small dead glacier. On reaching our cache we found that we were at the beginning of a long encampment along the trail, the extent of which we had not been able to see when making the cache on account of the storm. These encampments were a common feature on the glacier. We found that prospectors as a rule carried with them an outfit averaging 1,500 pounds per man. Few prospectors were provided with pack animals, and, as a good load for a man on even the gradual slopes of the glacier is only 150 pounds, an outfit of 1,500 pounds would necessitate ten trips, loaded, over the same ground. We found that the best progress was made by those who made trips not longer than $2\frac{1}{2}$ miles. Having the camp at one end and the cache at the other, the best workers would make on a fair working day, or rather night—for that is usually the best time for working on the glacier—five trips, carrying 150 pounds each trip, for $2\frac{1}{2}$ miles. Progress over the benches is necessarily much slower, but on the average a good worker could make the 23 miles from the bench to the summit with 1,500 pounds in eighteen days, provided he had good working weather.

The glacier presents some special difficulties which may be mentioned here. Warm, nourishing food and good drinking water are of first importance, and both involve the use of some kind of fuel. A good oil stove has been found to be the best solution of this problem. Toward

the latter part of April, after the snow has begun to melt, water may be obtained near the foot of the glacier, but after leaving this there is no water for 27 miles, and it is necessary to melt either snow or ice. The nearest dry wood is $1\frac{1}{2}$ miles from the foot of the glacier, and for those who are not provided with oil stoves a great amount of extra labor must necessarily be expended in hauling wood. At the summit of the glacier wood sold for 20 cents a pound, a small piece of dry cottonwood a foot long and eight inches in diameter readily bringing \$1.

For half a mile along the second bench, and for three-fourths of a mile before reaching the summit, snowslides are a source of considerable danger during and just after a storm, and a camp or cache should not be made at these places. Sudden changes of temperature are apt to occur. An icy wind will sometimes start from the upper glacier and cause a change of temperature in a few minutes of 20 to 30 degrees, and if not provided with extra clothing for such an emergency a chill is more than probable, and this may result in pneumonia. Snow-blindness is very common on the glacier. Besides the pain and the possibility of a permanent injury to the eyes, it involves loss of time, as it is necessary to keep the eyes closed for a brief period. It generally takes three or four days to effect a cure, and then there is considerable liability to a recurrence if care is not taken to keep the eyes well shaded. Snow glasses should be worn constantly while on the glacier. I have seen a pair of very inferior smoked glasses sell for \$5.

Crevasses must be guarded against as soon as the snow begins to melt on the lower glacier. At the present time no crevasses were open across the trail, but in several instances several narrow crevasses have opened a few feet away from the trail, near the foot of the glacier. These crevasses extend clear through to the bottom of the glacier, as on dropping stones into them the splash into the glacial river was distinctly audible at the end of the fall.

From the encampment, a mile and a half from the top of the third bench, the trail is a gradual grade halfway across the glacier and leads in a northwesterly direction for $1\frac{1}{2}$ miles. From thence it leads to the north for nearly 2 miles to what is known as "Five-Mile camp," so named from its estimated distance from the top of the third bench. Here we found about 300 people. The average width of the glacier from the foot to a point 3 miles above Five-Mile camp is $1\frac{1}{2}$ miles. At the latter point the glacier narrows to 1 mile, being forced between the high mountain on the east and a sharp, projecting spur of the mountain on the west. This causes the ice mass on the west to crumple up into a series of perpendicular ice ledges, the clear blue ice of which is visible at a distance of 5 miles.

