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REPORT

OF THE

OPERATIONS OF THE U. S. REVENUE STEAMER NUNIVAK

ON THE

YUKON RIVER STATION, ALASKA,

1899-1901.

BY

First Lieut. J. C. CANTWELL, R. C. S.,

Commanding.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.

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TREASURY DEPARTMENT.

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Division of Revenue-Cutter Service.

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LETTER OF TRANSMITTAL.

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
Washington, August 4, 1902.

SIR: The operations of the U. S. steamer *Nunivak*, conducted under obedience to Department orders bearing date April 24, 1899, having been completed, I have the honor to submit herewith the report of First Lieut. John C. Cantwell, R. C. S., covering the operations of his command during the years 1899, 1900, and 1901, and request that the same be printed.

Respectfully,

C. F. SHOEMAKER,
Captain, Revenue-Cutter Service, Chief of Division.
The SECRETARY OF THE TREASURY.

LETTER OF TRANSMITTAL OF REPORT.

U. S. REVENUE-CUTTER SERVICE,
APPRAISER'S BUILDING,
San Francisco, Cal., May 25, 1902.

SIR: In obedience to Department orders of October 2, 1901 (C.F.S.), I have the honor to transmit herewith a report of the operations of the U. S. S. *Nunivak*, while under my command, on the Yukon River station, Alaska, together with 155 photographs to illustrate the same.

In the execution of the Department's orders directing me to lay the vessel up for the winter of 1901-2 at St. Michael, Alaska, I have to acknowledge the receipt of a great deal of valuable assistance and many acts of courtesy extended to me through the kindness of Gen. George M. Randall, U. S. Army, commanding the Department of Alaska, and his staff.

Thanks are also due to the various officers of the Army on duty at the several military posts along the river for their unflinching cooperation with myself and officers in the promotion of the comfort and efficiency of the command, and to the managers of the various trading companies doing business in the country for their universal kindness and consideration of our wants while in the country.

In the preparation of the report I have to acknowledge, with gratitude, the services of Mr. Leverette Mills Loomis, director of the museum, California Academy of Sciences, of Prof. F. M. Anderson, of the University of California, and of Miss Alice Eastwood, curator of botany, California Academy of Sciences, in the work of identification and classification of the specimens of natural history collected on the station.

I desire to call the attention of the Department especially to the careful, painstaking, and eminently satisfactory manner in which the duty of selecting supplies for the command while on the station was performed by Lieut. D. P. Foley, R. C. S., purchasing officer of the Service at San Francisco, and to the several officers of the vessels of the Service to whom fell the duty of transportation of the supplies needed from San Francisco to St. Michael. A just idea of the splendid manner in which this duty was performed can be had when it is stated that of the thousands of articles thus handled not one was lost or injured in transit.

To Lieut. D. H. Jarvis, R. C. S., our thanks are due for the careful and satisfactory manner in which he attended to the business of paying off the command while on the station. This task was one which entailed upon that officer a considerable amount of extra work and responsibility for the safety of large amounts of money while in his possession, and it is to the credit of Lieutenant Jarvis that the duty was performed in the most satisfactory manner.

Finally, I desire to thank each of the officers of the Service who were attached to the *Nunivak* while under my command for their unwavering zeal, courage, and efficiency in the performance of the many novel duties which fell to them during the progress of the cruise. I gratefully acknowledge their untiring devotion to duty under the most trying and arduous conditions, and, while it is difficult to mention individuals without apparently detracting from the services of the whole body of officers, I desire to call the attention of the Department especially to the remarkable journey of over 1,000 miles across the country, made in the dead of winter by Assistant Engineer Lewton, R. C. S., in obedience to orders to join the *Nunivak*, which orders were sent with the expectation that the vessel would be met at St. Michael; to the remarkable series of observations of meteorological conditions, amounting to nearly 30,000 different observations, which were made under the personal direction of Lieut. Eugene Blake, R. C. S., and which entailed an enormous amount of labor and constant attention, and to the excellent pilot charts of the Yukon and Koyukuk rivers made by Lieuts. B. H. Camden, R. C. S., and Eugene Blake, R. C. S.

In addition to the above, I take this opportunity of expressing my appreciation of the manner in which Lieutenant Camden performed the duties of executive officer of the command. Throughout the entire period of our stay in the North, his attention to duty was unflagging, and his example of cheerful and implicit obedience to every order emanating from the commanding officer produced in the rest of the command a condition of contentment and patience under the most adverse circumstances, which was of incalculable assistance and which it is now a pleasure for me to acknowledge.

In conclusion, I have again to thank the Department for the honor conferred upon me in placing me in command of the *Nunivak*, and for the consideration and kindness with which all my subsequent requests and recommendations have been met.

Respectfully,

J. C. CANTWELL,

First Lieutenant, Revenue-Cutter Service.

Capt. C. F. SHOEMAKER, R. C. S.,

Chief Revenue-Cutter Service, Treasury Department,

Washington, D. C.

COPY OF ORDERS OF ASSIGNMENT TO DUTY AS COMMANDING OFFICER
OF THE U. S. S. NUNIVAK.

U. S. STEAMER BEAR,
San Francisco, Cal., April 4, 1899.

SIR: In accordance with directions contained in Department telegram of even date, signed O. L. Spaulding, you are hereby detached from this vessel and directed to report to Capt. C. L. Hooper, R. C. S., superintendent of construction and repair, Pacific coast, for duty as commanding officer of the U. S. S. *Nunivak*.

Respectfully, yours,

F. TUTTLE,
Captain, Revenue-Cutter Service, Commanding.

Lieut. J. C. CANTWELL, R. C. S.,
Present.

[Indorsement.]

Reported for duty April 5, 1902.

C. L. HOOPER,
Captain, Revenue-Cutter Service.

COPY OF DEPARTMENT ORDERS DEFINING DUTIES TO BE PERFORMED
ON THE STATION.

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
DIVISION OF REVENUE-CUTTER SERVICE,
Washington, D. C., April 24, 1899.

SIR: The duties of your command, after arrival upon the Yukon River, Alaska, are outlined as follows:

1. The primary purpose of a vessel of the Revenue-Cutter Service upon the Yukon River during the open season of navigation is to enforce the customs and navigation laws, and in addition thereto all laws falling under the purview of the Revenue-Cutter Service as set out in paragraph 98, Regulations Revenue-Cutter Service, 1894, with special reference to the following subdivisions of the paragraph cited, to wit, 1, 2, 5, 6, 8, 10, 12, and 15.

2. The cruising grounds of the *Nunivak* will be, according to circumstances, from the mouth of the river not to exceed 1,000 miles up the stream.

3. In order that the best interests of the public service may be subserved in the enforcement of the customs laws you will confer with such United States customs officers as may be found on the river. Collector Ivy, within whose district the *Nunivak* will cruise, may be found at St. Michael or vicinity, and you will extend to him such courtesies on public service as you can, he to bear his own mess expenses while on board.

4. You will extend such assistance as you can to destitute miners, seamen, and others.

5. Should you be called upon to aid the civil or military authorities in the enforcement of law, you will do so to the full extent of your power. Should you at any time become cognizant of violations of law, by evil disposed persons, you will, if possible, arrest the offenders and turn them over to the nearest civil authorities having jurisdiction. It will be your duty to let it be generally known, in a careful and judicious manner, among the people on the Yukon River and its tributaries navigated by the *Nunivak*, that your command is a part of the national armed force of the Government and must be obeyed accordingly. In view of the isolation of your command, and the practical impossibility of communication with the Department, contingencies may arise upon which you can have no instruction, and must be deferred to your judgment and discretion. In such cases you will exercise great care in forming your conclusions and in taking action.

6. You will, in course of cruising, make such examination of the main river channels and such hydrographic notes and establish such astronomical stations as will enable you to prepare a chart of your cruising on the river and its main or principal tributaries.

7. As opportunity offers, without interfering with your regular duties, the Department desires that you collect specimens and data relating to the fauna and flora of Yukon region; also that you collect reliable statistics relating to traffic and mining operations as far up the river as the vessel is to go; also data in regard to meteorological conditions; all to be embodied in a report to the Department.

8. At the close of navigation you will select a safe haven for the winter and place your command in winter quarters.

As the complement of officers and men of your command will be compelled to remain at least until the summer of 1900, they should, in what would otherwise be a season of enforced idleness, be kept busily employed, not only for the sake of health, but as well for the maintenance of harmony and good discipline; therefore you will organize a plan of operations covering an exploration of the Yukon country adjacent to your winter quarters, collecting information and data concerning features of the country, habits and customs of the native population, their condition as to morality, health, and all features of interest, the whole to be embodied in the form of a report to the Department.

And in the same connection to relieve and succor any persons in actual need, and to aid such to reach civilization and help. If it can be done with reasonable promise of success, such instruction as may be found practicable should be given to the natives. You are particularly enjoined to cultivate the most amicable and friendly relations with the native population with whom you may be thrown in contact.

In general terms the plan of operations of your command, submitted in your letter of the 8th instant, is approved, and such support and encouragement as can be will be given by the Department. Should you find that any of the enlisted force desire to return at the close of navigation rather than remain through the winter, you are authorized to discharge such; but with the distinct understanding that they bear their own expenses home, and that their pay shall cease upon date of discharge. You are further authorized to arrest and detain deserters from your crew until such time as you can replace them with other men, then to discharge them, with certificates of pay due, to be presented to the collector of customs at Port Townsend or San Francisco, to be submitted by such collector to the Department for approval.

Should officers become insubordinate, you will prefer charges against such, detach, and order them to report in person at the Department.

9. In the matter of pilotage on the Yukon, you are authorized to employ, at the lowest cost obtainable, occasional pilots. It is expected that yourself and officers will be able, by ordinary and well-known methods, to conduct the *Nunivak* over the most of her cruising ground, but you will on no account jeopardize the safety of the vessel for the lack of a pilot; in other words, you are authorized to employ a pilot when the safety of your command demands it.

10. The commanding officer of one of the vessels of the service will be instructed to turn over to you a steam launch for use of your command during the open season of navigation.

11. The person in charge of the United States reindeer station at St. Michael will be instructed to turn over to you the 12 reindeer asked for. You will arrange for the care of these animals as best you can. It is expected that you will do this with the force of your command and at the least possible expense.

12. The fur clothing to be supplied to your ship's company will be arranged for through the commanding officers of the *Bear* and *Thetis*, the same to be delivered to you at St. Michael, and, in view of the extraordinary services required of the vessel, the cost of said clothing will not be charged against the officers and men this year.

13. You are informed that Surgeon Call, of the *Bear*, will join you at St. Michael on the return of that vessel from the Arctic. Should you have another surgeon on the *Nunivak* at that time you will direct him to report to the commanding officer of the *Bear*, relieving Dr. Call.

14. Should officers of the Coast and Geodetic Survey, Fish Commission, Steamboat-Inspection Service, or other accredited Government officials apply to you for passage on the river or accommodations on board while you are in winter quarters you will extend the same to such, but with the distinct understanding that neither yourself nor the officers of your command are to be put to any personal expense by reason of their presence on board.

15. The importance of making ample provision for food supply for your command to last until at least September, 1900, or until fresh supplies can be sent you, should engage your serious consideration, and to this end you will consider the kind, quality, quantity, and cost of the food you desire, whether in canned goods or barreled. It is suggested that an ample supply of canned vegetables, sauerkraut in barrels, if obtainable, to serve as antiscorbutics, are essential.

You are directed, upon your arrival at Seattle, to immediately ascertain and wire the Department the quantities of food supply you will require, not only for yourself, officers, and crew, but for the relief of emergent cases that may arise, stating the lowest cost, first obtaining proposals, which you will forward to the Department by mail, after the authority to purchase shall have been given.

In submitting to the Department vouchers for the supplies which you may be hereafter authorized to purchase, you will see that the same bear date of July 1 next, as the articles are intended for use in the next fiscal year. You will be careful to see that all vouchers are properly prepared, certified, and forwarded prior to the departure of the *Nunivak* from Puget Sound.

Respectfully, yours,

O. L. SPAULDING,
Assistant Secretary.

Lieut. J. C. CANTWELL, R. C. S.,
Commanding U. S. S. Nunivak, San Francisco, Cal.

COPY OF ORDERS OF DETACHMENT FROM COMMAND OF U. S. S. NUNIVAK.

TREASURY DEPARTMENT, OFFICE OF THE SECRETARY,
DIVISION OF REVENUE-CUTTER SERVICE,
Washington, May 3, 1902.

SIR: Referring to letters, addressed to you under this date, relative to the sale of the *Nunivak*, or otherwise laying the vessel up at the close of the season, you will, in either case, consider yourself detached and proceed with the least delay and by the most direct route, or by the one entailing the least necessary expense, to your home in San Francisco, Cal., announcing your arrival there by wire to the Department. You will forward your extra baggage by some one of the vessels of the service; otherwise by freight. Before leaving the *Nunivak*,

if the vessel is not sold, you will arrange with the officer left in charge to have such work done during the winter months as can be done by the force on board. You will also provide yourself with a complete memorandum of the needs and requirements of the vessel if retained to put her in efficient state for service in the waters about St. Michael next summer, taking all necessary dimensions and making description for fitments of both hull and machinery. Herewith are transmitted orders for Lieutenants Camden, Blake, and Wheeler, Assistant Engineer Lewton, and Dr. White, which you will deliver to those affected when it shall be determined who is to remain in charge.

Respectfully,

O. L. SPAULDING,
Assistant Secretary.

First Lieut. J. C. CANTWELL, R. C. S.,
Commanding U. S. S. Nunivak, St. Michael, Alaska.

COPY OF ORDERS DIRECTING THAT A REPORT OF THE OPERATIONS OF THE U. S. S. NUNIVAK, ON THE YUKON RIVER STATION, BE MADE.

TREASURY DEPARTMENT, OFFICE OF THE SECRETARY,
Washington, October 2, 1901.

SIR: Referring to your telegram reporting your arrival at San Francisco, you are directed to prepare, as soon as practicable, a full report of the operations of the *Nunivak* while under your command, and transmit the same to the Department.

While in the performance of this duty you will be allowed commutation for quarters.

You will acknowledge the receipt hereof and advise the Department of your address.

Respectfully,

O. L. SPAULDING,
Acting Secretary.

Lieut. J. C. CANTWELL, R. C. S.,
Care of Appraisers' Building, San Francisco, Cal.

OFFICERS OF THE COMMAND.

First Lieut. J. C. Cantwell, R. C. S., commanding.
Second Lieut. B. H. Camden, R. C. S., executive officer
Third Lieut. W. J. Wheeler, R. C. S.
Third Lieut. Eugene Blake, jr., R. C. S.
Assistant Engineer H. N. Wood, R. C. S.
Assistant Engineer T. G. Lewton, R. C. S.
Surg. J. T. White, R. C. S.



U. S. REVENUE STEAMER NUNIVAK AT RAMPART.

REPORT
OF THE
OPERATIONS OF THE U. S. REVENUE STEAMER NUNIVAK
ON THE
YUKON RIVER STATION, ALASKA,
1899-1901

BY
First Lieut. J. C. CANTWELL, R. C. S.,
Commanding.



OFFICERS OF THE U. S. S. NUNIVAK.

Reading from the right are First Lieut. J. C. Cantwell, Second Lieut. B. H. Camden, Asst. Engineer T. G. Lewton, Third Lieut. W. J. Wheeler, Third Lieut. Eugene Blake, and Surgeon J. T. White.

PART I.

NARRATIVE.

CHAPTER I.

Prior to the discovery of the rich deposits of gold along the Klondike River, Alaska, the entire business traffic of the vast valley of the Yukon River was conducted by two competing trading companies having stations situated at convenient places on the river, and the supplies necessary for their maintenance were annually delivered by means of small steamers which ascended the Yukon from St. Michael, on the coast, at which place both companies maintained depots for the distribution of goods received from the outside in ocean-going vessels. The white population of the Yukon was composed only of the agents and traders of the companies and a few scattering prospectors who, as a rule, made their way into the country over the Chilkat or Chilkoot passes to the headwaters of the Yukon, remained during the short summer season searching for gold, and then drifted down the river to take passage on some ocean-going vessel bound for the States. A few more hardy or persistent gold hunters would remain in the country during the long winter, if they could secure employment, or their stock of supplies warranted such a step, but by far the greater number were content to enter and leave the country during the summer season.

Although gold had been discovered in Alaska previously to the Klondike discovery in 1897, notably so in the vicinity of Circle City and Fortymile River, it was not until that year that the prospects of rich diggings were sufficiently good to encourage any but the most sanguine to undertake the journey into this land of terrible cold and unknown difficulties and to endure the hardships inseparable from a life in this region in the search for the yellow metal. But the discovery of the marvelously rich deposits of gold in the gravel beds of the Klondike and its tributary streams set the world aflame with excitement. For upward of twenty years the reports of the presence of gold in this region had somewhat prepared the public for the news of George Carmack's rich strike on the Klondike; but it is probable that no one foresaw the extent of the migration of gold seekers into the territory which followed.

So great was the rush of people to the newly discovered gold fields that the trading companies found themselves utterly unable at first to move the immense amount of freight and passengers which accumulated as if by magic at every point on the river and its tributaries

accessible from the outside. The excitement was so great and the desire on the part of adventurous people to reach the new Eldorado was so intense that fabulous sums were paid for passage on the few steamers at that time available. To meet the demands of this sudden and overwhelming increase of business, the managers of the Alaska Commercial Company and the North American Trading and Transportation Company utilized the vast resources of their respective corporations with the greatest energy, and in an incredibly short time each company built and equipped a new fleet of river steamers to be operated on the Yukon River. But the two pioneer companies were not to be left in undisturbed possession of the field. New companies were formed all over the country, and the resources of the whole Pacific coast were taxed to the utmost to supply steamers for service on the Yukon. Owing to the entire lack of materials and facilities for the construction of vessels on the river or at any place on the coast near its mouth, this work had to be done in the States, and the vessels when completed were towed to St. Michael by ocean tugs. Some of the vessels were built on the island of Unalaska, one of the Aleutian group, where shipyards were hastily made, but by far the greater number were built at ports on Puget Sound, and even as far south as San Francisco new steamers were built, and old ones which had outlived their age of usefulness in other fields were pressed into service, hastily repaired, and sent to the Yukon to engage in the new traffic on the river.

It is but natural to suppose that under the circumstances attending their hasty construction or repair and the subsequent exposure to the strains and injuries incident to a sea voyage of from 3,000 to 4,000 miles many of them would reach their destination and attempt to engage in traffic on the river in very poor condition to meet the requirements of law.

These considerations and the fact that the sudden influx of people into the country might bring about a condition of disorder and misrule unless under some form of restraint at the hands of the Government, induced the Treasury Department early in the year 1897 to begin the construction of a vessel especially designed for duty as a revenue cutter and patrol boat on the Yukon River. This vessel was finished at San Francisco in 1899, was christened *Nunivak*, and on April 4 of that year I had the honor to be assigned to her as commanding officer.

DESCRIPTION OF THE NUNIVAK.

The *Nunivak* is a wooden vessel of about 450 tons. She is 209 feet long, 35 feet breadth of beam, 6 feet deep, and when loaded draws 4½ feet of water. The machinery consists of 2 tandem engines capable of developing 650 horsepower, and steam is supplied by 2 locomotive



INTERIOR VIEW OF CABIN OF U. S. S. NUNIVAK.



INTERIOR VIEW OF WARDROOM OF U. S. S. NUNIVAK.

boilers fitted to burn either wood or coal. Arrangements are made to heat the vessel either by steam or stoves, and she is lighted by electricity throughout. The maximum speed of the *Nunivak* in still water is 12 knots per hour, and her most economical or ordinary cruising speed is about 8 knots per hour. The quarters of the vessel are situated on the saloon deck and are designed to accommodate a complement of 7 commissioned officers, 4 petty officers of the first class, and a crew of 30 men. Three separate bathrooms furnish ample means for bathing, and in addition to the ordinary bathtub in the crew's quarters a lavatory with fixed bowls and running water is installed. The superstructure of the vessel, in which the quarters are arranged, is built of two thicknesses of 1½-inch, tongued and grooved redwood, with a 2-inch air space between the walls of the house. The roof is single and covered with canvas.

The armament of the vessel consisted of two 1-pounder Driggs-Schroeder rapid-fire rifles, mounted on the forward part of the hurricane deck, and the usual assortment of small arms for the equipment of the crew as an infantry division for drill or service on shore,

The greater part of the month of April was spent in taking on board the stores and equipment of the vessel to fit her for immediate duty upon arrival on her station; and as at least a year must elapse after leaving St. Michael for the scene of operations on the Yukon before additional supplies could be received, the utmost care in the selection of the articles required was observed. With the assistance of Lieut. F. M. Dunwoody, R. C. S., who, as assistant constructor of the *Nunivak*, had previously prepared a list of articles necessary for use on the new station, this material was carefully inspected and stored on board, the crew enlisted, and preparations for the long trip at sea made with all dispatch. The officers who had been assigned for duty on the vessel arrived and reported for duty, and finally, on the 1st day of May, 1899, we dropped down San Francisco Bay and came to anchor off Sausalito, at which point the U. S. S. *Rush* joined us, and the rest of the day was spent in final preparations for sea.

At 3 o'clock p. m. of May 2 we weighed anchor and, in tow of the *Rush*, stood down the harbor through the Golden Gate and started on our long journey of more than 4,000 miles by sea to St. Michael.

CHAPTER II.

It is doubtful whether in the history of all marine enterprises previous to the discovery of gold in Alaska any attempt had been made to send ordinary river steamers across an intervening ocean to their destination. The very qualities which render such a vessel suitable for river navigation—viz, lightness of construction and shallow draft—would serve to make the attempt one fraught with difficulties and dangers which can hardly be overestimated. Prior to the voyage of the *Nunivak* some 25 or 30 steamers of this class had undertaken the voyage from ports on Puget Sound, and of this number fully 50 per cent had either been lost en route or else had arrived at their destination so badly injured as to require extensive repairs to be made on them before they could be operated. It should, then, be a matter of congratulation with the Treasury Department, as it is one of just pride to the officers who took part in this expedition, that after traversing over 4,000 miles of ocean navigation, in spite of gales of wind and the unavoidable mishaps incident to such a voyage, the *Nunivak* finally reached St. Michael practically ready for immediate duty and in as good condition as when she left San Francisco. The Department has already been fully informed of the details of this voyage, but a brief résumé of the principal incidents occurring on the trip and a general itinerary of the journey may not be out of place as forming a part of this report.

On the day of our departure from Sausalito a fresh northwest wind was blowing, and as we passed out of the Golden Gate and turned into Bonita Channel an ugly cross sea was encountered, and even in this partially sheltered situation the violent straining and cracking of the *Nunivak's* lightly constructed frame warned us to prepare for what might take place should we be overtaken by any really bad weather. We reached Point Reyes some ten hours after leaving port, and rounding this headland, which had hitherto afforded us some protection from the wind, we soon found ourselves tossing and rolling in the open sea. The wind, which had been moderate at sunset, had gradually increased during the night, until at daylight it was blowing from 25 to 30 miles per hour, and the sea, while not high enough to interfere with the progress of an ocean-going vessel, caused the *Nunivak* to snap and crack in every joint and to bend from stem to stern

in a way to suggest all kinds of possibilities. Iron hog chains, which in this class of vessels are used as trusses to give support to the hull, were wrung and twisted from their fastenings, and at each impact of the sea the superstructure would sway from side to side with such violence that heavy beams were broken, molding and paneling disjointed, and the whole house appeared to be in danger of falling together, like a house of cards.

From the time of our departure all hands had been kept busy getting the vessel ready for sea. Not a moment's rest had been taken by anyone. The engine-room force, under the direction of Assistant Engineer Wood, was on duty on the lower deck to look out for the machinery and boilers; the carpenter and men detailed to assist him were kept busy making and putting into position where needed braces and extra stanchions, and the deck force, under the direction of the executive officer, Lieutenant Camden, was fully employed setting up tackles in the place of broken hog chains, renewing lashings which the violent surging of the vessel had caused to part, securing the boats, keeping the hawse clear, and a hundred similar duties. Sleep for anyone under the circumstances was out of the question, and so it was with a feeling somewhat of dismay that I received a report from Mr. Camden on the afternoon of our first day at sea that the vessel had sprung a leak. I had been hoping all day that the wind and sea would go down toward night and the crew could be given a chance to obtain some much needed rest; but with this new complication and a continuance of the head wind I felt certain that all the work which had been previously done would be but trifling when compared with that to be done later if the leak should prove to be a serious one.

An examination of the hold of the vessel disclosed the fact that the water was coming in through the seams of the bottom planking in the vicinity of the seat of the king-post. The violent motions of the vessel as she plunged in the sea simply made of the king-post an immense battering ram, and its downward thrust against the bottom planking had so loosened them that the water was pouring into the vessel by the barrel.

The steam pumps were immediately brought into requisition and for a time successfully controlled the inflow of water; but the violent motion of the ship caused the steam pipes to break, and soon it became necessary to call the already weary crew to the hand pumps. From that time until we reached the harbor of Eureka, Cal., on the third day from our departure from San Francisco, it was simply a race between the men and the sea as to which would control the vessel.

From the time of the discovery of the first leak hardly an hour passed that a new one was not reported, and by the evening of the second day at sea the oakum in the sides from the stem to a distance of 40 feet aft on each side was all loose, and in some cases entirely

spewed out of the seams, leaving openings through which the water poured in cataracts into the vessel.

Meanwhile constant reports of our condition were signaled to the commanding officer of the *Rush*, and by a judicious handling of his ship and the free use of oil to smooth the sea before it reached the *Nunivak* he did all that could be done to protect us from further injury. It was my earnest desire to get the vessel through to Seattle, where arrangements had been made to take on some additional supplies, with as little delay as possible, but on the morning of the third day at sea one leg of the towing bridle parted and a delay of three hours was necessary to repair the damage, during which time we floated in the trough of the sea. The leaks in the meanwhile were constantly increasing. At 6 o'clock p. m. the steel towing hawser was found to be stranded, but as the wind showed no signs of abatement and it was impossible for the men to hold out much longer at the pumps, I signaled the *Rush* that the leaks were gaining on us and advised the commanding officer to make for the nearest port, where temporary repairs could be made to the *Nunivak* before proceeding farther. After a brief consultation it was decided to make for Eureka, Cal. The course of the vessels was therefore changed, and we ran off before the wind and sea for that port. At this time there was about 12 inches of water in the hold of the *Nunivak*. As there were no athwartship bulkheads in the hold, this immense volume of water rolled back and forth the whole length of the vessel each time she rose and fell on the sea, threatening at each scend either to tear out the decks or by its overwhelming weight to cause the vessel to "turn turtle" or capsize. All night the weary men toiled at the pumps and were encouraged by the officers, who themselves took turns to relieve the nearly exhausted crew. In spite of their utmost endeavors, however, the water steadily gained, and it was therefore with a feeling of intense relief, at daylight next morning, that I recognized the landmarks in the vicinity of Eureka and knew that, barring any further accidents, we would shortly be in port. Just as we were about to turn in for the entrance to the harbor the towing hawser carried away on the *Rush*, and while it was being repaired the *Nunivak* again fell off into the trough of the sea. The water had now reached a depth of 21 inches in the hold, and I feared that at the very last moment, with the harbor in sight, we would be compelled to abandon her. Finally, however, the broken hawser was repaired, the *Rush* once more steamed ahead, slowly at first to test the repaired hawser, and then at full speed in over the bar. In half an hour we were safely anchored over a convenient mud flat, but so exhausted were the crews of both the *Nunivak* and *Rush* that signals of distress were set, and in answer to them the crew of the life-saving station at this place came on board and manned our pumps, and by their assistance the water was kept

down until the steam pumps could be got working again and the hold pumped out.

The Department was immediately informed by telegraph of the condition of the *Nunivak*, and orders were received to haul the vessel out at Eureka, make necessary repairs, and proceed to Seattle. This was accordingly done. Owing to the fact that there was no marine railway at Eureka large enough to accommodate the *Nunivak*, she was put on the beach at high water, and, by "working tides," the side seams were calked and covered with $2\frac{1}{4}$ -inch battens to hold the oakum in place; but it was obviously impossible to examine or repair the vessel's bottom until she could be hauled out. New hogchains were fitted, the towing apparatus overhauled and improved, and such repairs to the woodwork as could be done here were completed, and on May 19 we left port and again set our course to northward along the coast. The weather was fine and the sea smooth when we crossed Eureka Bar, and both continued so until our arrival at Seattle, on May 24.

Upon reaching this point orders were received from the Department to have the *Nunivak* docked at Quartermasters Harbor for the purpose of making necessary repairs to the bottom. We accordingly proceeded to that place in tow of the *Rush*, and were hauled out on the 29th of May. An examination of the vessel's bottom disclosed the fact that, with the exception of those planks in the immediate vicinity of the seat of the king-post, the bottom of the vessel was in good condition and the seams intact. It was therefore decided to calk the seams where the oakum had been worked out, and to sheathe the bottom of the vessel with half-inch spruce lumber in order to prevent the oakum from being forced out, and to strengthen the frame by the addition of heavy assistant keelsons placed amidships, and in such a position as to take up the downward thrust of the king-post. This work was all done in the most satisfactory manner, and on the 2d of June we returned to Seattle.

Meanwhile arrangements had been rapidly made for taking on board the additional supplies which the Department had ordered to be purchased at Seattle. The ordinary service ration not being deemed suitable in all particulars to meet the demands of the new station, a special ration was authorized, the component parts of which are given in another part of this report. While the repairs were being made on the vessel at Quartermasters Harbor, the officer having immediate supervision of the rations and supplies for the ship's equipment remained at Seattle to inspect these stores, and upon the return of the vessel everything was in readiness for delivery. Owing to an injury received on the voyage up the coast by Third Lieutenant Mead, it was found necessary at this time to send him to the hospital at Port Townsend for treatment. Much to his regret and my own, his condi-



OLD RUSSIAN BLOCKHOUSE, SITKA.

tion was found to be such that his detachment became necessary. Lieut. Eugene Blake, jr., R. C. S., who, among others, had volunteered to take Mead's place, was assigned to the duty.

Final arrangements having been completed, the *Rush* once more took us in tow, and on the 10th of June we left Seattle and sailed for Port Townsend, arriving at that place on the afternoon of the same day.

Upon our arrival at Port Townsend, Assistant Engineer Wood and the cabin steward were taken sick, and it was found necessary to send them on shore for treatment at the marine hospital. Mr. Wood's illness required a slight operation to be performed, which would confine him to his bed for a few days, but as we had decided to touch at Sitka on the way north, and the mail steamer would undoubtedly overtake us there, Assistant Engineer Maxwell, of the *Rush*, was assigned to temporary duty on the *Nunivak* to relieve Mr. Wood, and the latter officer was directed to rejoin us at Sitka if his condition was such as to warrant him in continuing with the party.

On June 13 we left Port Townsend and proceeded on our voyage via the inland passage along the coast of British Columbia and southeastern Alaska toward Sitka. Magnificent weather was experienced on the journey up the coast, and, after a delay of a couple of days at Comax to take on a supply of coal, we proceeded on our way and reached Sitka on the evening of June 22.

At several places on the way up to this point enough rough water had been encountered to prove to us that the repairs put on the vessel had greatly improved her seaworthiness. The sheathing on her bottom and sides and the addition of the heavy timbers along her keelson had so stiffened the whole hull that very little movement could now be observed in the superstructure, even when the vessel was exposed to a moderately heavy sea. This fact no doubt tended to allay any feeling of uneasiness which may have previously existed as to the chances of our being able to finish the voyage in safety, and from this time on matters of routine duty on board were attended to with the same regularity as is observed on any vessel of the Service. Assistant Engineer Wood rejoined the *Nunivak* at Sitka, and Mr. Maxwell returned to the *Rush*.

After a short stop at Sitka to obtain a supply of fresh water, we left that place on the morning of June 25 and shaped our course for the island of Kadiak. The weather again favored us, and we crossed the dangerous stretch of sea lying between Baranof Island and Kadiak, a distance of 700 miles, in five days without having experienced anything more serious than a passing rain squall during the passage. The high land of Kadiak Island was made out ahead on the evening of June 29, and next morning at daylight we entered the harbor of St. Paul and came to anchor.

Notwithstanding the smooth condition of the sea, the vessel pounded considerably during the run from Sitka to Kadiak and a slight leak made itself manifest in the forward part of the hull. At the suggestion of Mr. Wood the forward compartment of the hold was filled with coal, with the idea that this would decrease the vibration of the hull. The novel idea worked admirably and we had no further difficulty in this direction.

After renewing our supply of fresh water at St. Paul, the weather continuing to be fine, we left port on the 1st of July, and choosing the outside route around the island, in order to save time and avoid any possible delay on account of foggy weather, we stood to the westward, along the south coast of Kadiak, at a good rate of speed, with everything in excellent working condition. The Samedis, a group of rugged, treeless, and generally fog-drenched islets, lying some 90 miles west of Kadiak, were passed at 8 p. m. of July 2, and, shaping our course thence more to the northward, we entered the sheltered passages of navigable water lying between the Shumagin Islands and the mainland of the Alaskan Peninsula. In this locality fogs are of frequent occurrence during the summer season, and strong tidal currents make navigation through the narrow straits and intricate passages extremely dangerous unless one is well acquainted with the grounds. Long service in these waters, however, has familiarized most of our officers with the dangers, and although we experienced the usual amount of foggy weather our progress was not delayed, and we reached the vicinity of Unimak Pass on the evening of June 4 without any mishap.

We lay to off the pass during the night, and at 8 a. m. of the 5th of June entered Bering Sea and stood to the westward along the north coast of the Aleutian Islands.

The scenery in this portion of our Alaskan possessions is grand and awe-inspiring. Westward from Kadiak Island all signs of growing timber disappear, and the traveler is confronted with a frowning barrier of towering cliffs worn and splintered by ages of erosion, against which the whole force of the Pacific ocean is hurled in constant warfare. The long green swells of the ocean beat themselves into tatters of lace-like foam against the grim face of the ironbound coast, and at first it would seem to be a hopeless struggle on the part of the sea; but a little examination of the coast line will show where great breaches have been made in the apparently impregnable walls. Here deep caverns have been carved out of the cliffs, and there whole miles of softer material have given way before the tremendous assaults which have been made upon it and has been sucked down into the hungry maw of the ocean. Pinnacles and cathedral-like masses of more enduring rock now and then stand out a mile or more from the mainland, of which they once formed a part—grim remnants of a once solid mass of



RUSSIAN CHURCH, ST. PAUL, KADIAK ISLAND.

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**CHARACTERISTIC HEADLAND, ALEUTIAN ISLANDS, SHOWING EROSION ACTION OF THE SEA.
Masses of kelp in the foreground.**

earth which is being slowly but surely destroyed by its persistent and relentless enemy, the sea.

These outlying rocks are again attacked by shattering frosts, and flaying winds, and beating rains until at last, worn out and conquered, they sink beneath the waves. It is such sunken rocks and ledges that form the most dangerous obstacles to navigation, and in this region of sudden gales, of blinding sleet and snow, and dense fogs, where the best charts as yet made are not to be relied upon, where the Government has not yet extended its system of aids to navigation in the form of light-houses, fog signals, beacons, and buoys, and where the water is so deep right up to the shore as to make the use of the hand lead of no account, it is little wonder that this coast is approached with dread by the seaman, and that with each year's neglect the demand that Government aid shall be extended to this region should be more urgent.

Back of the abrupt shore line the land extends upward in long curves to the tops of the mountains, which trend in a general east and west direction. The treeless slopes are covered with a mantle of grasses, mosses, and flowering plants, while here and there in sheltered valleys along the course of streams, areas of dark-green foliage mark the places where thickets of dwarf willow and alder have taken root and grown. At frequent intervals the sky line is broken by the upheaved mass of extinct or active volcanoes. Eruptions from some of the latter are of periodic occurrence, presenting at such times a magnificent spectacle. The earth trembles, the sea is disturbed for a long distance, and the surface of both land and sea is covered with a fine, impalpable dust, which is so light that it will float for days upon the water and hang suspended in the air like a dense cloud until it is gradually dissipated by the wind. At the present time the most active volcano of the Aleutian group is Akutan volcano, situated on the island of Akutan, which lies to the westward of Unimak Pass. This volcano is from 3,500 to 4,000 feet high and has a well-defined crater, from which, during its periods of activity, a ruby-red column of flame is projected into the air to a height of 1,500 or 2,000 feet, when it expands into a vast mushroom-shaped cloud, from the purple depths of which a glowing shower of ashes and volcanic tufa falls slowly back to the earth. But magnificent as Akutan may be when in a state of eruption, in point of beauty it can not be compared with its near neighbor, Mount Shishaldin, which is situated on the western end of Unimak Island. This beautiful peak rises in the form of an almost perfect cone to a height of over 8,000 feet above the level of the sea. The original formation of the crater has never been marred by the breaking down of its walls, and as its upper portion is snow-covered during the entire year it presents to the eye a picture of serene beauty

and ineffable purity which lingers in the memory and preserves its charm long after the recollection of scenes of greater grandeur perhaps have faded from the mind.

Almost immediately after entering Bering Sea the fog was left behind and the view of the adjacent islands, bathed in brilliant sunshine, was grand beyond description. Westward as far as the eye could reach a succession of tremendous granite and basalt cliffs rose in almost perpendicular masses to a height of a thousand feet or more from the sea, and from their tops cascades of melted snow-water plunged downward over their rugged, frost-riven faces, and were torn into ribbons of foam by projecting rocks and finally disappeared in diaphanous veils of rainbow mist long before reaching the bottom. The character of the vegetation on the northern side of the Aleutian Islands is so different from that on the southern side as to attract immediate attention, and it can be easily explained. The Kuro Shiro, or Japanese warm current, sweeps eastward along the whole length of the Aleutian chain, and is at no place more than 30 or 40 miles distant from its shores. The influence of this warm current so tempers the climate of the southern side of the islands as to produce a luxuriant growth of vegetation here, while on their northern sides, exposed to the blighting influence of arctic winds and temperatures, none but the hardiest plants survive. Occasionally, in sheltered spots, especially so in valleys having a southern exposure, the eye is gladdened by the sight of green, meadow-like swales of grasses and low shrubbery, but generally speaking the undulant hills are covered with a thick mantle of moss and cryptogamic plants, and in every nook and cranny of the cliffs beautiful lichens paint the somber rocks with splashes of brilliant green and yellow color.

Approaching Unalaska Island from the eastward the view is picturesque in the extreme. Vast reaches of bare rock slopes rise in precipitous masses from the sea to a height of 1,500 to 2,000 feet, and the shore line is girt by a fringe of rugged bowlders over which the surf breaks and roars in never-ending fury. The shore of the island is indented by many deep bays or fiords, and at the head of one of these the old native settlement of Illiluk is situated. Early on the morning of June 6 we entered this beautiful bay, and after an hour's run came to anchor off the trading station of the North American Commercial Company at Dutch Harbor.

Ever since the acquisition of the Territory of Alaska by the United States the Alaska Commercial Company has maintained at Illiluk a post for the distribution of supplies to the numerous substations controlled by the company at various other points among the Aleutian Islands, and to gather the furs purchased from the natives for shipment to the outside world. The station is still maintained, but its



DUTCH HARBOR, UNALASKA ISLAND, COALING STATION FOR VESSELS OF THE REVENUE CUTTER SERVICE IN BERING SEA.



ARCH ROCK IN CAPTAINS HARBOR, UNALASKA ISLAND.



VIEW OF SHIPBUILDING YARD IN CAPTAINS HARBOR, UNALASKA ISLAND.



ENTRANCE TO CAPTAINS HARBOR, UNALASKA ISLAND.

importance has steadily diminished owing to the decadence of the fur trade in the islands. Many of the smaller and more remote stations have been abandoned on account of the scarcity of game, and the native hunters, with their families, have been removed by the company to more favorable localities where the struggle for existence, always hard for these people, can be carried on under better conditions. In spite of this fostering care, however, the natives are decreasing in numbers, and soon the devastating march of progress will surely crush them out of existence.

In the year 1870 the lease of the Fur Seal Islands by the Alaska Commercial Company expired by limitation, and a new corporation, entitled "The North American Commercial Company," secured the franchise from the Government. A station at Dutch Harbor, which is not over half a mile from Illiluk village, was built by the new company. Warehouses, a store, agent's dwelling, a clubhouse, and a commodious wharf with excellent facilities for coaling the largest class of vessel were erected during the first year of occupancy, and later on, when the rush of people to the gold fields of Alaska took place, a large hotel with ample accommodation for the traveling public was added to the plant.

The company has also laid pipes to a small lake near at hand and installed a system of waterworks whereby the houses at the station and ships at the wharf are supplied at all times with an abundance of fresh water. Both the Alaska Commercial Company and the North American Commercial Company keep on hand an ample supply of coal, and vessels bound into Bering Sea or the Arctic Ocean usually call in at Unalaska to renew their supply of coal and water.

The stores of both the companies are kept well supplied with the class of goods likely to be in demand in this locality, and the prices of articles are but little in excess of those asked for similar articles in the States. Live beef cattle and sheep are brought up in the spring of the year and turned out on the island to graze. A supply of fresh meat is thus assured for the summer months at least. A small herd of cattle has been for several years kept throughout the year on the island, but it is necessary to house them during some part of the winter months. Attempts have been made to raise vegetables here, but with the exception of a few radishes and a limited quantity of lettuce which arrived at maturity the experiment has not been altogether successful. This partial failure is not due, in my opinion, to the adverse climatic conditions so much as it is to the lack of proper preparation of the soil. The large amount of volcanic gravel and ash which is mixed with the soil should be first removed. But this is a tedious process, and has probably been the means of discouraging any extensive attempts at gardening. During the early spring and summer months the hills and mountain sides in the interior of Unalaska

Island are covered with a profusion of wild flowers. In the fall several varieties of edible berries are gathered and sold by the native children, and some of these berries are fully equal if not superior in flavor to the cultivated fruit.

Codfish, salmon, salmon trout, herring, and several other varieties of fish abound in the waters surrounding the island and in the hundreds of small snow-fed mountain streams. The natives each year secure large quantities of salmon and dry it for winter use; but the valuable codfish banks adjacent to the island have not as yet been utilized as a source of food supply by either the white or native inhabitants to any appreciable extent.

After renewing her supply of coal and water the *Rush* once more took the *Nunivak* in tow and with a hearty Godspeed from our friends on shore we left Dutch Harbor on the morning of July 8, and rounding Ulahta Head we stood out into Bering Sea. The day was fine and the sea smooth and soon we passed Cape Cheerful, a remarkable promontory which serves as a landmark for the navigator bound for Unalaska, and taking this as a point of departure our course was shaped northward for our port of final destination, St. Michael.

The auspicious conditions of our departure encouraged us in the hope that the pleasant weather would last long enough to enable us to cross Bering Sea, for, with the exception of the harbors in the Aleutian Islands, which we were now leaving behind us, there is no other safe anchorage for vessels like the *Nunivak* short of St. Michael, a distance of 800 miles. The good weather continued to favor us for two days, and we made fine progress until the vicinity of Nunivak Island was reached. Here a strong northeast wind and a heavy head sea was encountered. Since leaving Unalaska the sea had been as smooth as a mill pond; but under the influence of the northeast wind it soon rose and we found ourselves pitching and plunging in a way to cause the *Nunivak* to creak and groan in every timber. The short violent sea had no apparent effect on the *Rush* other than to cause her to roll a trifle more than usual, and her speed was undiminished. Finding that our progress through the rough water was too rapid, signals were made to the *Rush* to slow down. The request was immediately granted and the strain to which we had been subjected was at once relieved. During the day it became necessary to again resort to the use of oil to calm the sea and prevent it from breaking over the *Nunivak*, but toward night the wind decreased in force and the sea subsided so much that full speed was once more ordered and we proceeded on our way.

At 8 a. m. of July 12 land was made out a long distance away on the starboard bow. By noon we recognized it as Cape Romanzov, a bold headland near the coast, which is the western termination of a short range of mountains forming the southern limit of the flood



SPRUCE "FOREST," DUTCH HARBOR, PLANTED BY THE RUSSIANS AT THE TIME OF THEIR FIRST OCCUPATION OF THE TERRITORY.

These trees are the only ones growing on the Aleutian Islands.



ST. MICHAEL, LOOKING SOUTH TOWARD THE SITE OF THE NORTHERN COMMERCIAL COMPANY'S PLANT.

plain of the Yukon River delta. The Sand Islands, lying 5 miles north-eastward from Cape Romanzov, were raised about 2 p. m., and our course was altered slightly to the westward so as to clear the dangerous shoals known as the Yukon Flats. Toward night we lost sight of the land again, but our position off the mouth of the mighty Yukon could be easily determined by the muddy, discolored water through which we were now steaming. Occasionally we passed pieces of driftwood floating off to sea from the river, and this showed us that we were nearing our journey's end. The day had been an exceptionally fine one throughout, and our progress northward proportionately good. The short summer night fell gently around us, the stars came out and hung like myriads of brilliant lamps in a sky that was free from clouds, and every sign betokened a continuance of good weather. But toward morning the wind freshened from the southeast, and by 8 a. m. of July 13 a dense fog settled down, and so completely enveloped us that the *Rush* was almost invisible. It was only as she rose and fell on the sea that we now and then caught a glimpse of her wet and streaming decks, or a flash of phosphorescent foam from her churning wheel gleamed fitfully like a monster firefly from out of the murky waste of waters. All the forenoon we forged slowly ahead, with the fog whistles of both vessels sounding a dismal b-l-a-a-t of warning at intervals and with frequent stops to cast the lead and ascertain the depth of water. Finally at noon we ran out of the yellowish, roily water which discolors the sea off the Yukon Flats, and the sea took on a light olivaceous-green color, and although nothing could be seen of land we knew it was not far away. The *Rush* slowed down until our progress through the water was scarcely perceptible. The fog whistles were sounded frequently and the hand lead was now going constantly. Every eye was strained to pierce the veil of mist which hung over the sea, when suddenly as if raised by some invisible hand, the dense curtain of fog was lifted, and we saw before us at a distance of not over 2 miles a long line of white surf fringing a rock-strewn beach, and back of that, as the fog lifted, the undulant tundra plains, treeless, desolate, and drenched with flying clouds of mist, which we recognized as a portion of the coast between Tapkok Head and Golofnin Bay. The gulches were still filled with snow, and along the beach were strewn masses of sea ice which the summer sun had as yet failed to melt. We steamed along the land to the eastward until Rocky Cape was reached and taking our departure from this well-known landmark, although the fog still continued, we shaped our course with confidence across Norton Sound for St. Michael.

The southeast wind increased during the afternoon, and the sea rose rapidly as it always does in this vicinity, but our course to the eastward soon brought us into the comparatively sheltered waters of

Norton Bay, and our progress from this time until reaching port was unhindered.

At midnight of July 14 we entered the harbor of St. Michael and came to anchor. In more ways than one the voyage of over 4,000 miles had been a remarkable one. With the exception of the bad weather encountered during the first three days after our departure from San Francisco, and one day of storm off Nunivak Island, the conditions of the sea and wind during the entire trip could hardly have been improved. No injury had been sustained that could not be easily repaired on board by the ship's force, and it now only remained for us to assemble the machinery and take on board our supply of fuel to be ready for immediate duty.

CHAPTER III.

A week after our arrival at St. Michael the U. S. S. *Corwin* came into port with a barge in tow which was intended to be used as a coal tender by the *Nunivak*. The *Corwin* had experienced bad weather on the way up from Port Townsend, and upon reaching port the barge was so badly injured that a board of officers, convened for the purpose of ascertaining the extent of the injuries which had been received, reported that it would not be possible to use the barge for the transportation of coal until extensive repairs were made. This would necessitate hauling out the barge on the beach. Upon receipt of this report I asked for bids to do the work from the agents of the local trading companies. The lowest bid I received was so much in excess of the amount which I deemed fair and reasonable for the performance of the work required that I deemed it my duty to reject all of the proposals, and, pending further orders from the Department, to make other arrangements for supplying the *Nunivak* with fuel.

Meanwhile the necessary work of getting the *Nunivak* ready for service was rapidly progressing. The machinery was assembled, the wheel put together, and the supplies for the use of the command, which had been brought up on the United States steamers *Bear* and *McCulloch*, were received and stowed on board. As much coal as we could carry on the *Nunivak*, in addition to the other supplies, was received on board, and about 80 tons were placed on a barge which was very kindly loaned to us, free of all expense, by the manager of the Alaska Exploration Company. After delivering us the supplies which had been brought up from Seattle on the *Bear*, Lieut. D. H. Jarvis, commanding that vessel, left St. Michael and proceeded to the coast of Siberia, where a quantity of fur clothing, deerskins, native boots, and other necessary articles for the use of the crew of the *Nunivak* during the winter was purchased. The *Bear* returned from her cruise and delivered us the articles which had been purchased, and as our arrangements were now fully completed we left St. Michael on the 9th of August for our field of duty on the Yukon River.

On account of the entire lack of charts of the Yukon and the fact that none of the officers of the command had ever been over the river, it became necessary to employ a pilot to take the vessel over the ground

on the first trip. For this purpose the services of Capt. George W. Beers were secured, and he remained with us until we completed the journey over the station.

At the time of our departure from St. Michael the *Nunivak* was loaded almost to the guards and was drawing 5 feet of water. The tides were running rather low and we experienced some difficulty in crossing the flats. The vessel had not been constructed with a view of towing barges either alongside or ahead, and we were compelled to get along as best we could with the loaded barge towing astern. Crossing the bar of the Aphoon entrance to the Yukon with some difficulty, owing to the lack of water and the crooked channel, we observed the North American Transportation and Trading Company's steamer *Cudahy* aground on a sand bar, and we stopped to render what assistance we could to get her off. A line was run from the *Nunivak* to the stern of the *Cudahy*, and an attempt was made to pull her into deeper water. The tide was falling, however, and after one unsuccessful attempt had been made to start the vessel, her master requested us to desist as he feared we would injure the *Cudahy* by pulling on her any longer. He stated that he would be able to float his vessel without assistance when the tide turned, so we proceeded on our way.

The delay occasioned by handling the barge and in the attempt to assist the *Cudahy* caused us to be too late in entering the river to take advantage of the high tide, so that in working the vessel through the narrow and intricate channels of the Aphoon we frequently got aground, or else the barge towing astern would take a sheer and either run aground on a sand bar or crash into the low bushes which fringed the river bank, in either case involving a tedious delay to get straightened out again. In attempting to make the crossing at Kotlik, 7 miles upstream from the mouth of the Aphoon, the barge took a sudden sheer and ran hard aground on a mud flat. The strain on the towline caused the *Nunivak* to swerve from her course in the narrowest part of the channel, and she also got aground. Finding it impossible to back off, the big "jumping spars" were brought into play, and our first attempt to get the vessel into deep water by this means was tried. Meanwhile the tide was rapidly falling, and when we finally got the spars over the side it was too late to do any good and the work was abandoned until next high water.

The mosquitoes swarmed out of the low brush-covered banks and for a time made life miserable for all on board; but toward night a brisk wind sprang up and cleared the vessel of the pests and gave all hands an opportunity of getting some much-needed rest.

At midnight the tide came in sufficiently to float the barge, and after towing it upstream a short distance with the steam launch we soon "sparred" the *Nunivak* into the channel, and after picking up the barge we once more proceeded on our way.

Immediately on entering the river work was commenced on a chart which would show when completed the depth of water in the channel, courses and distances between points, character of the shores, obstructions to navigation, the position of prominent landmarks, and in general all the data which would be of assistance in the navigation of the stream. The steam launch was kept out ahead traversing the channel and locating shoal places, and soundings of the depth of water in the channel were taken on board the *Nunivak* every 200 yards. Our progress was necessarily very slow, as it was my intention to make as complete a chart of the river as practicable under the circumstances, so that it was not until 4 p. m. that we left the Aphoon and entered the Kwikpak branch of the Yukon. Here the river is nearly a mile wide, and for a distance of 10 or 12 miles upstream there is no well-defined channel. A short distance above the junction of the Aphoon with the Kwikpak, we ran aground on one of the numerous sand bars which obstruct the river, and before we could get the spars ready for use the tide fell and made it impossible to get the vessel afloat. The rest of the day was spent in locating the best channel through the shoals, and the next morning at daylight the tide rose high enough to enable us to get afloat again, and we backed downstream about a mile, where a channel, previously located by the steam launch, was entered, and without much further difficulty we got over this bad portion of the river and proceeded on our way.

At New Fort Hamilton we stopped to make an examination of the rudders, as they were working very badly, and it was found that the iron stock of the port center rudder was twisted and cracked so badly as to interfere with the free movement of the other rudders. Such repairs as could be made at the time were finished and we again went on our way. At 2 p. m. of August 14 the Big Bend of the Yukon was rounded and we emerged into the main stream, where high banks took the place of the low shores of the delta and a deep, unobstructed channel enabled us to proceed at a rate of speed and freedom from care which, until this time, had been impossible. For the first time since entering the river an opportunity was now afforded to straighten up the decks, which were littered with a mass of tangled cordage, hawsers, and the gear used in "sparring off" and in laying out anchors in our efforts to get the vessel afloat. When this work was finished, all hands except those on duty in the engineer's department and the seamen casting the lead were excused from duty to enable them to get some rest. We reached Andreafski at 6 p. m. of the 14th, and stopped here to repair our injured rudder. A machine shop is maintained at this place by the Alaska Commercial Company for the repair of any of their vessels which may be injured on the river, and I anticipated having no difficulty in getting the repairs we needed done here. But upon inquiry I was informed by Mr. Fredericks, the agent of the

company, that there were no machinists or blacksmiths at Andreafski at this time, and while he would allow us the use of the plant we would have to do all the work with our own men.

The injured rudderstock was therefore unshipped, and under the supervision of Assistant Engineer Wood an attempt to repair the damage was made by our firemen. The blacksmith shop forge proved to be too small, however, and after working two days without success to make a weld, the attempt was abandoned. I decided to disconnect the injured rudder entirely and depend upon the three remaining ones to control the vessel. This plan was accordingly adopted and upon subsequent trial it proved to be successful.

During our stay at Andreafski, all of the coal was transferred from the barge to the *Nunivak*, and as we had no further use for the former, it was left here to be called for by one of the Alaska Exploration Company's steamers on the way down the river. The boilers were washed out and refilled and a fresh supply of drinking water laid in at Andreafski, as the water of the Yukon during the summer season is too muddy for use.

At daylight of August 19 we left Andreafski and stood on our way up the Yukon. Our progress now was much better, as we were unhampered by the barge. With the exception of a shoal "crossing" now and then encountered there was plenty of water in the channel, which was wide and singularly free from any obstructions to navigation. Several of the steamers engaged in traffic on the river were met on their way to St. Michael, and boarded and examined according to law. In almost every case the vessels were found to be, in some particular, lacking in some of the requirements of law. All these deficiencies were duly noted and the delinquents reported to the collector of customs at St. Michael. It is but just to state that in most of the cases the failure to comply strictly to the law was the result of ignorance more than neglect on the part of the owners of the vessels, and prompt measures were taken by them to observe all the requirements of law when their attention was called to any omissions.

Our progress upstream from this point was marked by no unusual incident. We generally got under way in the morning at daylight and ran until darkness made it impossible to collect the data necessary for our chart, and then we would make fast to some convenient tree on the shore for the night. One or two attempts were made to anchor the vessel at night, but the holding ground proved to be treacherous and unreliable; so we soon adopted the general custom of the river steamboat men, which is to "go to the bank" whenever it becomes necessary to stop for any length of time.

After leaving Andreafski the current in the river gradually increases until it attains an estimated force of $3\frac{1}{2}$ miles per hour, and this amount does not vary much until after Anvik is passed. The main



ESKIMO DWELLING, RUSSIAN MISSION.

channel follows closely the west or right bank of the river, and now the treeless tundra plains of the delta give place to rolling hills, sparsely covered with poplar and birch trees, with here and there a few scattering spruce, the advance guard of the great forests of the interior. The islands no longer appear as bare shoals or low grass-covered plains, but are higher and sustain a growth of timber which gradually increases in size as we go up the river. In a general way it may be said that the timber of the Yukon Valley is distributed as follows: First the low brush of the delta, then the willow thickets and poplar or cottonwood of the lower river, and lastly the birch, spruce, and pine forests of the interior. Two days after leaving Andreafski we arrived at Russian Mission, where we stopped to call on the church authorities and visit the settlement. Father Korchinski, who was in charge of the mission, gave us a warm welcome, and seemed pleased to show us through the native village, which is one of the oldest on the river. The Greek church at this place, which is one of the finest churches in Alaska, was also visited under the guidance of our host, and after all the sights had been seen the officers of the ship accepted an invitation to take a cup of tea at the house of Mr. Belkoff, the agent of the Alaska Commercial Company at this place. The refreshments consisted of tea and sweet crackers. The tea was prepared by boiling water in a huge brass samovar, after the true Russian style, and served in glass tumblers instead of cups. It is a peculiar fact that this method of preparing tea has survived where nearly all other customs have succumbed to the changes wrought in the manner of living since the transfer of the territory from Russia to the United States.

I took occasion to explain to Father Korchinski, and requested him to inform his parishioners, that the duties of the *Nunivak* were not only to see that trade and commerce were conducted according to law on the river, but we were authorized to preserve order and arrest offenders against the law in any particular. It was also our duty to render what assistance we could to persons in distress, and it would always be our pleasure to do this or anything else possible which would tend to promote good order and happiness in the community. This information was afterwards given to those in authority at all of the settlements visited by the *Nunivak* on the river, and the opinion universally expressed was one of satisfaction that the Government should have placed such a means of help and protection as the *Nunivak* afforded within the reach of these isolated people.

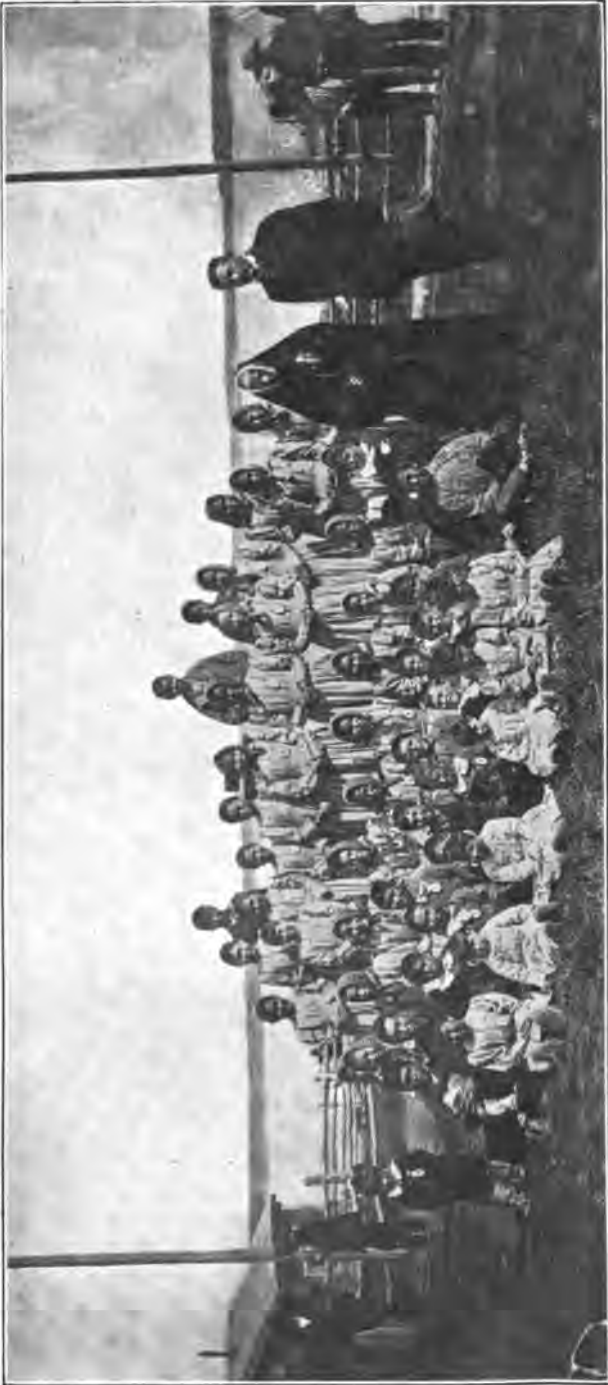
The morning of August 21 found us once more on our way up the river. The character of the stream varied but little from that observed the previous day. The channel still held persistently to the right bank, the islands became less numerous and much longer, and the mountains crowded in closer to the river, exposing to view cliffs of conglomerate and trachyte rock, much folded and contorted by the

plutonic forces which lifted the land, at some distant time in the past, to its present level. The highest peaks of the mountain range which lie to the westward of the river in this locality are probably not over 2,000 feet in elevation. Away off to the southeast a solitary snow-covered peak, Mount Kusiloff, dominates the otherwise low and uninteresting landscape, while farther to the eastward the faint outlines of a high range of rugged mountains, scarcely distinguishable against the background of pale-blue sky, mark the vicinity of the headwaters of the Kuskokwim River.

During the afternoon we arrived at Koserefski, at which place is situated the Roman Catholic Mission of the Holy Cross. We were met at the landing and given welcome by the Rev. Father R. J. Crimont, in charge of the mission, and spent a most enjoyable afternoon visiting the school, where some 25 native children, cleanly dressed, intelligent looking, and apparently happy, were at work under the supervision and instruction of three Sisters of the Canadian Order of St. Anne. Besides maintaining an excellent school for the instruction of the native children the little community of missionaries have cleared about 6 acres of ground and planted it to garden vegetables, which, under the fostering care of the "head gardener," Sister Mary Joseph, has flourished amazingly, and each year produces an abundant crop of cabbages, turnips, radishes, lettuce, beets, and other hardy vegetables, which for quality will compare most favorably with those grown in any part of the world. The sight of an old-fashioned garden, filled with the sweet bloom of mignonette, pansies, daisies, sweet pea, marigold, and other homely flowers, was a glad surprise for eyes which had grown tired of somber forests and desolate tundra plains. When we returned to the ship it was with arms full of redolent flowers, and a cart load of fresh vegetables, enough and to spare for everyone on board.

At daylight of August 22 we left Koserefski and continued our journey up the river. A short stop was made at Anvik, where the acquaintance of Rev. J. W. Chapman, in charge of the Episcopalian mission at this place, was made; but a steamer had been sighted coming down the river when we turned into the Anvik, and I did not want to miss having her boarded. Our stay at Anvik was cut short, and we had no opportunity of visiting the native school at this place at this time. The steamer proved to be the *Seattle No. 1*, from Dawson for St. Michael. We learned from her master that the steamers *Hannah* and *Robert Kerr* were expected to sail from Dawson a few days after the departure of the *Seattle*, and might be looked for at any time now. In anticipation of their arrival our mail was made ready for delivery to one of these steamers for transportation to the outside.

On the 23d we reached Kaltag Village, at which point the winter trail from the Yukon to St. Michael leaves the river to cross the portage. Here a stop was made long enough to get a fresh supply of water from the Kaltag River, which is a very clear little stream flowing



NATIVE SCHOOL CHILDREN AT HOLY CROSS MISSION, YUKON RIVER.



NULATO, YUKON RIVER, FROM A POINT ABOVE THE VILLAGE, LOOKING DOWN THE RIVER.

into the Yukon from the northwest. The Indians were busy catching and drying salmon and the beach was covered with racks filled with the fish.

On the 24th the steamers *Hannah* and *Robert Kerr* were met and boarded a short distance below Nulato. Dr. Bishop, a member of the Biological Survey, was a passenger on the *Hannah* and paid me a call. The doctor informed me that he had been busy all summer gathering specimens on the upper waters of the Yukon but had had the misfortune to lose them all by the upsetting of a small boat. I delivered a trunk and box of supplies, which had been brought up from Seattle on the *Nunivak* for Mr. Osgood, who was a member of the party, to Dr. Bishop, and after putting our mail on board the *Hannah* we proceeded on our way. Nulato was reached at 3 p. m., and we stopped for a short time to call on the Rev. Father Aloys A. Ragaru, who has charge of the Roman Catholic Mission of St. Peter Clavers at this place. There are about 350 natives over whom he has spiritual charge, but at the time of our visit most of the Indians were absent fishing.

Nulato is one of the oldest settlements and trading posts on the river, and is still the favorite trading place of the Koyukuk River Indians, who have annually brought their furs here to trade for supplies ever since the occupation of the territory by the Russians. The post was twice destroyed by hostile natives, and the white settlers killed to a man. It is still the rendezvous of natives who have been brought very little in touch with the white population; but the work of Father Ragaru has done much to enlighten them, and at the present day but little fear is felt of an uprising such as took place among the natives when the Russians were in charge.

Just above Nulato, on the right bank of the Yukon, a remarkable series of brown sandstone bluffs of the Marine Miocene period are seen, and it is a peculiar fact that no similar formation has been discovered at any other point on the river. The bluffs are rich in marine and vegetable fossils of the Miocene period, and would no doubt furnish a very interesting field for geological exploration.

Twenty miles above Nulato a coal vein in the right bank of the river has been recently opened up. We stopped to examine the mine and found that a considerable quantity of coal had been extracted, and we were informed by Mr. Pickert, the manager of the company, that it was being used with good results by several steamers on the river. The coal appears to be a form of lignite rather than a true bituminous coal, and is in this respect similar to the coal found in other parts of the Territory.

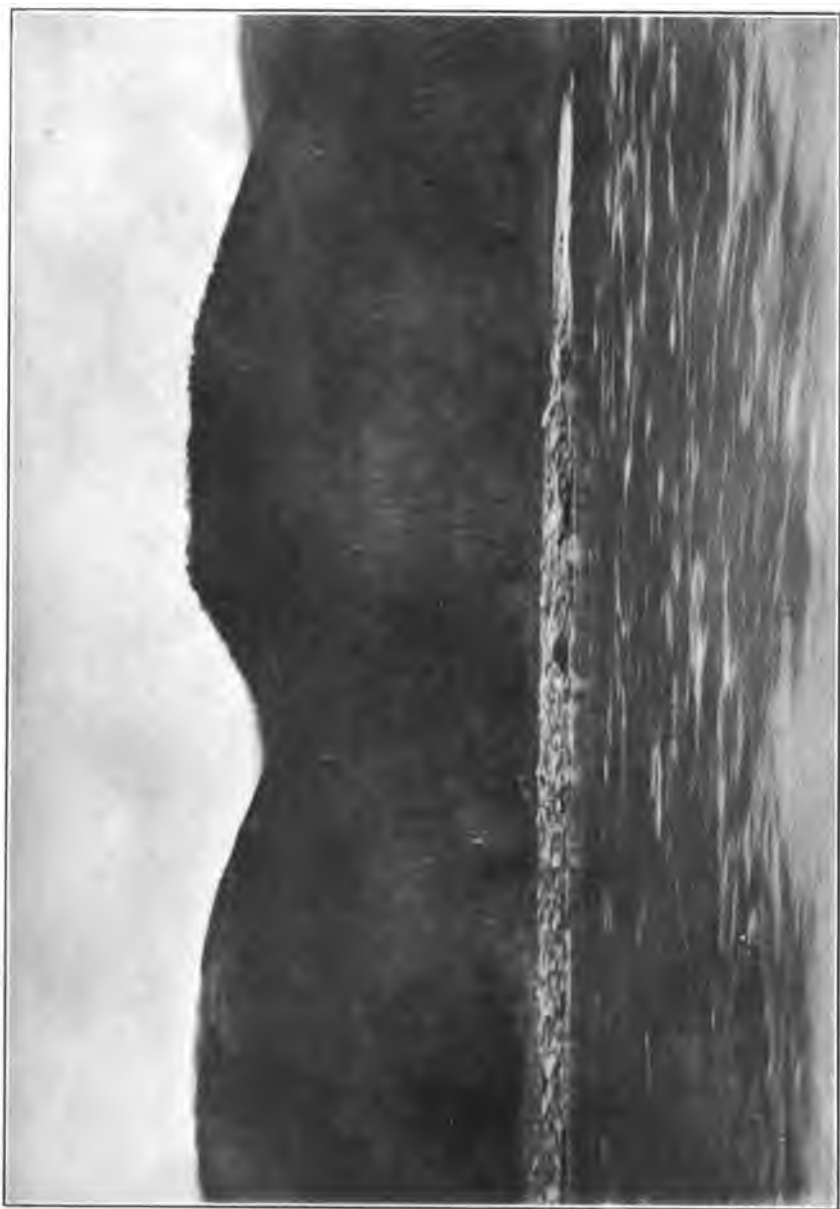
At 6 p. m. the mouth of the Koyukuk River was passed, and at dark we stopped alongside the bank at a wood chopper's camp and made fast for the night.

August 25 was fair and clear, and the portion of the river in which we now found ourselves was densely wooded on both shores. With the high temperature, luxuriant foliage, and blooming wild flowers on every side it was hard to realize the fact that we were journeying up a stream which touches the arctic circle in its course and whose entire length for eight months of the year is held hard and fast in the cold embrace of relentless winter.

On August 25 we reached the junction of the Tozikakit River with the Yukon and stopped long enough to examine the locality as a place for laying the vessel up for the winter. During the winter of 1898 several vessels had wintered here, and log cabins for the accommodation of their crews had been built on shore. These cabins were still standing, but were in a dilapidated condition and almost buried under a rank growth of grass and moss. The entrance to the Tozikakit was obstructed by a bar over which it would be impossible for the *Nunivak* to pass except during periods of exceptionally high water in the Yukon. Although our examination was very hurriedly made, enough was seen to prove to me that this is not a suitable place in which to winter a vessel of the *Nunivak's* size. Nine miles above the mouth of the Tozikakit are situated the important trading stations maintained by the North American Transportation and Trading Company and the Alaska Commercial Company for traffic with the Tanana Indians. The army post of Fort Gibbon is also located here. We stopped at the latter place and exchanged the customary calls of courtesy with the commandant of the post. After these formalities had been observed social calls were in order, and the acquaintance of the officers of the garrison was made. At the invitation of Maj. C. A. Booth, U. S. Army, commandant of the post, we remained at Fort Gibbon for a day, and the visit was thoroughly enjoyed by everyone.

While at Fort Gibbon I had the pleasure of forming the acquaintance of Rev. Mr. Prevost and Mr. Selden, who were connected with the Episcopalian mission of St. James, which is situated about 3 miles above the post, opposite the mouth of the Tanana River. I received much interesting information from these gentlemen in relation to the Tanana Indians, who come within the observation of the mission, and I was much impressed with the evident enthusiasm and devotion to duty manifested by them in their missionary work.

The season was now growing late, as shown by the rapid decrease of the hours of daylight, the coolness of the nights, and, more noticeable than any other feature, the sudden appearance of splashes of vivid scarlet and yellow autumnal foliage on the birch-covered hillsides. So with mutual expressions of regret that our visit to the post must be so soon terminated, we bade good-bye to our army friends at Fort Gibbon on August 29 and resumed our journey upstream.



ROCK ISLAND, AT LOWER ENTRANCE TO THE RAMPARTS, YUKON RIVER.

After passing the junction of the Yukon and the Tanana rivers, 4 miles above Fort Gibbon, the former stream narrows to less than a mile in width. The depth of water and the force of the current rapidly increase as we near the Rampart Rapids, which begin at a point about 40 miles above Tanana. Both banks of the river here are composed of towering cliffs of granite and conglomerate rock, through which veins of quartz are seen. The formation is much broken up and disjointed, and in some places the strata have been upheaved into almost perpendicular positions. At the lower end of the rapids a high bar, composed apparently of rounded granitic boulders, lies in midstream and is a dangerous obstruction to navigation. The channel at this point is less than 100 yards wide and the current rushes through at the rate of from 8 to 9 miles per hour. Along the boulder-strewn shores the river tore itself into ribbons of lace-like foam and the channel was filled with violent swirls and breakers, indicating that even in midstream dangerous rocks probably exist.

Before entering the rapids a careful examination of the engine was made to see that everything was in good working order, and when Mr. Wood reported that we were all ready the *Nunivak*, with a high pressure of steam on, was headed through the narrow passage. We had heard so much about this bit of swift water from the local steamboat men that considerable trouble in getting through it was anticipated. We were therefore very agreeably surprised to find that the *Nunivak* overcame the force of the current with hardly any perceptible difficulty, and in half an hour we had passed through the worst part of the rapids and reached the calmer reaches of the river above.

After passing through the lower gorge of the ramparts the river again expands to an average width of a mile between its shores and the mountains on both sides recede to a distance of 10 or 12 miles. The valley thus formed is comparatively level and is drained by numerous small streams.

At 4 p. m. we reached Rampart City, which is situated on the left bank of the Yukon, 75 miles above Fort Gibbon. This is the largest white settlement on the Yukon in American territory, and for several years has been the center of extensive mining operations on Minook Creek and other less well-known streams in the immediate vicinity. Here an opportunity for cleaning the boilers and overhauling the machinery was given the engineer's department, and we remained for five days. Pleasant visits were exchanged and the acquaintance formed of Lieutenant Tillman, U. S. Army, in charge of a small detachment of soldiers stationed at Rampart; Judge Knapp, the United States commissioner of the circuit court; Colonel Wiggin, the United States land commissioner, and the agents of the several trading companies doing business at this place.

While lying at Rampart all vessels bound either up or down the

river were boarded and examined. The steamer *Sovereign* was found to be engaged in traffic without having the necessary legal papers on board, and she was seized and sent to St. Michael in charge of a custodian appointed for the purpose and turned over to the custody of the collector of customs at that place. A full report of this seizure has already been made to the Department. A small stream entering the Yukon opposite Rampart was examined to ascertain whether it would afford the *Numivak* suitable winter quarters, but, as in the case of the Tozikakit River, it was found that a high bar obstructed the entrance, which made its selection for the purpose impracticable. Information from several sources had been received in regard to the suitability of Dall River as a place for winter quarters for all classes of river steamers, and after completing the repairs to our machinery we left Rampart on the morning of September 4, bound for Dall River for the purpose of looking over the ground. The distance to that place from Rampart is 85 miles, and we reached and entered the river without difficulty the afternoon of the same day. After spending a day in sounding out the stream for a distance of 2 miles from its mouth, and finding it free from any obstructions and in every other way the most suitable place we had yet seen on the Yukon in which to lay a vessel up, I decided to select this as our winter quarters.

The limits of the cruising ground assigned to the *Numivak* by the Department having been now reached, I did not deem the services of a pilot as any longer necessary. We therefore returned to Rampart, where Mr. Beers could secure passage back to St. Michael, and he left the ship.

We remained at Rampart, boarding all passing vessels and performing the other duties incident to the Service, until September 18, when, bidding good-bye to our many kind friends, we left for our proposed winter home in Dall River.

The weather was growing steadily colder, and while the days were as yet fine and clear ice formed on deck every night, and the tops of the mountains were white with newly fallen snow. Overhead long columns of geese were now daily seen headed southward, while flocks of sand-hill cranes were constantly rising from their feeding grounds, with raucous cries, to join the feathered company on its annual migration to some more genial winter home. The woods along the river banks, which for weeks had been musical with the trilling notes of innumerable song birds, seemed to have been suddenly deserted by every living thing except an occasional vagrant raven winging his idle flight among the bare branches of the poplar trees, or else, perched on the topmost branch of some swaying spruce, croaking in undisturbed enjoyment of solitary possession.

The question of fuel for winter use was now the most important one for solution. We had started from St. Michael with 225 tons of



PIONEER COAL MINE, 35 MILES ABOVE RAMPART ON THE YUKON RIVER.



FORT HAMLIN TRADING POST ON THE YUKON RIVER, 1,072 MILES FROM THE COAST.

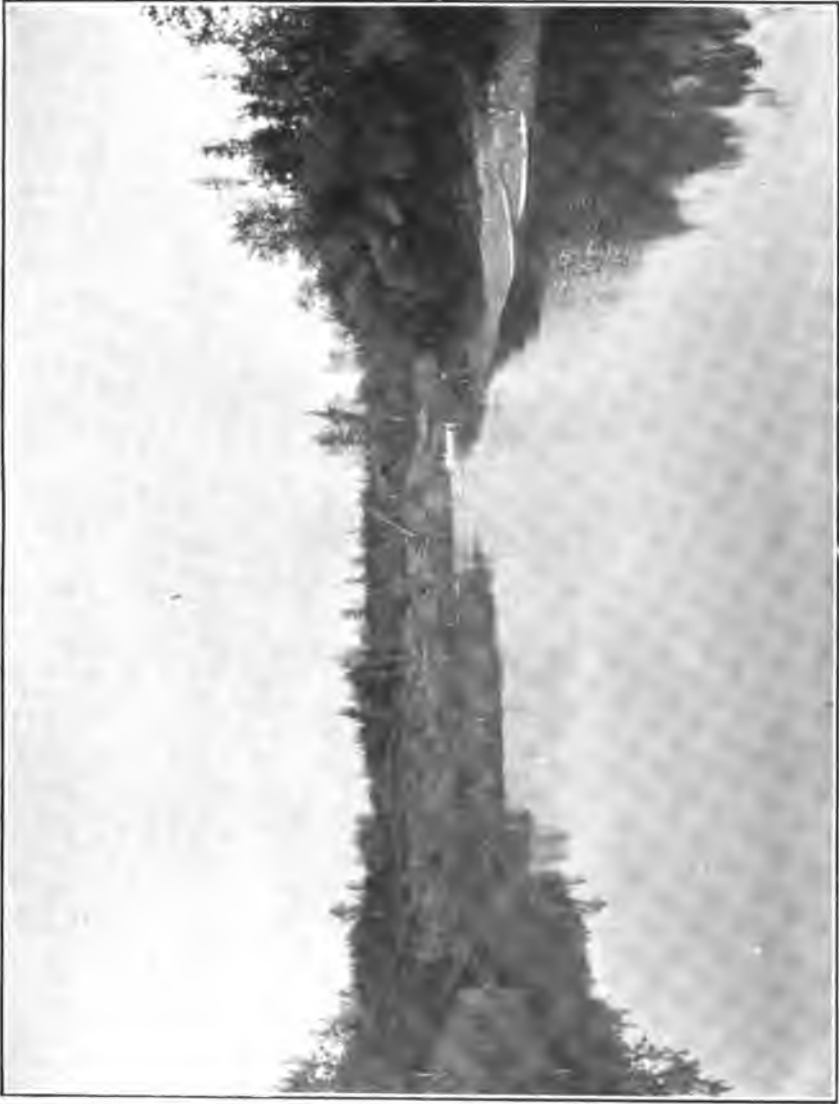
coal on hand, and the greater portion of this amount had been consumed in coming up the river, so that the approach of winter found us with barely sufficient coal for use in the galley during the eight or nine months which must elapse before we could receive a fresh supply from the outside. It would therefore be necessary to obtain an additional quantity of fuel for heating the vessel while we were in winter quarters. On our first trip to Dall River we passed the Pioneer coal mine, owned and operated by Mr. Thomas Drew, 25 miles above Rampart, and had taken on board a small quantity of the coal to test it for use in the furnaces of the *Nunivak*. After giving the coal a trial Mr. Wood reported that it would probably serve our purpose, and arrangements were therefore made with Mr. Drew to take on board a supply from his mine before finally leaving the river at the end of the season. The time left him for getting out the coal was, however, very limited, and when we reached the mine on the 18th of September we found that we could only obtain 42 tons. This would not be sufficient, but as it was the best that could be done under the circumstances this amount was taken on board, and on the 21st of the month, in the midst of a howling gale and thick snowstorm, we left for up the river. In spite of the bad weather, we made the run as far as Fort Hamlin, a distance of 50 miles, without mishap of any kind, and stopped there for the night. The steamer *Hamilton*, bound down the river, was boarded during the night, and I was informed by her master that no other steamer would probably leave Dawson this season, as navigation on the upper river, owing to very low water, was practically ended.

We left Fort Hamlin at daylight next morning and reached Dall River at 8 a. m. The water in the river was much lower than at the time of our first visit, but still high enough to enable the *Nunivak* to enter without difficulty. The day was spent in making a careful examination of the stream to find the best location for laying up the vessel, and finally a place about a mile from the mouth of the Dall was selected, and the *Nunivak* was hauled up to it and secured in such a way that she would rest on an even keel when the ice should form around her.

In spite of the fact that no previous attempt had ever been made to spend the winter on board a vessel by other parties wintering in this region, we decided that it could be done much more comfortably than to shift our quarters into log houses on shore, as is the usual custom. In order, however, to have a place of shelter in case of any accident which would compel us to leave the vessel during the winter, all the superfluous stores were taken out of the *Nunivak* and stowed in a commodious log house which we found already built near the vessel, and which was afterwards repaired so that it would furnish the whole command ample room for occupancy if any event should make it

necessary. In addition to the supplies of food and fuel which were placed in this house, all the paints, oils, and other inflammable material on board the *Nunivak* were transferred to the shore so as to guard as far as possible against accident by fire. These preparations occupied the command a week or ten days, and at the end of that time a system of winter routine was established, and all hands settled down to business with a realization that it would be at least eight months before we could move from our present position.

The name selected for our winter quarters was Fort Shoemaker, in honor of Capt. Charles F. Shoemaker, R. C. S., who, as chief of the Revenue-Cutter Service, had been indefatigable in his efforts to extend the operations of the Service to this region, and to whom I was personally indebted for many acts of consideration in the preparatory work of fitting out the vessel and the command for duty on the new station.



ENTRANCE TO DALL RIVER, 89 MILES ABOVE RAMPART CITY.



FORT SHOEMAKER, DALL RIVER, THE WINTER QUARTERS OF THE NUNIVAK.

CHAPTER IV.

Three days after our arrival at Fort Shoemaker the ice formed in the Dall and for a time it looked as if communication with the Yukon, which was still open, would be cut off. We had been led to hope that some other vessel might select the Dall as a place for winter quarters, and the early freezing over of that stream was on that account not very comforting. But much to our satisfaction the river opened again, and on the 3rd of October the steamer *Leah*, owned by the Alaska Commercial Company, and in command of Captain Dixon, arrived and took up quarters half a mile below Fort Shoemaker for the winter. The arrival of the *Leah* assured us that we would not be entirely isolated during the long winter and her quota of 25 officers and crew were hailed as a welcome addition to our little community.

About this time one of the difficulties, which seem to be inseparable from the command of enlisted men in isolated situations, arose and for a short while gave me considerable uneasiness. The crew of the *Nunivak* was composed partly of volunteers transferred from other vessels in the Service and partly of men who had enlisted for the regular term of three years required by our regulations. With few exceptions the conduct of the men had hitherto been all that could be desired. But now that winter was nearly on us and it became evident that our short supply of fuel would have to be augmented by cutting wood for the use of the vessel during the winter a spirit of unrest and dissatisfaction manifested itself in numerous ways. Trivial complaints and petty grievances were of frequent occurrence, and finally when the work of laying up the vessel for the winter was finished and the men were ordered to begin cutting wood, with hardly a single exception the entire crew asked to be discharged. The reason given by the men for this request was stated to be that they had enlisted as seamen, firemen, etc., and that woodcutting was not one of their duties.

I declined to entertain any requests for discharge whatever, and at a general muster of the crew I informed them that I should hold them strictly to the agreement under which they enlisted until their places could be filled by the enlistment of other men. I had made, as they well knew, every effort to purchase fuel for the vessel, and had failed to get enough to carry us through the winter. It would therefore be

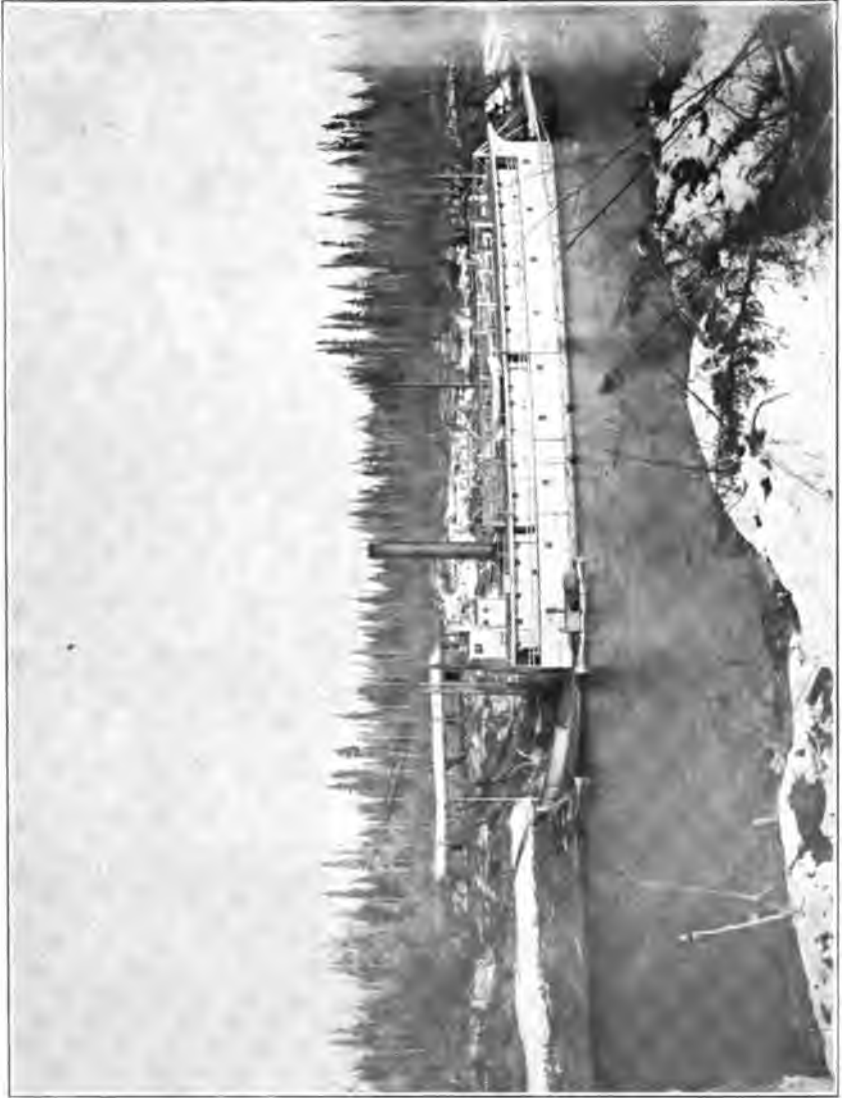
necessary to cut enough wood to supply the deficiency, and they must obey my orders or take the consequences.

I fully realized by this time that the minds of most of the men had been inflamed by the stories of fabulous riches acquired in the gold fields of Alaska, and that they had enlisted on the *Nunivak* with the preconceived intention of leaving her at the first opportunity after reaching the interior of the country. It was, however, imperatively necessary to maintain the command at its full strength, and while the most rigorous discipline was observed every effort was made to avoid exposing the crew to any unnecessary hardships and to make their surroundings as comfortable as possible. It can not be said that these efforts were altogether successful, as the men continued to be moody and at times irritating; but the work assigned to them was satisfactorily performed and there were no further open expressions of dissatisfaction.

Ice was first seen in the Yukon this season on October 3. It froze solid to the banks on each side of the river, leaving the channel still open. This shore ice gradually increased in width from day to day, and its daily growth could be easily determined by measuring the width of the furrow-like mass frozen to the main body of the ice during the previous night. The floating particles of ice gradually formed into cakes from 2 to 4 inches in thickness, which the action of the current formed into circular "pans" from 5 to 10 feet in diameter. The size of the "pans" gradually increased and finally choked the channel. The ice became cemented together into blocks of various thicknesses, which the current turned and twisted and piled onto each other in the wildest confusion. At last, when all motion ceased, the frozen surface of the river was upheaved into ridges miles in length, and upon the high bars were acres of mimic bergs, which had been forced out of the channel by the tremendous pressure and left there until the spring break-up of the river should float them off again toward the sea.

The ice did not cease moving in the Yukon until late in October, and it is probable that there were numerous open places and air holes through the ice which did not finally close for a month later. On November 6 the first mail "over the ice" was brought down the river by the mail man with a dog team. From that time until the breaking up of the ice in the spring travel on the river was uninterrupted.

Meanwhile the ice in the Dall grew stronger with each night of freezing temperatures, and by the 10th of October it was firm enough to bear the weight of a man. As no great amount of snow had fallen to roughen the surface, a fortnight of splendid skating was enjoyed by all the members of the party who had been thoughtful enough to provide themselves with skates. After the middle of October a succession of heavy snowstorms effectually put a stop to skating, and snowshoes came into requisition.



PREPARING TO GO INTO WINTER QUARTERS AT FORT SHOEMAKER, DALL RIVER,

Constant travel up and down the river and across the adjacent country by the Indians on their hunting trips, and by prospecting miners, soon made a network of trails leading in every direction, and afforded ample opportunity for our party to take such exercise as was necessary for the preservation of health. Hardly a day of winter passed that most of the members of the command did not spend at least a portion of the day in the open air. No inconvenience from the cold weather was experienced in temperatures ranging from -20° to -40° F. unless the wind was blowing, and as this was seldom the case after the temperature fell to -20° , our hunting parties were hardly ever kept indoors by inclement weather. Grouse and ptarmigan were fairly abundant throughout the winter and not only afforded excellent sport, but also furnished an agreeable change from our rather monotonous fare of canned meats. Two days of the week were set aside as holidays for the crew and permission was granted them to go hunting and trapping in the vicinity of Fort Shoemaker. With one or two exceptions, however, the men preferred to remain on board reading, smoking, or sleeping, rather than to go on hunting trips through the woods after game. As the regular drills and other duties gave them plenty of out-of-door exercise, I did not interfere with their method of spending the time given them for recreation and amusement.

Books, periodicals, and magazines belonging to the officers were freely loaned to the crew, and no effort was spared to make life as pleasant for them as possible consistent with the maintenance of good discipline. The system of routine adopted for the government of the command during the winter was modeled on the plan of a ship's daily, weekly, and monthly bill of stations and duties, with such modifications as were necessary to adapt it for our use, and it was carried out with regularity during the period of our enforced detention in winter quarters. The systematic performance of the duties of the vessel gradually tended to render the men, if not exactly contented, at least less inclined to complain, and their general conduct was such as to make any severe disciplinary measures unnecessary except on one occasion.

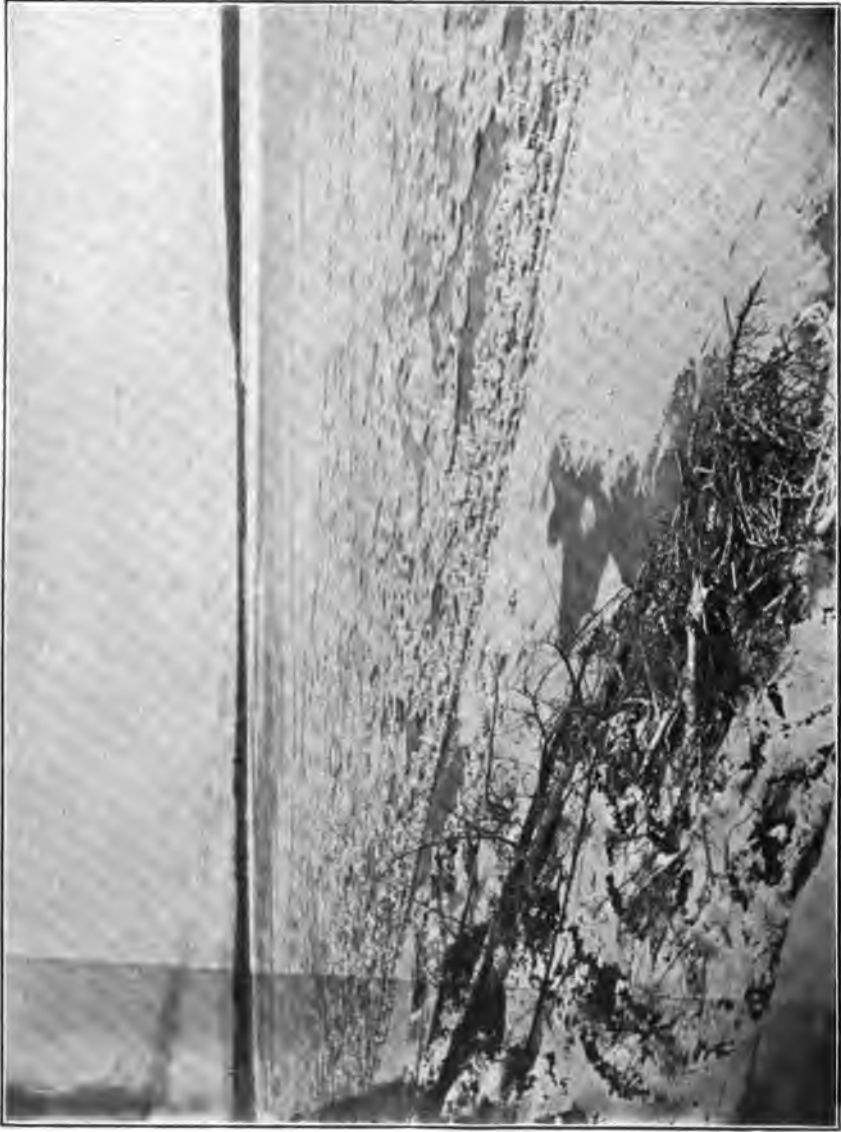
The exception to the general condition of good order occurred on the eve of Thanksgiving Day, 1899, when, by some means never disclosed, the crew obtained a quantity of liquor and almost to a man became intoxicated. One of the seamen became so boisterous that he was restrained and made to keep quiet only after considerable difficulty. His influence in the crew was, I knew, a pernicious one, and his language and attitude of defiance of authority at this time was so disrespectful toward the officers who had attempted to quiet him that I deemed it best for all concerned to get him away from the ship. In accordance with this decision the man was summarily and dishonorably discharged from the Service the next day, with sufficient food given

him to reach the next settlement, and warned not to come on the reservation again under pain of arrest and trial before the civil authorities. The manner of his discharge and departure from the vessel apparently had a most salutary effect on the rest of the crew, for from that time on there was not a single case of drunkenness reported nor any other dereliction of duty requiring severer punishment than a simple reprimand or short confinement to quarters to maintain good order.

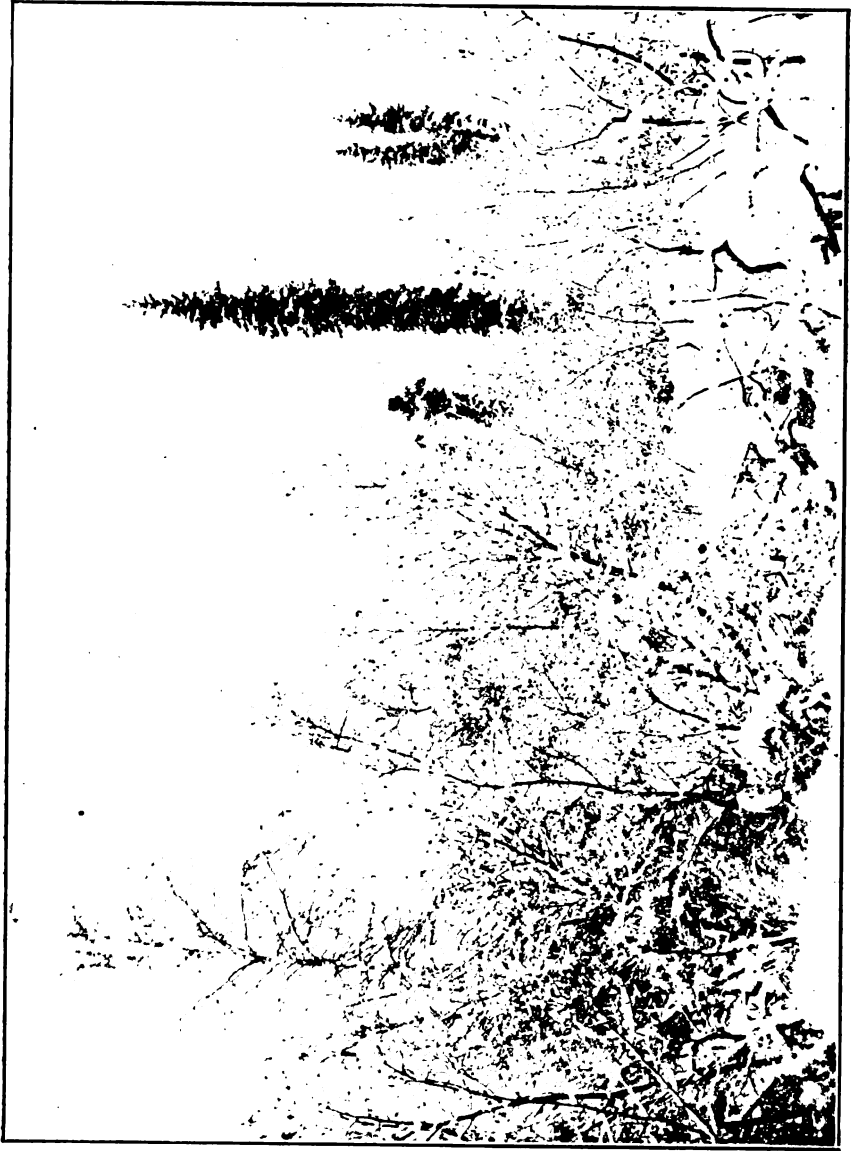
The end of November found us in the midst of an Arctic winter. Snow fell with more or less regularity during this and the preceding month until now the country was covered to a depth of 3 feet or more with a mantle of spotless white. Every branch and twig of the smaller growth of trees, the willows and alders and birches, were sheathed in a gleaming armor of ice, and the tall, somber spruces carried upon their dark, spreading branches each its burden of fleecy snow. Hardly a breath of air stirred in the woods, and the lagging sun rose each day like a great silver disk and ran its course across a sky that was absolutely free from clouds. Long after the sun disappears below the crests of the mountains which lie to the south the radiance of his setting bathes the sky in tender color, now green and pink, now softest lilac, shot with silver threads, and gradually as night comes on the more delicate colors fade away and insensibly the whole southern sky darkens to a splendid purple, lighted up by a host of trembling stars.