Opening out to the east between Five-Mile camp and the ice ledge is a large canyon, the mouth of which is $2\frac{1}{2}$ miles wide. This canyon contained at one time a large feeder of the main glacier, but at the present time the canyon glacier is separated and is apparently receding. From the ice ledge the trail leads northwest for $1\frac{1}{4}$ miles to the foot of the fourth bench, where was found an encampment of about 350 people. Here we learned that the trail was not broken through to the summit, and, it being 8 o'clock in the evening, we decided to spend the night there. At this time of the year there is very little night. It does not get dark until nearly 10 o'clock. It commences to get light by 2 o'clock. During a storm it was the custom to keep traveling over the trail with empty sleds in order to keep the trail open, but the storm which commenced on April 27 was so severe that this was soon given up, and all spare energy was given to keeping tents and goods from being snowed under. Near the summit of the glacier it was reported that over 10 feet of snow fell during the five days' storm.

Leaving camp at 4 a. m. May 3, we again started up the glacier. Early that morning a new trail had been broken by a working party coming through from the summit. Some went in advance with snowshoes, while others followed with shovels or light sleds, packing down the snow. The fourth bench is a slope averaging 10 degrees for a quarter of a mile. The rise is then gradual for 5 miles and the direction a little to the west of true north, to the foot of the summit. At the latter place there was a camp of fully 400 people. From the fourth bench the glacier widens out until at the foot of the summit it forms a large bay of ice extending down some 3 or 4 miles to the westward. Here the elevation was found to be 3,900 feet. The distance from this point to the summit is three-fourths of a mile, and the angle of slope nearly 17 degrees. The altitude of the summit is nearly 4,900 feet. On the second night before we

reached the summit there had been a heavy snow slide from the mountain to the right which had buried some twenty-five or thirty people who were encamped along the trail. These were located by their cries, which could be plainly heard through the snow, and all but two were taken out alive. A number of caches were covered to a depth of from 15 to 25 feet, and few of these were ever found, as the goods had been swept away in the slide. At the summit the air was much lighter than at the foot of the glacier, and it was also much colder. The distance from Port Valdez to the summit by the present trail was found to be 23 miles. Having reached this point, sledding down to the Copper River is a comparatively easy matter as long as the weather remains cold enough to form a crust on the snow. We found that prospectors loaded their sleds with as much as they could carry, occasionally as high as 1,000 pounds, for the trip down on the other side of the glacier. Just beyond the summit we found a camp of about 300 people. On this side the glacier averages 1 mile in width, and it extends with a gradual grade for 6 miles in a general direction N. 12° W., magnetic reading. The mountain ranges on either side are unbroken for this distance, and are between 4,000 and 5,000 feet high.

Being the first army officer to go over the glacier, and the pass being yet unnamed, I was given that privilege, and accordingly named it Bates Pass, after that most excellent and esteemed soldier, Brigadier-General Bates, United States Volunteers, and formerly colonel of the Second United States Infantry.

ACROSS VALDEZ GLACIER WITH SLEDS DRAWN BY HAND.

By Lieut. GUY H. PRESTON, Ninth Cavalry, U. S. A.

Under the orders of Capt. W. R. Abercrombie, on April 25, 1898, I organized an expedition to sled by hand across Valdez Glacier, the object being to place a cache as far up Copper River as possible. I took with me 13 men and 7 sleds, with 2 men to a sled. Each man was allowed 40 pounds of bedding and changes of footgear. Each sled was loaded with a total weight of 300 pounds.

Setting out April 26, we gained the top of the second bench of the glacier, but not without great labor. When we reached the top all of us were completely exhausted. We bivouacked in the snow, using an oil stove for cooking and melting snow. Fuel could not be obtained on the glacier. Such as was procured was brought from the beach. April 27 we set out along trail, hoping to reach the summit. Arriving at Five-Mile camp in a snowstorm, I found the trail beyond obliterated. I changed my plans at once to meet this condition, knowing that the trail might not again be open for several days. Not wishing to camp for that period and consume rations which had cost so much labor to transport, we returned to the beach, a distance which I estimated at 11 miles, caching the provisions at Five-Mile camp. I then recommended to Captain Abercrombie that upon setting out again I should advance into the country after the manner of prospectors, with a small party, sending back several men from the summit as soon as I should have attained that point with my cache. I also proposed that upon setting out again I should take additional supplies.