The month of November was marked by the most brilliant displays of the aurora borealis observed during our stay in the North. Some of these displays were so remarkable that we would frequently leave our warm quarters to watch the magnificent spectacle with fascinated interest while it lasted or until the intense cold would cause us to seek shelter.

As a usual thing the auroral displays were observed to be most brilliant just previous to a period of lower temperatures; but they were rarely seen during the prevalence of excessively cold weather. The phenomena of the aurora have so often been described by abler writers that I shall not attempt to do so here. There are no words at my command adequate for the purpose. The spectacle must be seen to be fully appreciated, and for one who loves nature in all her moods nothing can be more beautiful—and at the same time so awe-inspiring—than this mystic northern light drenching the sky from the zenith to the horizon with cascades of ever-shifting color. Now set in rigid lines of prismatic hue, and again tremulous and waving in crinkling folds across the sky, festooning the firmament with clinging, silken fabrics, through which the light glows and filters with soft radiance, and again, breaking into myriads of glistening, flashing particles—a whole world of jewels—to be strewn across the interspace with such reckless prodigality as to blind the eye and confuse the mind and to make any mere word description of its wonderful beauty weak and futile.



THE YUKON RIVER BEGINNING TO FREEZE OVER—VIEW OF THE RIVER LOOKING UPSTREAM FROM THE MOUTH OF THE RIVER, OCTOBER 5, 1899.



WINTER WOODLAND SCENE. DALL RIVER.

The fine, clear weather of November was taken advantage of to lay in a good supply of wood to last us through the month of December, when the short hours of daylight and probable colder weather would make such work impossible. By the last week of the month the crew had cut and hauled to the vessel about 160 cords of wood, which, with the supply of coal on hand, would be sufficient to supply our wants until the lengthening days of the new year would permit the work in the woods to be resumed.

Until this time we had not used the electric lights installed in the vessel on account of the increased quantity of fuel required to run the dynamo, but now that we had a good supply of wood on hand the lights were turned on at 2 p. m. and kept burning until bedtime. The better illumination of the quarters seemed to have a cheering effect on the spirits of everyone on board.

On the 8th of December the sun did not rise above the hills lying to the south of us, and did not come into view again until January 6 of the new year. We did not experience any great amount of inconvenience on account of the darkness, even after the sun had disappeared, as there was always at least four hours of moderately good daylight, and the nights, when the moon was full or nearly so, were almost as bright as day.

During this period of short days the movements of the command were of course somewhat restricted, and short trips away from the vessel only were practicable. There was, however, plenty of work to do to occupy the time, and almost unnoticed the time passed and the lengthening of the days gave promise of the return of the sun. Christmas and the holidays passed very quietly, and the beginning of the new year found us again busy cutting wood and hauling it to the vessel to replenish the supply of fuel, which was now getting too low for comfort.

The first week of January was marked by exceedingly cold weather. The temperature for three days in succession was never higher than -56° F., and fell as low as -62° F. During this time we experienced some difficulty in keeping the vessel warm, especially on the lower deck, but by keeping the doors and all approaches to that part of the ship closed and sealed up, and by the use of tarpaulins to prevent as far as possible the escape of heat radiated from the boilers, we managed to pass through this period of exceptionally cold weather, if not comfortably, at least without any great amount of suffering, and the fact that it is entirely feasible to live on a vessel built like the *Nunivak* during the coldest kind of weather was established beyond a doubt.

During this cold snap all travel on the river and over the adjacent trails ceased, and the *Nunivak* became the asylum of some half a dozen traveling parties who applied to us for shelter. It was easier to take care of the men forming these parties than their dogs, for the arrival of each strange team was a signal for a general fight between our own

dogs and the newcomers, and finally, after settling among themselves the question of supremacy by numerous bloody battles, the whole community, consisting of some 50 or more dogs, would pass the nights howling and baying the moon. With the most hospitable inclinations, therefore, it was still with a feeling of relief that we bade good-by to our guests when the weather moderated and they proceeded on their several ways.

On January 11 Lieutenant Blake and Assistant Engineer Wood left Fort Shoemaker with a dog team for the purpose of making a sled trip over the Koyukuk trail to the mountains which form the divide between the headwaters of the Dall and the Koyukuk rivers to ascertain the nature of the country and to gain practical knowledge of winter traveling. They were, however, driven back to the ship by the intense cold weather encountered on the first day of their proposed journey, not however before they had gone through the experience of making camp and sleeping in a tent in a temperature of -56° F. It was found to be impossible for them to break camp and pack their effects on the sled during the prevalence of such excessively cold weather, so they left all standing and beat a retreat to the ship to await for more favorable conditions. A fresh start was made by the same officers on the 21st of January, and after accomplishing the task set before them in a very thorough manner they returned to headquarters after an absence of two weeks. Lieutenant Blake's report of the journey and his chart of the ground covered during the trip is herewith appended.

As soon after the holidays as the lengthening days made traveling practicable the Indians living in our neighborhood began to leave their winter quarters and to go into the mountains on their annual winter hunting expeditions after moose and caribou. There appeared to be no regular set time for their departure, each hunter and his family seeming to leave whenever the notion struck him or when it was most convenient to do so. As a rule the old men went first and the young bucks followed in the trails made by their elders, not so much as a sign of deference to age it is feared, as because in this way they avoided the hard work of breaking the first trails. By the first week in February the winter villages were practically deserted by all the Indians except the very old or feeble ones, and these were in many cases left to shift for themselves.

One of our near neighbors, an Indian named Sam, who came to bid us good-by before starting off on his annual hunt, informed us that his old mother would be left behind, and in the course of the conversation the fact developed that the old woman was to be left without any food or means of procuring any during his absence. "But," we exclaimed, "what will she do?" "I don't know," he answered; "me tink bymeby she starve maybe." This was said in a way to suggest



HOUSE BUILDING AT FORT SHOEMAKER, NOVEMBER, 1899.



LIEUTENANT BLAKE AND ASSISTANT ENGINEER WOOD START OUT TO MAKE A RECONNOISSANCE OF THE DALL RIVER, KOYUKUK TRAIL, JANUARY, 1900.

the thought that, according to his way of looking at the matter, that event would not be of any great importance or cause of great regret. We came to learn by longer intercourse with the Indians that Sam's apparent indifference to the fate of his old mother is typical of the race. They are extremely unemotional, and generations of bitter struggle against adverse conditions have rendered them almost insensible to the ordinary appeals of humanity. They are not, however, lacking in either generosity or affection, as is manifested in the tender regard they all have for their children and for each other in times of plenty. But when the pinch of poverty or want comes, with very few exceptions, these people display an amount of stoicism and lack of feeling which is remarkable when the fact of their long intercourse with the whites is considered.

The middle of January saw the advance guard of the army of travelers bound for the new gold fields of Nome on their way down the river, and from this time until the cessation of winter travel on the river, in the spring, a steady stream of adventurous fortune-hunters passed our station on their way to the coast. With few exceptions they passed without stopping at Fort Shoemaker, as they all appeared to be in too great a hurry to reach their destination to delay for the purpose of exchanging mere civilities. It is a remarkable fact, in connection with this stampede of people to Nome, that of the thousands of travelers, many of whom were without any previous experience of the vicissitudes of arctic travel, practically none of them suffered any serious injuries as a result of their long and arduous journey. Although we took pains to have those traveling informed of the fact that medical aid would be furnished free of charge to anyone requiring it upon application to the *Nunivak*, I do not think that our surgeon was called upon more than a half dozen times for assistance during the entire winter.

Spring at Fort Shoemaker opened as gradually as winter had set in. There were no violent storms which in other regions characterize the change of seasons, and, with the exception of one or two windy days or an occasional heavy fall of snow, February and March passed and the long, bright, sunny days of April came upon us without any meteorological disturbance worthy of note.

The signs of spring were eagerly looked for, and I believe the willows first showed evidences of renewed life. The buds began to swell on the trees favored by the sun, the bare branches and twigs lost their reddish tinge and assumed more and more the greenish brown color of their vernal covering, and all at once, it seemed, the catkins burst their bonds and boldly wooed the warm, life-giving sunlight.

Snow began to melt on the trails and on exposed hillsides early in March and made the work of hauling wood to the vessel extremely arduous. By the middle of the month the condition of the trail was

so bad that sledding was impossible except during the early hours of the day, before the heat of the sun melted the snow.

On the 6th of March I noted the first appearance in the woods of a flock of warblers (*Dendroica Striata*), and although we had short periods of very cold weather after that date, the middle part of the days was, as a usual thing, warm and pleasant. The snow rapidly disappeared from the ground, the trails became running rivulets of muddy water, and the vernal foliage burst into bloom with a suddenness that was amazing. On all sides now could be heard the blessed sound of running water trickling over the steep banks or babbling up in tiny runnels from hidden springs over which the iron hand of winter was still held, but with a weakened and relaxing grasp.

On the 26th of March the work of cutting the ice from around the vessel was begun and by April 3 she was all clear and ready to float when the river should break up.

The first week in April was marked by a period of disagreeable weather such as we had not experienced during the entire winter. I quote from my journal of April 4:

The weather is cold and raw and is actually more disagreeable than during the coldest days of midwinter. All bird life has disappeared and even the omnipresent camp robbers (*Perisoreus Canadensis*) have deserted the vicinity of the ship and retreated for shelter to the dense thickets along the river banks. A high wind is blowing on the Yukon, and although we can not feel it in our sheltered position at Fort Shoemaker, its force is apparent from the swaying of the tree tops and the presence in the air of a cloud of flying snow particles which make it exceedingly unpleasant to remain out of doors any length of time. In the midst of the gale one of our Indian neighbors, "Dummy Isaac," started out on a moose hunt, as it is under such conditions of wind and weather that the shy animal can be easiest approached. As he staggered past the vessel I noted the fact that he had only his rifle, snow shoes, and a small bag in which he carried his ammunition and a scanty supply of food. No blanket, sled, or tent was taken along, and although he might be gone three or four days on the trip he would be without shelter of any kind except what the woods afforded during the whole of that time.

On April 8 a starving prospector limped painfully in from the Koyukuk trail and was given shelter and food on the *Nunivak*. At the time of his arrival suffering and privation had caused his mind to wander and it was not until several days afterwards that he was sufficiently recovered to tell his story.

His name was Samuel Morris and he had started from the Koyukuk country late in March with a dog team, but upon reaching the divide he had been overtaken by a severe snowstorm, in the midst of which he lost the trail and wandered aimlessly around for several days until all of his food had been exhausted, when he mercifully turned his dogs loose from the sled to give them a chance to reach some settlement. How he reached the vicinity of Fort Shoemaker he never knew, as after abandoning his sled he became bewildered and wandered on with-



CUTTING WOOD FOR USE OF THE NUNIVAK DURING THE WINTER OF 1899-1900.



HAULING FIREWOOD TO THE NUNIVAK DURING THE WINTER OF 1899-1900.

out sense of direction or distance until he finally met one of the crew of the *Nunivak* who was out hunting and who brought him to the vessel.

There seems to be no doubt that the disappearance of men in this country has been, in many cases, the direct result of foolhardy attempts to travel alone. Such attempts are usually made by men who leave no record by which they can be traced, and their disappearance is never noticed until long after any effort to render assistance to them in case of disaster would be of any use. A bleaching skeleton, a mass of tattered and unrecognizable rags, and a few scattered articles of camp outfit, which might be the property of any prospector, may sometimes be found to tell the sad story of starvation and death. But it is a tragedy which has been played out to the bitter end without an audience by an actor whose name will never be known, and in silence which is only broken by the wailing of the wind as it spreads a mantle of snow over the fallen form and sobs, and hurries on.

A heavy rain fell on April 15, causing numerous leaks in the upper or hurricane deck to appear, through which the water entered and our living quarters were soaked. The constant heat maintained throughout the winter had no doubt caused the seams to open, and nothing could be done to remedy the evil until the woodwork of the upper deck had become thoroughly saturated with moisture and by swelling would return to its original position. Fortunately the downpour was not of long duration, and before a second shower came the leaks had almost disappeared.

The annual migration of the geese and ducks was eagerly looked for by all hands, and hardly any incident of the year caused as much excitement as did the loud "honk, honk, ho-unk" of a flock of geese which passed over the vessel from the southeast on the morning of April 20. Men dropped whatever work they happened to be engaged in to gaze on the welcome sight, and the air was filled with cries more or less geoselike in character to entice the migrants to alight. They, however, flew on without stopping, evidently bound for some more likely feeding ground farther north. In a week more the air by night and day was filled with the sound of millions of beating wings and the noisy clangor of arriving parties of geese and ducks. The hundreds of small lakes and lagoons which dotted the surface of the country to the northwest of Fort Shoemaker were now free of ice and were soon filled with the feathered visitants.

The gunners of the party now spent most of their spare time hunting the birds, and succeeded in killing enough to furnish all the messes with an agreeable change of diet. But at this season the ducks and geese are in poor condition, and it really hardly pays to shoot them. By the latter part of April the ice in the Dall, which was from 5 to 6

feet thick, began to show signs of breaking up. I quote from my journal of April 28:

Overcast and soft mild weather. Temperature, maximum, 48° F.; minimum, 27° F.

The ice in the Dall is melting rapidly, and large quantities of discolored water are flowing over the surface of the river. We cut a trench in the ice so as to turn the water into the ditch surrounding the ship, and at 1 p. m., with a hardly perceptible jar, she rose from her winter bed in the mud and floated.

Owing to the impassable condition of the trails on the Yukon the mailman has discontinued his weekly trips by dog team, and our next mail will not be received until the opening of boat navigation.

Mosquitoes of large size were observed to-day for the first time, but are not as yet very troublesome. Flies and numerous insects were also noted during a short walk I took through the woods. Daylight lasts from 3.30 a. m. until 10 p. m., and even at midnight it is merely twilight, not dark.

On April 30 I noted in my journal that—

The Dall River ice is rotting and breaking up fast. Large masses of it floated down the river and jammed at the mouth, where its further progress was arrested by the ice in the Yukon, which is as yet solid and immovable. Pike weighing as much as 6 pounds were seen in the water around the ship to-day, and a number of this fine fish were obtained by shooting them with a rifle. They will not take a hook.

The sound of running water, the smell of growing plants and blooming flowers, and, above all, the sight of moving masses of soft cumulous clouds in the sky, are cheering evidences that the long, dreadful stillness of winter is at last broken and spring is at hand.

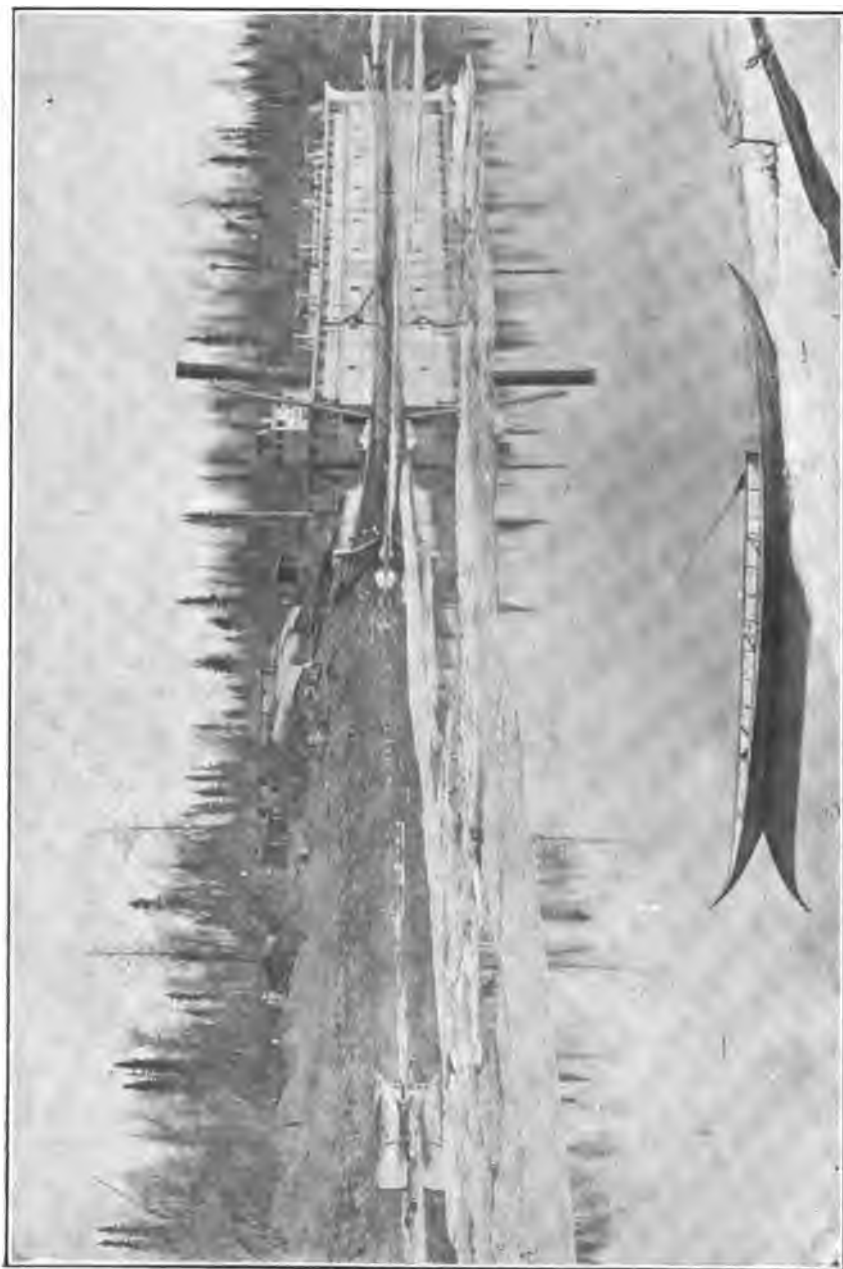
The ice in the Dall continued to run with more or less force until the 14th of May, at which date the river was practically clear. The water began to rise gradually at this time and the Indians predicted that the Yukon would be open inside of a week. It hardly seemed possible. Again I quote from my journal:

As the time approaches when we may reasonably hope to be released from our winter quarters, it is a curious fact that everyone seems to be more impatient and irritable than during the winter months. It is possible that the excessively long days now make it more difficult to get a sufficient amount of sleep, and this may account in a measure for the phenomena. Be that as it may, the fact remains that everyone is more or less destraint and uncommunicative. Even the dogs seem to share in the general feeling of gloomy irritability, and from having been as a usual thing extremely affectionate and playful, are now illnatured, quarrelsome, and morose.

The ice in the Yukon had for two weeks shown signs of disintegration, especially along the shore where the surface snow-water collected in pools it had slowly melted and broken away from the banks, forming in this manner lateral streams of sluggish water which daily increased in volume and force until the whole body of ice seemed to have been undermined by the current, and on the 16th of May it rose quietly from its resting place on the sand bars and moved downstream in a solid mass a distance of about a thousand yards. Here it jammed



CUTTING THE NUNIVAK OUT OF THE ICE IN WHICH SHE HAD LAIN DURING THE WINTER.



THE SPRING BREAK-UP OF ICE AT FORT SHOEMAKER, APRIL, 1900.

and the immense field of solid ice was broken into fragments and piled onto the shoal bars and along the banks of the stream in the wildest confusion.

Coincident with the breaking up of the ice in the Yukon, the water in the Dall rose very rapidly and a new danger threatened the safety of the vessel. I quote from my journal of May 17:

Fine, clear weather. Temperature, maximum 50° F.; minimum, 34° F.

The opening of the Yukon seems to have thrown so much water into the Dall that the current in the latter stream has almost ceased, and I fear that if a jam in the main river takes place below us we will be compelled to move farther upstream in order to avoid being crushed by the inflow of ice. Every preparation for a sudden move was therefore made. The lines by which the *Nunivak* was held to the shore were singled up and steam was ordered to be ready for immediate use. Later in the day, while I was anxiously watching the ice in the Yukon, which was at the time moving downstream at the rate of 7 to 8 miles per hour, a deaf and dumb Indian of our acquaintance, named Isaac, approached me, and with every evidence of great excitement finally gave me to understand that an ice jam in the Yukon was imminent, and if it did occur we would have to move upstream in the Dall. I at once informed Captain Young, of the steamer *Leah*, of the danger, and as his vessel was already under steam I requested him to watch the ice at the mouth of the river, and if it should begin to move up the Dall to give us warning by sounding his steam whistle. I then returned to the *Nunivak* to hasten our preparations for moving. The day ended with a strong southwest wind and a heavy downpour of rain.

At midnight we were aroused by a warning blast of the *Leah's* whistle, and a few moments afterwards she was seen coming upstream stern foremost, sounding her whistle continuously. At 12.10 a. m. she came up with the *Nunivak*, and I was informed by Captain Young that the ice was beginning to run up the Dall and that we did not have a moment to spare. Lines were quickly cast off from the bank and transferred to the *Leah*, and just as the ice was seen coming around the lower bend of the Dall both vessels started upstream.

The abrupt bends of the river and the large size of the *Nunivak* made the work of navigation very difficult; but with the able assistance of the *Leah*, under the management of Captain Young, we succeeded in getting about 3 miles up the Dall and safely mooring alongside a steep bank. We had hardly accomplished this work when the ice swept past us in huge masses, traveling at the rate of from 3 to 4 miles per hour, and although we received some hard blows the force of the impact was so much weakened by the jamming of the ice in the narrow and tortuous channel that no material damage was sustained. A few broken wheel buckets, and half a dozen windows in the lower house which were broken by sweeping branches, completed the list of our injuries. At 4 a. m. the ice ceased its upward movement and shortly afterwards turned and began to run downstream. By noon of the 18th the Dall was again clear of ice, but not deeming it prudent to take any chances we remained upstream until the afternoon of the next day, when we dropped back to our old landing at Fort Shoemaker.

On May 20 the steamer *Leah* left Dall River, bound for Dawson, but as it was not my intention to venture out into the Yukon until the river was clear of the floating driftwood, which always follows the ice downstream, and still not wishing to have any vessel pass us without being subjected to examination, I detailed Lieutenant Camden to accompany the *Leah* on her journey up the Yukon as far as Circle City for the purpose of boarding and examining any vessels encountered on the way which otherwise might escape our scrutiny.

Lieutenant Camden was also directed to obtain such information in regard to the Yukon as would be possible while on the trip, which would enable us to extend our chart of the river over the part so visited. A small boat was furnished Mr. Camden in which the return trip was to be made, and he was accompanied on the expedition by Mr. Philip Godley, an agent of the Census Bureau, who had been at work several weeks in the vicinity of Fort Shoemaker, gathering statistics in regard to the population, and who volunteered to accompany Mr. Camden on his trip to Circle City and to assist him in handling the small boat on his way back to the ship.

While we were waiting for better conditions to prevail in the Yukon before venturing out in the Nunivak, the crew was set at work painting the outside of the vessel, as we found that in many places the excessive cold weather of winter had caused the paint to peel off and leave the planking as bare as if it had been burned. This work occupied the crew for a week, and I took advantage of the opportunity to spend the greater portion of each day in the woods gathering specimens for our natural history collection. The willow thickets near the ship seemed to be a favorite nesting and breeding ground for the myriads of small birds which had arrived from their southern homes and taken up their quarters for the summer. The air was filled with the sweet notes of their caroling, and they were apparently so free from all sense of fear that it seemed a pity to take the lives of even the small number required as specimens. Among the few birds which remained in the vicinity of the vessel during the winter were the Canada jays (*Perisoreus canadensis*), and it was amusing to note their apparent resentment of the coming of the summer visitants. On one occasion I saw a jay coax a small warbler within reach by giving vent to a series of soft, alluring calls, until the smaller bird was within striking distance when it was suddenly set upon and given a severe beating by the treacherous jay. After this work had been done to his satisfaction, the jay perched himself on the highest limb of a neighboring tree and set up a most unearthly caterwauling, as if to warn all other warblers not to come on ground which he evidently considered as the property of himself and his kind alone.



THE YUKON ICE BACKING UP INTO THE DALL, SPRING OF 1900.



YUKON ICE BACKING UP INTO THE DALL DURING THE BREAK-UP IN THE SPRING OF 1900.

CHAPTER V.

Before leaving our winter quarters at Fort Shoemaker I received information of the departure of the steamer *Florence S*, a Canadian vessel, from Dawson, bound for the Koyukuk River with a party of miners and prospectors, and as it was important that the vessel should be boarded and examined before she left the Yukon, I stopped at Fort Hamlin to await her arrival.

While lying at Fort Hamlin, Frederick Edwards and James Cameron, two prospectors bound for Nome, applied to me for passage to the coast. The men claimed that they had originally started down the river in a small boat in company with two other men, it being understood that all the party should share equally in the labor and expense of making the trip. After reaching this point, however, they fell to quarreling, and Edwards and Cameron were forced to leave the boat by their two companions, and were put on shore at Fort Hamlin without food or money to make the rest of the journey down the river as best they could. Under these circumstances I received the men on board and issued them rations for their subsistence until we should reach the coast, or until they could secure employment on the river. Hundreds of small boats, scows, and rafts were now daily seen on their way down stream, filled with men and women of all classes and nationalities bound for Nome or other places from which reports of new gold discoveries had spread to tempt them into making the long, wearisome journey. As we made our way slowly down the river these adventurous parties were constantly being overhauled, and hardly a day passed that we were not called upon to render assistance to some wrecked or stranded party, or to settle some question of disputed ownership of property between discontented and quarreling travelers. It was not unusual to see, floating down the river side by side, the two ends of a boat which had been cut into equal parts and patched up so as to afford transportation to both portions of some disrupted party which had taken this novel and heroic means of settling its differences.

Most of the boats were constructed in the crudest manner and loaded to the guards with everything likely to be of value or profit in a mining camp. Boats and rafts, piled high with shovels, picks, stoves, clothing, food supplies, etc., in the midst of which, perhaps,

an assortment of restless and hungry dogs gave vent to their discontent in lugubrious howls; scow loads of horses gazing wistfully at the green shores, with now and then a lonely looking cow or beef cattle, worried and stung night and day by clouds of vicious mosquitoes, floated by us on the placid surface of the mighty river, all bound for that distant land of promise and prospective wealth, Nome.

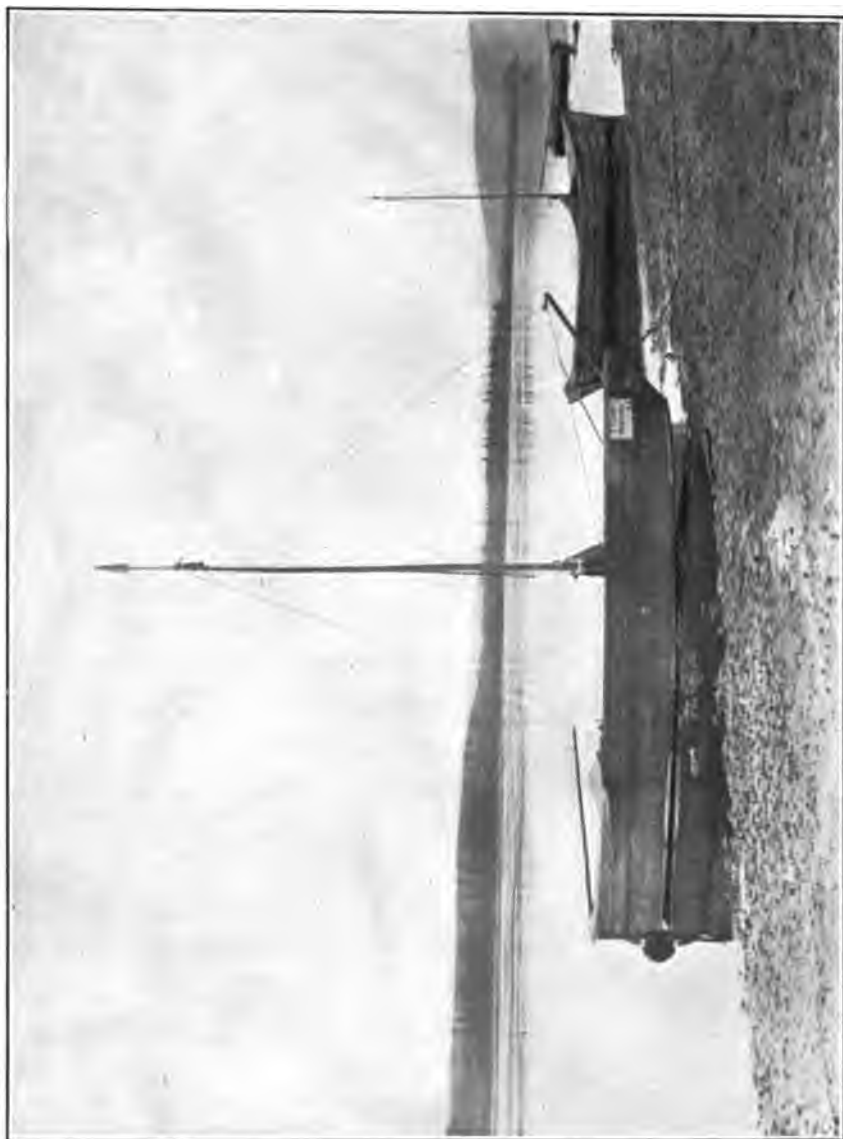
It was amusing to note the leisurely manner in which some of the travelers floated down the river, protected from the hot rays of the sun by improvised awnings, while others of less philosophical temperament would be pulling away at their oars as if life itself depended upon the utmost speed.

I have mentioned a few incidents of the Nome stampede, not so much because it is pertinent to this report as for the reason that it must always be accepted as one of the remarkable incidents in the history of Alaska. From the beginning of winter travel on the Yukon until the end of the summer of 1900 it is probable that upward of 3,000 people made their way by dog team, or by tramping and pulling their own sleds, and by small boats down the river to the coast. Many persons never reached their original destination, but either became disheartened on the way or turned aside to prospect more recently discovered gold fields than those in the Nome district. But taken altogether this great stampede of gold seekers must be considered one of the most remarkable movements of the kind which has ever occurred in the world's history of the search for the yellow metal.

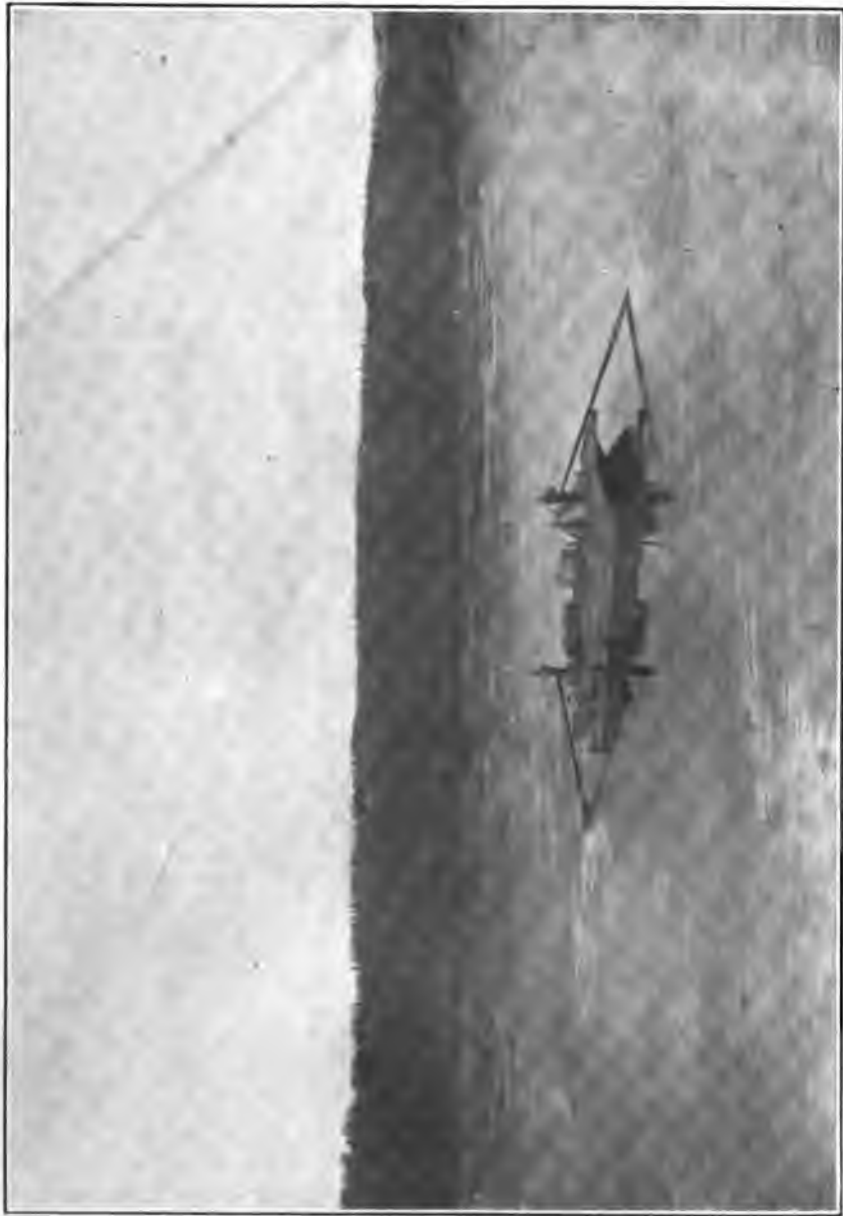
On May 27 the Canadian steamer *Florence S*, having on board some 40 passengers bound for Peavy, on the Koyukuk River, arrived at Fort Hamlin. Upon being boarded by an officer from the *Nunivak* she was found to be in charge of a custodian appointed by the collector of customs at Circle City with instructions to report to the *Nunivak* for further orders before entering the Koyukuk, where there is no customs officer stationed. The master of the vessel informed me that he had received verbal permission from the United States consul at Dawson to engage in traffic on the voyage to and from his destined port within the territory of the United States. I told him that the law strictly prohibited any vessel other than one documented as a vessel of the United States from engaging in local traffic within our territory, and if he did so it would be my duty to seize his vessel. After giving the custodian similar instructions and orders to communicate with the *Nunivak* after completing the voyage up the Koyukuk, the *Florence S* was allowed to proceed.

We dropped down the river next day to the Pioneer coal mine, where a stop was made to take on a supply of coal.

Lieutenant Camden and Mr. Godley returned to the ship from their trip up the river on the 29th of May. Mr. Camden reported that he had reached Circle City and while there had boarded the steamer



SPECIMENS OF BOATS USED BY MINERS IN THE YUKON RIVER STAMPEDE TO NOME.



PROSPECTOR'S SCOW WITH HORSES FLOATING DOWN THE YUKON ON THE WAY TO NOME.

Florence S., and had advised with the collector of customs as to the best way of allowing her to proceed. Copious notes for the chart for a distance of 355 miles of the steamboat channel of the Yukon were made, and much other valuable information of the region traversed was obtained. The return trip to the *Nunivak* was made in fifty-four hours, and Mr. Camden estimated the strength of the current in this part of the river to be 7 miles per hour. A full report of the journey of Lieutenant Camden is herewith appended.

Having received on board 65 tons of coal, we left the Pioneer mine on the morning of May 30 and ran to Rampart City. A stop was made at this place to communicate with the authorities.

On June 1 the Alaska Commercial Company's steamer *Victoria*, bound for the Koyukuk River, arrived at Rampart, and upon examination was found to be without marine documents of any kind on board. The vessel was accordingly seized. In view of the fact, however, that she was on her way to the upper waters of the Koyukuk with supplies and provisions for the mining camps in that locality, which had been reported as being in distress, I granted the master of the vessel permission to proceed on the voyage, but with the understanding that he was to immediately return, after landing the supplies, to St. Michael and there deliver the *Victoria* into the custody of the collector of customs at that place for trial.

After a pleasant sojourn of four days at Rampart, during which time the command was the recipient of many kind attentions from the hospitable community, we took our departure on June 5 and stood on our way down the river.

During the afternoon the Alaska Commercial Company's steamer *Leah* from Dawson was boarded, and having ascertained from Captain Young that he was bound on a voyage up the Koyukuk River, and being desirous of obtaining some information in regard to the traffic on that stream, I directed Lieutenant Camden to take passage on the *Leah* for the trip and to return to the *Nunivak* at Nulato by June 20. The objects to be attained by Lieutenant Camden while on this duty are set forth in the orders given him before leaving the *Nunivak*, a copy of which is herewith appended.

On June 7 we passed through the Rampart Rapids and narrowly escaped getting ashore on an island, which was covered with water at this stage of the river, but which was exposed at the time of our passage upstream. In passing through the narrow gorge we were running at a rate of 20 miles per hour, and it was only by the exercise of exceedingly good judgment and some very quick work by Lieutenant Blake, who was handling the vessel at the time, that the danger was avoided. Without further mishap we reached Fort Gibbon at noon and made fast to the shore during the prevalence of a violent rain squall. In spite of the inclement weather, Major Booth and his staff

of officers were on hand to welcome our return from winter quarters and to extend to the ship a cordial invitation to remain as long as possible at the post and renew the pleasant friendships that had been formed at the time of our first visit.

Many new buildings had been erected at the post during the winter, and the sight of well-made dwellings, graded streets, and the constant hum of machinery gave the place an air of civilization somewhat out of keeping with its wild surroundings. Major Booth informed me that the sawmill at the post had been kept in operation nearly every day during the winter, and had been of immense assistance in supplying lumber for the construction of the buildings for the accommodation of the members of his command. There were at the time of our visit 165 enlisted men on duty at the post and about the same number of civilian employees at work on the premises.

Assistant Engineer Wood having reported some slight repairs to the machinery as being necessary, I directed him to have the work done here, where a good blacksmith shop had been put at our disposal through the courtesy of Major Booth.

While lying at Fort Gibbon several vessels bound down the river from Dawson were boarded and examined and two, the Alaska Exploration Company's steamer *F. K. Gustin* and the steamer *Dawson City*, owned by private parties, were reported to the collector of customs at St. Michael for infractions of the law.

On June 11, having completed the repairs to the machinery, we bade good-bye to our army friends and left Fort Gibbon for down the river. At the request of Maj. C. A. Booth, U. S. Army, who was under orders to leave for the States, he was received on board for passage to St. Michael.

During the afternoon the steamer *Florence S.* was met on her return from the Koyukuk River, and we stopped to communicate with her. Mr. Pond, the custodian of the vessel, reported that the trip had been made in accordance with the instructions received by him from me, and that the vessel had not been engaged in any illegal traffic on the river. She was thereupon allowed to proceed.

We arrived at Nulato on June 12, and stopped there to await the return of Lieutenant Camden from the Koyukuk River.

At Nulato we found encamped some 50 or 60 prospectors who had grown tired of floating down the river and were now awaiting some other means of transportation to the coast. I received numerous applications to be furnished passage on the *Numivak*, but as no one appeared to be actually destitute or in distress, I declined to receive anyone on board.

Quite a number of Indians were gathered at Nulato getting their fish traps ready for the expected run of salmon on the river, building birch-bark canoes, cutting up driftwood for sale to the steamers and otherwise busily employed.



THE RAMPART RAPIDS, SHOWING ROCK ISLAND PARTIALLY SUBMERGED IN MIDSTREAM.
At times of high water this island is entirely under water and is a dangerous menace to navigation.



THE NUNIVAK TAKING ON BOARD COAL AT THE PIONEER COAL MINE, YUKON RIVER.

Complaint having been made to me by some of the Indians that a party of white men encamped at this place had taken some driftwood collected by the Indians and used it for firewood without paying for it, and had refused to either pay for it or replace what had been used, I caused the men to be brought before me and investigated the matter. It having been proved that the story of the Indians was true, I required the men to replace the wood and told them to break their camp and move on down the river, as their presence was likely to cause trouble.

Shortly after our arrival at Nulato I learned that an Indian boy had been accidentally shot and killed by a companion during the winter, and that a meeting of the principal men of the tribe was about to be held to determine what was to be done in the matter.

When the meeting took place all the Indians in the vicinity were present and were harangued by the shaman of the tribe for several hours. From the deck of the *Nunivak* everything which took place at the meeting could be observed and we could even hear what was said. I ascertained by means of an interpreter that the shaman was advising the parents of the dead boy to seize the person who had been responsible for the killing and to hold him as a slave. He furthermore informed them that if he refused to work for their support that it would be their right and duty to take his life as a blood atonement for that of their son.

As there was no one in authority in the settlement to interfere and prevent the execution of this sentence, I joined the meeting and informed the Indians that I had heard the decision of their council and that the Government of the United States would not permit them either to make a slave of the dead boy's companion or to take his life. If it could be proved that the act was done in anger or intentionally, which it appeared was never charged, then the Government would arrest the murderer and punish him. But, on the other hand, if any harm whatever came to him at the hands of the Indians, the Government would surely catch them if it took every soldier in the country to do so, and would send them far away and hang them. As for the shaman, I told him that he was telling the Indians lies and was giving them bad advice, and if he did not immediately stop doing so I would take him on the *Nunivak* down to the ocean and send him away on a big ship, and that he would never see his home again.

The meeting broke up in disorder and the shaman evidently did not consider himself safe from arrest until he had placed a wide stretch of country between us, as he immediately got into his canoe and paddled away and was not seen or heard of again.

As a sequel to this incident I would state that on the way up the river some weeks afterwards, the boy whose life had been threatened made himself known to me at one of the fishing camps near Nulato, and informed me that the matter had been amicably settled between

himself and the parents of the dead Indian, and that he was in no further danger.

On June 16 the steamer *Seattle No. 3*, owned by the Seattle-Yukon Transportation Company, arrived at Nulato and upon examination was found to have on board, in addition to an excessively large crew, 165 passengers, and was towing a barge in which were carried 75 additional passengers and 10 horses. After an inspection of the vessel had been made by an officer of the *Nunivak*, I decided that it would not be safe for the *Seattle* to accept any more passengers for transportation to St. Michael, and so informed the master of that vessel. He claimed, however, that the number of passengers allowed by law for him to carry on the barge was greater than the actual number then on board, and the pressure for passage from this point was very great and asked that he be allowed permission to receive them on board.

But in view, however, of the fact that the 10 horses on the barge were occupying space originally intended for the accommodation of passengers, and that the appliances for saving life in case of accident were, at the best, very meager, I declined to alter my decision. A number of the campers on the beach who had crowded on the vessel to secure passage down the river when she landed were compelled, much against their wishes, to go on shore again.

A quantity of fine grayling (*Thymallus signifer*) and salmon trout (*Salmo trutta*) were taken by some of the officers with hook and line from a small stream known as the Klatahenah River, which empties into the Yukon at Nulato. The fishing afforded considerable sport, but the myriads of mosquitoes which swarmed out of the dense undergrowth along the banks of the stream and attacked the fishermen made the undertaking too disagreeable to be long continued. Both kinds of fish rose rapidly to any bright-colored fly used as a bait, and they were game enough to furnish excellent sport if protection could have been had from the mosquitoes. It was almost impossible at this season of the year to remain any length of time in the woods or away from the immediate banks of the Yukon without wearing gloves and a hood made of fine netting to cover the head and face. Without this protection the vicious insects made life almost unendurable. Fortunately for those whose lives must be spent in this country, the mosquito season is comparatively short. Beginning in May, it reaches its height in June, and by the middle of July it is on the wane. In August the mosquitoes are no worse in Alaska than they are in many other regions, but their place is taken by a minute gnat which swarms in inconceivably large numbers, and it is hard to decide which is the greater evil, the mosquitoes or the gnats.

On June 20 the steamer *Leath* arrived at Nulato from her trip up the Koyukuk River and Lieutenant Camden returned on board the



YUKON RIVER PIKE (*ESOX LUCIUS*).



CHARACTERISTIC VIEW OF THE YUKON RIVER BELOW NULATO.

Nunivak, and reported that he had mapped the Koyukuk from its junction with the Yukon to a point 450 miles upstream. In addition to this important duty he had boarded and examined all vessels found engaged in commerce on the river. The full report of Lieutenant Camden's journey, including a copy of the chart made of the region traversed, is appended herewith.

Captain Young, of the *Leah*, informed me that the shaft of his vessel had been cracked while on the Koyukuk and he requested us to convoy him as far as Andreafski, at which place he hoped to be able to repair the injury. Arrangements were accordingly made to keep within touch of the *Leah* on the way down the river, and on the morning of June 21 we left Nulato and ran to Holy Cross Mission, where a stop was made to ascertain if we could be of any assistance to the members of the community. Information had been previously received that a native boy at this place had been injured by the accidental discharge of a gun while he was hunting, and that it had become necessary to amputate his foot. We found, however, that the injured boy had been sent down the river by Father Crimont for treatment at St. Michael. We remained at Holy Cross for the night, and while there we obtained a magnificent king salmon, the first of the season's run. It weighed 52 pounds and furnished a delicious meal for everyone on board.

The weather for several days had been exceedingly unpleasant. Heavy rains lasting from six to ten hours had fallen, accompanied by a strong southwest wind, which blew directly upstream. But on the afternoon of June 22 the wind died away until it was almost a calm. The heavy clouds rolled upward from the tops of the mountains, which for several days had been shrouded in mist, and as the sun lowered in the west the atmosphere took on a soft luminous quality, through which all objects appeared to be bathed in opalescent color. Innumerable song birds trilled and warbled from the adjacent shores, where the dense vernal foliage covered the undulant hillsides, rushed down the steep canyons, and poured in a perfect cascade of color over the varinted faces of the bluffs, while every detail of leaf and blossom was mirrored in the calm surface of the river. As we sped on our way, the eye, grown tired of the vivid splendors of the northern shore, turned for rest to where the tundra plains stretch away league on league to the shadowy lilac-tinted mountains in the south. Each tiny lake and willow-fringed lagoon glowed like a blood-red jewel set in an emerald field, while flocks of geese, alarmed at our approach, rose from their feeding grounds with strenuous clangor and drifted off in countless numbers to some securer resting place in the vast expanse of radiant marshes and rolling tundra lands.

We reached Andreafski on the afternoon of June 22, and took advantage of this opportunity to wash out the boilers and fill the tanks with the clear water of the Andreafski River. While engaged

in this work, the steamer *Leah* came into port, and, after communicating with the shore, Captain Young informed me that it would be impossible for him to repair the damage done to the *Leah's* shaft at this place, or even get it into condition to make the trip to St. Michael in safety. As he had on board 90 passengers and was short of provisions, he requested our assistance to reach that port.

In accordance with this request, the *Leah* was lashed alongside of the *Nunivak*, this being the most effective manner of towing her through the narrow channels of the lower river, and next morning we left Andraefski and proceeded on our way downstream.

Shortly after leaving Andraefski a dense fog was encountered, and at times both shores of the river would be lost to view. Navigation of the tortuous channels under these conditions proved somewhat difficult, but thanks to the accuracy of the chart made by the officers on the way upstream we succeeded in reaching the mouth of the river, with the *Leah* in tow, next morning without mishap of any kind.

The Alaska Commercial Company's steamer *Hannah* was met at the lower part of the Aphoon, and ascertaining from her master that the harbor of St. Michael was now clear of ice, we crossed the bar and stood out to sea on the course for St. Michael.

At 6 p. m. of June 24 we reached St. Michael and, casting loose from the *Leah*, we came to anchor, and were welcomed back to the coast by numerous steam whistles on the vessels which were already in port.

The day previous to our arrival at St. Michael the U. S. S. *Bear*, Capt. Francis Tuttle, Revenue-Cutter Service, commanding, had reached port from the outside, having on board supplies for the *Nunivak* and the weather at this time being fine and the sea smooth we went alongside that vessel at 4 a. m. of June 25 and began at once to receive our stores.