April 28 I completed preparations for my second departure. Warm rain continued upon the beach and a blizzard prevailed upon the glacier. April 28 the storm on the beach turned to snow, with a very heavy fog. The trail was deserted and was impassable by anybody. April 30, 30 inches of snow had fallen, and it still continued heavy and wet. Everybody was waiting to move, because they were alarmed and fearful that the glacier trail would be cut off for the summer. May 1 the storm continued, changing to rain.

At 9.30 a. m., May 1, the sky cleared. Prospectors upon the beach set out and broke trail. I followed at once with 11 men and 5 sleds, arriving at our cache at Five-Mile camp with the additional load. I found the trail on the lower benches rapidly disintegrating. At the third bench a snow slide had killed 13 head of stock, several men barely escaping death. Not being

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TANANA RIVER EXPLORING EXPEDITION.

Capt. E. F. GLENN, Twenty-fifth United States Infantry.

bring us out toward the head of the Sushitna River. He plainly discovered, he said, a pass through the range to the eastward, about 40 to 50 miles distant in a direct line. The country from our present location to the pass was an open one, with no obstacles except the Chestochena River. Our orders directed that all of the expeditions communicate with each other if practicable, so I decided to permit Mr. Kelly to go across for the purpose of examining this pass, and at the same time agreed to furnish men and stock to accompany him. The only real gain from this would be the possibility of establishing communication with Expedition No. 2. But this was regarded by all of us as being rather remote. In view of this fact, the lateness of the season, the distance from our present location to that point, and the possibility of his failing to join my party on its return, Mr. Kelly did not think it wise to go across, which conclusion all concurred in.

We found by observation that Mount Sanford, of the Wrangell group, lies south 60° east of us. We calculated that the Copper River was not to exceed 30 miles from us. About 6 or 7 miles to our right we could readily trace a stream flowing through two rather large lakes, which we took to be Chestochena River.

Mr. Kelly reported that he had found a plainly marked trail to our left that ran directly north toward the mountains. This I decided to take the following morning in the hope that it would lead us to the head of the Johnson River, down which we had been informed was an Indian trail to the Tanana River. The footprints of the white people which we had discovered the day before were evidently this trail. On the Chestochena River we found considerable evidence that it had been passed up by the white men this season. Although the grass in the willows was abundant and nutritious, our stock succeeded in breaking into the packs and destroying a 50-pound sack of flour. This was a serious loss.

On August 20, having sent the Indian and one guide forward to pick up the trail referred to, we followed with the command about two hours afterward. Traveling about 5 miles farther, we struck this trail and followed it for about 7 miles, when we went into camp. A small stream, evidently a tributary of the Chestochena, flowed directly by us, and it was full of grayling. Neither this stream nor those we had crossed for the past few days carried any gold. We were now satisfied that the trail we were on was not simply a game trail, as it gave evidence of having been in use by the Indians for a long time. Our general direction was still almost directly north.

Just before entering the pass in the mountains our trail led us through a beautiful network of lakes. The waters from some of them apparently had no outlet, while that of others seemed to flow in opposite directions—i. e., toward the Copper and Tanana, or Sushitna, rivers. (53-4-5-6.) About 12 miles from camp we ran into a trail we assumed to be Lieutenant Castner's. In any event we now felt that we had struck some pass that would lead us to the Tanana River. We passed through an abundance of huckleberries, which were growing more luxuriant and apparently larger than those found near the seacoast. After making the longest march of the trip, 17 miles, we went into camp on a spot where the grass was so luxuriant that the stock did not move from one small spot, of less than 1 acre, during the night, and gave evidence the following morning of being thoroughly satisfied. The next day we felt that we were over the divide and that the chances were excellent for reaching the Tanana. The first sign of Indian life seen by us since the command left Knik Inlet was on August 25. Just opposite the Indian camp, which was 270 miles from Knik Inlet, is a very considerable tributary which flows into Delta River, down which we were traveling. We named it Wilder Creek. A practicable trail for pack animals, a railroad, or wagon road can easily be made over the route we traveled. I am satisfied that to the right of the trail followed a lower pass could have been found that should have brought us out near the mouth of Phelan Creek. On August 24 we reached Lieutenant Castner and his command, and learned that he had nearly completed a raft on which he intended to float down the Delta to the Tanana, then down to the mouth of the latter.