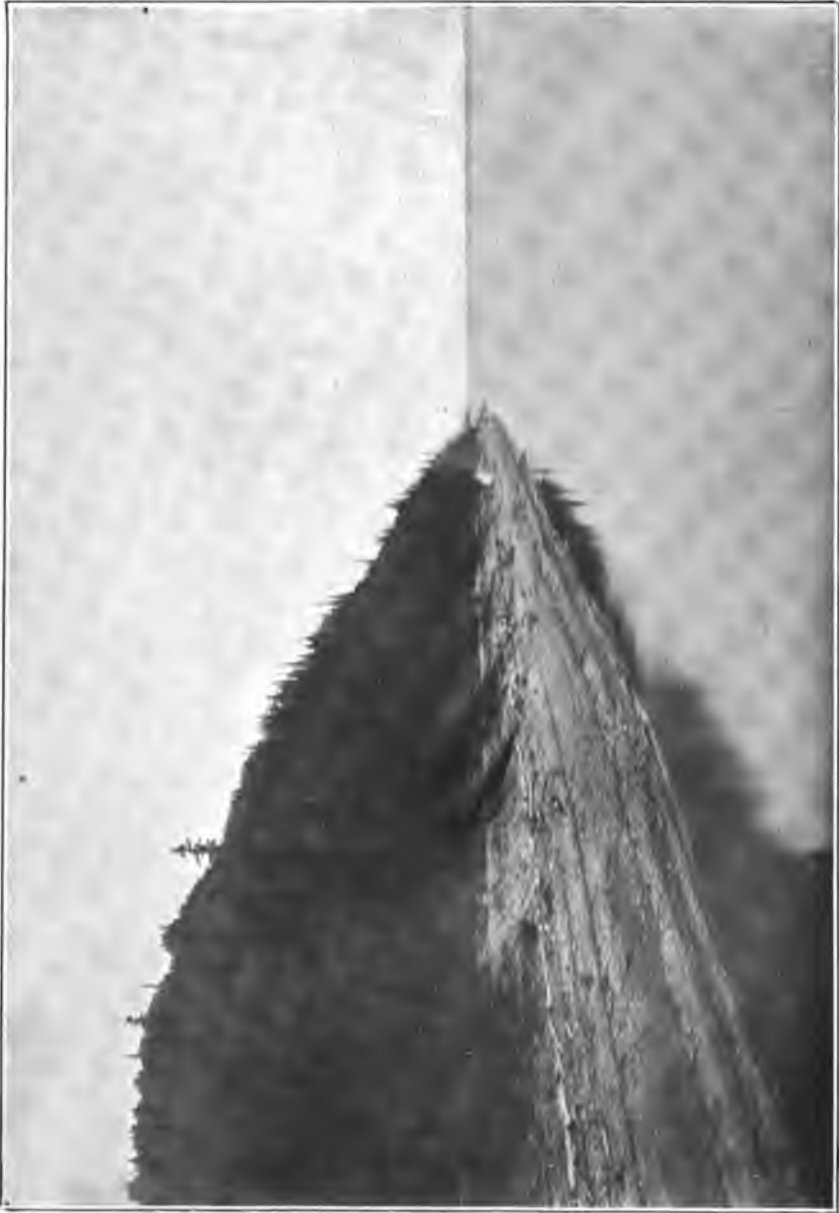
On June 26 the U. S. S. *McCulloch*, Capt. M. A. Healy, Revenue-Cutter Service, commanding, arrived with an additional quantity of stores for us and the day was spent in taking them on board. Arrangements were also made with Captain Healy for the transfer of the boat-swain, carpenter, a fireman, and a boy from the *McCulloch* to the *Nunivak*.

Dr. Pratt, who had been attached to the *Nunivak* as surgeon during the winter, having signified his desire to leave the Service, left the vessel at this place, much to the regret of all on board. He had proved himself to be a most agreeable shipmate and a thoroughly competent officer while attached to the command and it was with mutual expressions of regard and best wishes that he resigned his position and took up the duties of a position which had been offered him on shore. The duties of surgeon of the *Nunivak* were at once assumed by Dr. James T. White, who had arrived for the purpose on the *McCulloch*.

The hurried manner in which our stores had been received from the



CHARACTERISTIC SCENERY ON THE YUKON RIVER ALONG ITS MIDDLE SECTION.



CHARACTERISTIC YUKON RIVER BEACH, SHOWING MARKS OF SUCCESSIVE STAGES OF THE WATER LEVEL, WITH DEPOSITION OF DRIFTWOOD.

Bear and *McCulloch* made it impossible to properly stow them in the *Nunivak*; so, shifting our anchorage from the outer harbor to a more sheltered situation farther inside, the work of getting our supplies into shape was undertaken.

Meanwhile a number of the seamen who had shown most discontent during the winter were discharged and their places were filled by the enlistment of others more experienced in the vicissitudes of life in Alaska, and we were on the point of leaving St. Michael for our station on the river when the news of an epidemic of smallpox at Nome reached port. Under these circumstances I delayed our departure from St. Michael, feeling certain that in the event of a quarantine being found necessary at this port, the *Nunivak* could be more advantageously employed in assisting the authorities to maintain a quarantine of the port than by attending to any other duties on the river. I felt almost certain that if the disease ever reached St. Michael its spread up the river could be hardly prevented, and once in the river its progress through the country would be like wildfire. All other duties were, therefore, for the time relegated to a position of secondary importance.

On the 3d of July, by order of Brig. Gen. George M. Randall, U. S. Army, commanding the Department of Alaska, a quarantine of the harbor of St. Michael was established against all vessels arriving from Nome and coastwise ports to the westward, and I immediately called upon General Randall and signified my desire to cooperate with my command in the work of maintaining the quarantine. This tender of services was accepted, and preparations were at once made to guard the harbor.

The *Nunivak* was again anchored in the outer harbor, where an extensive view of the shipping could be had, and a night and day watch was maintained until the quarantine was raised. All vessels and boats arriving from sea were subjected to a rigid examination by a boarding officer and the surgeon of the *Nunivak*, and such craft, with their passengers, as were found to come within the restrictions of the quarantine were ordered to the anchorage of the detention camp established at Egg Island, some 10 or 12 miles from St. Michael. As an additional precaution against the landing of suspects a code of signals between the *Nunivak* and the army authorities was arranged, and sentinels were posted at convenient points on shore, with instructions to notify the *Nunivak* of the approach of all vessels and small boats toward the land in ample time to have them intercepted and examined before reaching the limits of the harbor.

All mail matter intended for St. Michael or in transit for points on the river was first brought on board the *Nunivak* and fumigated, under the direction of the surgeon of the vessel.

The quarantine lasted from July 3 until the 24th, when, all danger of the spread of the disease having passed, it was raised and we resumed our usual duties.

About this time reports began to arrive giving information of the prevalence of an epidemic of sickness among the natives along the coast from the mouth of the Yukon to as far westward as Cape Prince of Wales. The condition of the people soon became so bad that it was evident some steps must be taken by the Government to render assistance to them, or, failing this, great suffering from sickness and starvation would result. A consultation of the local army and Treasury officials was held, and it was decided, in view of the urgent nature of the case, that it would be necessary to immediately supply the natives with food, clothing, and medicines to tide them over their present distressed condition. In accordance with this decision a quantity of supplies were purchased from the local trading companies by Special Agent of the Treasury Joseph Evans, who was on duty at St. Michael, and placed on board the U. S. S. *Bear* for distribution to the natives along the coast to the westward, while the work of caring for the destitute ones in the immediate vicinity of St. Michael was undertaken by the army authorities.

From vessels arriving from the Yukon it was ascertained that the prevailing sickness had spread to the natives along the banks of the river in the region of the delta, and as we were about to leave for the region I suggested to Colonel Evans the advisability of placing some supplies on the *Numivak* for distribution to the sick and needy Indians in that locality. Accordingly a supply of food was taken on board for that purpose, and on the 13th of August we left St. Michael for our second journey up the Yukon.

Our progress across the Flats was made without incident worthy of note, and we entered the Aphoon mouth of the river at 8.30 a. m. of August 14. At Kotlik, 7 miles upstream, a party of the army telegraph construction corps was passed, and from some of its members we learned that many of the natives were sick and some had recently died from starvation as a result of their inability to catch their usual supply of fish during the summer. As we journeyed on the serious condition of affairs became more manifest with every mile of advancement upstream. The epidemic of measles, which appears to have originated on the coast, was now attacking the natives of the interior, and so rapidly had it spread that there was not a single settlement along the river from the coast to a distance of 1,000 miles upstream that was not more or less affected. How bad the condition really was we did not learn until later.

In most cases the attack of measles was followed by pneumonia, brought on no doubt by exposure. At this season of the year the natives live in thin tents or rude bark shelters, in which it is impossible for them to keep dry, as rains are of frequent occurrence.



INDIAN SUMMER FISHING VILLAGE, YUKON RIVER.

During the summer of 1900 many of these villages were almost depopulated by the ravages of sickness and starvation.



UNDERGROUND DWELLINGS OF ESKIMOS, AT HOLY CROSS MISSION, YUKON RIVER.

Fully 50 per cent of the natives of this village died of disease or starved to death during the year 1900.

Under these adverse conditions the poor creatures, for the most part living in isolated situations seldom or never visited by the whites, were simply dying like flies.

Night and day we pushed on up the river, visiting every native camp where signs of life could be observed, and everywhere the same condition of suffering and distress was found to exist. In places the whole community would be found either sick and starving or else so weak from insufficient nutrition as to be entirely helpless. In many cases the corpses of those who had died were left unburied in the tents because there was no one strong enough to perform the work of burial.

At Dog Fish Village, where we arrived on August 18, we found that out of a population of 27 souls only 7 remained, and of these only 2 were strong enough to take care of the food and medicines we left for them. At this place the bodies of some of the dead had been so insecurely buried that the dogs had dug them up, and the mangled remains were scattered over the ground where the animals had been feeding off them. Everywhere was there the unmistakable evidence of terrible suffering, absolute neglect, and grim despair.

The only exception to this rule was at places in the vicinity of the trading posts or church missions. At Andreafski all the natives were sick and had been attended to by the agent, Mr. Fredericks, until he fell sick himself, and when we arrived we found him helpless. At Russian Mission Father Korchinski and his assistant had worked nobly to alleviate the sufferings of their native charges, and at Holy Cross we found the sick people had been taken care of by the priests and sisters of the mission with a tenderness and devotion which no words can adequately describe.

About 200 natives live at or near Holy Cross Mission, all of whom had been sick, and 57 had died up to the time of our visit. Besides those directly under the care of the mission, the fathers had visited and attended to the wants of the natives at various settlements along the river within reach by boat, and their work had been constant, arduous, and self-sacrificing almost to the limit of human endurance. The mother superior of the mission had, in fact, died as a result of exposure and overwork while ministering to the sick Indians, and there was not one of the little community of Christian men and women who did not show the evidences of long days of weary watching and constant attention to the wants of their stricken fold. And yet on all their faces there was such an expression of patient cheerfulness that the heart must be made of stone that could remain unmoved in the presence of such absolute and unostentatious devotion to duty.

At Holy Cross we received on board the Rev. Aloys A. Ragaru and Sister Mary Antonio, of the Mission of St. Peter Clavers at Nulato, for transportation to that place, and on August 23 we resumed our journey upstream.

Arriving at Anvik at noon of the 24th, we ran in to communicate with Mr. Chapman, in charge of the Episcopalian mission at this place, and found the 150 natives under his charge were all sick and that his supply of medicines was almost exhausted. Mrs. Sabin, the superintendent of the native school here, had been working steadily fifteen hours a day for ten days attending to the wants of her pupils, all of whom had been sick at the same time, but thanks to her devotion all of them had recovered. Thirty-seven deaths had taken place among the Indians of the village adjoining the mission and many more of them were not expected to live at the time of our visit.

After visiting and prescribing for the sick and placing a supply of medicines on shore in charge of Mr. Chapman, we left Anvik at 4 p. m. and continued our progress up the river. The various native camps and trading stations where the Indians were gathered were visited and such assistance as was possible was given them. At Greyling we stopped for the night and found 65 Indians encamped and being cared for by Mr. R. G. O'Shea, an independent trader located at this place. In one of the tents on the beach a baby lay dead on a little mat of birch bark and the women of the family were crouched over the body chanting its death song. The men of the family sat outside the tent huddled around a logwood fire, apparently indifferent to the scene of mourning which was being enacted over the body of the dead child; but it may be that their indifference was only assumed and that their grief, though silent, was as sincere as that of the wailing women inside the tent. Who can tell?

Upon our arrival at Nulato the condition of the natives along the river had been ascertained to be so much worse than had been anticipated before our departure from St. Michael that I reported the facts to Colonel Evans and strongly urged him to send additional supplies, as quickly as possible, to the several missions and trading posts on the lower river for distribution to the Indians.

The lateness of the season and the knowledge that the prevailing condition of sickness and distress among the natives extended still further upstream made it impracticable to turn back with the *Nunivak* to get these fresh supplies. I therefore relied upon Colonel Evans and the army authorities at St. Michael to arrange the matter of transportation, and subsequent events proved that this action was the best that could have been taken under the circumstances. Upon receipt of my letters of advice Colonel Evans acted promptly, and with the hearty cooperation of the army authorities and the manager of the Alaska Commercial Company ample supplies of food, clothing, and medicines were hurried up the river and left at the various stations and missions in the hands of responsible parties for distribution. This work was so efficiently done that starvation to hundreds of the Indians was undoubtedly averted, their immediate wants supplied, and returning health



NATIVE TENT AT GREYLING, YUKON RIVER, IN WHICH A BABY LAY DEAD OF STARVATION AT THE TIME OF OUR VISIT.



NATIVE FOOD CACHES FOR STOWING FISH AND OTHER SUPPLIES FOR WINTER USE.

Usually these caches are filled with food each summer, but in the year 1900 owing to an epidemic of sickness they were empty and many natives starved the following winter.

soon saw the remnants of the several communities once more self-supporting.

The weather during the month of August was unusually disagreeable. Cold winds and driving rain storms made our journey anything but a pleasant one, and it was not until our arrival at Fort Gibbon on August 30 that the usual fine weather characteristic of the Yukon Valley was experienced. Here blue skies and warm sunshine succeeded the dull, moisture-laden atmosphere of the lower river, and once more our eyes were gladdened by the sight of verdure-clad hills and valleys filled with blooming flowers. The prodigal display of color in the landscape at this season of the year makes it appear as if all nature were uniting in one vast assemblage of flaming leaf and blooming shrub to say good-bye to earth before the coming of winter, and to die in a blaze of glory.

As we journeyed up the river our frequent stops at the wood yards gave Dr. White and myself opportunities for short rambles in the woods to gather specimens for our natural history collections. Blueberries of two varieties, the high and low bush cranberries, raspberries, currants, salmon berries, gooseberries, bearberries, and a species of edible rose-hip were found in abundance and furnished an agreeable addition to our larder.

The doctor was an enthusiastic collector of material for the herbarium and seldom returned from a trip through the woods without having obtained some new specimens for the collection, and always brought back quantities of wild flowers with which our quarters were decorated and the surroundings made to appear more homelike and cheerful.

The season was now so far advanced that the mosquitoes had almost disappeared, but their place was taken by swarms of minute gnats whose persistent attentions were quite as annoying though not as painful as those of the mosquitoes. The gunners of the party, whose tramps usually extended to some distance inland from the river, frequently returned empty handed, not on account of the scarcity of the game so much as because the attacks of swarms of gnats simply drove them wild and made careful shooting impossible.

We passed through the Rampart Rapids safely and with very little trouble on September 4, and the next day reached Rampart City. Here a stop was made to clean boilers and make some slight repairs to the machinery and also for the purpose of allowing the crew to purchase some needed articles of winter clothing from the army commissary depot located at this place, permission to obtain these articles having been kindly granted by the department commander.

While at Rampart City I received notification from the Department of the detachment of Assistant Engineer Wood from the *Nunivak* and his assignment to the U. S. S. *Bear*, and the information that Assistant Engineer T. G. Lewton, R. C. S., had been directed to join the

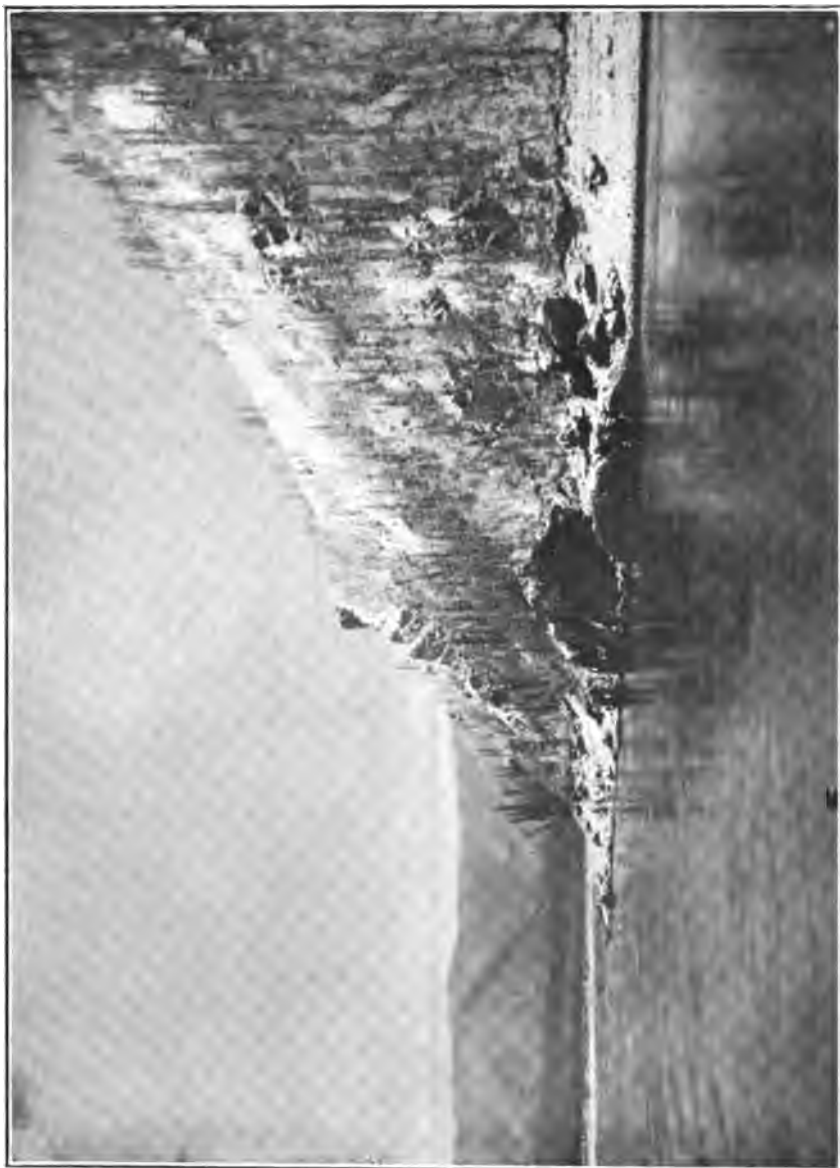
Nunivak as the relief of Mr. Wood. The latter officer was therefore directed to hold himself in readiness to take the next steamer met on her way to St. Michael, where the *Bear* could be joined in obedience to his orders.

After a pleasant stay at Rampart City of a few days, we left there on September 7 and ran to the Pioneer Coal Mine where we stopped and took on board 65 tons of coal for winter use. Proceeding slowly up the river and stopping at various places on the way, we reached Fort Shoemaker on September 13 and put on shore at our winter quarters a quantity of stores. The Indians in the vicinity were found to be suffering from the prevalent sickness and lack of food. Dr. White visited the village daily and prescribed for them, and a supply of food was given them from the emergency ration of the *Nunivak* sufficient for their immediate wants and we then returned to Fort Hamlin on the Yukon and resumed our duties on the river.

The steamer *Robert Kerr* was boarded on her way from St. Michael to Dawson, with a cargo of refrigerated meats, eggs, etc., on board. Through the kindness of Mr. Sedden, the manager of the company, we received a very acceptable present of a quantity of fresh beef and a couple of fine turkeys, all of which was very much enjoyed, as we had had nothing in the way of fresh meats since our departure from the coast. On September 15 the steamer *Susie* from St. Michael arrived on her way to Dawson, and we were all delighted to welcome Lieut. W. J. Wheeler, R. C. S., who had been ordered to duty on the *Nunivak*, and after a somewhat exciting chase of over 1,000 miles up the Yukon had finally overtaken us at this point. At the time of his departure from the coast Lieutenant Wheeler had heard nothing of Mr. Lewton's movements, nor could he give me any information as to the probability of any other vessel coming up the river later than the *Susie*, by which that officer could join us before the closing of navigation.

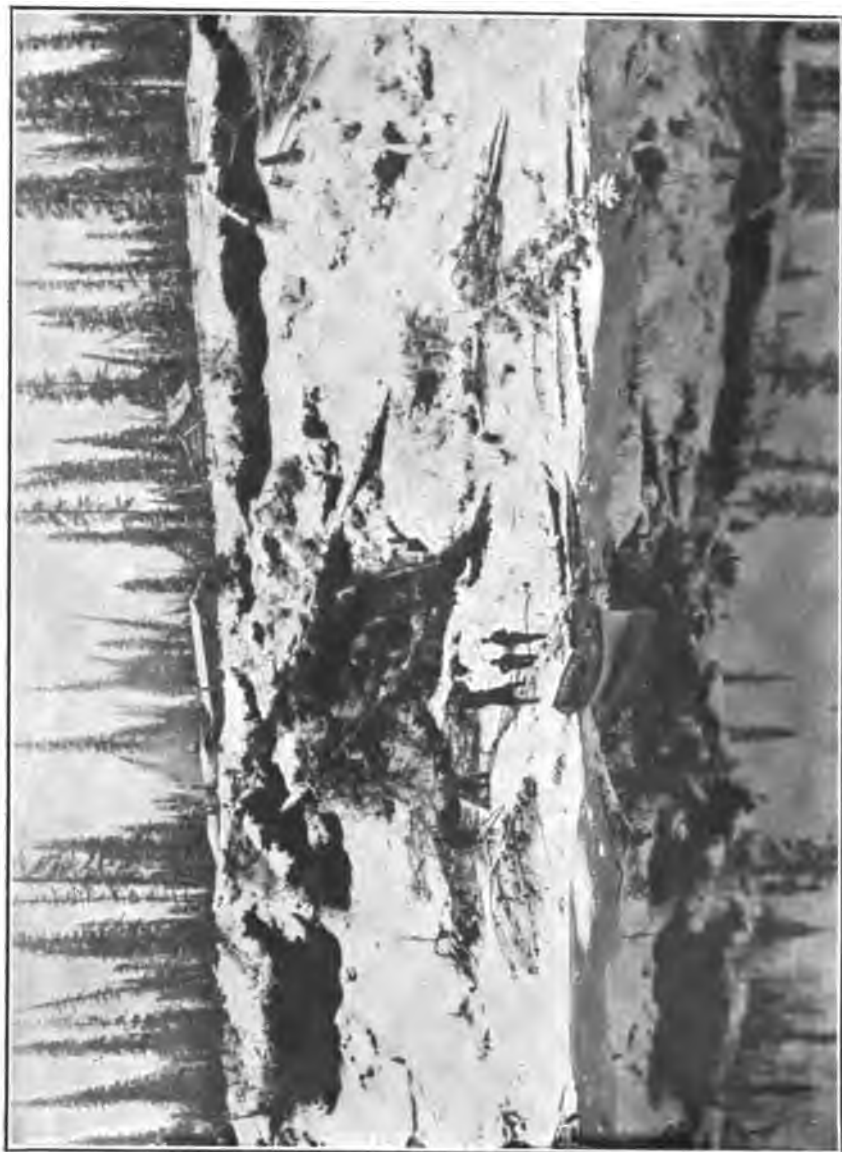
On the 16th of September the steamer *P. B. Weare* was boarded on her way from Dawson to St. Michael, and as this vessel would probably be the last one to reach the coast before the closing of navigation I directed Assistant Engineer Wood to take passage on her, in obedience to his orders of detachment. This left the vessel without an engineer officer, but I had no doubt that Mr. Lewton would manage to get to us in some way, and as we were fortunate in having two very competent enlisted machinists attached to the vessel who could carry on the duties in the engineer's department satisfactorily unless some unforeseen accident should occur, I had no hesitation in pursuing the course I did in regard to Mr. Wood's orders, especially as they were of a character as left me no discretion in the matter.

Meanwhile active preparations were being made to get a supply of wood into Dall River for winter consumption. Our experience of the previous year led me to believe that it would be impossible to procure



CHARACTERISTIC VIEW OF THE YUKON IN THE LOCALITY OF THE RAMPARTS.

The photograph was taken after the first fall of snow in the fall.



THE BEGINNING OF WINTER AT FORT SHOEMAKER—GETTING OUT HOUSE LOGS.

a sufficient quantity of fuel to last through the winter by cutting it near our station. We therefore busied ourselves during the day in taking on wood wherever it could be obtained in the immediate vicinity of Dall River and transporting it to Fort Shoemaker when the vessel was loaded. In this way we succeeded in getting about 160 cords landed at Fort Shoemaker before the closing of the river drove us into winter quarters.

The weather during the latter part of September was clear and cold, with the temperature ranging from 34° to 40° F. during the day, but considerably lower at night. I quote from my journal of September 20:

Ice forms on the deck of the vessel at night, and the tops of the mountains and some of the lower hills are covered with newly fallen snow. The bright-colored autumn leaves are falling in showers from the poplar and birch trees, and the smaller plants are beginning to shrivel up and turn brown. There is that strange cessation of noise on all sides which seems always to presage a change in atmospheric conditions, and all at once we realize that summer is ended.

On the 20th of September the steamer *D. R. Campbell*, from Dawson to St. Michael, was boarded and I was handed a letter from the master of the steamer *Robert Kerr*, informing me that the vessel had become disabled by the breaking of the shaft of one of her wheels when near Circle City, and requesting the assistance of the *Nunivak* to convoy him to Dawson. The lateness of the season and the fact that all the passengers of the *Kerr* had been transferred to another vessel for transportation to Dawson, thereby relieving the situation from danger of any loss of life, led me to decide not to attempt to perform this service. My decision in the matter was strengthened, also, by the facts that the *Nunivak's* cruising ground did not extend beyond Dall River and only the most urgent necessity would warrant me in going beyond these limits; there was no imminent danger to the *Kerr* in her present condition, as she could easily reach a safe place in which to spend the winter, and, furthermore, there were at least three commercial steamers to my certain knowledge within reach of communication from her in case the assistance asked for was absolutely necessary.

On September 21 the steamer *Alice*, bound up the river, arrived from St. Michael, and I informed her master, Captain Moore, of the condition of the *Kerr* and sent word by him to the master of the latter vessel that it would be impracticable for the *Nunivak* to come to his assistance.

On the 22d of September the steamer *Bella* passed on her way downstream and I was informed by her master that the river was falling very rapidly in its upper portion and that he did not think any other vessel would attempt to come down this year. He hardly expected to be able to reach the coast himself, but might succeed in getting

as far as Andreafski. I was also very much relieved to hear from the *Bella* that the *Kerr* had patched up her broken shaft and was making her way to Dawson without assistance.

On September 27, while lying in Dall River, smoke from a steamer coming up the river was observed and we ran down to board her. The vessel proved to be the North American Trading and Transportation Company's steamer *Powers*, from St. Michael bound for Dawson. I fully expected to find Mr. Lewton on board, and was much disappointed when I found that he was not. The master of the *Powers* informed me that his vessel would probably be the last one to leave St. Michael for the upper river this year, and after kindly waiting for us to get our mail ready for transmittal to the outside he proceeded on his way and we returned to Dall River.

The duties of the command on the Yukon now being practically ended for the season, and there being a considerable amount of work to do at Fort Shoemaker in order to get the ship comfortably arranged for the winter, I decided to delay no longer, but proceed at once to lay the vessel up.

The duties of the command during the season just closed had been for the most of the time exacting and arduous. Much of the work performed had been unexpectedly thrust upon us by unforeseen circumstances, but neither the additional duty in connection with the maintenance of the quarantine at St. Michael nor that which later fell to us in rendering assistance to the distressed Indians along the river had interfered with the performance of our regular duties on the station. Every vessel engaged in traffic on the river had been boarded and carefully inspected, to see that they were in compliance with the law, at least once, in some cases more times, during the season. Several reports of infraction of law had been made to the proper authorities, assistance to vessels and persons had been rendered whenever a legitimate case of distress or destitution had been encountered, law and order had been enforced on several occasions where the *Nunivak* was the only representative of the Government at hand, the steamboat channel of upward of 1,000 miles of river navigation hitherto uncharted had been accurately mapped, and, finally, much useful information of the country and its products had been obtained by the officers of the vessel while attending to their regular duties.

A feeling of general satisfaction and cheerfulness therefore pervaded the command when the signs of approaching winter informed us that the disagreeable summer, with its attendant trials, was a thing of the past, and it was with an actual consciousness of relief that we entered upon the second winter's occupancy of Fort Shoemaker.



DALL RIVER. CREW OF THE NUNIVAK HAULING SEINE FOR FISH TO BE PUT UP FOR WINTER USE.

CHAPTER VI.

One of the first duties after reaching Fort Shoemaker was to get a number of dogs belonging to the vessel, and some which were private property of the officers, ashore and out of the way on board. These animals had been confined on board for upward of two months, with hardly a single opportunity of getting any exercise on shore, and their presence on the vessel from first to last had been an unmitigated nuisance to everyone on board. Now that the time for their removal had arrived, it is hard to say which were more pleased at the change of their living quarters, the people who had been annoyed by the dirt and noise which their presence on board made, or the dogs themselves, who showed their joy on being released by the most extravagant antics when they finally were set at liberty. Among our dogs were 9 which had been secured for the use of the command by Capt. Francis Tuttle, Revenue-Cutter Service, commanding the U. S. steamship *Bear*, in Siberia. It was thought that these animals would be superior to those on the Alaskan mainland. But shortly after their arrival on the *Numivak* nearly all of these dogs were taken sick, and several died after a lingering and painful illness of a week or ten days from the time of first seizure. It was at first thought that the dogs had been poisoned by eating food which had been prepared in a brass kettle. But as none of the other dogs seemed to be attacked, we finally decided that the long confinement of the animals on the *Bear* in transit from Siberia and their subsequent journey on the *Numivak*, together with the change from their accustomed form of diet, all tended to make them sick. As a matter of fact, however, the Siberian dogs are not as well adapted for use in Alaska as the native-born animal, and with one or two exceptions none of those which had been secured for our use at so much trouble by Captain Tuttle could stand up to the work cut out for them by the dogs which we had purchased on the Yukon River. A whole volume would be necessary to write a complete description of the dog, his peculiarities, habits, training, endurance, etc., and in point of fact no report of this region would be complete without taking this subject into consideration. A good dog team is absolutely necessary to the traveler in this country in the winter time, and in spite of various proposed substitutes all efforts

to find a more suitable or efficient method of transportation have been more or less failures. I shall endeavor in another part of this report to give some idea of the manner in which dogs are raised, trained, and handled in this country, and as our experience with the animals was somewhat varied and extensive the results of our observations may be of some interest.

On the 1st of October we were very glad to hear the sound of a steamer's whistle in the Yukon, and as ice was running in that stream we felt assured that it was from some vessel which was making for the Dall River as a haven for winter quarters. Our surmise proved correct, for in a short time the steamer *Alice*, belonging to the Alaska Commercial Company, Capt. J. H. Moore commanding, came into the river, and her master informed me that he had been ordered to lay the vessel up at this place for the winter.

A good location about half a mile above Fort Shoemaker was selected by Captain Moore, and the *Alice* at once proceeded upstream, and the work of putting the vessel into winter quarters was begun.

At the first signs of ice in the Dall, grayling in large quantities appeared in the water alongside the vessel, and as they eagerly bit at almost any kind of bait we succeeded in taking them in large numbers and freezing them for future use.

Meanwhile the work of getting the *Nunivak* stripped and prepared for winter occupancy was pushed to completion before the advent of cold weather. Our experience of the previous winter had taught us several lessons in the matter of making the vessel comfortable, and one of the most important of these was the method of housing her in. The previous year we had thought it necessary to cover the entire hurricane deck with a false roof made of lumber, which extended from the sides to the center line of the roof and was made practically air-tight. This necessarily excluded all of the light coming through the skylights, and for this reason was very objectionable. This winter the false roof was made to extend only as far as the sides of the skylights, thus leaving the windows clear for the admission of as much light as possible. The top of the false roof was covered with a layer of building paper, over which was placed a layer of empty coal sacks, which, when frozen, formed an ideal roof for this climate. Air spaces were left at intervals to ventilate the space between the false roof and hurricane deck, and this was found to be an effective method of preventing the collection of frost on the interior of the living quarters, a matter which had given us considerable trouble the first season. The side windows of the living quarters were made double by simply inserting in the sash an additional pane of glass with less than a quarter-inch space between, but made absolutely air-tight. In this way the glass never collected frost and remained perfectly clear the entire winter. Windows which were allowed to remain single soon were



FORT SHOEMAKER, DALL RIVER. ARRIVAL OF THE MAIL MAN AT THE BEGINNING OF WINTER TRAVEL ON THE YUKON.

On account of the thin ice at this season only the lightest sleds, with small loads, are used.



FORT SHOEMAKER, DALL RIVER, SHOWING CLUBHOUSE, STOREHOUSE, AND FOUNDATION OF GYMNASIUM BUILT BY THE CREW OF THE NUNIVAK FOR USE DURING THE WINTER.

obscured by a mass of frost, varying in thickness from a mere filmy coating to as much as $1\frac{1}{2}$ inches. It was a peculiar fact that the glass in the skylights, although allowed to remain single, collected very little frost during the winter. This was accounted for by the fact that the dry heat of the quarters collected in the skylight space overhead, and so prevented the accumulation of sufficient moisture on the surface of the glass to form frost. I observed also that a window which was directly over a steam heater in my bedroom remained clear as long as heat was turned on, but immediately became covered with frost when the heat was turned off.

All of the doors leading from the exterior of the house into the quarters which could possibly be dispensed with were closed and covered with canvas held in place by weather strips, and we found that this not only made the interior of the vessel much more habitable, but a greater evenness of temperature could be maintained than was otherwise possible during the entire winter.

In laying up the vessel a spot was selected as far from the bank as possible, where the bottom was found by careful sounding to be free from any inequalities, and finally, when she settled on the bottom, the few inequalities observed were removed by the use of the steam pumps and fire hose to hydraulic them away. The lower portion of the wheel was removed and the rudders unhung and hoisted up clear of the water before the ice formed so as to avoid the labor of cutting them out in the spring, and when the vessel took the bottom heavy shores were put in position under the ends of the cylinder timbers and wedged up to take off the strain. The hog chains were then slackened to prevent undue strains on the hull which would result from the contraction of the metal during the cold weather. To insure having a clean supply of water for use in the boilers an oil barrel, through the bottom and side of which numerous holes were bored, was sunk alongside the vessel in a position convenient of access from the engine room, and a small steam pipe led into it kept it open all winter.

These and other minor preparations occupied the command until the middle of the month, when the ground was sufficiently well covered with snow to furnish good running for sleds, when the men were set at work in the woods getting out logs for the construction of additional houses, which experience had shown would be of value to us while in winter quarters. A space was cleared on the bank of the Dall next to the large storehouse in which were placed the most of our supplies and equipment, and here were built two new houses, one of which was 20 by 15 feet and the other was 25 by 30 feet. The smaller house was fitted up as a clubhouse for the accommodation of the crew while off duty, and the larger building was utilized as a gymnasium and drill room in which to exercise the men during cold or inclement weather. Both houses were heated during the winter by stoves and proved to be

of great convenience to the command while at Fort Shoemaker. The clubhouse was particularly desirable as furnishing a place in which the men could congregate during the long winter evenings and amuse themselves without disturbing others on the vessel. It was well lighted and furnished with a large table, benches, etc., and kept supplied with files of newspapers, magazines, and books contributed by the officers. Both these houses were built with a view of their possible occupancy in case of any accident, as of fire for instance, happening on the *Nunivak*, and when they were completed I felt considerably relieved, as the fear of fire on the vessel was seldom absent from my thoughts. Our arrangements for extinguishing fire on the ship were as complete as it was possible to make them under the circumstances, but at the best I realized that if one should unfortunately take place during the intense cold of midwinter it would be hard to control, and in case we had to abandon the vessel with no place to find immediate shelter the whole command would be in a bad position.

The Dall froze over solid on the 14th of October, and by the 19th of the month the Yukon had also ceased to run opposite the mouth of the Dall.

The Indians only awaited this event to inaugurate a grand rabbit hunt on an island opposite their winter village at the mouth of the Dall, and when it happened, men, women, and children crossed the Yukon and spent the day in rounding up and slaughtering the animals. Their plan was to have all the women and children enter the woods at one end of the island and to march through to the other end in a long extended line, shouting and beating the brush as they went. The frightened animals were driven in this way out into the open and fell an easy prey to the hunters lying in wait for them. During the progress of the hunt the Indians became much excited and when the rabbits came in sight a fusilade of shots greeted them, but the firing was so rapid and careless that the wonder is that as many women and children were not killed as rabbits. Strange to say, however, but few such accidents occur. We knew of only one instance during the winter where any of the people were wounded in one of these battues. I happened to be present when this occurred, and was horrified to see young Titus, a boy whom we all knew on the *Nunivak*, suddenly fall to the ground and with a heartrending groan apparently give up the ghost. I ran to his assistance, and after finding that he was not dead I helped him to his feet and made a hasty examination of his "wound." A single shot had struck his thumb nail and slightly abraded the flesh, but had passed on without doing any further damage. When Titus fell all the Indians incontinently fled, and half an hour afterwards I accompanied Titus to the village and found every hunter hidden away in his house and the women all ready to set up a death song. Meanwhile Titus, after having his arm put in a sling, took to his bed and was with difficulty persuaded that he was not really very seriously injured.



FORT SHOEMAKER, DALL RIVER. HUNTING TRAIL THROUGH THE WOODS AFTER THE FIRST HEAVY FALL OF SNOW.



FORT SHOEMAKER, DALL RIVER. TYPICAL VIEW OF WOODLAND SCENERY—SPRUCE, BIRCH, AND WILLOW TREES PREDOMINATE.

With the closing of the Yukon the weather, which had been more or less unsettled for some time, gradually grew colder, the snow fell steadily, and by the 20th of October all the inequalities of the land were hidden from sight and the work of making winter trails began to be prosecuted in earnest.

One of the pleasant experiences of a winter's sojourn in this country is to walk through the woods at this time of the year and note the innumerable tracks of the little denizens of the forest as they appear in the newly fallen snow. Here can be traced the dainty footsteps of the grouse as he marches across the river to some tiny water hole, where one can in imagination almost see him dip his beak into the babbling spring and then lift his head with grateful thanks to the Giver of all Good for the draft. After quenching his thirst he evidently is in no hurry to leave, as his footprints show. But finally, as if seized by some sudden thought, off he goes straight across the river again and up the steep bank, where, if we are so inclined, we can follow and see where he has been perched on some old fallen tree and the tumbled snow tells the tale of a period of strenuous drumming. There a hunched imprint of four little feet with sharp claws at intervals of 2 or 3 feet in the snow (the distance depending entirely on his state of mind while running) shows plainly enough that an ermine has passed, and there the dog-like track of a predatory fox pierces the fleecy surface, and alongside of his trail there is now and then a curving gash which the drooping wing of some murdered bird he is bearing away makes in the snow. If we follow up this trail we will not see the fox, but we will likely find a soft little pile of feathers and a heap of well-cleaned bones to tell the tale of Reynard's prowess. The country is crossed and recrossed with the trails of the wild animals, and after the first month of snow these have developed into well-defined runways and beaten paths through the thickets of willow and alder and along the banks of the smaller streams. The depth of the snow in former years can be easily determined by the old marks of the rabbit's teeth on the willow branches, and where a moose has passed is as plainly shown as if the occurrence and time of his visit had been written and posted on a signboard.

As soon as the Dall froze over solid and the winter trails were in condition for traveling all the members of the command whose duties would permit of their absence from the vessel spent most of their time in making short excursions through the woods in search of game or, for those of less energetic temperament, the level surface of the river, completely sheltered from the wind by the high banks, was an ideal place for taking some milder form of exercise. Our amusements at this time of the year consisted of hunting grouse, which were fairly plentiful in the woods, snaring rabbits, and trapping the smaller animals. Skating, bicycle riding, football, and snowshoeing

absorbed the attention of some of the party, while the work of training our numerous dogs was a never-failing source of interest to others. Fort Hamlin, the trading post of the Alaska Commercial Company, situated about 9 miles from Fort Shoemaker, was the objective point of occasional sled trips, and this run on the main trail of the Yukon frequently brought us into contact with travelers faring up and down the river, from whom the smallest item of news was always eagerly received and brought back to the ship as the latest bulletin "from the outside."

The month of October is spent by the Indians in their winter houses as a kind of holiday season. As a usual thing the fish they have taken during the summer furnish them with food sufficient for present needs, and beyond this they have very little concern. The women do most of the household drudgery, besides making the moccasins, mitts, and other articles of clothing of native manufacture; but, on the other hand, they are allowed a considerable amount of personal liberty and are, as a general rule, well treated by the men.

By the middle of October all the Indians living in the vicinity of Dall River had returned from their various fishing camps and taken up their quarters in the winter village at the mouth of the Dall. Under the care of Dr. White, and with the assistance that was given them by the *Nunivak*, most of the natives who were sick when we arrived at this point in September were by this time fully recovered, and all were frequent visitors at the ship. As we were almost entirely dependent upon the native men for our supply of fresh moose meat during the winter, and upon the women for native-made moccasins, mitts, etc., without which it is impossible to get along in this country, every effort was made to cultivate a friendly feeling between them and the members of the command. It gives me pleasure to say that during the two winters we were at Fort Shoemaker there were less than half a dozen complaints of ill treatment made by the Indians against the members of the *Nunivak's* crew, and not one of these was of a serious nature. The conduct of the natives was most exemplary. There was no drunkenness observed among them, although, like all other natives, they have an inordinate appetite for liquor of any description, and their conduct on the vessel was always marked by extreme deference to our wishes and an entire absence of intrusiveness. On the whole, I think that our presence in the river did much to alleviate the hardships of their life, and they were certainly of great assistance to us in many ways. Of their customs and manner of life I shall endeavor to give an account in another part of this report.

On October 27 the mailman arrived on his first trip from Rampart, and reported that the Yukon was not yet entirely closed below Fort Hamlin, and that on his way up he had been compelled to leave the river and travel along the banks. He had had a hard trip, and his



TYPE OF INDIAN HUNTER AND SLED DOGS.

The large dog in the foreground is a St. Bernard, imported from the outside; the one on the right of the hunter is a pure bred Malamute, and the other two are mixed breed.



FORT SHOEMAKER, DALL RIVER. LOG HOUSE INTENDED FOR USE AS A HOSPITAL BUT ITS OCCUPANCY WAS NEVER FOUND TO BE NECESSARY.

dogs' feet were in a bad condition. We invited him to stop with us for a few days in order to rest his dogs, and the invitation was accepted. After a rest of two days the mailman left, taking our letters for the outside, and this event seemed to accentuate the fact that we were indeed cut off from the outside world. The weather had been so fine during the month of October, and we had been so busy, that no time had been left to think much of our isolated situation; but with the shortening of the days and a realization of the fact that it would be months before we could receive answers to the inquiries we had just sent out to our loved ones at home came a feeling of sadness which it was impossible to prevent and which required the utmost effort of the will to shake off.

I quote from my journal of November 1:

The rapidly shortening days, the brief glimpse of the sun at noon over the tops of the mountains in the south being the chief event of the twenty-four hours worthy of note, and the monotony of our duties all tend to make this time of the year the hardest to get through with. In the absence of birds to work on, the doctor and I to-day attempted to skin a mink. We found to our sorrow that the animal has an odoriferous means of defense fully the equal of that of the polecat, and we were compelled to call to our assistance one of the Indian boys, who agreed to skin the mink if we would give him the carcass. This arrangement, being eminently satisfactory to all, was agreed to without discussion.

The flesh of the mink and muskrat both is eaten by the Indians, and is esteemed as a dainty. I have not yet tried the mink, but I did eat some muskrat and found it excellent, without a particle of objectionable flavor.

The month of November was characterized by an extraordinary range of temperatures. During the first week the usual cold weather prevailed, the temperature ranging from -10° to -25° F., but after this time the weather turned much warmer, and on the 18th of the month a heavy rainfall occurred during the night. This melted the snow on the roof and the water soaked through into the living quarters and for a time made it very uncomfortable. After this, however, the weather cleared and by the end of the month the temperature fell as low as -50° F., and remained at this point for several days. While the weather was in its unsettled condition the temperature frequently fluctuated over 40° during the twenty-four hours. On November 5 the water from the Yukon backed into the Dall and raised the ice nearly 2 feet. The surface of the ice was upheaved and cracked and the trails were ruined by the overflow of water. All travel was for the time being suspended, but with the settling of the weather and the next heavy fall of snow things resumed their normal condition.

During this period of alternately freezing and thawing weather our attention was called to the beautiful snow crystals which formed on the windows of the ship and upon the surface of the river. These crystals took the shape of masses of feathery fronds and fern-like

plants, and were especially beautiful along the margins of surface cracks and water holes. On very thin ice the crystals were formed into tiny groups and clusters, composed of innumerable geometric figures which never seemed to be exactly alike in any two localities, but were apparently the result of varying atmospheric conditions, which caused them to be deposited with the infinite variety of kaleidoscopic designs. I made several attempts to obtain photographs of these snow crystals, but they were too delicate to permit of being handled, and before suitable apparatus could be devised for the purpose the opportunity had passed.

December opened with clear and cold weather. The ice in the Yukon by this time had attained a thickness of about 2 feet, and the Indians, who were fortunate enough to have fish traps, now set them through holes cut in the ice. The traps consisted of two wing weirs 12 feet long and 4 feet high, and a cylindrical basket, having in each end a cone securely fastened, with its apex pointed to the center of the basket. The weirs were set in water from 10 to 12 feet deep, at right angles with the current, and held in this position by long poles driven into the bottom. The basket was suspended between the ends of the weirs at their point of intersection and so placed that fish either coming up or down stream and encountering the weirs would be compelled to enter the basket through the inverted cones in order to proceed. Once inside the basket they can not escape owing to the small size of the opening at the apex of the cone. The hole through the ice is kept opened by the use of a long-handled implement made in the shape of a double-edged chisel. The traps are visited irregularly, the time varying with the demand for fish and the capacity of the baskets. The Indians kept us pretty well supplied with fresh fish caught in their traps during the winter, selling them to us at the rate of 25 cents per pound or exchanging them for such articles as flour, tea, sugar, etc., which we could spare from our supplies.

Most of the fish taken at this season were of the genus *Coregonus*, or white fish, of which there were several varieties, and all of them furnished an excellent substitute for our rather monotonous fare of canned goods and moose meat. Another common winter fish is the "losh" (*Lota maculosa*?), which is very popular with the natives on account of its very rich oily liver, but is not much eaten by the white population, except when no other fish can be obtained.

On December 2 our Indian neighbor Sam arrived from his cache in the mountains, about 40 miles away, with two legs of moose meat which he and his younger brother Harry had hauled to camp on a sled themselves. They had been on the trail for three days, with hardly anything to eat except meat, and had had a hard time. Sam was very nearly exhausted and immediately went to bed on reaching his house, but Harry, who was a boy of 14 years of age, seemed but little the



YUKON RIVER "LOSH" (*LOTA MACULOSA*).



FORT SHOEMAKER, DALL RIVER. TYPICAL VIEW OF WOODLAND SCENERY—SPRUCE, BIRCH, AND WILLOW TREES PREDOMINATE.

With the closing of the Yukon the weather, which had been more or less unsettled for some time, gradually grew colder, the snow fell steadily, and by the 20th of October all the inequalities of the land were hidden from sight and the work of making winter trails began to be prosecuted in earnest.

One of the pleasant experiences of a winter's sojourn in this country is to walk through the woods at this time of the year and note the innumerable tracks of the little denizens of the forest as they appear in the newly fallen snow. Here can be traced the dainty footsteps of the grouse as he marches across the river to some tiny water hole, where one can in imagination almost see him dip his beak into the babbling spring and then lift his head with grateful thanks to the Giver of all Good for the draft. After quenching his thirst he evidently is in no hurry to leave, as his footprints show. But finally, as if seized by some sudden thought, off he goes straight across the river again and up the steep bank, where, if we are so inclined, we can follow and see where he has been perched on some old fallen tree and the tumbled snow tells the tale of a period of strenuous drumming. There a bunched imprint of four little feet with sharp claws at intervals of 2 or 3 feet in the snow (the distance depending entirely on his state of mind while running) shows plainly enough that an ermine has passed, and there the dog-like track of a predatory fox pierces the fleecy surface, and alongside of his trail there is now and then a curving gash which the drooping wing of some murdered bird he is bearing away makes in the snow. If we follow up this trail we will not see the fox, but we will likely find a soft little pile of feathers and a heap of well-cleaned bones to tell the tale of Reynard's prowess. The country is crossed and recrossed with the trails of the wild animals, and after the first month of snow these have developed into well-defined runways and beaten paths through the thickets of willow and alder and along the banks of the smaller streams. The depth of the snow in former years can be easily determined by the old marks of the rabbit's teeth on the willow branches, and where a moose has passed is as plainly shown as if the occurrence and time of his visit had been written and posted on a signboard.

As soon as the Dall froze over solid and the winter trails were in condition for traveling all the members of the command whose duties would permit of their absence from the vessel spent most of their time in making short excursions through the woods in search of game or, for those of less energetic temperament, the level surface of the river, completely sheltered from the wind by the high banks, was an ideal place for taking some milder form of exercise. Our amusements at this time of the year consisted of hunting grouse, which were fairly plentiful in the woods, snaring rabbits, and trapping the smaller animals. Skating, bicycle riding, football, and snowshoeing

absorbed the attention of some of the party, while the work of training our numerous dogs was a never-failing source of interest to others. Fort Hamlin, the trading post of the Alaska Commercial Company, situated about 9 miles from Fort Shoemaker, was the objective point of occasional sled trips, and this run on the main trail of the Yukon frequently brought us into contact with travelers faring up and down the river, from whom the smallest item of news was always eagerly received and brought back to the ship as the latest bulletin "from the outside."

The month of October is spent by the Indians in their winter houses as a kind of holiday season. As a usual thing the fish they have taken during the summer furnish them with food sufficient for present needs, and beyond this they have very little concern. The women do most of the household drudgery, besides making the moccasins, mitts, and other articles of clothing of native manufacture; but, on the other hand, they are allowed a considerable amount of personal liberty and are, as a general rule, well treated by the men.

By the middle of October all the Indians living in the vicinity of Dall River had returned from their various fishing camps and taken up their quarters in the winter village at the mouth of the Dall. Under the care of Dr. White, and with the assistance that was given them by the *Nunivak*, most of the natives who were sick when we arrived at this point in September were by this time fully recovered, and all were frequent visitors at the ship. As we were almost entirely dependent upon the native men for our supply of fresh moose meat during the winter, and upon the women for native-made moccasins, mitts, etc., without which it is impossible to get along in this country, every effort was made to cultivate a friendly feeling between them and the members of the command. It gives me pleasure to say that during the two winters we were at Fort Shoemaker there were less than half a dozen complaints of ill treatment made by the Indians against the members of the *Nunivak's* crew, and not one of these was of a serious nature. The conduct of the natives was most exemplary. There was no drunkenness observed among them, although, like all other natives, they have an inordinate appetite for liquor of any description, and their conduct on the vessel was always marked by extreme deference to our wishes and an entire absence of intrusiveness. On the whole, I think that our presence in the river did much to alleviate the hardships of their life, and they were certainly of great assistance to us in many ways. Of their customs and manner of life I shall endeavor to give an account in another part of this report.

On October 27 the mailman arrived on his first trip from Rampart, and reported that the Yukon was not yet entirely closed below Fort Hamlin, and that on his way up he had been compelled to leave the river and travel along the banks. He had had a hard trip, and his



TYPE OF INDIAN HUNTER AND SLED DOGS.

The large dog in the foreground is a St. Bernard, imported from the outside; the one on the right of the hunter is a pure bred Malamute, and the other two are mixed breed.



FORT SHOEMAKER, DALL RIVER. LOG HOUSE INTENDED FOR USE AS A HOSPITAL BUT ITS OCCUPANCY WAS NEVER FOUND TO BE NECESSARY.

dogs' feet were in a bad condition. We invited him to stop with us for a few days in order to rest his dogs, and the invitation was accepted. After a rest of two days the mailman left, taking our letters for the outside, and this event seemed to accentuate the fact that we were indeed cut off from the outside world. The weather had been so fine during the month of October, and we had been so busy, that no time had been left to think much of our isolated situation; but with the shortening of the days and a realization of the fact that it would be months before we could receive answers to the inquiries we had just sent out to our loved ones at home came a feeling of sadness which it was impossible to prevent and which required the utmost effort of the will to shake off.

I quote from my journal of November 1:

The rapidly shortening days, the brief glimpse of the sun at noon over the tops of the mountains in the south being the chief event of the twenty-four hours worthy of note, and the monotony of our duties all tend to make this time of the year the hardest to get through with. In the absence of birds to work on, the doctor and I to-day attempted to skin a mink. We found to our sorrow that the animal has an odoriferous means of defense fully the equal of that of the polecat, and we were compelled to call to our assistance one of the Indian boys, who agreed to skin the mink if we would give him the carcass. This arrangement, being eminently satisfactory to all, was agreed to without discussion.

The flesh of the mink and muskrat both is eaten by the Indians, and is esteemed as a dainty. I have not yet tried the mink, but I did eat some muskrat and found it excellent, without a particle of objectionable flavor.

The month of November was characterized by an extraordinary range of temperatures. During the first week the usual cold weather prevailed, the temperature ranging from -10° to -25° F., but after this time the weather turned much warmer, and on the 18th of the month a heavy rainfall occurred during the night. This melted the snow on the roof and the water soaked through into the living quarters and for a time made it very uncomfortable. After this, however, the weather cleared and by the end of the month the temperature fell as low as -50° F., and remained at this point for several days. While the weather was in its unsettled condition the temperature frequently fluctuated over 40° during the twenty-four hours. On November 5 the water from the Yukon backed into the Dall and raised the ice nearly 2 feet. The surface of the ice was upheaved and cracked and the trails were ruined by the overflow of water. All travel was for the time being suspended, but with the settling of the weather and the next heavy fall of snow things resumed their normal condition.

During this period of alternately freezing and thawing weather our attention was called to the beautiful snow crystals which formed on the windows of the ship and upon the surface of the river. These crystals took the shape of masses of feathery fronds and fern-like

plants, and were especially beautiful along the margins of surface cracks and water holes. On very thin ice the crystals were formed into tiny groups and clusters, composed of innumerable geometric figures which never seemed to be exactly alike in any two localities, but were apparently the result of varying atmospheric conditions, which caused them to be deposited with the infinite variety of kaleidoscopic designs. I made several attempts to obtain photographs of these snow crystals, but they were too delicate to permit of being handled, and before suitable apparatus could be devised for the purpose the opportunity had passed.

December opened with clear and cold weather. The ice in the Yukon by this time had attained a thickness of about 2 feet, and the Indians, who were fortunate enough to have fish traps, now set them through holes cut in the ice. The traps consisted of two wing weirs 12 feet long and 4 feet high, and a cylindrical basket, having in each end a cone securely fastened, with its apex pointed to the center of the basket. The weirs were set in water from 10 to 12 feet deep, at right angles with the current, and held in this position by long poles driven into the bottom. The basket was suspended between the ends of the weirs at their point of intersection and so placed that fish either coming up or down stream and encountering the weirs would be compelled to enter the basket through the inverted cones in order to proceed. Once inside the basket they can not escape owing to the small size of the opening at the apex of the cone. The hole through the ice is kept opened by the use of a long-handled implement made in the shape of a double-edged chisel. The traps are visited irregularly, the time varying with the demand for fish and the capacity of the baskets. The Indians kept us pretty well supplied with fresh fish caught in their traps during the winter, selling them to us at the rate of 25 cents per pound or exchanging them for such articles as flour, tea, sugar, etc., which we could spare from our supplies.

Most of the fish taken at this season were of the genus *Coregonus*, or white fish, of which there were several varieties, and all of them furnished an excellent substitute for our rather monotonous fare of canned goods and moose meat. Another common winter fish is the "losh" (*Lota maculosa*?), which is very popular with the natives on account of its very rich oily liver, but is not much eaten by the white population, except when no other fish can be obtained.

On December 2 our Indian neighbor Sam arrived from his cache in the mountains, about 40 miles away, with two legs of moose meat which he and his younger brother Harry had hauled to camp on a sled themselves. They had been on the trail for three days, with hardly anything to eat except meat, and had had a hard time. Sam was very nearly exhausted and immediately went to bed on reaching his house, but Harry, who was a boy of 14 years of age, seemed but little the



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FORT SHOEMAKER, DALL RIVER. WINTER TRAIL MADE BY THE CREW OF THE NUNIVAK TO REACH THE YUKON RIVER BY A SHORT CUT.

worse for his trip, although no doubt he had worked fully as hard as Sam.

On December 6, all the Indians living at Rampart House, a native settlement situated on the Yukon 6 miles above Dall River, came down to pay a social visit on their kinsmen at our place. A dance at the village was to be given to welcome the visitors and the officers of the *Nunivak* received a special invitation to attend. Incidentally we were asked to contribute something for the feast which was to precede the dance, and we responded by making a donation of a sack of flour and some sugar, tea, condensed milk, etc. When Charlie, one of the Indians who acted as spokesman of the invitation committee, looked over this donation he affected to be surprised that we had not also given them some baking powder. The baking powder was added with suitable apologies for the oversight, and then he expressed a fear that the Indians would be offended unless a can of lard was included in the list of presents. We, however, drew the line at the lard, and told him that perhaps after all our presence was not desired at the dance, and we would take back the food and stay at home. At this all of the Indians protested that this would never do, and seizing the groceries they carried them off with many voluble expressions of thanks, in the midst of which the voice of Charlie was the loudest of all.

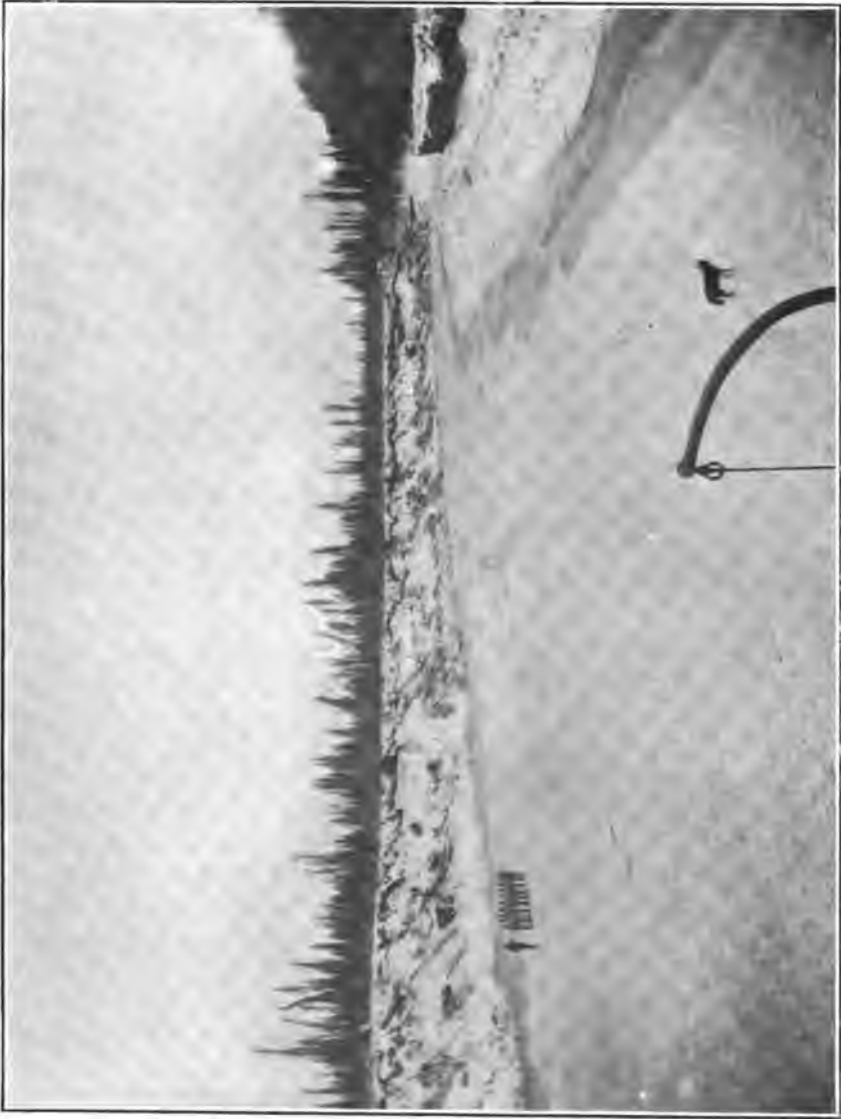
The dance was held at night in a large cabin owned by Paul, and was largely attended. In fact, too crowded for comfort. Room was made for the officers who attended by Mrs. Paul placing her sleeping baby under the bed and inviting us very politely to take seats on that article of furniture. Soon a "set" was formed of eight couples and the dance began. Music was furnished by two Indian boys, William and Theodore, who took turns scraping the strings of a much-battered violin and the figures were called out by Rampart Peter who had had the advantage of a winter's sojourn in a white-man's town and enjoyed his position as social leader to the utmost. His interpretation of the figures was somewhat bewildering to the outsider, but the Indians all settled down to the work of getting through with the "set" with the greatest degree of earnestness. The men shuffled over the floor with their eyes glazed in a vacant stare, and the women with lowered eyes and arms held rigidly to their sides kept time with the music in a most decorous manner. When, however, Peter wanted to interject a little more life into the dance, he would call out "Swing your partner once and a half time 'round," and each buck would seize his partner and the air for a moment would be filled with flying skirts and twinkling moccasined feet. This remarkable maneuver having been successfully performed, the orderly progress of the dance would be resumed as if nothing out of the usual course of events had occurred. The signal to stop was usually given by the musician ceasing to play when he felt that he needed a rest and all the dancers would leave the

center of the room and seat themselves on the floor along the walls. As a mark of special honor one dance was reserved for the white men by our hosts, and the women having each chosen her partner, we were led out on the floor and duly put through our paces.

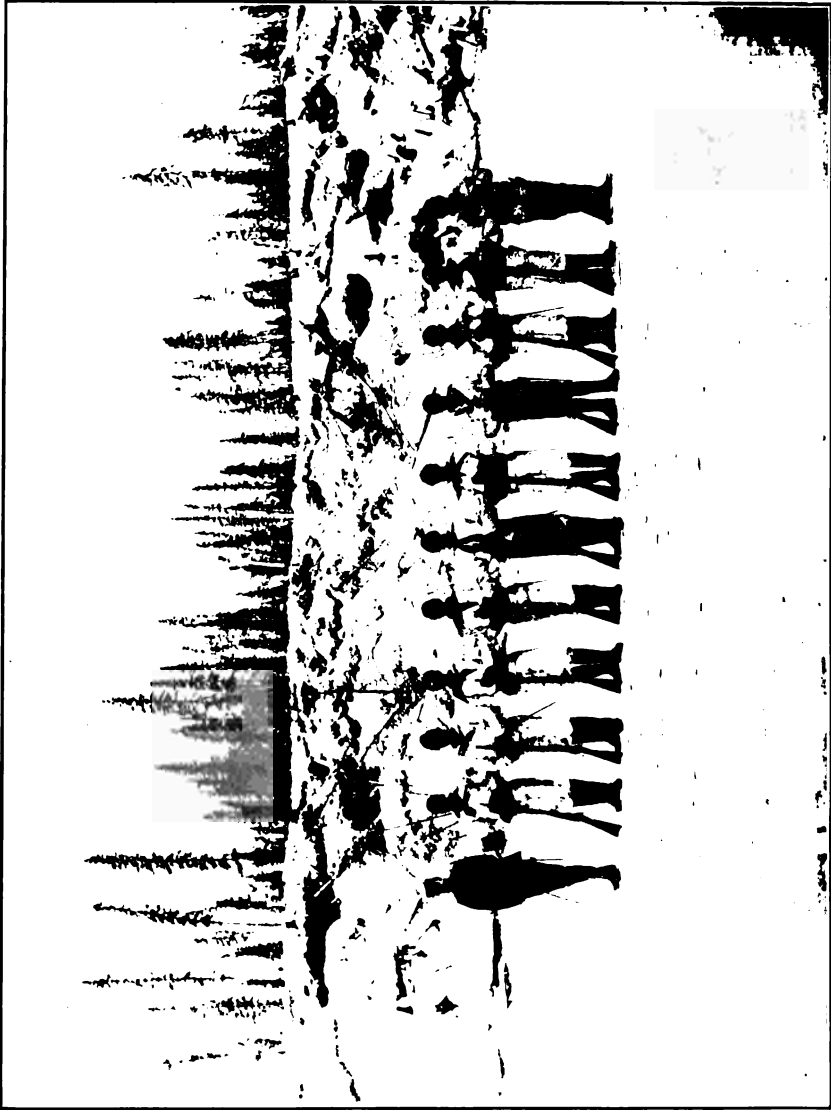
These dances take place at frequent intervals during the winter months, when the Indians are living in their winter houses; that is to say, during the months of October, November, and December. It is but just to say of them that, at places where they have not been contaminated by association with vicious white men, the dances are conducted in the most orderly manner and form a very innocent source of amusement to these people. The old native dances have long since been abandoned by all these Indians, with the exception perhaps of some of the communities in isolated localities, but we witnessed on one or two occasions a woman's dance at Dall River, which is perhaps a survival of some ancient ceremonial dance among the Indians. A short description of this dance may not be out of place at this time.

The signal for the dance is usually given by one of the old men of the tribe, who takes his place on one side of the room in which the dance is to take place and begins to chant a song commemorative of the achievements of some absent or dead member of the tribe. He is quickly joined by other men who join in the song and produce a not inharmonious chorus. As the song proceeds, the women, who are now grouped on the other side of the room, rise and begin to keep time with the singers by a gently swaying movement of the upper portion of their bodies while their eyes are studiously kept fixed upon the ground and their arms are extended with the palms of the hands downward at a slight angle with the body. As the voices of the singers gradually increase in volume the cadence of the song also increases. The women bend more and more toward the floor, and their hair, which has been loosened before entering the dance, is allowed to fall around their faces, and the appearance of the dancers at this stage of the dance is very wild and picturesque. During the progress of the dance several distinct songs are sung, all of which have apparently some particular significance and the airs of which are without exception exceedingly harmonious and pleasing. The dance ends abruptly with the discontinuance of the singing and the women resume their seats and proceed to braid up each other's hair again.

I was not sufficiently well acquainted with the language of the Indians to catch the full meaning of the songs, but from what I learned there is little doubt but that all of them are commemorative in character, and from the accurate concordance of the words with the airs as sung it is more than likely that they are also poetic in structure. The Indians as a rule are exceedingly averse to giving any information in regard to their folklore or traditions. They fear ridicule more than death, and for this reason, and because perhaps their older super-



FORT SHOEMAKER, DALL RIVER. EXERCISING THE CREW ON THE ICE -INFANTRY DRILL.



FORT SHOEMAKER, DALL RIVER. INFANTRY DIVISION OF THE NUNIVAK'S CREW, IN CHARGE OF LIEUTENANT BLAKE, ENGAGED IN REGULAR DRILL.

stitutions have been laughed at by the whites, they have been taught to believe that their myths and legends are something of which they ought to be ashamed. The result of this sensitiveness has been, perhaps, to permit this part of their history to be gradually forgotten.

On December 10 Lieut. H. C. Rogers, U. S. Army, on his way from Fort Egbert on the Upper Yukon to Rampart City, arrived at Fort Shoemaker, and, at my invitation, stopped for a day's rest on the *Nunivak*. Mr. Rogers brought us the first authentic news of the reelection of President McKinley. The news had been received at Eagle by telegraph from the outside.

On December 20 Assistant Engineer T. G. Lewton, R. C. S., arrived from St. Michael and reported for duty.

Mr. Lewton informed me that his orders for the vessel had not been received until after the departure from St. Michael of the last vessel bound up the river, and in consequence he had been compelled to remain at St. Michael until the 26th of November, at which time he left the coast in company with the mail man on his first trip across the portage from Unalaklik to Kaltag on the Yukon by dog team. The journey across the portage was a very arduous one, on account of the lack of snow on the trail, and when the river was reached it was found necessary to break trail over the ice almost the entire distance from Kaltag to Fort Gibbon, a distance of 600 miles. Upon his arrival at this point he gladly accepted the invitation of the officers of the post to stop there long enough to recover from the fatigue of his long journey before proceeding farther. Up to this time he had not lost a day, but had with the greatest persistence kept up with the mailmen along the route, and when he arrived at Fort Gibbon he was suffering considerably from the effects of the exposure and fatigue of his trip. After a few days' rest at Fort Gibbon he again set out on the trail and encountered a severe blizzard while passing through the Ramparts, and was compelled to camp twice without a tent or stove on account of the high wind and low temperature. Notwithstanding all these difficulties he arrived at Fort Shoemaker in fine shape and without any serious mishap. Several times while on the journey his face and feet had been badly frozen, but, being in the company with experienced travelers who were accustomed to these accidents and knew how to treat them, he received no permanent injury.

When the fact is considered that Mr. Lewton started out on this midwinter trip with no experience whatever of the difficulties and dangers of the trail, and with scarcely any preparation for the journey, the energy and determination he displayed in keeping up with the mailmen, who are the fastest travelers in the country, is highly commendable.

Christmas at Fort Shoemaker passed with more than the usual amount of jollity and good-fellowship. Through the thoughtfulness

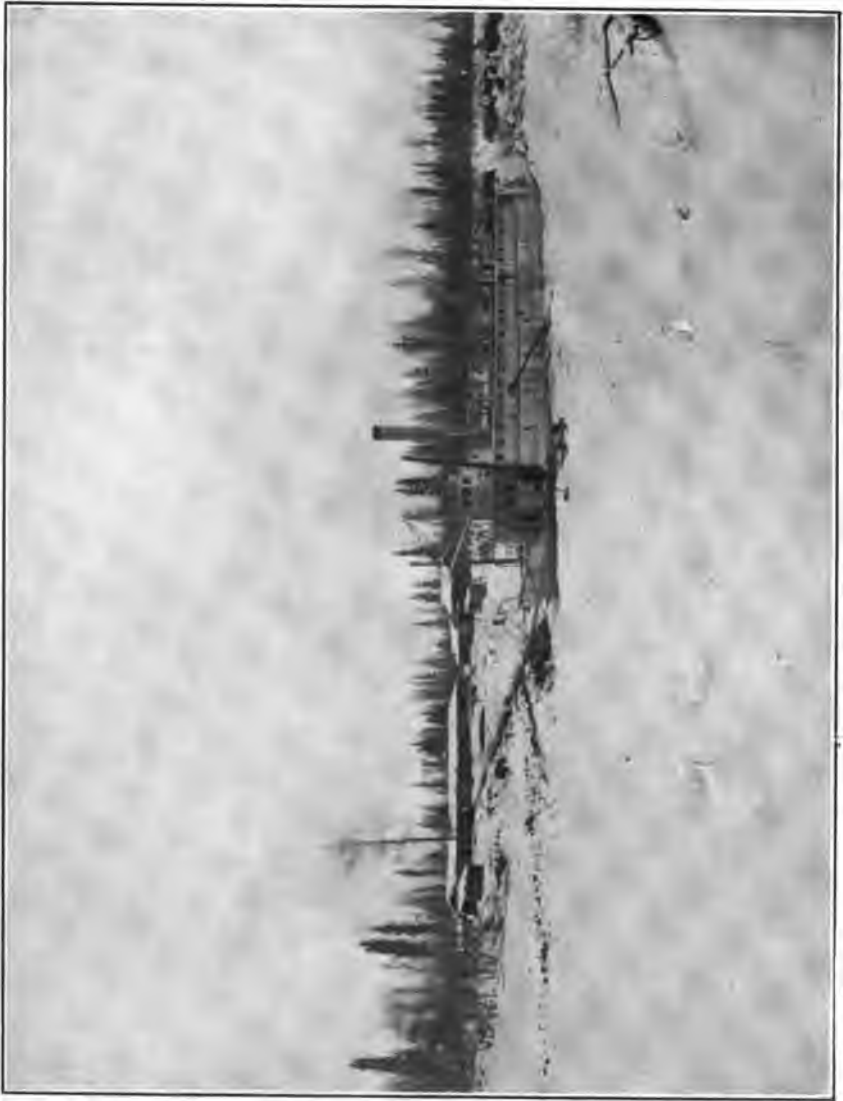
of Lieutenant Camden the crew had been furnished with footballs, baseballs, boxing gloves, etc., and on Christmas day a series of athletic games was arranged in which most of our men and some of the crew of the steamer *Alice* took part. A large crowd of Indians gathered to witness the contests, and the presence of several wood choppers and prospectors who came into camp to spend the day added considerably to the liveliness of the occasion. A course over the level surface of the river was laid out, and over this the competition for the several prizes for running races was held. Snowshoe races, sack races, and relay races furnished all hands with a great deal of sport, but the contest which seemed to cause the greatest amount of amusement was one in which a certain number of potatoes are placed in line at a distance of a yard apart and are picked up as quickly as possible, one at a time, and deposited in a bucket, which must be kept at the end of the line. This game requires a great deal of running back and forth, and when a dozen men are in the competition it becomes very exciting. The Indians had never seen an exhibition of the game before and showed their appreciation of fine plays made by some favorite by loud yells and cries of encouragement. After the sports in the open air had been concluded the men adjourned to the gymnasium and a series of boxing and wrestling matches took place. The Indians joined in the latter contests, and some of them proved themselves no mean antagonists. They know nothing of the science of wrestling as understood by white men, but among the young men there are many who are capable of extreme endurance, and their muscles, especially of the back and legs, are like bands of steel. A Christmas dinner, composed of the regular ship's rations augmented by donation of a liberal quantity of delicacies from the private stores of the officers, was served to the men, and the day was brought to a successful close by an exhibition of fireworks at the Indian village under the direction of Mr. Camden.

Among the pleasantest events of the day and one which made our second Christmas at Fort Shoemaker so much more enjoyable than the first, was a visit I received from a committee appointed by the crew to wait upon me and to express the thanks of the enlisted force of the vessel for the universal good treatment they had received from the officers, and to wish for us a Happy New Year.

Two days after Christmas Lieut. H. J. Ericksen, U. S. Army, in charge of a party engaged in making a reconnoissance of the country between Rampart City and Eagle, arrived at Fort Shoemaker and spent the night with us. Lieutenant Ericksen's party consisted of a topographer and two packers, with two dog teams to carry their camp outfit and supplies, and the object of the reconnoissance was to ascertain the best route for the army telegraph line at present under construction along the Yukon River. An invitation to accompany the party was kindly extended to any of the officers of the *Nunivak* who



FORT SHOEMAKER DALL RIVER. TYPICAL WINTER WOODLAND SCENE—BIRCH AND ALDER TREES INCRUSTED BY ICE.



FORT SHOEMAKER, DALL RIVER. MIDWINTER SCENE.

could go by Mr. Ericksen, and as I desired to obtain information of life on the trail by actual experience, I gladly availed myself of the offer. Lieutenant Wheeler having also expressed a desire to take this trip, the necessary arrangements were made to have him go along.

We left Fort Shoemaker at daylight on January 2, and after an absence of twenty-three days Lieutenant Wheeler and I returned to the vessel, having had a most varied and interesting experience while on the trail. During the trip, which was made along the Yukon from Dall River to the mouth of Beaver Creek, we encountered many obstacles, and the sleds being heavily loaded our progress was slow and very laborious. The condition of the trails was about as bad as they could be, and the temper as well as the stamina of every one of the party was frequently taxed to the limit of human endurance. Our fare was necessarily of the simplest kind, and consisted of beans, bacon, and baking-powder biscuits with large quantities of tea to help fill up the yawning cavity which always seemed to be present in our stomachs. The weather was all that could be desired for persons anxious for experience on the trail, as it varied from temperatures so high as to make traveling very disagreeable on account of the heat to those so low that it was simply impossible to move out of camp. At one time we had to remain in camp for nearly two weeks with the temperature ranging from -65° to -72° F. During all this time we slept in thin cotton tents, but although the slightest imprudence would cause the face, hands, or feet of members of the party to be frozen if left exposed, no serious injuries were received, and when Mr. Wheeler and I finally returned to the ship, we both felt that in spite of the hard trip we had been amply repaid for all our labor by the experience that had been gained. A more extended account of this journey will be found in another portion of this report. (See Transportation and Traffic.)

The latter part of January and a large portion of February was marked by excessively cold weather, the temperature at several times averaging -50° F. for two or three days in succession.

There was much suffering among the Indians at this time owing to the lack of sufficient food. Sickness during the preceding summer had prevented them from laying up the customary amount of fish for winter use, and although the supplies which I issued them from time to time from the *Nunivak* averted actual starvation, the health of the community suffered for want of fish, which seems to be a necessary part of the diet of these people. Nearly every native showed evidences of digestive disorders, and before the hunters began to bring in fresh moose meat an epidemic of a peculiar form of skin disease, which Dr. White ascribed to their low and restricted diet, spread through the village. Several children who were not yet weaned died as a result of insufficient nutrition, and it was with the greatest difficulty that the

parents could be induced to follow the directions of the doctor, who tried to save their lives by giving them artificially prepared foods furnished by the vessel. In one case the doctor had prescribed malted milk to be given to a child about 2 years of age which was evidently slowly dying of starvation. Careful directions as to the manner in which the food was to be administered were given to the mother of the child, and we all confidently hoped to save its life. But it grew steadily weaker, and finally a rigid investigation by the doctor proved that the parents had failed to give the child the milk as directed, but were using it themselves to put in their tea. When we expressed disapprobation of their action, which the doctor did in no uncertain words, the poor wretches seemed to be utterly dumbfounded. They had made up their minds that the child was fated to die, and although there is no doubt they were fond of it, they simply sat hour by hour by its side waiting for the end. It frequently happened that the shroud of the sick would be made before death took place, notwithstanding the fact that the other arrangements for burial were never hurried.

In order to give as much assistance to the natives as possible without pauperizing them, I induced several of the men who had families to support to cut wood along the banks of the Yukon where we could get it for the use of the vessel upon the opening of navigation in the spring and paid them in advance for this service. But their shiftless, irresponsible disposition prevented them from taking full advantage of this opportunity for obtaining remunerative employment, and it was only when they were driven to work by actual want that they would leave their cabins and go to cutting wood for a living.

The approach of spring and the moose-hunting season was the signal for a general exodus of the natives from their winter villages on the river to the mountains of the interior country. By the last week in February nearly every native, with the exception of the very old and feeble ones, had started out on their annual hunting and trapping trips, leaving the sick and helpless to get along as best they might until their return. Among the unfortunate ones who were too sick or feeble to start out on the hunt was our old friend Sam, who had been more or less under the weather for a month or more, most of the time being confined to his bed suffering from a severe cold and some form of stomach trouble which made it impossible for him to retain his food. Finally he managed to crawl up to the ship one day late in February, but he was still very weak and miserable. Three days after rising from his sick bed news was brought into camp that a large moose had been seen out on the Koyukuk trail, and we were astonished to hear that Sam had started out on its trail. At the end of two days he returned to camp, dragging a sled upon which were two immense legs of moose, and he informed us that he had hunted down and killed two



GROUP OF YUKON RIVER INDIAN HUNTERS WITH THEIR TRAIL SLEDS.



FORT SHOEMAKER, DALL RIVER. WOOD YARD, WITH TEAM OF DOGS RESTING DURING THE MEAL HOUR OF THE CREW.

large and three small moose during his absence. To accomplish this he must have traveled at least 50 miles on snowshoes, and during the entire time of his absence he had no other shelter than that afforded by a brush hut hastily constructed in the woods, and perhaps not this. His food while on the hunt was necessarily very scanty, as the method of hunting the moose, which is simply to get on its trail and persistently follow it up until the animal is worn out and can be approached close enough to be shot, makes it necessary for the hunter to discard every ounce of weight to be carried outside of his rifle and a few rounds of ammunition. The incident is recorded to show the remarkable recuperative powers of these people under certain conditions. The intense yearning which they manifest for the hard life of the trail when the time comes each year to be moving after game is one of the peculiarities of the Alaskan Indians which must always be carefully considered in any attempt made to better their condition in life. The desire to hunt and fish is instinctive with them, and if anything prevents them from following out the promptings of their natures in this direction they soon lose strength of character and become physically weak and an easy prey to the mildest form of disease.

During the month of February we experienced a period of remarkably warm weather. The temperature suddenly rose from 36 below zero to 45 above zero in less than twelve hours and remained above the freezing point for three days. We had on hand a quantity of fresh meat, game, fish, etc., and at one time feared that it would be spoiled, but by burying it in snow and keeping it well covered we managed to keep it frozen until the return of cold weather. The trails on the river during this warm spell were a mass of slush and running water and travel for the time being was at a standstill. Everybody suffered more or less from the effects of the unseasonable weather and were glad when it was over.

On February 13 Mr. Stewart Menzies, the auditor of the Alaska Commercial Company, accompanied by two traveling companions, Messrs. Hill and Mariner, arrived at the *Nunivak* on their way from St. Michael to Dawson, and we were glad to learn that the party intended to make a short stop at Dall River in order to give their dogs a rest before proceeding farther. To add to our pleasure Messrs. Duncan and Wobber, the agents of two of the trading companies at Rampart City, arrived in camp next day on a visit to the officers of the ship.

The presence of so many new faces cheered us all up wonderfully, and although there was no fresh news to be had from the visitors they were none the less welcome. To show our appreciation of this mid-winter visit an entertainment was given on board the *Nunivak* and all the strangers were invited. We were fortunate in having on board a piano and several other musical instruments and a most enjoyable

musical concert was inaugurated. A bowl of eggnog was brewed for the occasion, and in the midst of our arctic surroundings, but with hearts full of joy and thankfulness for good health, we drank to our dear ones at home.

The memory of the kindly, beaming faces around the board on that winter night will always remain with me as one of the pleasantest souvenirs of our sojourn in the north. May each member of that little company cherish in his heart an equally pleasant recollection of the occasion!

The days were now long enough to permit of the employment of the men in the woods again, and after the enforced confinement to the limits of our quarters during the long, dark days of winter, it was an agreeable change for them to get into the woods once more. A good supply of fuel was still remaining from the amount on hand upon entering winter quarters, but as this would not last until the opening of navigation every effort was made to have a sufficient quantity cut and hauled to the vessel before the opening of spring would cause the work of cutting wood to be abandoned. The scarcity of available timber near the vessel made it necessary to go farther and farther away from the banks of the river to find suitable trees to cut, and here our dogs were brought into requisition to haul out the logs on sleds. Without their aid we could hardly have accomplished the work. An attempt was made to burn wood obtained by cutting some of the poplar trees (*Populus balsamifera*) which were abundant near the vessel, but they were found to be so full of moisture that they could not be used for the purpose.

On February 15 Mr. Lewton, accompanied by the carpenter and one of the oilers, left the vessel on a hunting trip. They followed the Koyukuk trail for about 15 or 20 miles and then pushed across country to the foothills of the mountains lying west of Fort Shoemaker. A light fall of snow, which covered the crust formed during the warm spell of the previous week, made ideal hunting conditions, but after a week's absence the party returned without having seen any signs of moose. The persistent hunting of the animal in the vicinity of Dall River has no doubt driven it into less accessible localities, and the few that are killed hereabouts are probably stragglers. We did not suffer for the want of fresh meat, however, as the Indians, who had gone hunting into the mountains lying northeast of us, frequently came into camp with a sled load of meat and reported that moose were very plentiful in that locality. Several attempts were made by members of the party to induce the Indians to act as guides and show our hunters where to look for moose and how to trail them. But they all seem to have a rooted objection to perform this sort of service. It is probably well that it is so, as the animal at present furnishes the Indian with the principal means for his support, and if



FORT SHOEMAKER, DALL RIVER. STAND OF POPLAR TREES NEAR THE WINTER QUARTERS OF THE NUNIVAK.

The wood was found, on trial, to be unfit for use as fuel.

the hunting of it is once taken up by the whites it will no doubt be exterminated.

March came in very mild and spring-like, but the weather was extremely cold again by the middle of the month. Strong winds prevailed, and at times these were so high that travel was much interfered with on the Yukon. Where we were situated was almost completely sheltered, but we could see the blinding clouds of snow swirling down the main stream past the mouth of the Dall, and now and then a belated traveler staggered in from the trail to seek shelter until the wind subsided. On March 13 Judge James Wickersham, of the circuit court of Alaska, arrived from Rampart City, where he had been holding a term of court, and we were glad to welcome him on board for the night. A furious gale of wind from the northeast sprang up during the night and effectually prevented the judge and his party from proceeding on their way, and at 11 a. m. Mr. Downing, the mail contractor, arrived from Fort Hamlin and sought shelter from the storm with us. He stated that he had been more than four hours coming the 9 miles from Hamlin, and although he is an exceptionally hard traveler both he and his dogs were almost exhausted when they pulled up at the *Nunivak*.

On March 15 the storm abated and our guests left the ship on their way up the river. The next day Mr. George Sharp, who had a contract to furnish the army post at Fort Gibbon with 600,000 feet of saw-log timber, arrived at the vessel and requested permission to have his party of 10 men remain here until he could locate a body of timber in the vicinity from which he would be able to secure the desired amount of saw logs. I allowed the party to take up their quarters in one of our vacant log houses, and Mr. Sharp left next morning on a tour of inspection of the country. On the 25th of the month he returned, and informed me that he had been unable to find any timber large enough for his purposes either on the Dall, Yukon, or Ozina rivers within 100 miles of Fort Shoemaker, and that he would have to return to the post and give up his contract, or possibly renew the search for good timber on some of the tributary streams of the Tanana River. The incident is related as evidence of the fact that at the present time nearly all of the available timber of merchantable size has been cut off along the banks of the Yukon and its tributary streams in this vicinity. The inroads made upon the forests to supply fuel for the steamers plying on the river have been tremendous during the last four years, and it will not be very long before all of the timber within easy reach of the steamers will be gone and they will have to use some other sort of fuel, or else tramways must be built to transport wood from points at a distance from the river which under present conditions are too remote to permit of the timber being utilized as a source of fuel supply.

The trails along the river at this season are in their best condition. Our last mail came through from the States in thirty-two days, which is about as fast as it can be carried under the present conditions. From one of the Indians who returned from a hunting trip on the 20th of March I learned that Old Jacob and his family of three women had been seen encamped on the river about 50 miles from Fort Shoemaker, and that they were all suffering for food. The old man had not been able to kill any game, and as these natives are slow at rendering assistance to each other I sent word to Old Jacob to return to Fort Shoemaker and I would see that he had food enough to keep him and his family from starving until the opening of the river. In the course of a few days I heard from the old man, and the message he sent was to the effect that he expected to kill plenty of moose by and by, and did not want to come back; but if I would send him some tobacco he would be greatly obliged. As I have already stated, the craving for the annual hunt is so intense with these people that it is almost impossible to help them in the ordinary ways. I hardly expected Jacob to forego the pleasures of the chase to come in and work for a living, and so I was not surprised at his answer. I subsequently learned that he did succeed in killing a moose just in the nick of time to save himself and his family from starvation.

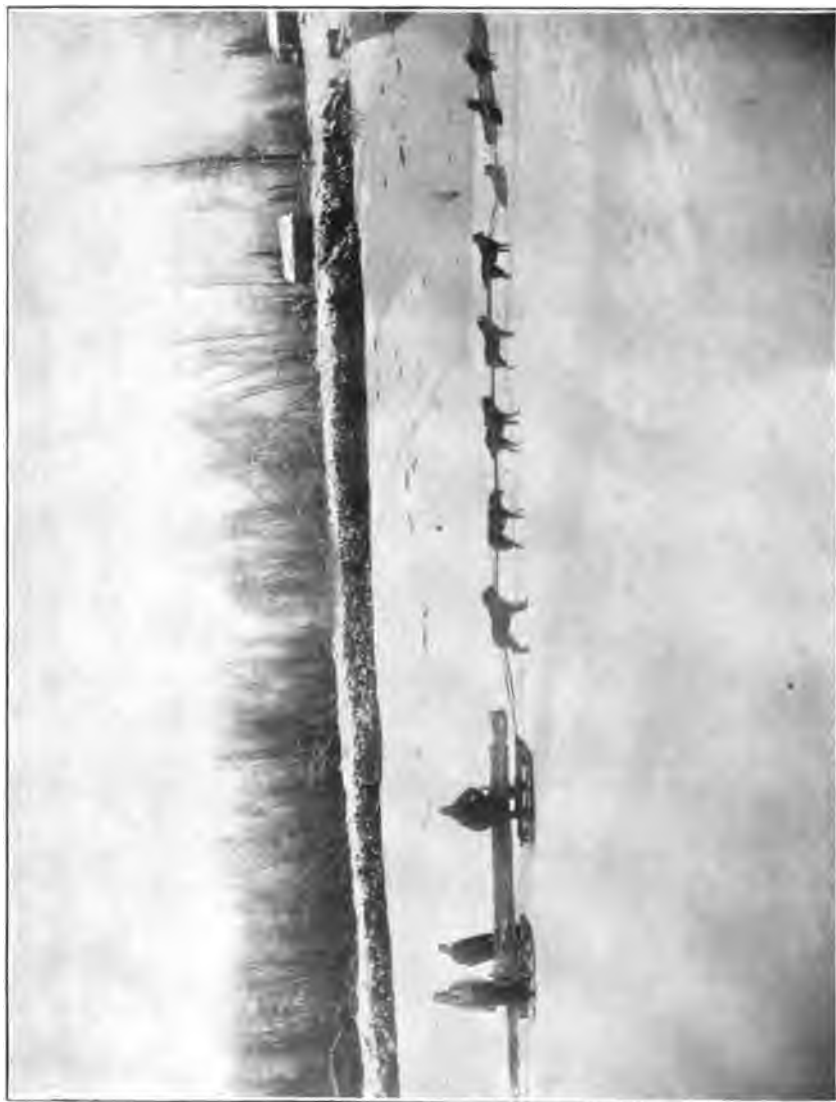
By the 20th of March the men had cut enough wood to last us until the opening of the river, and this work was discontinued. The remainder of the month was spent in hauling it into the ship with the dog teams and cutting it up into suitable lengths for use in the furnaces.

The trails along the Dall for several miles were now in excellent condition and afforded a splendid road for the use of the bicycles. The temperature hardly ever went lower than 10° below zero, and in the absence of wind this sort of weather was ideal for exercise on the wheel.

Since the above was written it has been decided by the Northern Commercial Company to use oil as fuel on its steamers on the Yukon. Tanks for storing the oil have been erected at convenient points along the river, and it is expected that oil-burning furnaces will be installed in all of their river steamers by the end of the season of 1902.

On the 23d of the month a flock of migrating snow buntings (*Plectrophanes nivalis*) were observed near the vessel and I succeeded in procuring a number of them for the collection. Among the birds were several specimens of McKay's snowflake (*P. borealis*) which I believe have not been noted in the interior of Alaska before. These birds were the first migrants observed this year, and they passed on after only a short visit.

On the 29th, the mailman passed on his way to Rampart, and as I was desirous of getting some information of winter travel under differ-



FORT SHOEMAKER, DALL RIVER. HAULING WOOD TO THE NUNIVAK BY DOG TEAM.



A BASKET SLED AND TEAM OF THOROUGHBRED MAHLEMUTE DOGS.

ent conditions from those which I had obtained at the time I was with Lieutenant Erricksen's party, I joined him with a toboggan and four of our fastest dogs for the trip. Mr. Oldfield, the mailman, readily agreed to make the run as quickly as possible in order to test the endurance of the dogs, and after a night's rest at Fort Hamlin we started out at 7 a. m. over a good trail and with fresh dogs. The run to our first stopping place was 15 miles, and was accomplished in three hours and ten minutes. After a rest of one hour for lunch and to give the dogs a breathing spell, we again set out and made the distance to Tucker's Cabin, 35 miles, in seven hours and thirty minutes. The dogs were comparatively fresh at this point and could have gone on at the same rate of speed for some time longer, but darkness made it necessary for us to camp, and we stopped at Tucker's for the night. Leaving this place at 7 o'clock next morning, the run to Rampart, a distance of 30 miles over a heavy trail, was made in six hours and thirty minutes. The actual time and distance made during this trial trip was 80 miles in thirty and one-half hours of elapsed time. We therefore made an average of a little less than 5 miles per hour while actually traveling. I am confident that the entire distance of 80 miles could have been made in less than twenty hours if we had not been delayed by darkness.

The return trip from Rampart to Fort Shoemaker was made in company with Mr. Manchester, an attaché of the Alaska Exploration Company, who was on an inspection tour of the wood-yards along the river belonging to his company. The trail was found to be in very bad condition from having been cut up badly by a train of pack horses which had recently passed over it, and we were caught in a severe snow-storm, which entirely covered up the trail and made traveling very difficult. In spite of the difficulties, however, we reached Fort Hamlin after being on the road two days and a night. The next morning we ran up to Fort Shoemaker, and I found everything going on as usual on board. During my absence Mr. Camden had completed the work of cutting the ice from around the vessel, and Mr. Lewton had begun to assemble the machinery in anticipation of approaching spring.

While I was absent from the vessel the Right Reverend Bishop Rowe, of the Episcopal diocese of Alaska, passed on his way down the river on a visit through the diocese and was entertained on board the *Nunivak* by the officers. I met the bishop and his party when half way to Rampart during the prevalence of a blinding snowstorm and stopped to shake hands with him on the trail. A subsequent and more extended acquaintance with him confirmed the high opinion I formed of his character as a hard-working Christian gentleman. The good work that Bishop Rowe has done in carrying the consolation of religion to the people in this country can not be overestimated. Everybody who has ever had the pleasure of his acquaintance and has seen

him at work in the field is filled with admiration of his frank and lovable nature. There is not a single humble woodcutter's hut along the river that he has not at some time during the dreary winter visited and brightened by his presence, and the good that he has done in these inhospitable regions is incalculable. Surely such men as Bishop Rowe, in whose breast the true missionary zeal burns with such a pure and steady light, should never lack the means of carrying on the good work which is so urgently needed in this country.

The month of April was marked by an unusual number of snowstorms, and from the Indians who came in from time to time to bring fresh moose meat from their camps in the mountains we learned that the snow was exceptionally deep, and they prophesied a late opening of navigation with very high water in the spring.

On April 14 the false roof over the quarters was removed, and preparations for painting the vessel were started. The hurricane deck leaked as it did the previous year after the removal of the false roof, and the frequent snowstorms made it necessary to abandon all other work except that of keeping the vessel clear of snow. In spite of these precautions, however, our quarters were made almost untenable by the dripping of water from the upper deck. In order to hasten the return of the deck planking into place, the boilers were blown down on the 16th, so as to decrease the temperature of the quarters, and by so doing prevent the condensation of the frost in the roof planking, but until the deck became tight again by gradual swelling of the planks all hands suffered a great deal of discomfort.

On April 17 the owner of a train of pack horses, which were being driven up the Yukon to Circle City, paid us a visit and informed us that the deep snow on the river made it impossible for the animals to proceed, and he had accordingly gone into camp on the banks of the river opposite the mouth of the Dall, and would remain there until steamboat navigation opened in the spring. His supply of feed for the animals had been exhausted, and the animals were at present subsisting on beans and flour with what grass that could be obtained by shoveling off the snow in places and allowing the animals to graze on last year's growth. From the information I received from Mr. Johnson, the owner of this train, I am led to believe that the use of horses, except where there are good roads in this country, is not practicable. He had had two years' experience in the matter and was thoroughly discouraged. We furnished him with all the beans and flour that we could spare, and I afterwards heard that with the addition of fresh young willow buds obtained later he succeeded in carrying his animals through until a steamer arrived and transported the outfit to its destination.

Many of the Indian hunting parties returned from the mountains during the latter part of April and reported that they had had a fairly



GROUP OF YUKON RIVER INDIAN HUNTERS.



GENERAL VIEW OF THE YUKON RIVER ICE AT THE TIME OF THE SPRING BREAK-UP.

The photograph shows the town of Forty-mile in the background and was kindly furnished the author by Mr. Charles W. Hall, agent of the Northern Commercial Company at that place. During the run of ice in 1900 the town was almost destroyed by the overflow caused by an ice jam.

good season. Their appearance was much improved, and although all bore numerous signs of frost-bite and were very much tanned by exposure to the glare of the sun from the surface of the snow, they were in much better health than when they set out on their hunt. The use of snow glasses as a protection from the glare of the sun does not appear to be very common among these natives, neither does it appear that they blacken their faces as the Eskimo do to lessen the effect of the sun's intense rays at this season of the year. It is probable that the danger of snow blindness is not so great, however, in a forested country as it is on the coast where there are no trees, and this may account in a measure for the fact that the natives of the interior neglect to take these precautions.

On April 27 a sudden rise of the temperature to 44° above zero caused the snow to melt in an astonishingly rapid manner, and during the afternoon the water could be heard running underneath the river ice for the first time in months. On the 29th the sky was partially covered with flying masses of soft cumulous clouds and at night a heavy rain took the place of the usual fall of snow. As if awaiting a signal to appear the willow buds burst into bloom, the woods all at once resounded with the gladsome sound of innumerable song birds, and as conclusive evidence that the long winter was at last over and spring was at hand, on the last day of the month, far over head, a flock of geese trailed harrow-like across the sky, winging their way toward the north.

The natives who had returned from their hunting camps now began to dig their boats out of the snow drifts in which they had lain all winter and to transport them by sled farther up the river to favorable points among the islands of the Yukon where the geese and ducks would congregate as soon as open water showed on the river. No time was to be lost as even now the trails were impassable except during the night and early hours of the morning. The rest of the day the trails were rushing rivulets of water which cut miniature gorges in the hard, thin, packed snow and formed little lakes on the surface of the ice where hollows were.