On August 25, after traveling about 10 miles, we crossed a small creek, and then climbed a hill to a small lake. This hill runs abruptly down to the river, whose bed at this point was about a mile in width, to a valley on the other side of about the same width. The indications pointed to our being near the mouth of the Delta and therefore near the Tanana. We panned some on the

St. Elias Range, except there exists many more low, broad passes or openings through it. Many of these are known to be sufficiently low and broad as to offer no serious obstacle to travel through them. The valley of the Tanana River at the point we saw it—the mouth of the Delta River—is from 20 to 30 miles wide. It was covered with a dense growth of timber of medium size, principally spruce, throughout which was a dense growth of moss. Beyond it on the northern side for a distance of 40 to 70 miles, estimated, is a low range of foot hills that we assumed to be the Tanana or Ketchumstock Range.

The range of mountains between the Mataraska and Sushitna rivers presents the same general appearance as the range along the coast until some distance above the head of the Little Sushitna River, when the peaks gradually become lower, terminating in a plateau near the Chaniltno River.

The Kenai Peninsula, which lies between Cook Inlet and Prince William Sound, is quite mountainous on the eastern and southern portion, but on the northwestern side there is a comparatively low gravelly country which slopes back gradually to the mountains for a distance of about 40 miles. The country on the north coast of Cook Inlet is, in general, very similar to that just described. The distance from the coast to the mountains varies from a few miles to 70 or 80.

AVAILABLE ROUTES OF TRAVEL.

The only available routes by which one could reach the gold fields of Alaska, or that region of country north of the Tanana River, including the Yukon and its tributaries on both sides from Rampart City to Lake Bennett, and popularly described as the "Klondyke" region, up to the beginning of the year 1898, were via the head of Lynn Canal, either through the Chilkoot or Chilkat passes, thence down the Yukon River, by boats or dog sleds, depending upon the season of the year, and via St. Michael, thence up the Yukon by steamer. The objection to the former consists principally in the fact that as soon as one reaches the summit of the mountains back of Dyea or Skagway he passes out of American into English or Canadian territory, through which he travels during the remainder of his journey to Eagle City, just below or north of Dawson City. In passing into foreign territory one is forced to pay duty on everything in his outfit which, to the average prospector, is a serious burden.

The only serious objection to the route via St. Michael was and is that the Yukon River freezes over for nearly nine months of the year, thereby cutting short the time for prospecting during the first year.

To avoid the foregoing objections it was necessary to explore the intervening points on the seacoast of Alaska that presented the most favorable prospects for an opening into the interior of that Territory. Such points must not only furnish a practicable outlet, but this outlet should be from a harbor open during every month of the year, if possible. By previous explorations it had been determined that the Copper River could not be ascended from its mouth; so that if the valley of this stream should prove to be of value as a trail to the interior, it must be reached via Prince William Sound, about 100 miles above its mouth. Valdez Inlet was considered as the most favorable point from which to start an exploration. It was also known that Cook Inlet, and all points of the coast north of it, were frozen over during certain months of the year; but it was believed that from the head of that inlet a trail could be found to the Yukon. The first duty in connection with this work was to find, if possible, a trail from Prince William Sound to the head of that inlet, and the next to find an outlet from that point.