The mailman passed us during the night and took our letters for the outside. He informed us, however, that they would probably not go out until the resumption of steamboat travel on the river. But what did we care? Spring was coming, spring was here! A sort of mad joy seemed to possess us all. The irritation caused by long waiting disappeared, and the men went about their duties singing and laughing. Even the dogs scampered up and down the shores now bare of snow and dug great holes in the soft, warm earth, with no other object in view, apparently, but to show their joy. It was amusing to note with what amazement the little puppies, which had been born during the winter, made their first acquaintance with running water. At first

they were evidently very much afraid of this new substance, but their curiosity soon overcame all other feelings and they would spend hours at a time watching the tiny rivulets which coursed over the surface of the ice.

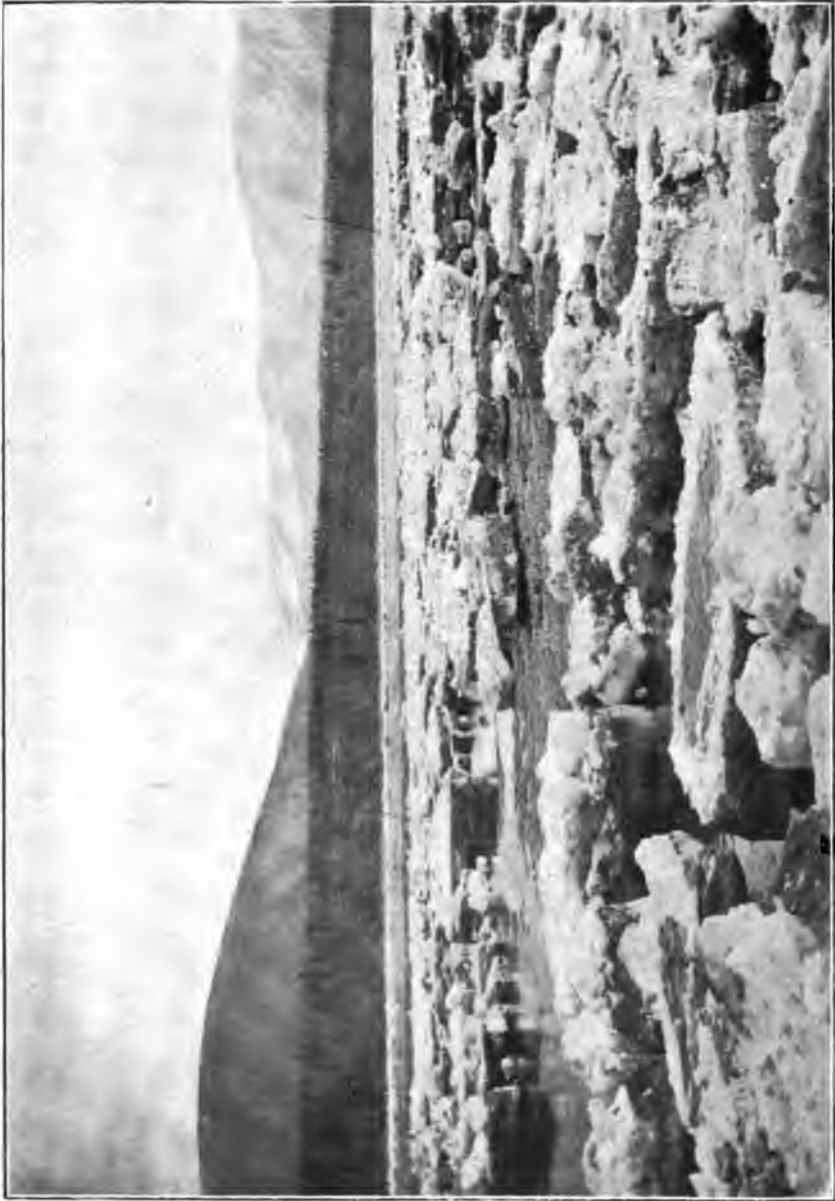
As the snow melted it was seen to be literally alive with millions of minute insects which we identified as the common snow flea (*Achoreutes nivicola*) of the United States. In some places the surface of the snow was almost covered by the insects. The doctor secured a quantity of them for the collection.

Although the first week in May was marked by the recurrence of several heavy falls of snow and for a few hours at a time the landscape once more was decidedly wintry in appearance, the hot sun soon melted it away again, and spring fairly rushed in on us.

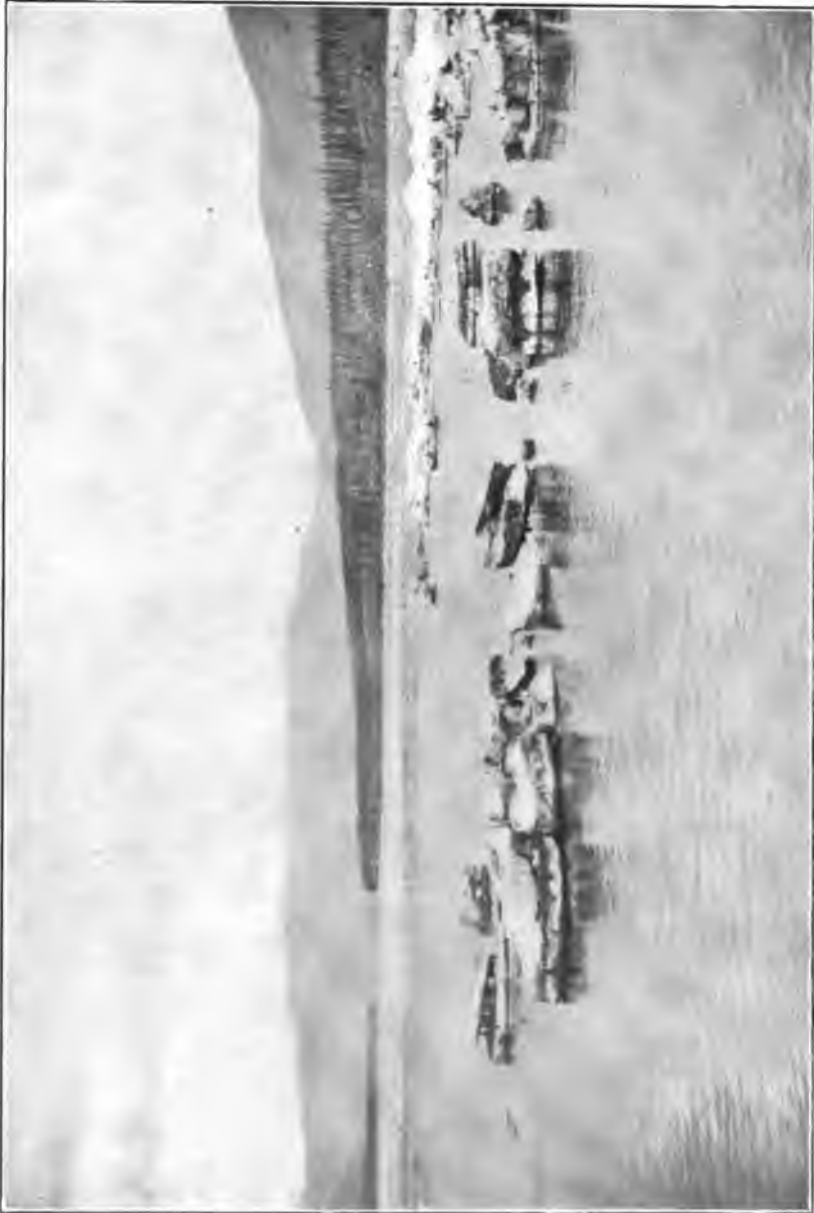
On the 16th of the month the water in the Dall rose high enough to float the vessel, and four days afterwards the ice began to break away from the bottom and melt rapidly. The breakup in the Dall occurred somewhat later than it did last year and was not accompanied by any run of ice. It simply melted where it lay or slowly drifted down toward the mouth of the stream as the water rose. On the 24th of May the ice in the Yukon broke opposite the Dall and for three days ran past in a mighty stream of broken fragments, completely filling the river from bank to bank. The water in the Dall rose 15 feet above its normal level, and I was informed by the Indians that as long as the high-water stage prevailed there would be no danger to us from the Yukon ice.

I quote from my journal of May 27:

Overcast cloudy weather, with occasional snow flurries. Temperature ranging from 28° at night to 44° above zero during the middle of the day. Ice running very strong in the Yukon, but as yet has shown no signs of backing up into the Dall. We are lying with steam up, ready to move at the first appearance of danger, which would be indicated by a cessation in the movement of the ice in the main river. A close watch was maintained at the mouth of the Dall night and day while the ice was running, and it was a magnificent sight. Most of the ice was pretty well broken up, but now and then a huge cake an acre in extent would come lumbering along, grinding and crushing everything in its path, whirling in circles, and ramming the banks with such tremendous force as to cause the solid earth to tremble and the trees to shiver from bottom to top. Quantities of driftwood and bits of wreckage—the flotsam and jetsam of winter travel on the river—floated past. A broken sled or snowshoe, the blackened remains of an old fire, showing where a camp had been made, a child's moccasin, and the crushed fragments of a birch-bark canoe whirled past as I watched the progress of the ice. Now and then huge masses, carrying tons of earth, would be pressed upwards a distance of 10 or 12 feet and then sink back again with a sullen roar. And again a clean green berg would suddenly shoot up into the air, and catching the rays of the sun would send forth a perfect cascade of many colored scintillations. The rapid, irresistible movement of the ice, its great volume and immense power, as it swept past at the rate of 8 or 9 miles per hour, all combined to make a most awe-inspiring spectacle. Unfortunately the day was too much overcast to enable us to get good photographs of the scene.



CHARACTERISTIC VIEW OF THE YUKON RIVER ICE AT THE TIME OF THE SPRING BREAK-UP.
The channel of the river is shown in the middle distance. The ice in the foreground has been forced out onto the gravel bars.



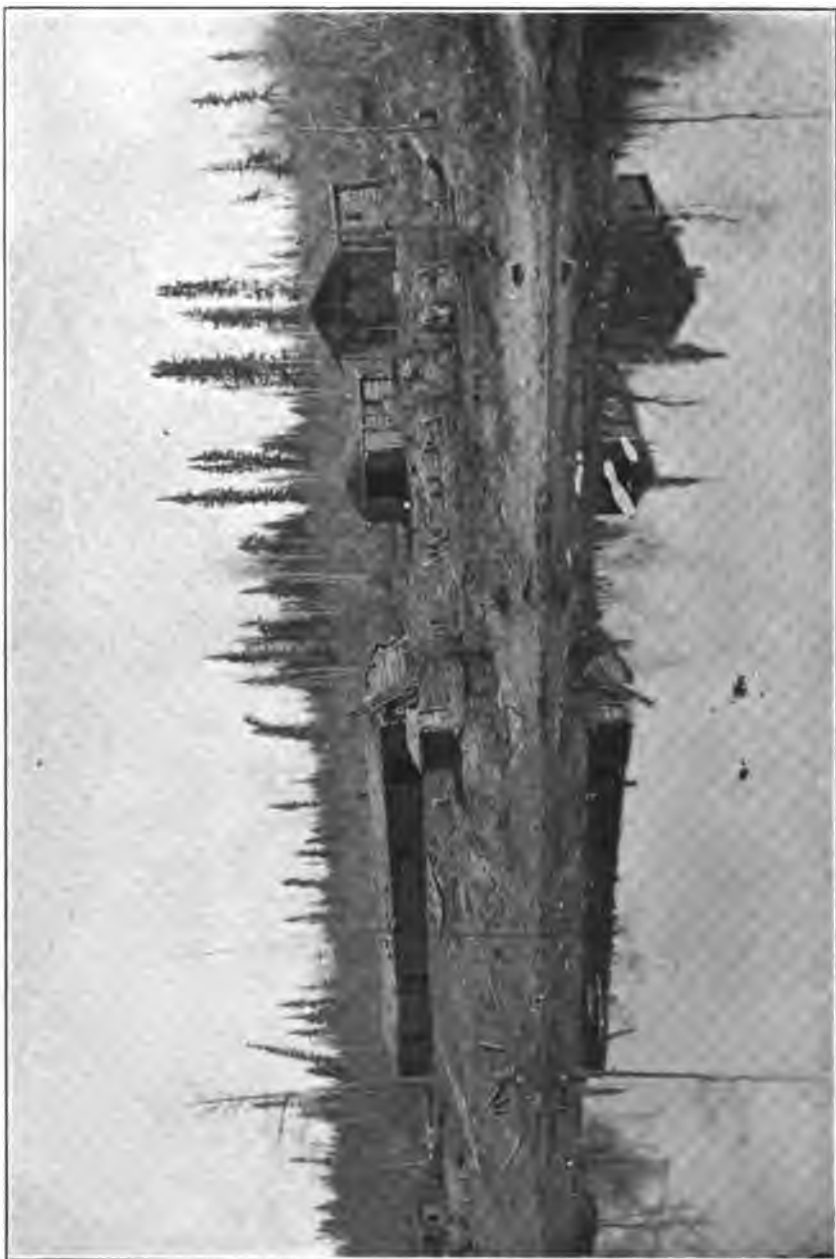
CHARACTERISTIC VIEW OF THE YUKON RIVER ICE AT THE TIME OF THE SPRING BREAK-UP.

An ice jam has occurred in a narrow part of the stream, causing a rapid rise of water and resassation of the current until the jam is broken.

On May 30 the Yukon was almost clear of ice but still running large quantities of driftwood. Captain Moore of the *Alice* was anxious to get away at the earliest possible moment, and left at noon of this day. But after getting as far as Fort Hamlin he was compelled to seek shelter from the masses of drift material coming down the river, and tied the *Alice* up at the lower end of an island near by to wait for a better chance to proceed.

On May 31, the river being almost clear, we got under way and steamed out into the Yukon, with hearts full of gladness at being once more under way, and with a joyful sense of freedom of movement after our long imprisonment in winter quarters.

The second winter of the command in the country had passed without serious accident to any member of the party, and the opening of navigation found us all ready to resume our duties on the station.



FORT SHOEMAKER, DALL RIVER. AFTER BEING ABANDONED IN MAY, 1901.

CHAPTER VII.

The lateness of the season and the information I had received in regard to the unusually large quantity of snow which still remained on the ground in the mountains caused me to delay our departure from the vicinity of Dall River for a few days, as all the conditions were favorable for a period of exceptionally high water in the Yukon, and in that event the Indian villages would most likely be washed away. I caused it to be generally known among the Indians that, in case of danger from the threatened flood, they would be received on board the *Nunivak* and transported to a place of safety; but fortunately the water did not reach the danger point, and after it began to subside we made our final preparations for the journey to the coast.

On June 3, having taken on board everything belonging to the vessel, at Fort Shoemaker we dropped down the Dall and swung out into the Yukon. As we passed the village all the natives were gathered on the bluff to witness our departure. A long blast of the steam whistle and the firing of a blank cartridge from one of our 1-pounders was answered by a chorus of farewell yells by the Indians, and as a further demonstration of their good feeling for the *Nunivak* they ran along the shore waving their hats and handkerchiefs until a bend in the river hid us from their sight.

As I looked back for the last time at the motley collection of natives on the shore and recalled many incidents of our association during the past two years my heart went out to them in sympathy. I wondered what changes would take place in the little community before I should see it again. In my mind's eye I could almost foresee the ones who would be next to succumb in the terrible struggle for existence which they are compelled to maintain, and as we sped swiftly on our way the recollection of their faults faded away and left only the memory of their childlike simplicity in many things and their unquestioning reliance in our ability to help them in time of need. Poor, weak, obstinate, pleasure-loving creatures! Civilization is sapping their energies, and in the rapid march of progress they find it impossible to keep in line. As a distinct people their day is done. The night of their complete obliteration from the scene is not far off.

We stopped at Fort Hamlin to finish the work of painting the vessel before proceeding farther, and to get rid of some of our dogs which were the source of constant annoyance and discomfort while on the vessel. We found the agent of the Alaska Commercial Company very busy getting the affairs of the station into shape for a transfer of property to the new company, which had been formed during the winter by the merging of the several trading companies doing business on the river into one corporation, to be known as the Northern Commercial Company. The news of the change had been brought down the river by the steamer *Alice*, which had passed a few days previous to our arrival at Fort Hamlin.

On June 5 we left Fort Hamlin and ran to Rampart City, a distance of 81 miles, in four and a half hours. The river was very high and the current much stronger than in its normal condition.

Upon our arrival at Rampart City, Lieutenant Rogers, U. S. Army, in command of the post at this place, informed me that a quantity of stores were needed at Fort Gibbon, which were on hand here, and requested our assistance in getting them down the river. The supplies were taken on board the *Nunivak*, and on June 9 we left Rampart and proceeded on our way. Five destitute persons were received on board for transportation to the coast while we were at Rampart, it being agreed that they would work their way down the river.

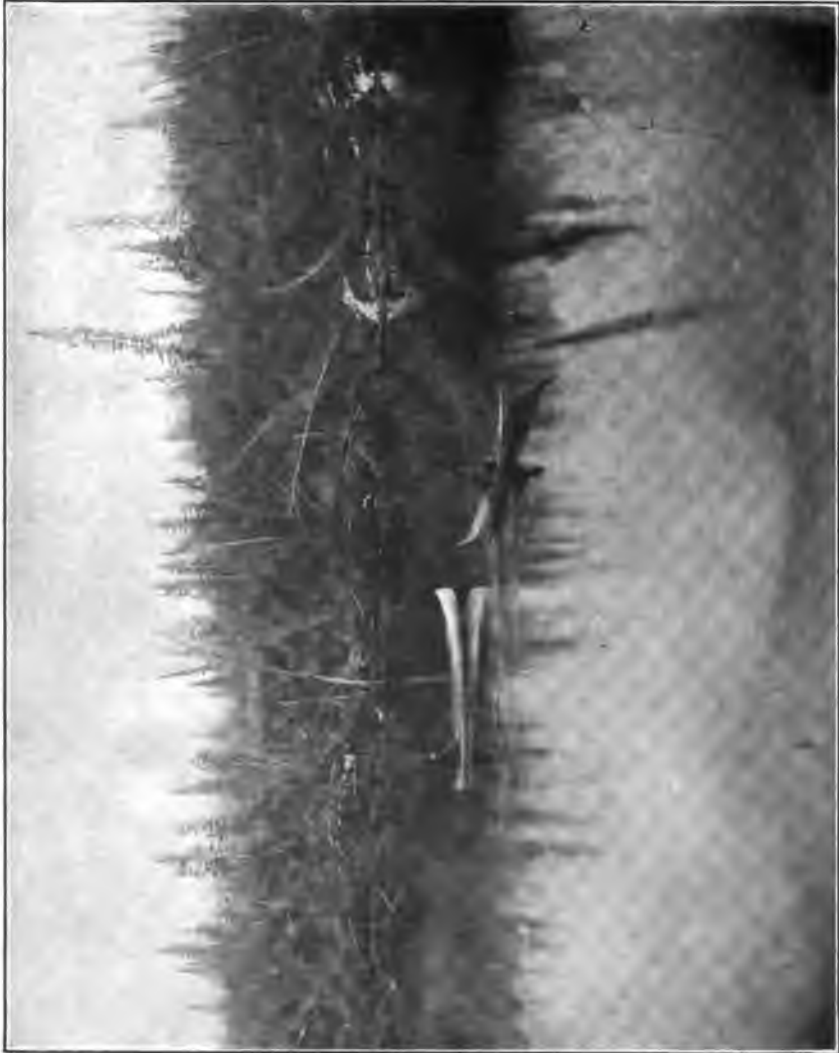
On June 10 we arrived at St. James mission, and stopped to call on Bishop Rowe and see if we could be of any assistance. A large number of Indians from the Tannana River were encamped near the mission, and the bishop informed me that he had had some trouble in preventing unscrupulous white men from trading whisky to the Indians for their furs, but his firm attitude in the matter had evidently been effectual in abating the evil, for at the time of our visit the natives appeared to be in a very orderly condition. After a day's sojourn with the bishop we dropped down to Fort Gibbon and delivered the supplies we had brought from Rampart City for the post.

All the officers of the post were in good health and gave us a hearty welcome. Captain Wright, who was in command, tendered the facilities of the post to us in case any repairs were necessary to the *Nunivak*, and the crew were given the privilege of purchasing any small articles of which they might stand in need out of the commissary. We received on board five more destitute persons at Fort Gibbon for transportation down the river, and Bishop Rowe also came on board as a guest of the commanding officer for passage to Anvik. After spending two very pleasant days visiting our kind friends at Fort Gibbon, we left that place on the 14th of June and continued on our way.

While at Fort Gibbon, Thomas McKatchney, one of the seamen of the vessel, showed signs of violent insanity and was with difficulty



SUMMER ENCAMPMENT OF NATIVES ON THE YUKON RIVER AT THE BEGINNING OF THE FISHING SEASON.



CHARACTERISTIC VIEW OF YUKON RIVER BANKS, SHOWING RESULTS OF EROSION.

controlled. His mania seemed to be a fear that a conspiracy had been formed by some of the crew to murder him. His actions during the winter had been somewhat peculiar, but until our arrival at Fort Gibbon his real condition had not been suspected. After the first violent outbreak he quieted down, and under the doctor's directions he was released from confinement and set at work where he could be constantly watched. During the passage down the river McKatchney showed no further signs of becoming dangerously insane. Upon our arrival at St. Michael he was kept on board the vessel until the surgeon pronounced him fully recovered. McKatchney was an old deep-water sailor, and it is more than likely that the isolation of our life while in winter quarters was the cause of his temporary mental derangement.

One of our destitute passengers, a man named Daniel O'Connell, developed signs of acute mania shortly after our departure from Fort Gibbon, and he attempted to kill himself, but was prevented by the prompt action of one of his companions. During the balance of the time he was on board it was found to be necessary to maintain a constant guard over him to prevent him from injuring himself or others, and when we reached St. Michael he was turned over to the civil authorities for transportation to the outside.

Our journey down the river to Kokrines Station, where we made our next stop, was much delayed by large quantities of driftwood which the prevailing flood in the river was bringing down. Fortunately for the purposes of navigation the largest amount of drift material seemed to collect in the sloughs and eddies of the stream and out of the main channels. Otherwise it would have been impossible to proceed. As it was, we were compelled to make frequent stops to clear the wheel and rudders from débris, and at times we were in great danger of being driven ashore by the current while so engaged. Fortunately, however, we got through the worst portion of the river without any serious mishap, and reached Kokrines on June 15, and stopped to communicate with the trader, a half-breed Russian, who has a store at this place. A number of Indians were gathered at Kokrines for the purpose of exchanging their furs for supplies, and everything was in an orderly condition. During the night Bishop Rowe held services on shore and a large number of the natives attended.

On June 15 we reached Kaltag and stopped to communicate with Maj. Frank Greene, U. S. Army, who was in charge of the construction of the army telegraph line along the river. The line was in operation between this point and St. Michael, and through the kindness of Major Greene I was enabled to get news from that place that the ice was still intact in the harbor of St. Michael, and that it would probably be ten days before it would break up.

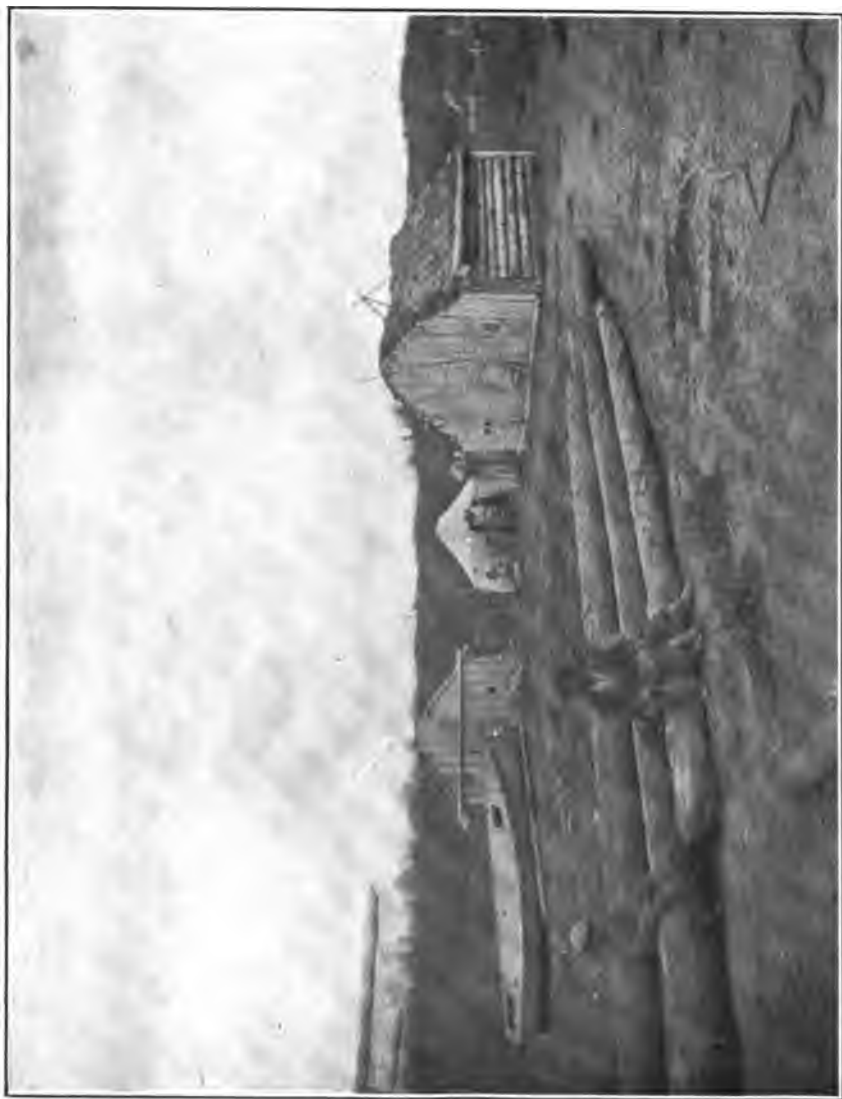
While lying at Kaltag the steamer *Leon* arrived from Dawson with a large number of passengers for St. Michael. Upon boarding the vessel it was found that she was carrying more passengers than allowed by law and I reported the matter by telegraph to the collector of customs at St. Michael.

The banks of the river in this locality showed the effects of the recent run of ice to a remarkable extent. For miles along the shores the trees had been cut down by the ice, and even at this late date large masses still remained unmelted where it had been stranded by the flood. At Nulato the village had been nearly washed away and the inhabitants had been compelled to seek safety by moving to a high bluff near the village until the period of high water had passed. The houses were flooded, and at the time of our visit the main street of the village was filled with mud and melting masses of ice which had been deposited there when the river broke up in the spring.

On June 17 we reached Anvik, and Bishop Rowe left the vessel. At the request of Rev. Mr. Chapman, who was in charge of the Episcopal mission at this place, he was received on board the *Nunivak* for passage to St. Michael. The children attending the mission school were suffering from an epidemic of whooping cough, and the arrival of the *Nunivak* had been anxiously looked for by Miss Sabine, the superintendent of the school, who stated that the supply of proper medicines had become almost exhausted. Surgeon White spent the most of the time we were at Anvik in attending to the wants of the little community and before leaving, prepared a quantity of medicine for the sick children and left it with Miss Sabine.

Proceeding on our way, we reached Holy Cross Mission at 6 p. m. and tied up for the night. A visit was paid to the Catholic mission, where we were received with the customary welcome by the Rev. Father Crimont and the Sisters of Charity in charge of the school. Everybody was well, and we spent a pleasant evening talking over events of interest which had taken place during the winter. The vegetable garden was very backward, owing to the exceptionally late season; and I was much interested in the novel manner in which Sister Mary Winifred had attempted to protect the young plants from the frost. Each tiny plant was carefully covered with an empty tin can every night, and the garden looked as if a crop of cans were expected rather than vegetables.

On June 18 we ran from Holy Cross to Andreafski, stopping on the way at Russian Mission to make inquiries. At the latter place the natives were found to be in good health, and I was informed by Mr. Belkoff, the trader at this place, that the supply of provisions which had been put under his charge last fall by Colonel Evans, special agent of the Treasury, had been distributed to the natives during the winter, and had been the means of preventing much suffering. He did



ESKIMO HOUSES AT RUSSIAN MISSION, YUKON RIVER.



OLD ESKIMO KASHIM, OR DANCE HOUSE, ON THE BANK OF THE LOWER YUKON RIVER.
The opening to the passageway leading to the interior is shown at the left of the picture.

not think that any further help was needed at the present time, but recommended that a supply of provisions and clothing be placed here and elsewhere on the river, to be used in case of absolute need at any future time. We reached Andreafski at 11 p. m. and found Mr. Fredericks and his family well. The natives in the vicinity of this place had been helped through the winter by the distribution of supplies left with Mr. Fredericks, but were now all right again, and he had still a quantity of unexpended stores on hand. It occurred to me that it would be a good plan to distribute some of these stores to other stations along the river where the stock had been exhausted.

At Andreafski all signs of the river Indians disappear, and their places are taken by the coast Eskimos. The latter natives are not as clean or honest as the river Indians, and Mr. Fredericks reported several instances of petty thefts committed by them during the winter, as well as several cases of inhuman treatment of their sick neighbors. The presence of free stores of provisions and clothing might easily have caused these natives to have fallen into the condition of beggars had the distribution of the supplies been left in the hands of a less experienced man than Agent Fredericks, but under his able management a great deal of suffering was prevented, and at the same time the natives were not encouraged in taking up a life of idleness after they were able to return to their ordinary pursuits.

Mr. Fredericks also reported that he had been greatly annoyed by the acts of unscrupulous white travelers along the river during the winter, who had taken advantage of the prevailing sickness among the natives to rob their caches and commit other acts of malicious mischief. As an instance of the unnatural depravity of some of the white people who are encountered in this country, Mr. Fredericks related the case of a party of three men whom he had taken into his house and furnished with free food and shelter for several days. One morning he awoke to find that his guests had taken their departure without a word of thanks and carried off with them several of his best dogs. Before leaving they had deliberately broken in the sides of a boat which was lying on the beach, evidently with no other object in view than to show their utter contempt for even the ordinary decencies of life.

We remained at Andreafski long enough to give the engineer department a chance to wash out the boilers, which were very foul from using the muddy water of the Yukon, and to take on board a full supply of drinking water. Having completed this work, we left on the 25th of June and proceeded on our way toward the coast. A day's run brought us to Kotlik, 7 miles from the mouth of the Yukon, and here we tied up for the night, or rather for that portion of the day which in more southern latitudes would be night. In this locality at this season of the year daylight is continuous, and in order to obtain sleep

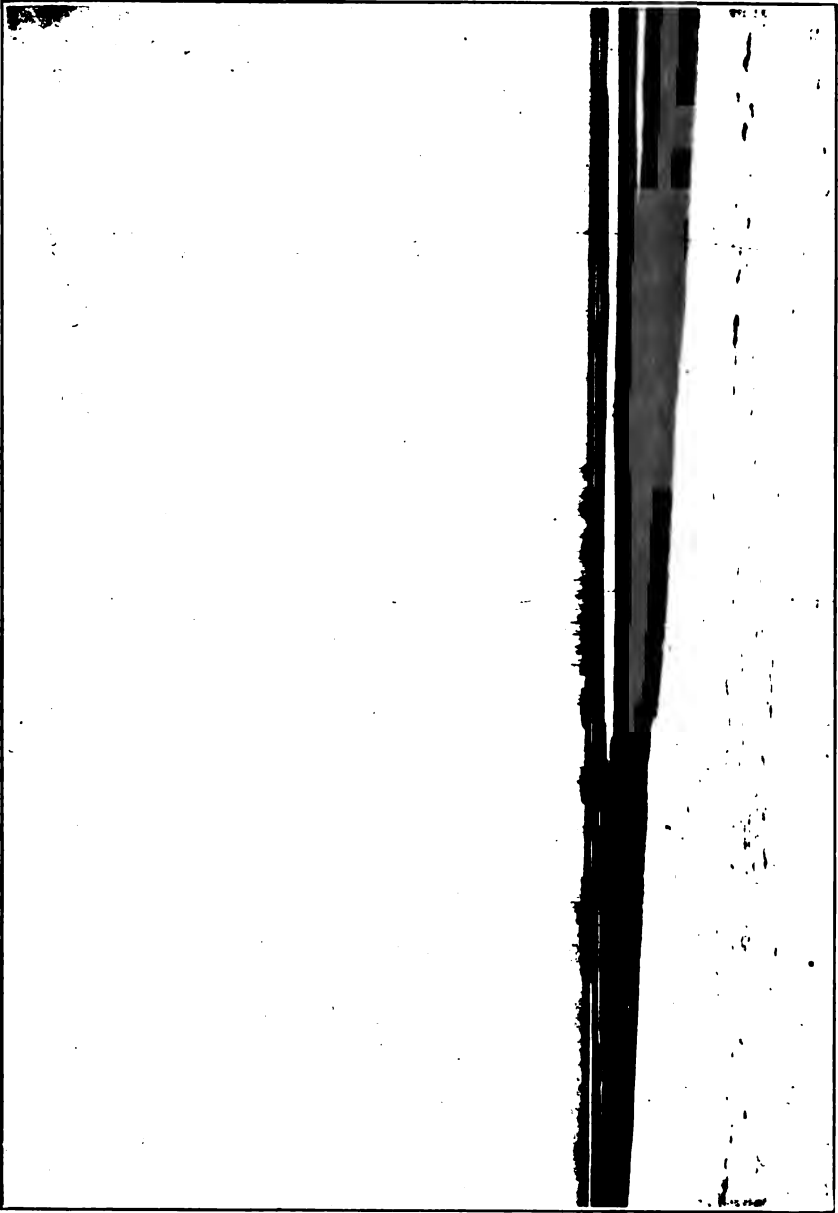
it is necessary to darken the quarters artificially and forbid all loud talking or the making of any unnecessary noise during certain hours. In spite of these precautions it was not always possible to obtain the proper amount of rest, and the faces of nearly everyone showed the lack of it.

A number of vessels had already arrived at the mouth of the river and were awaiting the opening of ocean navigation. These were all boarded and examined in accordance with law. Several of the vessels from Dawson were found to be carrying an excess of passengers over the number allowed by law and were duly reported.

On June 22 we dropped down to the mouth of the river and found the ocean ice intact as far as it could be seen offshore. From its appearance I felt sure that it would be several days before it would be possible for us to start for St. Michael. I therefore ordered the fires to be hauled in order to save fuel, and made other preparations to lay here until navigation should be opened.

Meanwhile the number of vessels at the mouth of the river steadily increased with fresh arrivals from up the river, and as all of them were more or less short of provisions it became evident that unless relief was afforded in a short time the situation would become serious. The steamers *Leon* and *Monarch* were both overcrowded with passengers and were the first to run short of provisions. We furnished both these vessels with what could be spared from the *Nunivak* to help them out, but as we had some 15 destitute persons on board, in addition to our own men, to feed we could not spare as much as would have been desirable. The passengers of the *Leon* were mostly of the class that had been forced to leave Dawson by the authorities in the spring, and under the stress of their detention at this place became very unruly, and finally their conduct was so objectionable to the respectable portion of the people on board that a complaint was lodged with me in regard to their misconduct. I sent for the master of the *Leon* and told him a complaint had been made of the noisy, obscene, and generally disorderly manner in which the majority of the passengers on board his vessel were allowed to conduct themselves, and it must be stopped; if he could not control his passengers it would be my duty to interfere for the protection of the peace, and I should certainly do so if any further complaints were made to me. During the afternoon I caused the *Nunivak* to be hauled alongside the *Leon* for the purpose of being at hand to preserve order if our services were required, but, much to my relief and that of the respectable persons on board the *Leon*, the rough element concluded they had gone far enough, and no necessity for us to interfere took place.

On June 24 one of the passengers on board the *Monarch* died during the night. He was a soldier who had been stationed at Fort Gibbon and was on his way to St. Michael for medical treatment in the army hospital at that place. Major Greene, of the Army, who was a pas-



WINTER QUARTERS OF YUKON RIVER STEAMERS IN THE CANAL NEAR ST. MICHAEL, ON THE COAST.

senger on one of the other steamers, called on board the *Nunivak*, and we had a conference as to the best disposition that could be made of the body. It was decided to have it carried to St. Michael if possible, and with that end in view a coffin was made by the carpenter of the *Nunivak* and sent on board the *Monarch*. A quantity of ice was also furnished to preserve the body of the dead soldier until the arrival of the *Monarch* at St. Michael.

While lying at the mouth of the river we received information of the discovery of some dead bodies lying exposed on the tundra, and a burial party was sent out from the *Nunivak* in charge of Lieutenant Camden to give the remains decent interment. Mr. Camden found the bodies and identified them as being a family of Eskimos who had evidently perished of starvation during the winter. A grave was made and the bodies buried, while Rev. Mr. Chapman read the services for the burial of the dead.

On June 26 the weather was overcast and squally, with a rapidly falling barometer, indicative of southerly winds. During the latter part of the day the wind increased in force, and the ice offshore for the first time showed signs of weakening. On the 27th, under the influence of a strong southeast gale, the ice moved offshore during the flow of the ebb tide, and several of the smaller vessels ventured out, but were forced to return by the inflow of the ice on the flood tide. It was, however, pretty well broken up, and at 1 a. m. of the 28th we left the river and stood along the coast toward St. Michael. The departure of the *Nunivak* was the signal for the whole fleet of delayed steamers to follow. When we arrived off Cape Romanoff, a quantity of drift ice was encountered, through which the vessel was carefully worked until the vicinity of Stephens Pass was reached, at 5 a. m. The pass was completely filled with ice, and, finding that it was impossible to get through, we turned and ran for the canal, this being the nearest place where shelter could be obtained. Our change of course was noted by the rest of the fleet, which by this time were stretched out in a long line as far as the eye could reach in the direction of the mouth of the Yukon. The most of the vessels followed the direction taken by the *Nunivak*, and at 8 a. m. some 10 or 12 vessels reached the entrance to the canal. The mouth of this estuary was almost choked with ice, which the ebb tide was carrying out to sea, but as there was scarcely water enough over the bar for the *Nunivak* to enter at low tide, I decided to attempt to work the vessel through the drift ice rather than take the chance of being caught by the sea ice should we remain outside until the flood tide should make. We accordingly entered the canal, and after an hour of hard work succeeded in working through the drift ice and into the clear water beyond. Several of the fleet followed the *Nunivak*, and we finally reached a sheltered position near the winter quarters of the steamers lying in the canal and made fast alongside the bank.

At this time there were upward of 20 steamers lying in the canal, some of which were all ready to leave for St. Michael as soon as ocean navigation should be open, while others had been so badly injured by the ice when the canal broke up in the spring as to be practically worthless. I was informed by persons who had wintered here that the place was not fitted for winter quarters for a vessel on account of the violent movements of the ice both at the time when it was forming in the fall and during the spring breakup. Most of the vessels had suffered considerable damage by having the oakum pulled out of the side seams by the action of the ice, and in some cases whole planks had been torn off by this means. All of the vessels which had been left without full crews to care for them were either sunk or forced far out on the flat marsh land bordering the canal. The place was otherwise objectionable on account of its unsheltered situation. Constant gales during the winter swept in from the sea, and for days at a time it was impossible to stir out of doors on account of the inclement weather.

On June 29, on complaint of Capt. P. C. Rickmers, in charge of the steamers belonging to the Empire Transportation Company which had wintered in the canal, I caused the arrest of two men for selling liquor to the crews on the vessels in port without a license. After a preliminary examination of the accused parties on board the *Nunivak*, at which conclusive evidence of their guilt was adduced, I decided to send them to St. Michael by small boat, under guard, to be turned over to the United States commissioner at that place for trial. Lieutenant Wheeler and Seaman McGrath, of the *Nunivak*, were detailed to perform this duty, and left the ship on June 30 with the prisoners. They returned from St. Michael on July 2, Lieutenant Wheeler reporting that he had delivered the two men into the custody of the United States commissioner, as ordered. Mr. Wheeler reported that the harbor of St. Michael was still closed by ice, but that it was open alongshore, and all that was needed was a strong southerly wind to drive it out to sea. It was possible for small steamers to reach St. Michael by way of the canal, and at the request of Capt. J. E. Hansen, superintendent of transportation for the Northern Commercial Company, permission was granted him to transfer a number of the passengers on the large steamers to smaller craft for transportation to their destination. This measure was necessary on account of the scarcity of provisions and the impossibility of getting a fresh supply at this point until the opening of navigation. The steamers *City of Paris* and *Rock Island*, both light-draft vessels, were accordingly dispatched through the canal with passengers from the other vessels. Lists of passengers so transferred were furnished by Captain Hansen for the information of the collector of customs at St. Michael, so as to enable that official to keep an accurate record of the number of passengers which each vessel had brought down the river.

A strong southwest gale sprang up during the night of July 3, and by noon the ice, which had clung persistently to the shore in the vicinity of the entrance to the canal since our arrival, suddenly broke away and drifted off to sea. At 2 p. m. a steam launch arrived from St. Michael with the welcome news that the harbor was at last open. We immediately got under way and dropped down the canal to its mouth, with the intention of starting for St. Michael, but a dense fog shut in and we did not get away until 9 p. m. By this time nearly all the detained vessels were under way, and with the *Nunivak* in the lead the fleet started across the open stretch of ocean which lay between us and our destined port. Stephens Pass was found to be clear of ice, and although there was still a large number of detached bergs in the sea beyond we made our way safely through the open leads, and at 2 a. m. of July 4 the *Nunivak* dropped anchor in the inner harbor, with the honor of being the first of the river fleet to reach its destination this year. The harbor was crowded with ships of all descriptions, which had arrived from the outside, and the town, with its many new buildings which had been built during the winter, seemed to our eyes a veritable metropolis.

A large quantity of mail matter, some of it nearly a year old, was received shortly after our arrival, and for several days we were kept busy reading letters and catching up with the news from the outside.

Among other letters received from the Department at this time was one in which I was informed that it was not the intention of Department to keep the *Nunivak* in commission during the ensuing winter, but that after the summer's work in the vicinity of St. Michael had been finished the vessel was to be laid up at that place, and the crew, with the exception of enough men to look out for her while in winter quarters, discharged.

In pursuance with instructions contained in Department letter of the 3d of May, 1901, I informed the collector of customs at St. Michael that the *Nunivak* would remain in the harbor during the summer and I should be glad to render him any assistance possible in the execution of the laws for the protection of the customs revenue and in the enforcement of the navigation laws.

I am glad to state that the official relations between the officers of the customs service and this command were at all times cordial and pleasant.

On July 13 I left St. Michael on the steamer *Dora* and visited Nome for the purpose of conferring with Lieut. D. H. Jarvis, R. C. S., in regard to matters of official business, and returned to St. Michael on the 17th instant.

On August 5 the U. S. S. *Thetis* arrived in port with a supply of coal and stores for the *Nunivak*, and also brought me further instructions from the Department in regard to the disposition of the vessel and command. The U. S. S. *Manning* arrived several days later, bringing us an additional quantity of coal, all of which was in due course taken on board the *Nunivak*.

The Department has already been fully informed of the failure on the part of Lieutenant Jarvis to dispose of the *Nunivak* by sale and of the manner in which the vessel was subsequently hauled out on the beach under my directions and placed in winter quarters. It only remains for me to tender my sincere thanks to the commanding officer of the U. S. S. *Bear*, Capt. Francis Tuttle, R. C. S., for valuable assistance given this command in the work of getting the vessel safely into winter quarters, to Lieut. D. H. Jarvis, R. C. S., who as special disbursing officer, settled the accounts of the command at various times during our stay in the North, in many cases at great personal inconvenience, and to Lieut. D. P. Foley, R. C. S., purchasing officer of the Service at San Francisco, to whom fell the onerous and most important duty of selecting and purchasing supplies for the vessel as needed from time to time. The work done by all these officers contributed in a great measure to our comfort, and, what is of more importance to the economical and successful management of the command in its isolated situation.

To other officers of the Service to whom we were indebted for many acts of thoughtful consideration, I desire to extend my thanks and assurances of my sincere appreciation. The mere enumeration of their names would comprise almost the entire list of officers who during this period were attached to the several vessels of the Service in Bering Sea, and, under the circumstances, my failure to give personal credit for every act of kindness done for us will I feel sure be understood and pardoned.

On the 15th of September the work of hauling the *Nunivak* out on the beach at St. Michael was completed, the members of the crew who were to remain by the vessel selected, and the remaining members of the crew transferred to the U. S. S. *Bear* for transportation to the States.

Lieutenants Camden and Blake were detached and ordered to proceed to their homes via the Yukon River route, and directed to obtain the necessary data for the construction of a chart of the upper portion of the river while en route.

Lieutenant Wheeler and Assistant Engineer Lewton were transferred to the U. S. S. *Bear* for duty on that vessel, and Surgeon White, who had volunteered for the duty, was left in charge of the *Nunivak* for the winter.

On September 16 I bade good-bye to Dr. White and the little band of men left with him to take care of the vessel, and with a sincere feeling of regret at parting with my first command I took passage for the States in the steamer *Rounoke* and arrived at my home in San Francisco, Cal., on the 2d of October, and reported my arrival to the honorable Secretary of the Treasury as directed in my orders of detachment dated May 3, 1901.



BLOCKING UP THE NUNIVAK ON THE BEACH AT ST. MICHAEL AFTER HAULING HER OUT AT THE END OF THE ACTIVE SEASON OF 1901.

PART II.

- CHAPTER I. DESCRIPTION OF THE STATION.
CHAPTER II. TRAFFIC AND TRANSPORTATION.
CHAPTER III. WINTER TRAVEL.
CHAPTER IV. ECONOMIC CONDITIONS.
CHAPTER V. SOCIAL CONDITIONS.
CHAPTER VI. LAW AND ORDER.



ST. MICHAEL, LOOKING FROM THE INNER HARBOR TOWARD THE SITE OF THE NORTH AMERICAN TRANSPORTATION AND TRADING COMPANY'S PLANT.

CHAPTER 1.

DESCRIPTION OF THE STATION.

THE CRUISING GROUND.

The cruising ground of the *Nunivak*, as defined by Department orders of April 24, 1899, embraced all that portion of the Yukon River from its mouth to a distance up the stream not to exceed 1,000 miles. Owing to the necessity for us to return each year to St. Michael to receive our annual supplies, this port and the stretch of coast between it and the mouth of the Yukon also came within the scope of our operations.

The town of St. Michael is the most important settlement in Alaska, as it is the port of entry for all vessels bound from the States with passengers and freight for the interior. Here are situated the extensive warehouses, stores, hotels, and offices of all the trading companies engaged in business on the Yukon, besides being the site of the largest military post in the Territory. During the years 1900 and 1901 the military authorities built a number of large and comfortable dwellings, offices, storehouses, wharves, etc., for the accommodation of some 300 men forming the post, and this was designed to be the headquarters of the military division of Alaska, until it was transferred in the summer of 1901 to Vancouver Barracks, Oreg. The post is now occupied by two companies of infantry, and is known as Fort St. Michael.

The site of the town is on the irregular, curving shores of the extreme western portion of the island, and is about 35 feet above the level of the sea. The soil is composed of volcanic débris, covered to a depth of 4 or 5 feet with muck and disintegrated volcanic matter, over which a luxuriant growth of arctic moss and scattered dwarf willow shrubbery forms an almost impervious mantle. During the short summer months the landscape is beautified by the presence of a great number of flowers, but in the winter season the level tundra plains are swept by howling gales, and the scene is one of utter desolation.

The shores of the bay are fringed by bowlders of volcanic rock which have fallen from the abrupt cliffs, and the bottom of the bay near to the shore is in places made difficult and dangerous of navigation by the presence of rocks and reefs which have been formed by the

action of the ice. There are two small coves in which small steamers can find shelter from the wind and sea, and where they can be hauled out for repairs.

The harbor carries a depth of $2\frac{1}{2}$ fathoms of water from the sea to a point about a mile from the wharves of the Alaska Commercial Company, with soft muddy bottom and moderately good holding ground. Vessels drawing more than 12 feet should not venture into the harbor farther than a point bearing east-southeast (*true*) from the north bluff of the town.

The tides are variable in height, depending in a great measure on the direction and force of the wind. Strong northerly winds cause a low stage of water and a high sea in the harbor, and render it an unsafe anchorage for the larger class of vessels and very disagreeable for the shallow-draft river steamers. Southerly winds, on the other hand, cause the tides to run higher, and as the harbor is sheltered from winds from this direction it is usually safe to remain at anchor until the wind has subsided. During the prevalence of northerly gales ocean-going vessels of deep draft usually leave St. Michael harbor and seek shelter under the lee of Egg Island, which lies north of St. Michael, about 10 miles distant. Good anchorage can be obtained in from 5 to 6 fathoms of water close to shore on all sides of this island, with mud and shell bottom and excellent holding ground.

The river boats haul out to heavy moorings in the harbor when it gets too rough for them to lie at the wharves, or else boldly push in as near the beach as possible and so lie out the gale. But, as I have before stated, the shores of the harbor are fringed with dangerous rocks and reefs, and no one should venture to approach very close to land unless he has a perfect acquaintance with the character of the bottom.