From the best information obtainable, a route existed from some point on Port Wells Inlet of Prince William Sound; still another from Resurrection Bay on the east coast of the Kenai Peninsula. An investigation of the former showed that our information was erroneous. We succeeded, however, in sending a small party over what is reported by Mr. Kelly as being a practicable trail from Portage Bay to the head of Knik Arm, passing Turnagain Arm on the north side. From this report the details concerning this trail can be gathered. It is only necessary to mention here that this route runs from Portage Bay, on the coast, up Cabin Creek, over the divide, to the head of Twenty Mile River; thence up to the west fork across to Winner

Creek; down this to and across California Creek; thence up Crow Creek, a tributary of California Creek, to Raven Creek; thence down it and the Yukla River to Knik Arm.

The serious obstacles to be overcome in going over this trail are to be found in crossing the divides. The first one, between Cabin Creek and Twenty Mile River, is less than 2,000 feet high, with no reported danger from snow slides. There is no glacier to cross, but some difficulty may be experienced in reaching the top of it with a satisfactory grade. The distance from tide water to the summit is about 6 miles.

From the foot of the divide on the north, Mr. Kelly says:

From Lake Glenn the proper course is westerly across the main stream, the Twenty Mile River, thence up the right bank of the west branch to the pass, over a comparatively level ground which required the cutting of some brush. By means of a winding trail the ascent and descent of the pass is easy, as timber extends nearly to the top. While the snow was very deep on the summit, we found no glaciers nearer than 2 miles.

As to the next divide, he says:

I * * * proceeded to the summit of Crow Creek, where I found a favorable pass with fairly good traveling and a gradual ascent. The descent on the other side is not difficult to Raven Creek, which runs due north for 7 miles to Yukla River. A trail can easily be worked down the right bank of this gulch.

There is a glacier at the head of Raven Creek about 2 miles long, which was avoided by Mr. Kelly, who left it to his right. Although this is a comparatively short glacier, it is impracticable to construct a trail over it or any other glacier. This can be avoided, as reported, by passing over the high ground to the south of it. An investigation of the route from Resurrection Bay to Sunrise City showed that a trail could be constructed to the last-named point. This would be of local value only, since the difficulties in the way of crossing the Turnagain Arm are practically insurmountable, were it not for the fact that instead of going to Sunrise City a trail has been found down a creek that puts into the head of Turnagain Arm. From this point the trail would pass up Twenty Mile River to the west fork, from which point it would coincide with that previously described from Portage Bay.

The Kelly trail should, immediately after passing out of the mountains, leave the Yukla River, turn up the Knik Arm toward and across the Knik River; thence up the valley of the Matanuska River on the east bank for about 20 miles. Here this stream should be crossed by means of a bridge. At this point it strikes the trail followed by my command in returning from the Tanana River. No obstacles that are insurmountable, or even extremely difficult, will be encountered from this point to the Tanana River. From the head of the Matanuska River this trail crosses the Tazlena River at its head; proceeds thence to Bubb River over comparatively easy grades in a direction somewhat east of north; proceeding thence in the same general direction to the Alaskan Range of mountains. As previously stated, the trail from Bubb River passes along the divide between the Copper and Sushitna rivers. This was conclusively shown by the fact that the streams we crossed were very small and flowed from lakes whose outlet streams ran in opposite directions.

After passing through this district my own trail turned somewhat more toward the north, but an equally good trail exists to the Slahna River, on the east. Thence it passes through the Alaskan Range, and strikes the Tanana River much farther to the eastward and nearer its head waters. From a careful inspection of the intervening country to the east there exists not the slightest doubt that Lake Menasta Pass can be reached readily. The only difficulty will be in crossing the Chestochena River, a tributary of the Copper. This should not be difficult, as it was crossed by Expedition No. 2 near its mouth.