The astronomical position of St. Michael from the latest determination made by the United States Coast and Geodetic Survey is $63^{\circ} 28' 41.5''$ north latitude and $162^{\circ} 01' 06''$ west longitude. There are generally two tides each day, but the second tide is so inconsiderable as to be a negligible quantity for the purposes of navigation. The mean height of high water is $3\frac{1}{2}$ feet. Spring tides may be as high as 5 feet, and storms sometimes cause the water in the bay to rise high enough to cover the wharves.

Steamers leaving St. Michael bound for the mouth of the Yukon usually time their departure so as to reach the bar at the entrance to the Aphoon mouth of the river at or near the time of high water. The course taken is by sea along the north shore of St. Michael Island to Stephens Pass, which is a narrow strait separating St. Michael from Stuart Island, and thence in a direct course over the Yukon Flats to the mouth of the river. In the north entrance to Stephens Pass there are $3\frac{1}{2}$ fathoms of water and in case of sudden gales shelter may be



ANDREAFSKI, YUKON RIVER.

obtained in several coves on Stuart Island. The shores of this island are usually covered with quantities of driftwood from the Yukon, but landing is difficult except when the sea is smooth.

Once through Stephens Pass the water rapidly shoals to 8 feet, and when off Cape Romanoff, a solitary rounded headland of crystallized schistose rock about halfway from the pass to the mouth of the river, the water decreases in depth to 6 feet. This depth is maintained with great regularity until the mouth of the Pastoliak River is reached.

Here close inshore is found a narrow and somewhat winding channel with from 8 to 10 feet leading across Pastol Bay and into the Aphoon. The distance from St. Michael to the Aphoon entrance to the river by the sea route is 60 miles. Small steamers and boats sometimes make this journey by way of the Canal, a narrow and tortuous channel which separates St. Michael Island from the mainland, in order to avoid the rough water encountered on the way through Stephens Pass. Both entrances to the Canal are obstructed by bars, over which 5 feet is the most that can be carried at high tide. Once over the bars, there is plenty of water through the Canal, but the channel is strewn with rocks and in many places difficult of navigation.

Passing up the Aphoon mouth the country on each side of the river is low and uninteresting. The immediate banks of the stream are clothed with a dense growth of willow and alder bushes, and back of this the country stretches away for mile on mile in dreary expanses of level tundra plains. To the southward these plains join the sky in an unbroken line, but toward the north a low range of mountains having a general northwest-southeast trend marks the northern limit of the flood plain of the Yukon Delta, and serves to relieve the monotonous character of the landscape.

Generally speaking, there is plenty of water through the Aphoon, but at several places the channel is obstructed by sand and silt flats. About 33 miles above its mouth we pass out of the Aphoon into what may be called the main part of the Yukon. This is called the Kwikpak Mouth, and is almost a mile wide. The channel winds in and out amidst a labyrinth of low sand islands, some of which are completely covered at high tide, and navigation through this portion of the river is tedious and perplexing until the head of the delta is reached. The course upstream to this point has been in a general southeast direction, but now the river sweeps around the base of a mountainous headland in a great curve to the northward, and for the first time a view of the noble river in all its beauty, confined on both hands by high commanding banks, is obtained.

Andreafski, the first white settlement of any importance to be seen on ascending the river, is situated on the Andreafski River near its junction with the Yukon at a distance of 120 miles from the mouth of

the latter stream. Here are located the regular winter quarters of the Alaska Commercial Company and its trading post. The company has erected a commodious two-story building for the accommodation of the crews of its vessels while in winter quarters, and has installed a fine machine shop, electric plant, etc., for the use of the station. A marine railway is at the present time in process of construction, which is designed to haul out the largest vessels owned by the company, thereby doing away with an immense amount of expense and trouble incurred while looking out for them if left in the water and allowed to freeze in. The water in the Andreafski River is beautifully clear and this is a favorite place for vessels to call in and fill up their tanks before proceeding further up the Yukon.

From Andreafski the Yukon carries from 5 to 10 fathoms of water in the channel, and this depth of water may be said to continue for 1,000 miles upstream, or until the island system of the river is reached, just above Dall River. So far as known there is not in all this distance a single hidden rock or snag to menace navigation. The channel is in many places somewhat intricate, but our experience leads me to believe that it is subject to very few changes in the main portion of the river. A deep channel through the lower portion of the Yukon and across the bar which obstructs the Aphoon entrance could be easily made by systematic dredging at comparatively little cost. The wooden ranges at present in place on the tundra at the mouth of the river could be replaced by lighted range beacons to great advantage for the use of vessels entering the river, especially during the latter part of the season of open navigation, when darkness makes it impossible to see the wooden marks. It is impracticable to maintain buoys in position except during a portion of the open season on account of the action of the ice, but it is perfectly feasible to maintain lighted beacons on shore, which would answer the same purpose. With these aids to navigation the Yukon for at least 1,000 miles of its length would be one of the easiest and safest rivers in the world to navigate.

THE CURRENT.

The strength of the current in the Yukon is very variable. During high-water or flood periods it attains its greatest force, and at such times and in certain localities—as, for example, at the lower entrance to the Ramparts—it has a velocity of from 8 to 9 miles per hour. In general, however, the force of the current from the Aphoon mouth to the Andreafski River averages $2\frac{1}{2}$ miles per hour, from Andreafski River to Anvik $3\frac{1}{2}$ miles per hour, from Anvik to the Ramparts $5\frac{1}{2}$ miles per hour, and through the Ramparts to Dall River $6\frac{1}{2}$ miles per hour. From a reconnoissance made of the Yukon between Dall River and Circle City by Lieutenant Camden, in the spring of 1900, it was ascertained that the strength of the current in this part of the river



CHARACTERISTIC VIEW OF THE YUKON RIVER SHORES ABOVE THE DELTA REGION AND BEFORE THE WOODED SECTION IS REACHED.



SHORE LINE OF YUKON RIVER, SHOWING TO SOME EXTENT THE FLUCTUATIONS IN THE RIVER LEVEL.

The photograph was taken at a medium low-water stage of the stream.

attains a velocity of 7 miles per hour, and I am informed by local steamboat men that this force is maintained all the way to Dawson. There are many places in the Yukon, locally known as "rapids," where for a short distance very swift water is encountered, but, on the other hand, there are long stretches of the river, especially in its middle section, where the current does not exceed 3 miles per hour.

HIGH AND LOW WATER STAGES.

The mean annual succession of high and low water stages in the Yukon is quite uniform, but so many exceptions are noted that it is not safe to make any definite predictions in regard to the height of water for any short period. In general it may be stated that the river is at its highest stage at the time of opening of navigation and lowest just before the river closes in the fall. After the subsidence of the spring flood, which usually occurs in a week or ten days after the breaking up of the ice, the river maintains its normal height until the summer rains begin, in the middle of July, when it oscillates with the amount of rainfall, which is a very variable quantity. A long-continued period of dry weather will cause the water in the river to fall rapidly, and it is doubtless true that during such periods the volume of the river is much decreased by rapid evaporation.

Steamboat men and others whose observation of the river has extended over a period of several years state that there is always an increase in the height of water during the month of September, locally designated "the September rise." This may easily be attributed to the melting of the first fall of snow in the latter part of September. But this rise is of short duration, and is soon checked by the freezing of the small tributary mountain streams, which takes place usually by the first week in October. After this the river falls rapidly until the ice begins to form and navigation closes.

SEDIMENTARY MATTER.

The percentage of sedimentary matter carried in suspension varies greatly at different seasons, but apparently does not depend so much on the stage of water as it does on the character of the tributary from which it flows. It is also largely influenced by the caving of the river banks, which is always greatest while the river is falling after the spring freshets. During the first part of summer the sedimentary matter is to the water by weight as 1 to 1,600, and when in this condition is unfit for domestic use except after it has been boiled and filtered. Drinking water in large quantities is rather difficult to obtain except at two or three places on the station. Vessels engaged in traffic on the river find it necessary to carry fresh-water tanks, which are filled from the Andraefski, Anvik, or Kaltag rivers, all of which

are easily accessible and furnish an abundance of clear, pure water, free from all impurities. Immediately after the first ice forms in the Yukon the water in the river becomes perfectly clear and so remains until spring.

VEGETATION.

Under the influence of the long, sunny days of April and May, while snow is yet on the ground and the rivers are still icebound, vegetation of all kinds bounds into life with a rapidity which is astonishing, and by the middle of June the whole face of the country is abloom with the fervid life of innumerable plants and flowers. In July the grasses are waist high and the foliage of deciduous trees so dense as to be almost impenetrable to the eye. In August the berries ripen, and by the 20th of the month the leaves of the birches and poplars begin to take on the gaudy coloring of autumnal decay.

Gardens are planted out of doors in May, and by the end of June some of the more rapidly growing vegetables are ready for the table. Radishes, spinach, parsley, and lettuce are first to mature. After these, in rapid succession, come green peas, kale, turnips, and cabbage. With proper attention to location and drainage excellent potatoes can be raised, and in addition to all these vegetables I have seen a very good quality of celery which was grown at Holy Cross Mission.

Several varieties of vegetables were planted in boxes on board the *Nunivak* for experimental purposes, and it was found that lettuce, radishes, parsley, and kale could be raised in this way in from six to eight weeks. The soil used in conducting these experiments was taken from the top of one of our log houses on shore, where it had been lying since the preceding fall, and to a certain extent it had been dried out by exposure to the sun and air. A small amount of lime was used to counteract the natural acidity of the soil, but with this exception no fertilizing material of any kind was added.

Several species of indigenous wild plants which can be used as vegetable food grow abundantly along the banks of the Yukon and its tributary streams. Among them we noted the parsnip, onion, a species of rhubarb, and a kind of spinach which when properly prepared was fully as palatable as the cultivated plant.

At numerous places along the river I noted the presence of natural meadows of various kind of grasses, which no doubt would furnish excellent hay; but the local demand for this article has not as yet become great enough to encourage its cultivation as a marketable product.

THE SOIL.

The soil of the Yukon Valley is a rich alluvial, composed of fine sand, mud, and vegetable matter. In many localities, where erosion had exposed a section of the river bank, large deposits of marl were



SPRING VEGETATION IN THE YUKON RIVER VALLEY.



VIEW OF THE WOODED SECTION OF THE YUKON RIVER, SHOWING THE DENUDATION OF THE FORESTS ALONG THE LINE OF STEAMBOAT TRAVEL.

observed, and the soil appeared to be free from frost. This was not found to be the case in the treeless, moss-covered country near the coast. Here the cut banks showed large quantities of ice, and it is doubtless true that it never thaws out to a greater depth than a few inches from the surface. In the interior an entirely different condition exists. Early in the spring, in digging a hole in the ground at Fort Shoemaker, much to our surprise the earth at a short distance beneath the frozen surface was found to be comparatively dry and free from frost. This condition of the soil doubtless obtains in all localities where land has been formed by alluvial deposition, and where it is not covered by the moisture-absorbing, nonconductive mantle of moss. The agricultural possibilities of the Yukon Valley are yet to be determined by systematic and intelligently conducted experiments. Efforts have been made in the past to grow some of the cereals at different places along the river, and it is true that the results were not very encouraging. But it must be remembered that these experiments were made by traders in a more or less perfunctory manner, and should not be accepted as final proof that the country is not suited to agriculture. During the last decade many vegetables have been added to the list of those which were known to be possible of cultivation in this region, with the result that the meager fare of fish, wild fowl, and venison, which formed almost the only source of food supply for the early settlers, has been greatly diversified and improved. There seems no good reason to doubt that in many parts of the interior, especially in sunny, well-drained alluvial valleys, with deep plowing and proper preparation of the soil, barley, oats, and wheat of the hardier variety would reach maturity. It is to be earnestly hoped that the Government will undertake the work of making some systematic experiments along these lines at an early day.

TIMBER.

It has been truly said that the first requisite for habitation in any country is timber. In this particular the Yukon Valley is well supplied. With the exception of the treeless tundra plains of the region near the coast, which extend inland to the first range of mountains, the country is well forested throughout its length and breadth. The heaviest growth of timber is found along the small tributary streams draining the lateral valleys of the Yukon system and on some of the sloughs of the main river. It is probable that the mean annual temperature is higher in these localities than it is directly on the shores of the main stream, and it is certain that the valleys are more sheltered from the wind. This will no doubt account for the larger growth attained by the trees in these localities.

The most important of all the forest trees found in this region is the white spruce (*Abies alba*). This beautiful conifer attains a height in

some favored localities of over 100 feet, with a diameter of over 4 feet at the butt. The stump of one tree which I examined at Dall River measured 3 feet across the top, which was 4 feet above the ground, and the annual rings showed that the tree had reached the age of 90 years. The average size of the spruce trees found along the Yukon is, however, considerably less, and in exposed situations show signs of climatic repression.

Great inroads have been made in the spruce forests along the immediate banks of the Yukon to supply fuel for the steamboats plying on the river, and in certain localities the shores have been almost entirely denuded of timber.

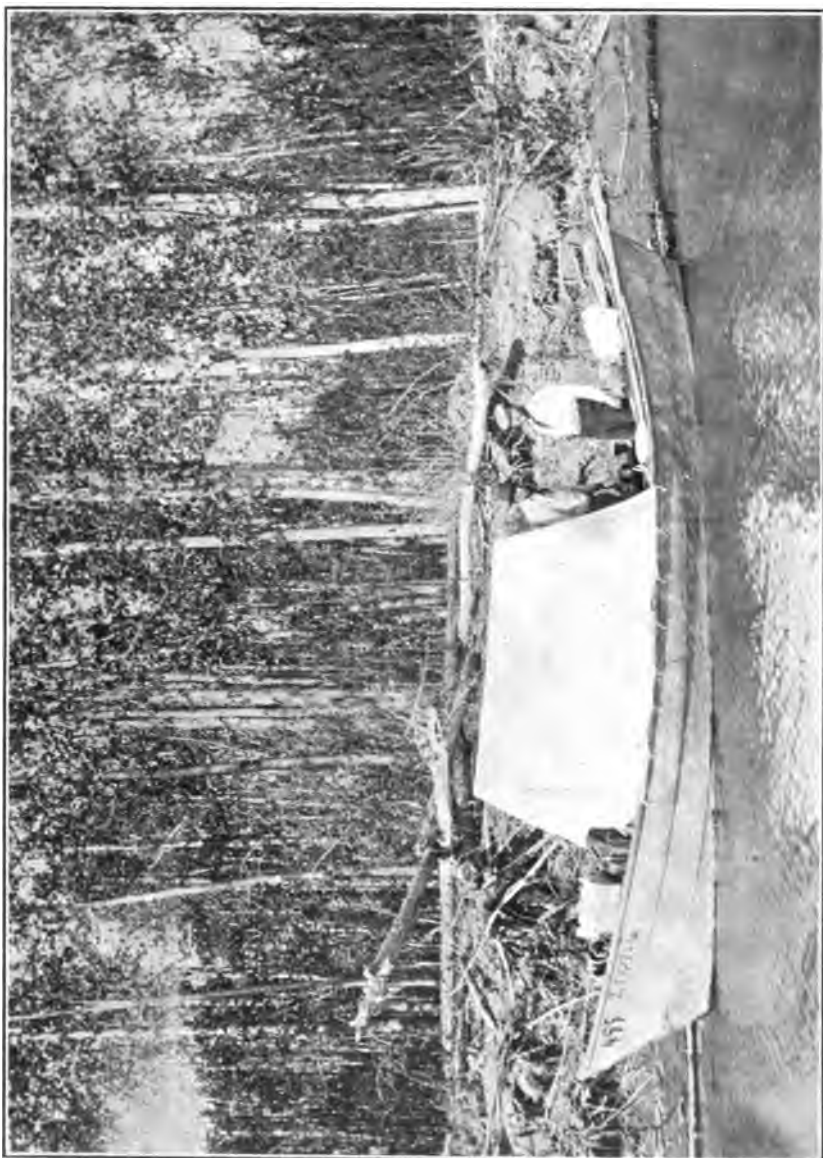
The spruce furnishes the only source of supply for lumber for building purposes in the country, and in the vicinity of the large mining camps and military posts, where a demand for lumber has arisen, the forests have been almost depleted of the larger-sized trees. At the present time it is found necessary to leave the main stream and go some distance up the small tributaries of the river or on some of its outlying sloughs in order to find any considerable stands of timber suitable for the manufacture of lumber. During the winter of 1900-1901 Mr. George Sharpe undertook to furnish the military authorities at Fort Gibbon with 600,000 feet of saw logs, which, according to the terms of his contract, were to measure not less than 12 inches at the butt, 8 inches at the top, and to be 12 feet in length. Mr. Sharpe made a thorough examination of the Yukon River banks from the Ramparts to a point 75 miles above Dall River, and informed me that in all this region he did not find enough timber of the size required to warrant him in setting his men at work. In order to fill his contract he was compelled late in the season to go up the Tanana River a distance of about 80 miles from the mouth of that stream to find a suitable place to begin operations.

What has been said of the scarcity of large-sized trees, however, should not be understood as applying to trees of smaller growth. There is in every lateral valley and along the shores of the Yukon, as well as upon nearly every island in the river from Russian Mission to Dawson, an ample supply of spruce timber to last for years to come; but as I have before stated, the forests along the margin of the steamboat channels have been greatly depleted, and very soon tramways or some other means of transportation will become necessary in the work of laying down the wood within reach of the steamers.

Next in importance to the spruce for commercial purposes comes the birch, of which two varieties are found in this region, namely, the white or paper birch (*Betula papyracea*) and the red birch (*B. lenta*). Both of these varieties attain a size sufficiently large for use as fuel, and in some localities, as in the vicinity of Nulato, it forms the predominating feature of the forest growth. Its principal use, however,



TIMBER OF THE YUKON RIVER VALLEY.



TIMBER OF THE YUKON VALLEY—A STAND OF POPLAR (*POPULUS BALSAMIFERA*) IN THE MIDDLE SECTION OF THE RIVER.

is for the manufacture of canoes, snowshoes, and sleds by the Indians, and to a more limited extent in the manufacture of native baskets and household utensils of various kinds.

Two species of poplar, *Populus balsamifera* and *P. tremuloides*, were noted. The former frequently grows to a height of 60 to 80 feet, with a diameter of 2 feet at the butt. Both species are used in the construction of log houses when spruce logs can not be readily obtained, and to a limited extent for fuel. For the latter purpose, however, it is not at all satisfactory, owing to the excessive amount of moisture it contains.

Willows and alders grow in the greatest abundance along the banks of the main river and its tributaries. The former is most generally seen in the form of low-spreading bushes along the water courses, and is seldom over 12 feet in height. In some sections of the lower and middle river, however, a slender variety is found which attains a height of 60 or 70 feet, and except at the extreme top is entirely devoid of branches. The trunk is seldom larger than 6 inches in diameter. The timber is of no use as an economic product, as it is invariably rotten at the heart.

In open situations a species of larch (*Larix Americana*) is sometimes seen, but it is comparatively rare, and is seldom more than 15 feet in height.

A dwarf variety of juniper (*Juniperus communis*) was observed at one or two places on the river, but aside from the value of its berries as a diuretic agent it has no commercial value.

The list of trees as above given comprises all the known varieties indigenous to the region.

COAL.

At several places along the Yukon coal of a fair quality has been found, and as authentic reports of its presence on the Koyukuk River have been received, it seems most probable that the deposits of coal which are known to exist on the Kowak River and the northwest Arctic coast form a part of a vast coal-bearing region extending from the Yukon Valley northward to the Arctic Ocean.

The full value of the Yukon coal has as yet not been satisfactorily determined. A considerable amount of money has been spent in the work of developing several of the most promising veins along the river, and while some very fair coal has been obtained, its use as a substitute for wood as fuel has not been general. The coal when first taken from the mines has the appearance of the best form of lignite, but it has a decided tendency to "slack" after exposure to the open air, and in this condition it is of very little value as fuel. By analysis it compares very favorably with any of the coal found west of the Rocky Mountains, and if it could be prevented from "slacking" it would undoubtedly be a very valuable product.

The veins of coal are usually found inclosed between thin layers of shale and brown Miocene sandstone. The widest and best-defined seams of which a personal examination were made by the writer were at the Pioneer Coal Mine, situated on the right bank of the Yukon, 25 miles upstream from Rampart City. Here there are three distinct seams, the largest of which was nearly 3 feet wide. At a distance of a thousand yards upstream from the Pioneer Mine there was observed a vein of coal interbedded with the shales, and sandstones forming the stream bluffs; and along the slopes of the hills lying north of the river dark bands, parallel to the bedding, were observed, and are probably the outcrops of coal beds. There seems to be no doubt that further exploration in this locality will disclose a vast deposit of the mineral, which may prove of great value in the future.

GRASSES.

The treeless plains of the coast and the lowlands of the interior are covered in spring with a luxuriant growth of many varieties of grasses which would furnish the best of pasturage for cattle for at least six months of the year. The depth of snow on the level ground is never so great as to completely cover up some of these grasses, and even in the winter season horses have been subsisted on these natural meadows by shoveling off the surplus snow, so as to give the animals a chance to graze.

Among the most common and valuable grasses noted and identified were the Kentucky blue grass (*Poa pratensis*), the meadow foxtail (*Alopecurus pratensis*), and the redtop (*Agrostis vulgaris*), all of which grow luxuriantly in the open swales and uplands all over the country. The redtop and blue grass grow to a surprising height during the hot summer months, often waist high and in several places along the river give the impression of cultivated fields. The blue joint grass (*Agropyrum glaucum*) was also noted in many places, and would furnish abundant pasturage for cattle.

Among the undersirable grasses noted is the squirrel tail (*Hordeum jubatum*), which might cause some trouble to feeding cattle, but fortunately it is not common among the other grasses, and could be easily avoided.

With the building up of the country and the introduction of cattle there will be a large demand for hay, and there seems to be no doubt that the cultivation of this article would prove a profitable form of employment if energetically and properly conducted.

CLIMATE.

The climate of the Yukon Valley differs very materially from that of the coast in the same latitude. On the coast the summer months are characterized by excessive precipitation, and cold, disagreeable



CHARACTERISTIC VIEW OF THE YUKON RIVER SHORES IN THE WOODED SECTION.
The mountains shown are from 2,000 to 2,500 feet high. Timber grows almost to the summits.

rains are of frequent occurrence. The average summer temperature of the air on the coast is some 25 degrees lower than that of the interior, and to this fact may be attributed the occurrence of frequent fogs in the delta region of the Yukon. The influence of the warm water of the river in producing fogs is felt for a long distance from land in Bering Sea, but it is a rather remarkable fact that at times when the whole northwestern portion of the sea may be shrouded in impenetrable mists, the harbor of St. Michael is generally free from fogs. Its immunity is the result, most probably, of its situation out of the line of the fluvial path of the Yukon where it empties into the sea.

The cold, misty weather of the coast during the summer season is not experienced in the interior. Beyond the first range of mountains, which forms a barrier between the treeless plains of the coast and the Yukon Valley, the summer climate is tropical in character. Temperatures of 90° in the shade are not infrequent, and authentic records show that at some times the temperature has been as high as 110° in the shade for short periods. The warmest months are June and July, when the sun is practically in sight all the time. During seasons of small amount of rainfall, which are by no means uncommon in this district, the fierce heat of midsummer causes much suffering among the inhabitants of the river settlements, and if long continued may result in considerable sickness.

The greatest amount of rainfall occurs in the Yukon Valley during the month of August and the first part of September. In the absence of any authentic statistics on the subject, it is impossible to state the amount of annual rainfall. Our own movements were such that the necessary data could not be collected, as we were absent from the river during the month of July and the most of August. From the opening of navigation in May until we left the river in the latter part of June we experienced very little rainy weather; that is, very little as compared with the amount encountered on the coast.

The winter climate of the interior is much colder than that of the coast, but, owing to the excessive dryness of the atmosphere inland and the absence of wind when the temperature is very low, it is much more endurable. As a matter of fact, the consensus of opinion of those who have lived in the country long enough to be competent judges is that the winter months are the pleasantest ones of the year.

The approach of winter is gradual, and as a general thing free from gales or other objectionable features which usually mark the change of seasons in other localities. The opening of spring is likely to be more disagreeable, owing to the melting of the winter's snow, which renders travel very difficult for a few weeks, and also on account of the sudden changes of temperature which take place at this season. Work in the open air can be carried on during the entire winter with

very little discomfort or danger. The periods of cold weather which render it unsafe for travel or work in the open air are of very short duration, seldom lasting over a week, and these exceptionally cold periods seldom occur more than twice in the same season. During the winter of 1901 the temperature fell as low as 72° and for two weeks did not go higher than 66° below zero (Fahrenheit), as registered by a standard spirit thermometer. This is probably the longest period of excessively cold weather that has ever been recorded in the country. In order to dispose of the fallacy that life in the open air under these circumstances is attended by any great danger, it may be of interest to know that, in company with Lieut. H. J. Erricksen, United States Army, and a party of men under his command, Lieut. W. J. Wheeler, of the *Nunivak*, and myself spent the whole of this time in camp on the banks of the Yukon with no other protection from the weather than that afforded by thin drilling tents. It was of course impossible to move camp under these conditions, but aside from the enforced detention we suffered no serious discomforts.

The crew of the *Nunivak* were required to work in the open air all winter cutting wood for the use of the vessel, and aside from a few cases of frostbite caused by imprudent exposure of the hands or feet they suffered no inconvenience.

During the progress of the stampede to Nome, which took place in the winter of 1900, upward of 2,000 persons of both sexes made the long journey by sled from Dawson to the coast. It is doubtful whether a similar journey could have been performed by as many people with less amount of actual suffering from exposure in any part of the world.

From our experience in the country, covering a period of over two years, and from information gathered from various authentic sources, I am irresistibly drawn to the conclusion that the winter climate of the interior of Alaska is superior in many respects to that of many of our Northern States. With cheaper means of transportation, by which the necessaries of life can be procured at less cost, and better facilities for communication with the outside world, there is no good reason why this little known and greatly misrepresented country should not become the abiding place of a large and prosperous population.

As I write, the press of the United States is filled with reports of the problematical riches of our recently acquired possessions in the Torrid Zone. The benefits and profits to be reaped from trade concessions and political affiliation with the peoples of these far-away lands are eagerly discussed. The National Government is pouring out a stream of blood and treasure, first to subjugate and then to develop these alien islands. Meanwhile Alaska, with its hundreds of thousands of square miles of virgin forests, its countless rivers and far-reaching seas teeming with the most valuable food fishes known to

man, with its millions of acres of pasture lands, capable of sustaining flocks and herds of sheep and cattle large enough to feed the world, and with its mountains in which the buried treasures of ages lie waiting for the miners' pick and shovel, Alaska stands at our doors ignored, neglected, and almost despised, because it is "cold." God grant that the day is not far distant when the youth of this country, whose forefathers hewed from the ice-bound shores of Maine and Massachusetts the foundations of the great Republic, will awake from their lethargic dream of life under the tropic skies of the land of mañana and set their faces toward our northern province. Here, amidst sterner but healthier surroundings, may they make their homes and perpetuate a race of fearless, self-reliant, and strenuous men and women of the type which—

Born of the hills and nurtured by the winds,
Knows only Freedom's mighty song of life.

CHAPTER II.

COMMERCE AND NAVIGATION.

HISTORY.

Prior to the acquisition of the Territory of Alaska by the United States in the year 1867, traffic between the Russians and the natives of the interior was maintained by means of trading posts or stations located at convenient points along the Yukon River. These stations were supplied with goods brought up the river in large pulling boats, called *bidarras*, which ascended the river every summer after the opening of navigation, and after delivering the supplies and collecting the furs which had been procured by the traders during the previous winter they returned to the headquarters of the company at St. Michael, on the coast, before the close of navigation in the fall. Communication with the several stations was kept up during the winter by means of dog teams, and small quantities of supplies were sometimes sledged over the portage to the near-by stations after winter travel set in. The amount of material that could be transported in this way was very small, however, and the area of operations was limited to the stations in the immediate vicinity of St. Michael. The more remote posts were compelled to depend upon their own resources entirely in case of a shortage of supplies during the winter.

Following closely the cession of the Territory to the United States, a trading company was incorporated by a party of Americans, under the title of the Alaska Commercial Company, for the purpose of engaging in trade in our new possessions. This company at once set about the work of reorganizing the business methods which had hitherto been in vogue, and among other innovations they built and put in operation a small 60-ton stern-wheel steamer for the transportation of merchandise from the coast to points on the river. This little vessel, which was christened the *Yukon*, was the first steam vessel ever to ply on the river, and from its advent may be dated the beginning of a new era in the development of the country.

The *Yukon* continued to run for several years, making trips from St. Michael as far upstream as Selkirk, a distance of over 1,500 miles,

with more or less regularity each season, until it was accidentally destroyed by fire, when a second and somewhat larger vessel bearing the same name was built by the company to take its place. Meanwhile business at the several trading stations, under the better management of the Americans, increased to such an extent that more transportation facilities were needed, and the steamer *Arctic* was built. After the *Arctic* came the *Beaver* in due course of time, and from this small beginning the present splendid fleet of more than 100 magnificent river steamers has been evolved to meet the demands of the steadily expanding commerce on the river.

For nearly twenty years the Alaska Commercial Company remained in almost undisputed possession of the commercial field. Now and then competing companies would be formed for the purpose of securing a portion of the business, but either through lack of enterprise or because the business of trading with the natives was never really important enough to warrant competition, opposition companies were not successful in maintaining a foothold in the country until the discovery of gold caused an influx of white men and a sudden demand was made for supplies and transportation immensely greater than the old company could meet.

Until this period the business of the Alaska Commercial Company was confined to the exchange of merchandise for the furs collected by the Indians of the interior almost exclusively. There were but few white people, with the exception of their agents, in the country, and of these it may be said they were more frequently a source of expense and worry than of profit to the company. The discovery of gold for the first time in paying quantities in Alaska was in the year 1886 in the Stewart River country and in the vicinity of Fortymile River.

When the news reached the outside, it was received with varying degrees of credulity, but from this time on the population of the Territory slowly but surely increased. Many prospectors came into the country ignorant of the existing conditions, and speedily found themselves destitute and without means of returning to their homes without assistance. Many small traders followed the first movement of the gold seekers equally ignorant and equally unfortunate. Left alone in the vast interior without help, it is certain that these early pioneers would have suffered incredible hardships had it not been for the generosity and forethought of the Alaska Commercial Company. Orders were issued from the home office to the agents of the company throughout the Territory forbidding any of its employees to charge any more than the regular market price for any article in its stores, under any circumstances, and an additional quantity of supplies were hurriedly sent into the country at one time when it became known that an unusual number of prospectors had resolved to winter in the interior, and orders were given to the agents of the company to use



SIDE VIEW OF A LARGE PASSENGER AND FREIGHT PACKET EMPLOYED IN TRAFFIC ON THE YUKON RIVER.

every effort to see that no one suffered for lack of food on account of the lack of money. In cases of actual destitution the agents were authorized and directed to furnish food and shelter to all who applied for help under these conditions free of charge.

There is no doubt but that this generous and large-minded policy of the Alaska Commercial Company encouraged prospectors to enter the country and persevere in the hunt for gold, and has in this way been one of the most important, if not the most important, factor in the growth and marvelous development of the country.

From the year 1886 until 1891 the population of the valley of the Yukon steadily increased, and new discoveries of gold throughout the region made the prospects of a still larger population so probable that a new trading company, composed of Chicago capitalists, under the direction of Mr. Portus B. Weare, was organized, and preparations were made on a scale never before attempted to enter the field for the purpose of competing with the Alaska Commercial Company for a portion of the now rapidly increasing business on the river.

The new company was incorporated under the name of the North American Transportation and Trading Company, with headquarters at St. Michael. During the summer of 1892 a steamer of 400 tons was completed at St. Michael, christened the *P. B. Weare*, loaded with a full cargo of merchandise, and late in the fall of that year was dispatched up the river to engage in traffic in the country. This initiatory step was followed by the erection at St. Michael and at various points on the river of stores, warehouses, and dwellings of a size and style hitherto unheard of in the territory.

Meanwhile the Alaska Commercial Company had not been idle. New steamers were built, new posts established, warehouses enlarged, and, in fact, everything possible was done to keep pace with the business energy of its younger rival. For nearly ten years these two companies remained alone in the field. But with the discovery of the rich gold-bearing placers of the Klondike River and its tributaries a rush of people into the country took place, which for a time absolutely overwhelmed the transportation companies. To meet the demands of the new commerce new vessels were built by both the Alaska Commercial Company and the North American Transportation and Trading Company and put in commission as quickly as possible, and new companies were formed and preparations made to enter the field with astonishing rapidity.

Many of these new companies never survived the first throes of organization, that is to say, after the first issue of the capital stock had been foisted onto a gullible public the "company" disappeared from existence and the stockholders were left to console themselves as best they might with the possession of a lot of worthless certificates of stock, while the promoters of the enterprises quickly withdrew from

sight to enjoy in seclusion the fruits of their ill-gotten gains. Others succeeded in reaching St. Michael with their vessels in a partially wrecked condition or found upon arrival at that place that, through ignorance of existing conditions, the vessels forming a part of their outfit were unsuitable for the work to be performed. Still, others there were who, with more persistence or greater intelligence in the work of preparation, actually succeeded in getting their vessels started up the river only to find themselves beaten at the very outset in the race for the new business by the older and more experienced companies in the field. Hundreds of abandoned vessels, with their outfits of machinery and supplies, can be seen at the present time lying on the shores of St. Michael Harbor and scattered along the Yukon from its mouth to Dawson, the mute but convincing evidences of misdirected efforts and disappointed hopes.

Among the many unsuccessful ventures none seemed so sad as those in which farmers and mechanics, with no experience whatever either in the handling of a vessel or in the details of business affairs, formed small cooperative companies and embarked their entire fortunes in various desperate schemes for making money in the country.

The record of these ill-advised ventures is one of complete failure. Not a single one of them met with even partial success. One instance which came under our personal observation was that of an old man who had mortgaged his farm in one of the Middle States and with the funds obtained in this way had joined a party of gold seekers bound for Alaska. A small steamer was purchased and fitted out with supplies, and the expedition after undergoing almost incredible hardships finally succeeded in getting up the Yukon as far as Nulato. Here the machinery of the vessel broke down, winter overtook them, the supplies became exhausted, and the members of the party were compelled to seek employment wherever it could be obtained to avoid starvation.

The old man was too feeble to work and was left with a scant supply of provisions to take care of the vessel during the winter. But the terrible strain had been too much for him. Worn out by excessive labor, weakened by the lack of proper food, and harassed by fear in the midst of his strange surroundings, he lost his reason and finally ended his life by committing suicide.

Not all of the companies, however, that sprang into existence at this period were doomed to failure. Several corporations were formed and under the careful management of shrewd business and professional men succeeded in obtaining a foothold and a share of the immensely profitable business of furnishing supplies and transportation to the thousands of eager people who were now pouring into the territory. Among the corporations which were formed at this time and which succeeded in establishing a profitable business, those that are mentioned below were the most important, viz:



BOW VIEW OF A LARGE PASSENGER AND FREIGHT PACKET EMPLOYED IN TRAFFIC ON THE YUKON RIVER.

The Alaska Exploration Company, the Seattle-Yukon Transportation Company, and the Empire Transportation Company.

From the year 1898 until the opening of navigation in the year 1901 these three companies and the two older concerns, namely, the Alaska Commercial Company and the North American Transportation and Trading Company, were all independent corporations, each operating separate lines of ocean and river steamers, and each maintaining at the principal settlements in the interior stores where merchandise of every kind suitable for use in the country could be purchased.

Meanwhile the Canadian business men had not been idle in Dawson. Lines of fast steamers were built and put in operation between Dawson and the termination of the trail over the mountains from the coast, and every effort was made to induce people to enter the country by this route and to purchase their supplies from British business houses. The completion of the railroad from Skagway to White Horse, in British territory, was a severe blow to the transportation business on the lower river. In order more effectively to compete with the railroad and steamboat transportation companies of the upper river a temporary arrangement was entered into during the winter of 1901 between all of the American transportation companies by which a new company was formed under the name of the Northern Navigation Company for the transaction of all the transportation business in the American part of the territory, and another company was formed at the same time for the transaction of all the mercantile business under the name of the Northern Commercial Company. All of the companies also entered into this merger with the exception of the North American Transportation and Trading Company, which maintained its separate organization. In so far as the arrangement for the combination of the transportation business interests of all the companies under one head relates to this latter company it is understood that it terminated at the end of the open season of navigation in the summer of 1901. It will be thus seen that at the present time the mercantile and transportation business of the Yukon Valley is in the hands of the following corporations, viz, the Northern Commercial Company, the Northern Navigation Company, and the North American Transportation and Trading Company.

In addition to the above-named transportation companies there has been recently organized an independent line of steamers under British ownership to ply between Dawson and St. Michael. Terminal facilities at the latter place have been granted the company by the United States Government, and although by law these steamers will not be allowed to engage in any local traffic on the river they will no doubt prove active competitors with the American steamers in the transportation of passengers and freight between the terminal points in the

district A complete list of the vessels, including barges, which were in use on the Yukon River during the season of 1901, together with the tonnage of the same, is shown in the appendix.

METHODS OF TRANSPORTATION.

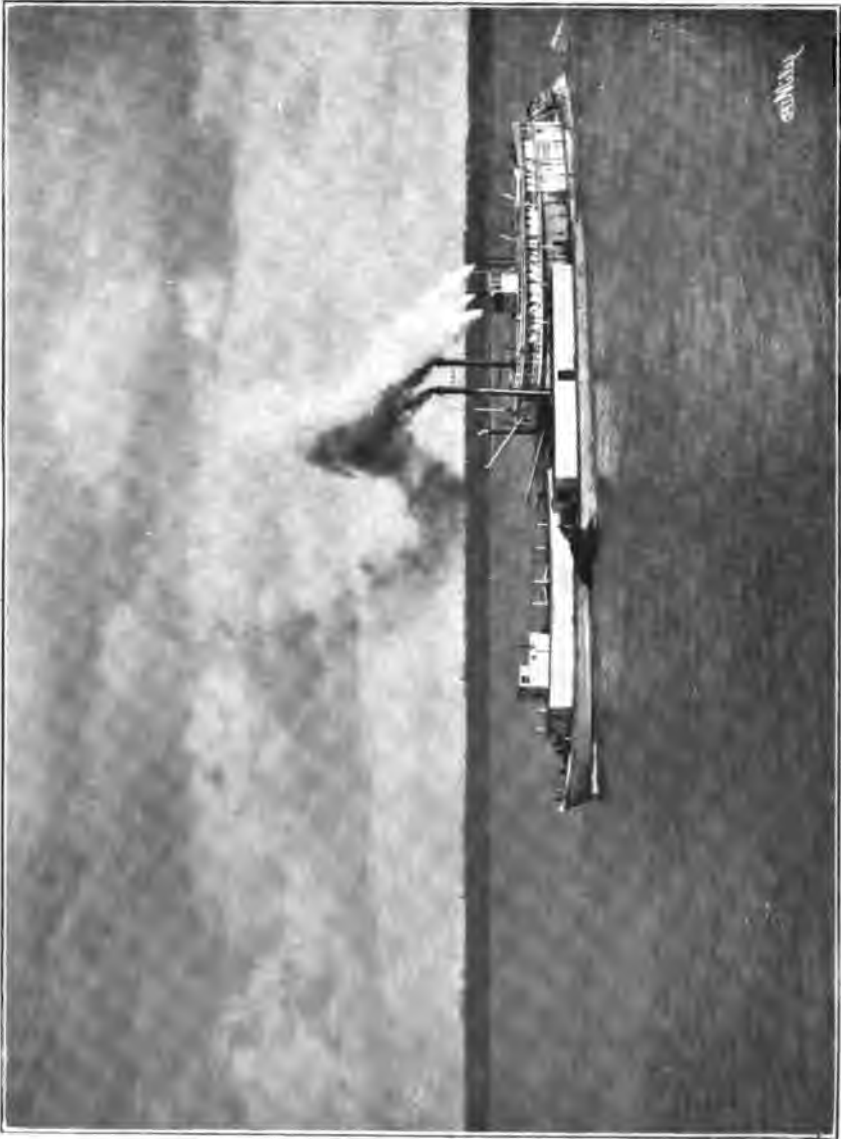
In a general way it may be said that transportation of passengers and freight throughout the American portion of Alaska begins when navigation on the Yukon opens in the spring and ends when the river freezes over in the fall. Winter transportation by sled over the trails at the present time is confined to the movement of individuals and has as yet not been taken up as a business to an extent which renders it worthy of discussion. Sled traveling as a means of communication will be mentioned under another heading later on in this report.

The Yukon usually breaks up in the latter part of May, is open for navigation during the summer months and closes by the first week in October. The harbor of St. Michael is seldom free from ice before the 20th of June. It will be seen therefore that the traffic on the river may be going on at least a month before communication is possible by boat between points in the interior and St. Michael. On the other hand the upper waters of the river are the first to freeze over and the lower portion and the sea may be open for navigation two weeks after all movements of boats in its upper portion has become impossible.

Advantage has been taken of this by some of the companies to send steamers fully loaded into the river from the coast late in the fall, and lay them up for the winter in some suitable place on the lower river. By this means they are enabled to send these vessels on their way upstream immediately after the river is clear of ice in the spring.

Goods intended for stations in the interior are purchased in the States during the winter months and shipped in ocean-going vessels to St. Michael on the opening of navigation in the spring. Here they are transferred to the river steamers and by them transported to the several points of destination.

In the early days of transportation on the Yukon passengers bound for the interior of the territory also came by way of St. Michael, but with the completion of the railroad connecting Skagway, on the coast of southeast Alaska, with White Horse, on the upper waters of the Yukon, by far the greater number of passengers choose this more convenient and expeditious method of reaching their destinations. The trip by rail over the mountains is made in a few hours, and upon arrival at White Horse passengers can make close connection with a line of fast and commodious steamers plying between that point and Dawson. From Dawson to places still farther downstream ample means of transportation are furnished by the fleet of American steamers, and delays en route are of infrequent occurrence.



YUKON RIVER STEAMER TOWING THREE BARGES—ONE BARGE IS LASHED AHEAD AND ONE ON EACH SIDE OF THE BOW.



METHOD OF CONSTRUCTING THE BOW OF YUKON RIVER STEAMERS USED IN TOWING BARGES, LASHED AHEAD.

The class of vessel universally in use on the Yukon is the stern-wheel steamer, similar in construction to those in use on the rivers of the States. The older boats were designed more as freight carriers than for the accommodation of passengers, but later additions to the fleet are furnished with every appliance for the comfort of passengers usually found on first-class vessels of this kind in any section of the country, and in point of speed and accommodations will compare favorably with other boats of this kind anywhere. All of the larger vessels and most of the smaller ones are lighted by electricity, heated by steam, and have all the other accessories which modern ideas of comfort demand. The large packets have refrigerating plants installed and are by this means enabled to furnish passengers with fresh meat, vegetables, and fruit throughout the trip up or down the river. The cooking and service is good—in fact, very much better than one would be led to expect in such an out-of-the-way locality.

The shortness of the open period of navigation on the river and its tributaries and the great distances over which it is necessary to transport supplies make it necessary to load the vessels as deeply as possible on each trip. In addition to its own load all of the vessels, with the exception of the large passenger packets, are frequently called upon to take one or two, and sometimes as many as three, loaded barges in tow. When two barges are towed, one is taken on each side of the steamer, but if only one is taken it is lashed firmly to the steamer's bow directly in line ahead, and in this position is pushed rather than towed up or down the river. It is claimed by old steamboat men that this method of handling barges is far superior to the usual custom of towing them astern. In order to conveniently handle a barge in this way, however, it is necessary to have the bow of the steamer constructed in a peculiar, manner the details of which can readily be understood by reference to the accompanying photograph of the bow of the steamer *Leah*.

All of the river steamers have as a part of their equipment a set of heavy spars and tackles in place on the forward deck, technically termed "the sparring outfit." These spars are used to assist in getting the vessels off sand bars or shoal places and into deep water in case they should get aground. With skillful handling of the sparring outfit by an experienced steamboat man, a vessel can be almost lifted bodily over a sand bar or "crutched" into deep water by setting the spars on the bottom at a slight angle, making the tackles fast, and then working the vessel either ahead or astern, as may be more advisable, with the wheel. For simply pushing the bow around in any direction so as to get into deeper water one of the spars is set on the bottom on the side opposite to the direction in which it is desired to have the vessel moved and then taking the hauling part of the tackle attached to the spar to the capstan, a strain is put on it until the

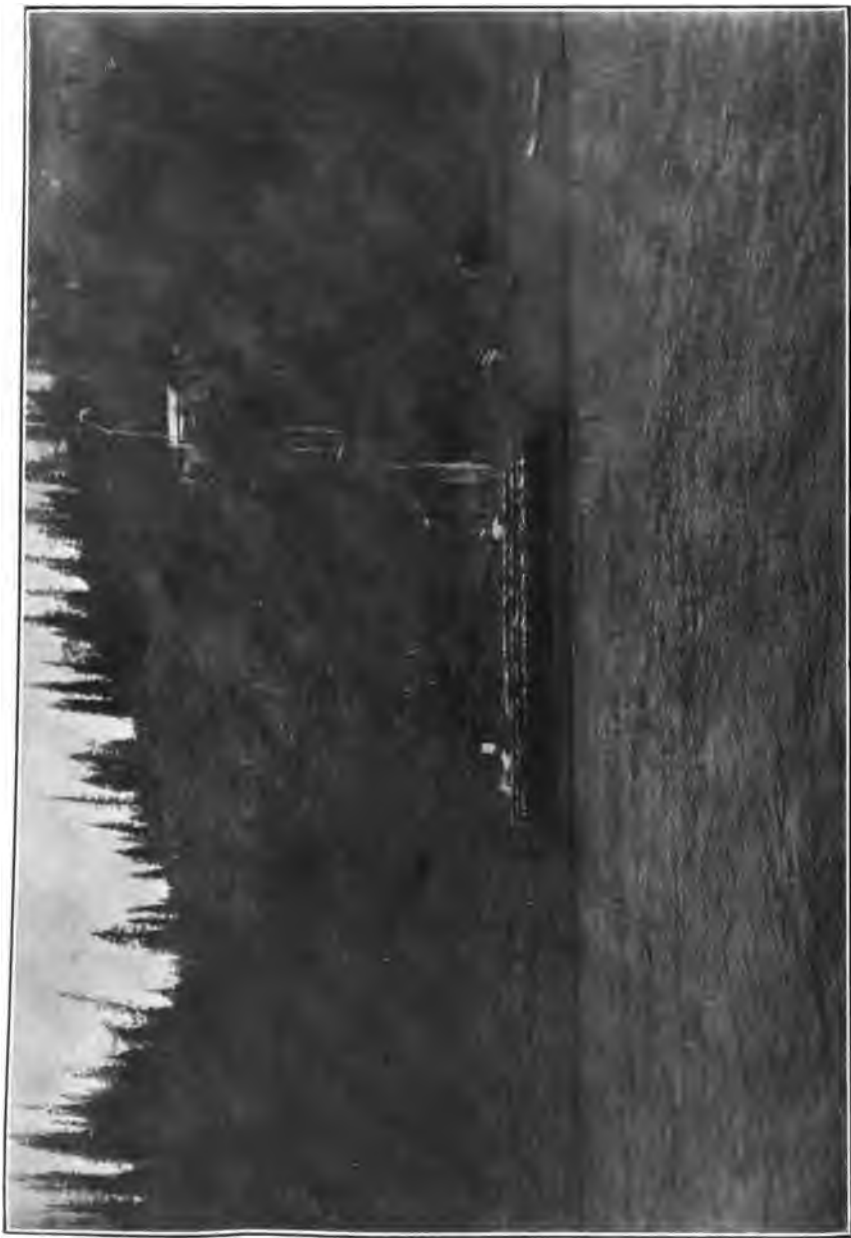
desired end is accomplished. Anchors, the usual resort of seamen in case of the grounding of their vessels, are of but little use on the Yukon for getting a boat off shore. Aside from the difficulty and danger of laying out a heavy anchor in a rapid current, the poor quality of the river bottom as holding ground usually makes such attempts ineffectual.

In the navigation of the "flats" it sometimes happens that the channel is very narrow and tortuous, while at the same time the current may be very strong. In these cases there is great danger that a vessel in attempting to make its way through these places will be swept by the current onto the bar or reef forming the lower side of the passage. To overcome this difficulty an appliance called a "deadman" is very generally brought into use. The "deadman" is a short spar not over 15 feet in length and light enough to be handled by one man. When the vessel is approaching one of the narrow channels a man is landed on the upper end of the shoal and works the lower end of the "deadman" down into the sand a distance of 6 or 8 inches. A long line is then run from the steamer and the end made fast to the "deadman" about a foot from the ground. When the line is hauled taut aboard the steamer and all is ready the man on shore holds the free end of the spar and by "giving and taking" in on the line as the vessel drops down stream it can be held taut enough to prevent the vessel from swinging out of the channel while making the short turn. The proper handling of the "deadman" requires considerable skill on the part of the man on shore, and, as a rule, when undertaken by a novice is liable to end in failure.