In returning to my own trail of last summer and fall it is only necessary to add that it leads through a very good pass in the Alaskan Range, and showed evident signs of having been used by the natives from the Copper, Sushitna, and Tanana rivers for an indefinite period. This was apparent from the number of trails we found leading into it. Our time for exploration was so limited that it was impossible to determine whether or not the trail actually followed by the command was the best that could be found down the Delta River. From the hurried observations made by us we were satisfied that a route with a lower grade—one, in fact, that would avoid all the heavier grades—could be found down the river a few miles, to the east of the trail we

followed. In going through we were following the Indian trail without regard to the surrounding country. Aside from the few marshy places that can be readily made passable with material close at hand, aside from the necessity of bridging certain streams crossed, especially the tributaries of the Matanuska that it is advisable to bridge, and aside from the labor required to cut out the number of trees necessary to permit of passage through with wagons or pack animals, no very great amount of labor will be necessary to construct a perfectly practicable trail for pack animals or wagons from Cook Inlet to the place where my expedition turned back.

After leaving the St. Elias Range of mountains, and during practically all of the time that intervened up to our return to the same point, the rainfall was almost constant. It is fair to assume that the country passed over was seen under the worst possible condition. It is quite certain that all marshy places would be as troublesome as at any season of the year. Only two places had to be repaired before passing over them. The amount of corduroy used for the two did not exceed 30 to 40 feet. This is fairly good evidence of the facility with which a pack train can be utilized in that section of Alaska. The party that was sent up the Sushitna River did not use pack animals, but relied upon boats to carry their goods up the river as far as the forks, or to the Talkeetna River. As stated hereinbefore, the intention was to furnish this detachment with pack animals, via the heads of the Chicaloon and the Talkeetna rivers. In this we failed, but so certain am I that our information, obtained from the Indians, to the effect that a practicable trail for pack animals can be found over this route and from there up the trail followed by Sergeant Yanert is right, I ordered him to make a snowshoe trip over it during this winter.

The Sushitna River is filled with islands and innumerable sand bars, as shown by the inclosed map prepared by Sergeant Yanert. In fact, the word "sushitna" means sand. In English the river would be known as the "River of Sand." Several attempts were made during the past summer to navigate this river with steam launches, but with indifferent success, above the Alaska Commercial Company's store, about 25 miles from its mouth. The small steam launch of the Boston Company, above referred to, managed upon one occasion to go about 5 miles above the station, but was unfortunate enough to break all but two blades of her propellers and was forced to return. The small stern-wheel boat went up quite a distance farther without serious accident of any kind, but her wheel was ridiculously short and her power so inadequate that her failure would imply nothing whatever as to the navigability of the stream. I made diligent inquiry of all persons who were at all familiar with this stream from actual experience, and all agree that a properly constructed stern-wheel boat with sufficient power to successfully stem the current or to check herself quickly when descending the river could navigate it. Not only is the river filled with sand bars and islands, but the channel changes with great frequency, so that the channel followed in ascending will not usually coincide with that used in descending.

From a report upon this subject by Lieut. H. G. Learnard, who had command of the detachment sent up that stream, I learned that he had arrived at the conclusion that this stream was navigable for about 120 miles. The type of boat recommended is a sternwheeler, with a speed of about 15 knots. The following extracts from letters addressed to me by Messrs. W. J. Jack and Paul Buckley, who are the best informed upon this subject of any persons in that section of Alaska, express the situation quite clearly, and need no comment:

TYOONOK, ALASKA, October 2, 1898.

* * * I beg to inform you that in the year 1897 I went up the main Sushitna to the Middle Fork and up that stream to its head. I was accompanied on this trip by eight companions. Our principal object was prospecting. During last summer I went up this stream as guide for the party in charge of Mr. George H. Eldridge, of the geological department. On both trips we used small boats and depended upon rowing and cordelling them. In my best judgment a properly constructed boat drawing not to exceed 2 feet of water can navigate this river (Sushitna) from its mouth as far as the forks, and from that point up the Middle Fork for a distance of about 37 miles, or to Indian Creek. The only obstacle to be overcome in this fork is a sand bar. This may not exist another season, but during this season it confined the current to a very narrow, swift channel. At no stage of water have I found this river with a channel that did not contain sufficient water to float a vessel of the draft above mentioned. The mean fall in this river from the forks to its mouth is about 3 feet to the mile. In the main fork the mean fall is about 7 or 8 feet to the mile. The current is about the same as that of the Missouri River, or from 4 to 5 miles per hour, in the main stream, and probably a mile more in the fork. The difficulty in navigating this stream will be greater in descending than in ascending. The type of boat for this stream must be a flat-bottomed, stern-wheel, with sufficient power to

enable it to be checked quickly, especially in descending the river. The principal reason for this, aside from overcoming the current and handling the boat readily, is that the channels change frequently and quickly, and freshets bring down a great amount of driftwood in the shape of large trees, which must be avoided. The changes in the channels are so easily, quickly, and frequently made that the same channel used in going up will not be used in coming down on the same trip. The total navigable distance, according to the above, is 119 miles, which a boat would have to travel at least 130 miles to overcome. * * *

W. J. JACK.

SUNRISE CITY, ALASKA, *October 20, 1898.*

* * * In regard to the navigability of the Sushitna River, it is my opinion, from the observations I have made in going up and down the river, that it could be boated safely for a distance of nearly 100 miles, say, up to the forks of the river. I should think about a 50 or 60 ton steamer, stern-wheeler, built similar to the Ohio River and Mississippi River steamboats, and drawing not over 2 feet of water, would be the proper boat to go up that river. I came down the river from the head of it in August, 1897, when the river was down very low, and I think a boat similar to the one spoken of would have no trouble in boating from the forks to the mouth. * * *

PAUL BUCKLEY.

No private concern or corporation is likely to undertake fitting out a boat for this purpose until by further development the interior of that section of Alaska is better known; or, in short, until prospecting it shows clearly that business up that stream will warrant the necessary expenditure of money. The evidence is so strongly in favor of this river being navigable for the distance named that the fitting out of a suitable steamer for the purpose is highly desirable, and such a steamer would greatly facilitate the work of exploring that section of country. The result would be that an exploring outfit could be landed far enough into the interior to make the trip across from Cook Inlet to Circle City a certainty. The point of landing would be above or through the St. Elias Range of mountains. That pack animals could be used from that point, certainly as far as the Tanana River, appears conclusively from the report of Sergeant Yanert.

Lieut. J. C. Castner's report, dated at Weare, Alaska, indicates that this trail would reach Circle City via Saljacket Creek, up which the Tanana Indians travel to that city. In addition to all this, should a steam vessel demonstrate the fact of the navigability of this river up to the point named, prospectors would be able to ship their goods to within a comparatively short distance of the most promising gold-bearing section traversed by any part of my command during last season. Finally, such vessel, when no longer needed by the United States, could be readily disposed of in Cook Inlet without great sacrifice, according to the best information obtainable.

From the report of Sergeant Yanert, who went farther than any other member of my command on the Sushitna route, it is apparent that this route should be further examined during the coming season. The nature of the country from the head of navigation, as far as explored, is in general the same as that traversed by my own party 90 to 100 miles to the eastward. The capability of sustaining stock is certain as far as investigated and a trail through this section should be established if practicable. The Sushitna valley and river have been used as a winter trail by the Tanana Indians for years. There is but little doubt that a trail for summer use can be found through this valley. We were not furnished with proper facilities for investigating this section during last season; nor did we procure the necessary animals until it was too late. At that time all detachments were out of reach except the members needed by myself for exploration up the Matanuska River.

Cook Inlet and the Sushitna River are generally open to navigation from some time in the month of April until some time in the month of October, or about five to six months of each year.

FEASIBLE ROUTES FOR RAILROAD CONSTRUCTION.

The routes described under the previous subhead, Available Routes of Travel, cover the only sections examined by Expedition No. 3 that are feasible for railroad construction. These need not be further described under this head; but it can be safely stated that the material necessary for ties, bridge timbers, etc., can be readily procured near the line of road, as can also all the gravel necessary for a road bed.

The great trouble, in fact the greatest obstacle for operating a railroad in any portion of Alaska, will be found to arise from the excessive snow falls on the coast and through the