FUEL.

The steamers plying the Yukon are fitted with furnaces designed for burning either wood or coal to make steam. While the former is used almost exclusively, it sometimes happens that a vessel leaving St. Michael is compelled to use coal for fuel until the wooded section of the river is reached, a distance of about 200 miles from the coast. The Eskimos living in the delta region collect driftwood in the spring for sale to passing steamers, but this supply is limited as to quantity, bad in quality, and exorbitant as to price. During the summer of 1901 a number of steamers were unexpectedly delayed at the mouth of the river by the presence of ice in the harbor of St. Michael where they were bound. Fuel became somewhat scarce before the opening of navigation, and the thrifty Eskimos met the increased demand for wood by steadily increasing the price for what they had on hand. The original price per cord had been fixed by them at \$8, but when they learned that some of the vessels were short it gradually rose until it reached \$45 per cord!

The average cost of wood along the river is \$8 per cord. After



WOOD YARD ON THE BANKS OF THE YUKON RIVER, FROM WHICH PASSING STEAMERS ARE SUPPLIED.

Andreafski is passed the wooded section of the river is entered and wood-choppers' camps are found at convenient distances apart all the way upstream.

The commercial companies have their own wood yards, where a supply of wood is constantly kept on hand, and for which wood choppers are paid a fixed price per cord as agreed upon from year to year by contract. Each company has in its employ agents whose sole duty it is to travel up and down the river throughout the year making contracts for the cutting and storing of wood for the use of the steamers during the season of open navigation, keeping an account of the supply on hand and the location of bodies of timber from which future supplies of fuel can be obtained. It is hardly necessary to say that this duty calls for the exercise of business ability of a high order and can be filled only by men capable of enduring a life of almost constant exposure.

In addition to the wood yards maintained by the several trading companies, there are a large number of men engaged in cutting wood for sale in open market. Most of these independent wood choppers originally entered the country to search for gold, and failing to find the precious metal have resorted to this means of gaining a livelihood. Very little wood is now cut by the natives of the interior for sale. The more energetic white man has almost entirely driven the indolent and easy-going native from the field.

Wood yards are usually located conveniently near to some place which is accessible to vessels and at the same time has facilities in the way of high banks on which the wood can be piled out of the reach of high water. In a number of places the timber is cut high up on the steep hillsides and corded where the trees are felled. It is afterwards run down to the water's edge in chutes and taken on board vessels in whatever quantity that may be desired. In other places the use of chutes to get the wood down the hills is dispensed with. By cutting away the prop which supports the lower end of a long pile of wood, the whole mass is started and comes thundering down the steep bank to the water's edge like an avalanche. It is then picked up stick by stick and carried on board the steamer.

The question of fuel for vessels engaged in traffic on the Yukon is one of the most important ones to be considered. The expense for this item alone is enormous, as can be easily understood when the amount required by the steamers is known.

The average daily consumption of wood for fuel during the active season on one of the smaller sized vessels is about 30 cords and from 45 to 50 cords on the large packets. The cost of fuel alone used on one of the larger vessels while making the trip from St. Michael to Dawson and return will approximate \$15,000, and in the case of steamers towing barges this cost will be still greater.

Considerable loss and annoyance is suffered by the owners of wood yards along the river as a result of the dishonest methods of some of the masters of independent steamers plying the stream. Unless a constant watch is maintained over their movements, wood will be taken by them and no attempt ever will be made to pay for it. If the bill be presented it may be paid, but if, unfortunately, as sometimes occurs, the owner of the wood can not tell what steamer took it, the chances of his being paid are very poor. This reprehensible conduct on the part of dishonest steamboat men is one not easily guarded against, and will be more fully commented upon under another subheading of this report.

As has been already stated, the development of the coal measures of the Yukon Valley has as yet not reached the stage where it may be predicted with certainty that its use will supersede that of wood for fuel. It is probable that in the future coal of good steaming quality may be mined on the river, or within easy reach of the line of steamboat travel by short lines of railway. The substitution of coal for wood would tend to simplify questions of transportation of vastly greater importance than the mere difference in cost of the two articles. The use of wood for fuel necessitates frequent stops and long delays to take on fuel, and a great deal of valuable space, which, under present conditions, must be reserved for the stowage of wood, could be used for the transportation of freight if coal were used. Good steaming coal would probably command a price of \$15 per ton, if laid down within reach of the steamers on any part of the river. In order to sell it at this figure, however, it must be found in the country. The cost of transportation effectually prevents its importation.

CREWS.

In the early days of traffic on the Yukon the crews of the steamers, with the exception of the officers, were almost exclusively made up of natives, but with the beginning of the new commercial era on the river the more exacting duties and harder work required of the crews of the competing steamers soon caused the indolent and pleasure-loving natives to be driven out of this field of employment and their places were filled by white men. At the present time no natives are employed on the river steamers except in the capacity of pilots, and even as such they are not satisfactory, and their services are being dispensed with as soon as white men can be found with a sufficient knowledge of the river channels to take their place. The hard and almost continuous work which the crews of the vessels are called upon to perform during the active season makes it necessary to employ a much larger force of men than would suffice on vessels of a similar character in other localities. From the opening of navigation until its close the



CARRYING WOOD FROM THE SHORE ON BOARD STEAMERS ON THE YUKON RIVER.

vessels are kept going night and day, and in the absence of the usual facilities for handling freight at the several stations along the river every article to be landed must be carried by hand from ship to shore and transported up the steep banks to the stores and warehouses. Wood for fuel is also brought on board in the same way, and in order to save time a large number of men is indispensable.

The complement of the crew usually carried by the larger vessels comprises the following: One master, 2 mates, 1 chief engineer, 1 assistant engineer, 1 purser, 1 freight clerk, 1 steward, 2 pilots, 8 firemen, 25 deck hands, 3 cooks, and 17 waiters.

It will be seen from the above list that the complement of the crew for the larger vessels is about 60 men. The smaller vessels have the same number of officers but a smaller number of subordinates. The full complement usually carried on these boats is about 30 men.

In the past the officers of the steamers have been generally engaged under contract for a term of from one to three years, but the condition of the labor market on the river is now such that this will probably not be necessary in the future. The salaries given by all the companies are liberal enough to induce the best class of men to seek employment on the steamers, and there is no lack of material from which to choose. The result of this state of affairs is that the steamers plying the Yukon are officered by as fine and as intelligent a body of men as can be found in similar employment anywhere in the country. The crews are engaged by the month. The average salaries paid by all the companies to its employees on the river boats is as follows:

	Per month.
Masters.....	\$200
Mates	100
Chief engineers	150
Assistant engineer.....	100
Pilots.....	150
Pursers	100
Freight clerks.....	60
Steward	100
Cooks	90
Waiters	50
Firemen	75
Deck hands.....	60

All the employees of the companies, both ashore and afloat, receive, in addition to their pay, board and lodging. The privilege of purchasing any article from the stores of the companies at San Francisco cost price, with 25 per cent added to cover cost of transportation, is also given all the employees, and leaves of absence, with free transportation to and from their homes in the States, are granted the officers of vessels on an average of once in every two years.

AMOUNT OF TRAFFIC.

The amount of freight transported from St. Michael to points on the Yukon River and its tributaries during the season of 1901 can not be given accurately, but from the data which are available the following statement is made and is approximately correct:

Vessels, exclusive of barges, employed on the river...number..	35
Freight transported upstream from St. Michael.....tons..	25,000
Passengers transported from Dawson.....number..	500
Passengers transported to Dawson.....do....	350
Passengers transported from way points upstream.....do....	500
Passengers transported from way points downstream.....do....	1,200

The amount of freight transported downstream is too small to be taken into account.

For a schedule of freight and passenger rates on the river, see appendix.

WINTER QUARTERS.

As has been already stated, the period of open navigation on the Yukon begins about the 26th of May and usually ends before the middle of October. After the first week in October it is unsafe for a vessel to attempt to make the run through from St. Michael to Dawson. The trip upstream takes from fifteen to twenty days in midsummer, when all the conditions for quick transit are most favorable. Toward the latter part of the season the decreasing hours of daylight and lower water in the river make progress slower, and the fastest vessels of the fleet would require at least twenty days to make the run. Should a vessel be caught and frozen in the main river, the chances of its escape in the spring during the annual break-up would be very small. The movement of the ice is so sudden and violent at this time that no vessel can escape either serious injury or total wreck. For this reason as soon as the first ice forms on the upper river all traffic is suspended, and the vessels are taken into some safe haven and laid up for the winter.

There are several places on the river which furnish safe quarters for vessels during the winter and several methods of laying them up. A brief description of these methods may not be out of place at this time.

Vessels which are wintered at St. Michael or anywhere on the coast where the tidal movement of the ice is felt are usually hauled out on the beach above high-water mark, blocked up level, and left in this position until the opening of navigation in the spring, when they are again launched. In order to haul out a vessel in this way, it is necessary to construct "ways" of heavy timbers, upon which the vessel is floated at high water as far up as possible, and then, by means of very heavy tackles attached to crabs or winches on shore, hauled up out of reach of the highest storm tides. By means of jacks the vessel is then



NORTHERN COMMERCIAL COMPANY'S STEAMER ALICE IN WINTER QUARTERS AT DALL RIVER.

The living quarters of the crew are in the houses which are shown in the background.



HAULING OUT THE NUNIVAK AT ST. MICHAEL AT THE END OF THE ACTIVE SEASON OF 1901.

lifted up and securely placed on blocks in a level position. The outer ends of the "ways" are taken up to prevent them from being washed away by the waves and also to prevent injury to the vessel in case they should be torn up by the sea and dashed like battering rams against the hull.

Stern-wheel steamers being perfectly flat on the bottom, are for convenience sake almost invariably hauled out broadside to the beach. In order to fully appreciate the labor and power needed to haul out a steamer in the manner above described, it may be stated that when the *Nunivak* was hauled out at St. Michael seven tackles formed of triple 24-inch blocks and 4-inch manila cordage for a fall were used. One of the blocks of each tackle was hooked into a sling made from a 6-inch hawser passed around the vessel's hull and the other block was hooked into a long wire pennant, which in turn was secured to a heavy piece of timber buried in the ground to a depth of 6 feet to serve as an anchor. The hauling part of each tackle was led to a crab set up on shore, and the services of 60 men were required to move the vessel even with this immense purchase.

The material for the construction of the "ways" for hauling out the *Nunivak* was as follows: Thirty pieces lumber 8 by 12 inches by 50 feet; 60 pieces lumber 4 by 6 inches by 24 feet, surfaced; 60 pieces lumber 2 by 12 inches by 20 feet; 20 pieces lumber 2 by 4 inches by 16 feet; 4 pieces lumber 4 by 12 inches by 24 feet, for "deadmen;" 50 pieces lumber 8 by 8 inches by 20 feet, for blocking; 1 keg of 6-inch spikes; 1 keg of 4-inch nails.

Up to the present time no attempts have been made to haul out vessels which are wintered in the interior. They are simply taken into some place where they will be out of danger from the running ice in the spring and allowed to freeze in. The safest and most convenient places for wintering a vessel in the interior are found on some of the small tributary streams of the Yukon, but they are not always accessible, and in such cases vessels have safely wintered in some of the slack-water sloughs of the main river, where as a usual thing but little danger exists from the movement of the ice when it breaks up in the spring. This statement is, however, not to be accepted as implying an entire absence of danger from this source, as experience has proved that the movement of ice in the spring varies so much from year to year that hardly any dependence can be placed upon prophecies as to its action for any given season. A jam in the main river when the break-up takes place may cause the water and floating masses of ice to back up into a slough to such an extent that when it goes out it will be with such a rush that everything movable will be taken with it. In such an event a vessel wintering in the slough would be no better off than if she had remained in the main part

of the river. In some of these slack-water sloughs—as, for instance, in one near the mouth of the Tozikakit River—vessels which have passed the winter in the slough may be able to enter the mouth of the river before the ice begins to move in the main stream, as it is a fact worthy of note that the tributary streams and sloughs are always open before the Yukon is in the spring.

The most preferable and by far the safest method of wintering a vessel in the interior is to enter some small tributary stream of the main stream at the close of navigation and spend the winter there. The ice invariably breaks up in these small streams before it does in the main river. The movement of the ice in breaking up is seldom so violent as to cause any great amount of damage. The danger to vessels wintering in the small streams from ice backing up in them from the Yukon if a jam occurs in the latter at the time of the annual spring break-up, a contingency by no means of unusual occurrence, can be avoided by moving the vessel farther upstream and keeping clear of the ice until the jam is broken and it runs out and leaves the river clear again. After the ice in the tributary streams breaks up in the spring, and some days before the main river is clear, the water in the former rises rapidly and in some seasons overflows the high banks. Care must be observed in moving a vessel from place to place during this stage of high water not to get aground, as the subsidence of the flood is as rapid as its rise, and serious injury may result from being caught by the falling water and left high and dry. This danger may be better understood by an examination of the photograph of the Dall River, taken just before the annual flood period, shown on the opposite page. The mass of débris seen in the foreground of the picture was entirely submerged at the time of high water, the river having risen 22 feet above its normal stage before the Yukon broke and allowed the flood to subside.

In laying up a vessel in winter quarters care must be taken to see that the bottom of the river over which it is purposed to lay is level and free from any obstructions; otherwise when the vessel settles on the bottom and freezes in, the hull will be subjected to severe strains and most likely badly injured by lying in this position throughout the winter. All hogchains and iron braces of every kind should be slackened to avoid having them broken by the action of the extreme cold of midwinter. If the vessel is to be used as a living place for the crew during the winter, a false roof made of board lumber should be placed in position over the hurricane deck as an additional protection against the cold. The roof need not be air-tight. In fact, it was found to serve its purpose more satisfactorily on the *Nunivak* when small spaces were left for ventilation. The top of the roof should be covered with builders' paper, and this in turn covered with a thin layer of dirt, to prevent snow from drifting through the cracks. The heaviest



CHARACTERISTIC SHORE LINE OF SMALL TRIBUTARY STREAMS OF THE YUKON.

At the time of the annual break-up of the river ice the water rises rapidly and fills these streams from bank to bank.



FORT SHOEMAKER, DALL RIVER, SHOWING WHEEL OF THE NUNIVAK WITH LOWER PORTION REMOVED TO PREVENT INJURY BY ICE DURING THE WINTER.

fall of snow during the winter occurs in October and November. It should not be allowed to accumulate on the roof, as the heat from the interior will cause it to melt and leak into the quarters. After November and until April the fall of snow is very light and gives but little trouble.

All of the approaches to the living quarters, except those absolutely necessary for ingress and egress, should be closed up and covered with canvas so as to exclude the air. Sufficient ventilation can be secured by opening up the quarters for a short time once or twice a day and requiring everybody to vacate them long enough for the air to be completely purified. In addition to this general airing, which was a part of the daily routine on board the *Nunivak*, the living quarters of the vessel were all supplied with stoves, which were found to be admirably adapted to the purpose of securing ventilation. Even when not used to heat the vessel the drafts could be so arranged as to carry off the vitiated air, and in this way they were of great assistance in preserving a healthy state of the atmosphere.

Before the ice forms around the vessel the lower part of the wheel and the rudders should be removed, both to prevent injury by the ice and to avoid the labor of cutting them free in the spring. It is very important in laying up a vessel that arrangements be made by which a good supply of water can be readily obtained for general use on board and to guard against the danger of fire. The plan adopted on the *Nunivak*, and which proved to be very satisfactory in operation, was to sink a number of large barrels, through the sides and bottoms of which were bored holes, close alongside the vessel and allow them to freeze in. Each barrel was supplied with a small steam pipe connected with the boiler, and by means of these a constant supply of water was kept ready for instant use throughout the winter. The place selected for winter quarters should have an abundant supply of timber from which fuel for winter use can be readily obtained, and if practicable it should be in the vicinity of a native village, in order that a supply of fresh moose or deer meat can be obtained from the Indian hunters.

The following places on the river, named in the order of their location from the mouth of the Yukon upstream, have been used as winter quarters at different times by vessels plying the river: A lagoon entered from the river at Fort Hamilton, Andreafski, a slough opposite Russian Mission, Beaver Creek, a slough at the mouth of the Tozikakit River, Dall River, a slough near Fort Yukon, a slough near Circle City, and Stewart River, a short distance from Dawson. There is no timber from which fuel can be obtained either at Fort Hamilton or Andreafski, and vessels wintering at these places must carry with them a supply to last them through the winter. The difficulties of wintering a vessel in a slough have already been described and, taken

altogether, it is probable that Dall River offers the safest and most desirable place for winter quarters that can be found in the country. A Government vessel intended for patrolling the Yukon should by all means winter as high upstream as possible. In this way only is it possible to intercept and examine all of the vessels engaged in traffic in the district. As has been previously shown, the movement of vessels during the season of open navigation begins on the upper waters of the river some three or four weeks before the mouth of the stream is open to entrance from sea; hence vessels engaged in illegal traffic are enabled to descend the river from Dawson as far as the confluence of the Koyukuk and Tanana rivers and many other less important streams with the Yukon before they could be examined by a vessel of the Government service which would be compelled to reach these points by coming upstream. Once off the main river such craft would be reasonably safe from any interference or examination by our officers. Reference will be made to this matter in another part of this report.

SETTLEMENTS AND TRADING POSTS.

Beginning at the mouth of the river and extending upstream to the limit of the cruising ground of the *Nunivak*; the permanent settlements on the station, with a brief description of the same, are as follows:

Kotlik, a small trading post in charge of an old Russian trader named Komkoff, is situated 7 miles upstream from the Aphoon mouth of the Yukon. This station is not on the immediate banks of the steamboat channel, but stands a short distance back on the tundra and can be reached only with the smaller class of steamers or boats. The goods for the station are purchased by the agent, Mr. Komkoff, from the Northern Commercial Company at St. Michael and traded to the Eskimos of the delta region in exchange for their fish and furs.

Twenty miles above Kotlik is New Fort Hamilton, built by the North American Transportation and Trading Company more as a depot of supplies than a trading post. There are at this place a large warehouse and store, built of corrugated iron, but neither have been occupied recently.

Pitkas Point is a native settlement of Eskimo fishermen and hunters situated at the mouth of the Andreafski River. The settlement has a population of about 75 Eskimos. There are a dozen huts made of driftwood covered with sods, a few log cabins, a small chapel, a store, and trader's dwelling. The trader is a half-breed Russian, named Pitka, and his store is a branch of the Northern Commercial Company's station at Andreafski. Besides fishing and hunting for a living, the native population at Pitkas Point collect driftwood during the spring freshets and cut it up into cord wood for sale to passing steamers. They appear to be rather more energetic than most of the



TYPICAL TRADING POST OF THE YUKON VALLEY.



RUSSIAN MISSION, YUKON RIVER.

natives, probably owing to the influence and good example of Pitka, who is a man of considerable intelligence and business ability.

Andreafski, the most important trading post on the lower river, is situated on the right bank of the Andreafski River, about 2 miles from its junction with the Yukon. Here are located the various warehouses, stores, and dwellings comprising the plant of the Northern Commercial Company, the successors of the Alaska Commercial Company, which previous to the incorporation of the new company had maintained a trading post here ever since the transfer of the territory from Russia to the United States. A mile above Andreafski, on the same side of the river, is situated the extensive winter quarters of the Northern Commercial Company. There is a good machine shop at this place equipped with all the modern appliances for making ordinary repairs to the machinery of the river boats, a large hotel for the accommodation of the officers and crews of vessels laid up in winter quarters, and a good electric plant to furnish light for the buildings.

Lumber and materials for the construction of a marine railway at this place have been laid down here, and it is expected that the "ways" will be completed and ready to be put into operation by the beginning of the season of open navigation in 1902. The purpose of the company in building the "ways" is to enable it to haul out its vessels instead of allowing them to remain afloat all winter, as has been the custom heretofore. By this means a much smaller force of men will be required to look out for the vessels during the winter than would otherwise be necessary.

Mr. Fredericks, the agent of the company at Andreafski, has been an employee of the Alaska Commercial Company ever since the station was established, and is well known throughout the Yukon Valley as a man of sterling integrity and great ability in the matter of transacting business with the natives.

Russian mission is 112 miles above Andreafski on the right bank of the Yukon, and from the river it presents the appearance of being a compactly built little town. The large church of the Russian Greek mission at this place with its gaily painted minarets and towers lends an imposing air to the settlement which, however, is not sustained by a closer inspection. At the mission there are about 350 native Eskimos, whose log houses are crowded together near the water's edge, and they are looked out for and advised by a resident priest and assistant of the Russian Greek Church.

Mr. Belkoff, the trader at this place, is one of the few men who were in the country at the time of the transfer of the Territory to remain and take an active part in the organization of business under the new conditions. He has a very comfortable home and a family of intelligent, well-educated children and is always most hospitably inclined toward visitors and strangers.

Russian mission is chiefly interesting as being the site of the oldest church mission on the river. The remains of some of the old native underground houses are still to be seen side by side with the more modern habitations, and there is an old native dance house or kashim here which is the largest structure of the kind in the country and is still in a good state of preservation. The round-shaped doorway, which is a characteristic feature of Eskimo architecture, is still to be seen in the native houses, but it is not common, and farther upstream it disappears altogether, being replaced by the square frame doorway of the white man.

The native women at Russian mission make a very fair quality of basket from the grasses which are found in this region, and also from the twisted fiber of the inner bark of the spruce trees. It is somewhat remarkable that the art of basketry appears to be unknown or to have been long since discontinued among the natives of the interior farther up the river. After leaving this point basket weaving by the natives is not again seen. The men cut a little wood for sale to passing steamers when they have nothing else to occupy their time, but the greater part of the year is spent by them in the more congenial labor of hunting and fishing. The finest quality of red foxes and minks are taken in the region which is tributary to the mission.

Pimute village is situated 38 miles above Russian mission, on the same side of the river. The population consists entirely of natives and numbers about 50 souls. It is a typical dirty, evil-smelling Eskimo fishing village, and is of no commercial importance whatever. The natives do their trading at the Russian mission for the most part, but in some instances they travel upstream to Koserefski to get their supplies.

Koserefski, or Holy Cross Mission, is 28 miles above Pimute village, and its situation on the right bank of the Yukon is very similar to that of Russian mission. The similarity of the situation, however, is all that is alike in the two places. There is at this place a mission school in charge of Sisters of the Catholic Order of St. Anne for the instruction of native children. The pupils are instructed in the fundamental rudiments of an English education, and in addition to their other duties the girls are required to learn how to sew, cook, and take care of a house generally. The boys are taught gardening and the use of simple tools. The school is usually very well attended and the pupils seem to be very much attached to their teachers. There is an excellent garden always maintained at Holy Cross by the sisters in which the finest vegetables seen on the river are raised. Two or three cows are also kept, which furnish fresh milk for the school, the only place in the district where this article can be obtained. The settlement has a resident population of about 350 souls and a very much larger population of natives living in the region lying between the



NATIVE FISH TRAPS ON THE ANVIK RIVER.
The town of Anvik is shown in the background.

Yukon and Kuskokwim rivers make this their headquarters during the trading season and are under the spiritual charge of the resident Catholic priest, Father R. J. Crimont.

The natives on this part of the river are mostly of the Ingalik or Indian tribes of the interior, and are far superior in point of looks and manner of living to the coast Eskimos seen farther downstream. Their houses are kept in much better condition and their general appearance shows the result which has been attained here by the persistent and patient instruction of the good priests and sisters of the mission.

Anvik, which is 47 miles from Koserefski, is the next white settlement to be seen on the way upstream. It is situated on the right bank of the Anvik River about 3 miles from the junction of that stream with the Yukon. Here is located an Episcopalian mission under the charge of the Rev. J. W. Chapman and a school for the instruction of the native children in connection with the mission under the superintendence of Miss Bertha W. Sabine. The mission was founded by the Rev. O. Parker in the year 1887, and called Christ Church Mission. Mr. Parker was followed by Mr. Chapman shortly after the founding of the mission, and succeeded the former minister as superintendent in the year 1889.

The native children are taught in a day and boarding school. In the day school the scholars are taught the rudiments of the Christian religion and given instruction in the primary branches of secular knowledge. In the boarding school they are taught in addition to the above housekeeping, cooking, sewing, and the like.

A small sawmill owned by the mission furnishes all the lumber required for building purposes, and as it is operated entirely by native labor it favors the instruction of the boys in the use of tools and machinery. The native arts of fishing and hunting are encouraged, and under the advice of Mr. Chapman the products of native labor in these occupations are disposed of to a much better advantage than is the case of natives who act independently. Most of the work of caring for the mission buildings, garden, etc., is done by the pupils of the school, and in this way the expense of maintenance of the establishment is materially decreased. The annual expense of caring for one scholar in the boarding school is about \$100.

The Anvik River heads well over toward the coast of Norton Sound, and its valley furnishes an easy means of winter communication by dog-team travel with St. Michael. This trail is frequently used by the missionaries and traders whose stations are in this vicinity. It was by this route that the Russian explorer Glasanof first reached the Yukon from St. Michael in the year 1833. At the time of his visit he found a large Indian village at the present site of Anvik.

There is a post-office and money-order station at Anvik, and the

Northern Commercial Company has a store and trading station on the right bank of Anvik River a short distance below the village.

The Indians living on the Anvik River and in the immediate vicinity catch large quantities of salmon during the fishing season and dry them for winter use. In the height of the season the nets of the natives can be seen for miles set along the banks of the stream, and in some years the quantity of fish taken is enormous. Should the canning of salmon on the Yukon ever be attempted for commercial purposes Anvik River would be one of the best sites in the country for the erection of a cannery.

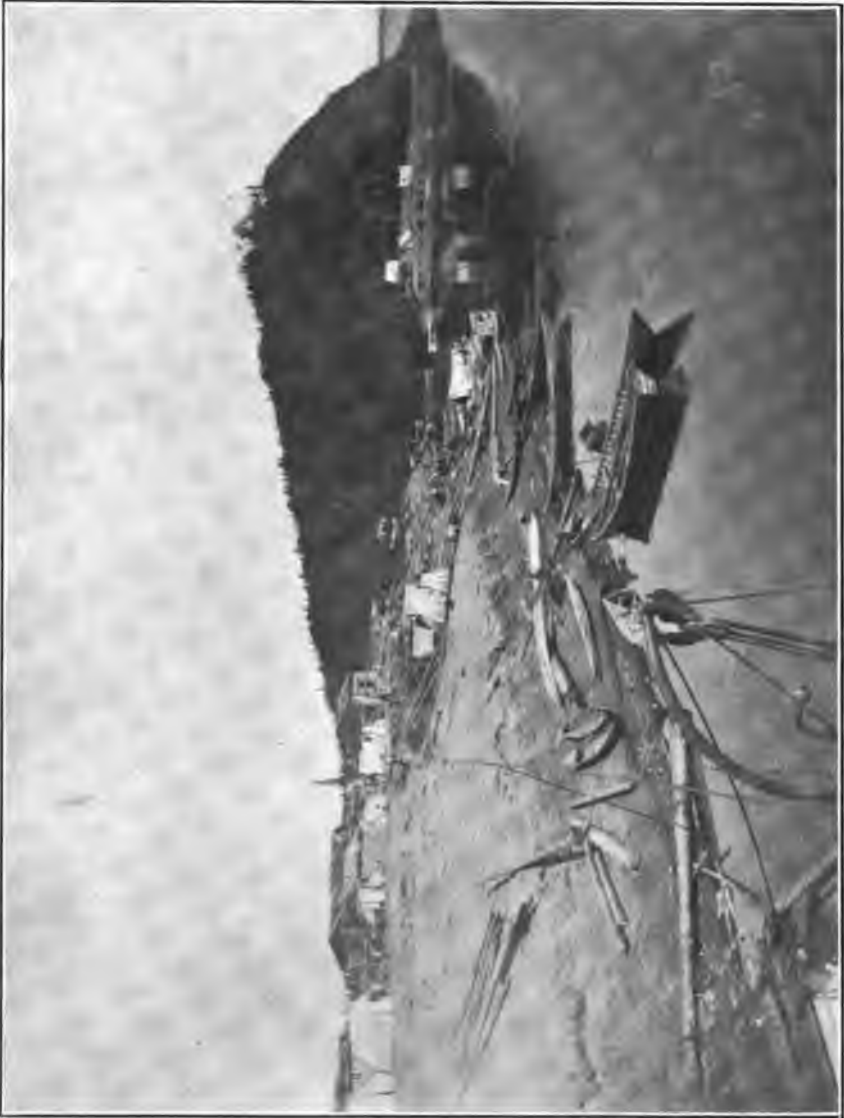
The water of the Anvik is clear and sweet, but of a very dark reddish-brown color. This is no doubt caused by the fact that it comes from the moss-covered plains of the interior country, where the soil is never thawed out except for a short distance from the surface, and the water has never been cleared of the vegetable coloring matter it contains by filtration. An analysis of the water showed that it was free from any deleterious matter.

Greyling, which is next passed on the way upstream, is 22 miles above Anvik on the right bank of the Yukon. There is at this place a store and dwelling occupied by Mr. O'Shea, who maintains one of the largest independent wood yards on the river here. There are about 75 Indians in the vicinity who are employed from time to time by Mr. O'Shea in cutting wood, when hunting or fishing does not occupy their attention. There are half a dozen white wood choppers also employed by Mr. O'Shea, and from 1,200 to 1,800 hundred cords of wood are annually put up for sale to passing steamers.

The first coal mine to be seen on the Yukon is situated 90 miles above Greyling on the right bank of the river. This property was developed by the Alaska Commercial Company and a considerable amount of coal has been procured. Several comfortable dwellings for the use of the employees of the company, a coal bunker, loading chutes, etc., have been built, and although the quality of the coal has not as yet proved to be very satisfactory for use as fuel for the steamboats, the work of development is still going on, and it is expected that a better quality of coal will be obtained later on.

Kaltag, 54 miles farther upstream, is important as being the point on the river where is situated the first station of the Government telegraph line, which is intended to connect St. Michael with the outside world. The line is already in operation from St. Michael across the country to Kaltag and along the Yukon as far upstream as Fort Gibbon, and it is expected that it will be completed through to Fort Egbert at Eagle by the spring of 1902. From the latter place a line is already in operation which connects it with the outside.

Kaltag is the river terminus of the winter sled trail which connects the Yukon Valley by the shortest route with St. Michael. In the



NULATO, WITH PROSPECTORS' TENTS ON THE BEACH.
On the hill in the background is situated the Indian burial ground.

early days of the Territory the Eskimos of the coast were accustomed to use this means of communication between their settlements on the coast of Norton Sound and the settlements of the river natives of the interior during their annual trading expeditions. Kaltag marks the highest point on the Yukon usually reached by the Eskimos on these trips. From this point they either returned to the coast over the portage or proceeded downstream to the coast. At this period the natives of the coast and the interior were frequently at war, but since the advent of the whites a new system of traffic has been established which effectually separates the two tribes and war is unknown.

Nulato, which is 40 miles above Kaltag, on the right bank of the river, is one of the oldest trading posts in the country. Its situation, some 10 or 15 miles from the mouth of the Koyukuk River, makes it easy of access to the natives of that region, who have been accustomed since the early days of occupancy of the country by the Russians to make the place a sort of rendezvous, where each year they brought their furs to be exchanged for ammunition and supplies. The early history of this post is filled with accounts of bloody conflicts between the white settlers and the fierce and treacherous Koyukunks. In the year 1838 Malakoff, an officer of the old Russian trading company, ascended the Yukon and built a blockhouse and stockade near the site of the present settlement of Nulato, but it was quickly burned while he was absent on a trip to St. Michael, and his native care-takers were foully murdered by a predatory band of Koyukuk Indians. Malakoff never returned, but his place was taken by Lieutenant Zagoskin, of the Russian navy, who reached this point in the year 1842, rebuilt the fort, and attempted to establish friendly relations with the natives. Zagoskin was recalled shortly after completing the new post, and in his place came one Dershavin, who undertook to carry on the work. His administration of affairs was marked by many acts of extreme cruelty to the natives, and in the year 1851 the ill feeling between the whites and Indians culminated in the infamous massacre of the entire garrison by the Koyukuk Indians under the leadership of the notorious Larriown, a medicine man of the tribe, who lived many years afterwards to boast of his crime. Among the white men to lose his life on this occasion was Lieutenant Barnard, of the English navy, who had been sent out by his Government to search for the lost Sir John Franklin. A portion of the headboard marking the grave of this officer is still one of the objects of interest in connection with by-gone days that are to be seen at this place. In later years the post was moved 2 miles farther upstream from its original site to where it now stands, at the mouth of a little tributary of the Yukon called by the natives Klat-kahatna, or "Stop a bit" River. It was at this place that Mr. Robert Kennicott, the naturalist, lost his life as a result of disease brought on by exposure

and hardships incurred in the prosecution of scientific research. His death may not have been as violent, but he is none the less entitled to be remembered as a martyr to duty with the victims of the earlier tragedies.

Nulato at the present day consists of a well-built collection of log houses, stores, and warehouses, a Catholic church and school, under the charge of Father Ragaru, a Jesuit priest, and several sisters of the Order of St. Anne. Some attempts have been made to maintain vegetable gardens at Nulato, but owing to the lack of proper drainage these efforts have not been as successful as at other more favored places on the river. The importance of Nulato is due to its position as a trading post. It is still the annual rendezvous for hundreds of natives from the Koyukuk River and the adjacent regions, who come here for their supplies. Some years have now elapsed since they have shown any signs of violence, and the influence of Father Ragura has done much toward taming their former fierce and treacherous natures. The growing population of whites and the presence of law officers in the country has also contributed to render them less liable to outbreaks, but they are still years behind the natives of the Yukon in point of civilization. They will probably never again rise against the whites in any organized attempt at resistance, but sporadic cases of violence will doubtless occur from time to time, especially if they think they are being cheated or abused.

One of the interesting features of Nulato from an ethnological point of view is the native cemetery, which crowns a high bluff just above the village. The strange combination of Christian and heathen emblems placed over the graves form a striking object lesson of the social progress of evolution among these people. In the photograph of this burial place it will be seen that the cross is a prominent feature over all the graves. But side by side with the cross, emblems of the old heathen beliefs hold an equally prominent position. On one of the crosses a mirror has been nailed to ward off evil spirits, and at the base of another a glass-covered box contains a number of presents which have been given by the friends of the dead as offerings to propitiate his departed spirit. Still another grave has at its foot a cross as a symbol of the influence of the church, while at the head is a larger piece of timber surmounted by the carved figure of a bear. The combination of heathen and Christian emblems in this case was evidently intended as a sort of compromise by the friends of the deceased.

The second coal mine in operation on the river as we ascend is situated 12 miles above Nulato, on the right bank of the Yukon. It is owned and operated by Mr. Frank Pickarts. The coal, like that found farther down the river, is a kind of lignite, and development work has not yet reached the point where it can be said with certainty that it will ever be used as a satisfactory substitute for wood as fuel. The



INDIAN BURIAL GROUND AT NULATO, ON THE YUKON RIVER.

owners of the mine, however, are hopeful that as further progress is made and a lower level is reached in the mine the coal will be found to be of better quality.

Six miles above Pickarts's mine is a small trading station operated by the Northern Commercial Company, known as the Koyukuk Station. The main steamboat channel at one time passed directly by this place, but at the present time it follows a right-hand branch of the river some 4 miles farther south of the old channel. In consequence of this change, Koyukuk Station has ceased to be of any commercial importance. Should, however, the Koyukuk country prove to contain valuable gold-bearing ground, this station may yet be a convenient depot of supplies for the miners in that region.

The Koyukuk River enters the Yukon 20 miles above Nulato from the north. The mouth of the river is concealed from view of passing vessels by a large island, but its location can be determined by the position of a large rounded hill locally known as Sopka Mountain. There is a small settlement of Indians near the mouth of the Koyukuk, with a population of about 20 people.

The Melozikakit River enters the Yukon 60 miles above the Koyukuk, and just above the junction of the rivers there is a large native fishing village, with a population of from 75 to 100. The winter home of these people is situated on the banks of a slough of the Yukon about 5 miles from the summer village. This place is a favorite fishing ground of the Indians during the summer, and large quantities of salmon are usually caught and dried for winter use.

The next trading post to be seen after leaving Koyukuk Station is at Korkrines. This place is 120 miles from the Koyukuk and is situated on the right bank of the Yukon. The highest mountains along the river lie to the north of Korkrines and form the watershed between the Yukon and the Melozikakit rivers. A winter trail leads from Korkrines over the mountains into the valley of the Melozikakit and furnishes an easy means of communication with the natives of that region. Reports of gold-bearing ground on the upper waters of the Melozikakit have induced several parties of prospectors recently to visit this country, and I have been informed by some of these men that the trail from Korkrines over the mountains is an easy one and practicable for horses at any season of the year. The mouth of the Melozikakit can not be entered by vessels drawing over a foot of water, and for that reason its waters have not been explored. The character of the country which it drains is very similar in formation to that of the gold-bearing country in the vicinity of Minook Creek, and it is the general opinion of practical miners who are familiar with both localities that the upper portion of the Melozikakit Valley will prove to be as richly mineralized as the former region. If this surmise should prove to be correct, Korkrines Station will undoubtedly become one

of the most important depots for miners' supplies on the Lower Yukon, as it is the most convenient place on the river from which to ship such supplies into the Melozikakit Valley.

The Tozikakit River joins the Yukon 125 miles above Korkrines Station. Just above the mouth of this river there is a collection of log houses which were built in the year 1898 as winter quarters for a number of vessels which laid up here during the closed season. The houses have since been abandoned, but could be made habitable with very little trouble and they would afford good shelter in case of necessity.

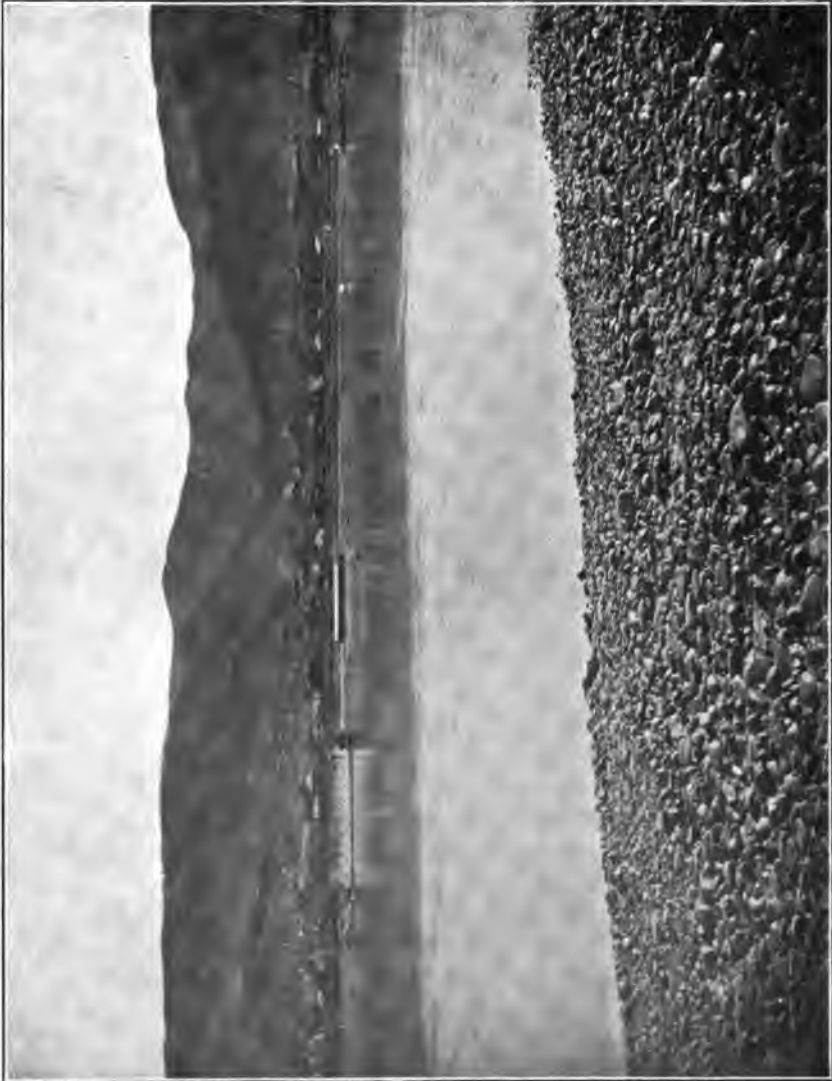
About 5 miles above this point is the original site of St. James Episcopal Mission. Some of the houses are still standing, but the mission has been removed to a point 13 miles farther upstream, as will be noted later.

Fort Gibbon, the largest army post on the river, is situated on the right bank 10 miles above the Tozikakit. Here a number of commodious frame buildings have been erected for the accommodation of the officers and men forming the post. There is a good-sized sawmill, blacksmith and machine shops, laundry, stables, warehouses, and stores, and in fact all the accessories which go to make up a well-ordered town. Gardens have been started in which all the hardier kinds of vegetables are planted, underbrush cleared away, plank walks and wagon roads constructed, and other improvements projected by the army authorities which when completed will transform what was at one time a bleak bit of moorland into an attractive and comfortable little town.

A short distance beyond the limits of the army post the North American Transportation and Trading Company has a trading station called Weare. Here there is a large and well-supplied store, warehouses, and agent's dwelling. The Government maintains at this place a post-office and money-order station. A considerable amount of business is transacted at Weare with the natives of the Tanana River, which enters the Yukon from the south a short distance above this point, and also with prospectors who make this place their point of departure when leaving the Yukon for the Tanana country.

What has been said of Weare as a business center is also true of Tanana Station, which is a mile farther upstream and is conducted by the Northern Commercial Company. Tanana is on the site of the old Indian settlement of Nuklukyet, and has for years been the rendezvous of the Tanana River Indians who came here to meet the traders in the spring every year. The natives of the Tozikakit Valley also make this their headquarters during the trading season, and at its height there are sometimes assembled in the vicinity the largest number of natives to be seen at one time on the river.

St. James Mission, which is conducted under the auspices of the



RAMPART CITY, YUKON RIVER, LOOKING FROM A POINT ON THE OPPOSITE SIDE OF THE RIVER.

Episcopalian Church, is situated 3 miles above Tanana Station on the same side of the river. The mission is directly in charge of Mr. Selden, a lay minister of the church, but is frequently visited by the bishop of the diocese, the Right Rev. P. T. Rowe, whose influence over the Indians is very great and beneficial. Through his efforts the Indians have been induced to make their summer camp near the mission instead of around the trading posts, and in this way they are in a measure shielded from the temptations which are thrown in their way by a certain class of unscrupulous white men who are engaged in selling liquor in the vicinity of the army post, and who do not hesitate to trade it to the Indians if they can do so without detection.

The new church at St. James Mission is beautifully situated in the midst of a cluster of spruce and birch trees, and is a credit to all who have contributed by their labor to bring it to completion. Through the picturesque lower ramparts, 75 miles brings us to the mining camp of Rampart. This town is the most important white settlement on the lower river, and is situated on the left bank of the Yukon just below the junction of Minook Creek with the main stream.

Rampart is a typical mining camp, and owes its existence to the discovery of some very rich deposits of gold on the creeks which take their rise in the mountains in the near vicinity. The richest of these placer diggings have been found on Little Minook, Hunter, Alder, and Big Minook creeks, all of which are within easy reach by trail from the town.

All of the trading companies and a number of independent concerns have stores at Rampart, where almost every article likely to be required by a person living in the country can be procured. Besides the regular trading stores, there are an ample number of saloons, restaurants, boarding houses, drug stores, and the miscellaneous catch-penny concerns usually found in such communities.

Rampart boasts a weekly newspaper which is edited with considerable ability, a church and hospital supported by the Episcopalian board of missions, a post-office and money-order station, and a jail. Law and order is represented by a commissioner and deputy marshal of the circuit court of Alaska, and there is a small detachment of soldiers in charge of an officer of the United States Army stationed here to assist the civil authority to preserve order in case of necessity. At one time the town had a population of about 2,000, but the extent of territory in which valuable gold-bearing ground has been located is limited, and at the present time many of the early settlers have left the place to search for gold in some other more promising field. At the present time there not over 400 persons who make this their home.

Good trails lead from Rampart over the mountains in nearly every direction, and constant new discoveries of gold are being made or

reported. There seems no good reason to think that the town will not continue for some years at least to be the distributing point of supplies for the country of which it is the geographical center. The Pioneer coal mine, 25 miles above Rampart, on the right bank of the Yukon, is the third place on the river passed on the way upstream where coal is being mined for sale. So far this mine has produced some of the best coal found on the lower river. A shaft has been sunk 75 feet deep, and from 500 to 600 tons have been taken out.

Fort Hamlin, a trading post operated by the Northern Commercial Company, is situated on the left bank of the Yukon, 65 miles above the coal mine. It consists of two good-sized log warehouses and a dwelling for the agent. Besides the buildings of the company there are several neat log houses occupied by three or four families of Indians, a road house for the accommodation of passing travelers, and a mail station for use of the mail carrier during the winter.

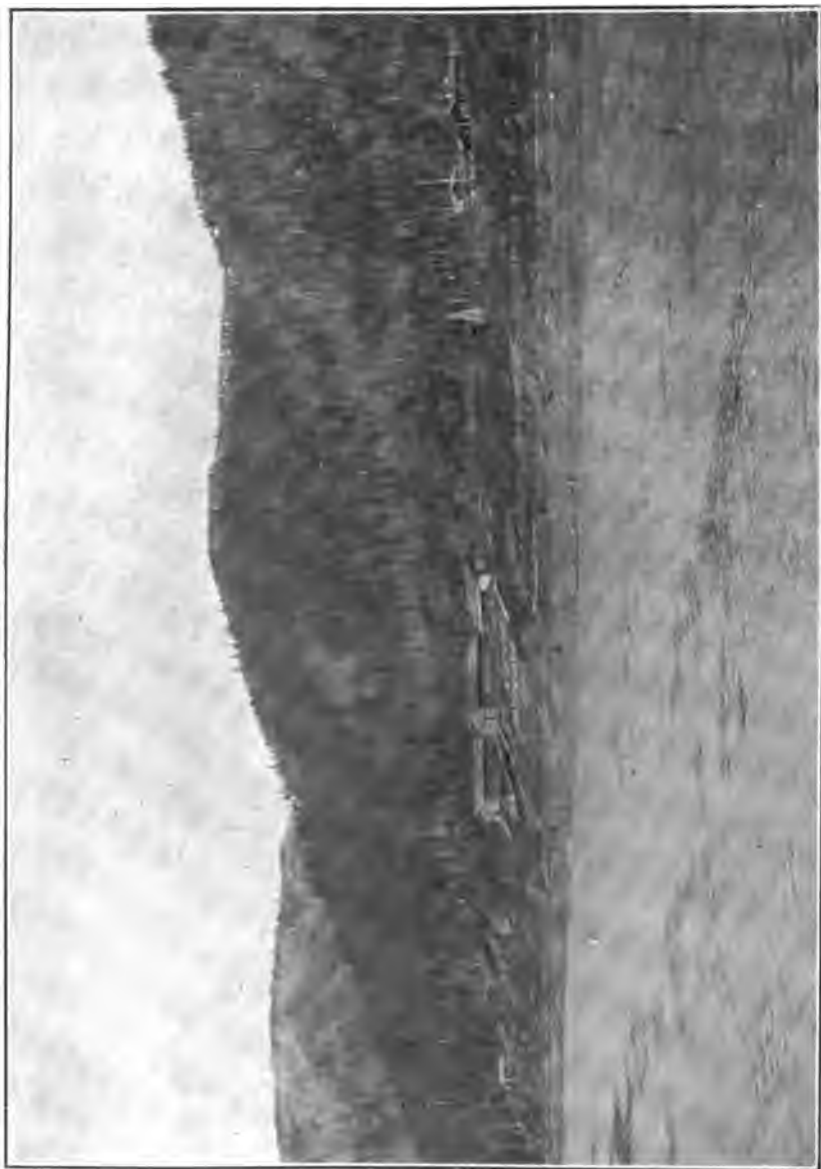
Fort Hamlin is the last trading station to be seen on the lower river. Above this point the Yukon Flats begin, and there is no other store until Fort Yukon is reached. The station owes its importance to the fact that it is the most convenient place for the purchase of supplies by miners bound into the Koyukuk country over the Dall River trail. It has also had a considerable trade with the natives living in the vicinity previous to the building up of Rampart. The advent of the whites at that place caused a considerable number of the Indians to change their place of abode so as to be more in touch with the white population, and for this reason Fort Hamlin is not as flourishing as it was in former days.

A short distance above Fort Hamlin the river is divided into two channels by a large island, the right-hand channel being the one usually taken by steamboats bound up the river, while the left branch leads directly to the mouth of Dall River, in which stream, at a distance of a mile from its mouth, is situated Fort Shoemaker, the winter quarters of the *Nunivak* and the termination of our cruising ground.

For a more complete itinerary of the station showing the location and distance apart of the settlements on the river see appendix.

MERCHANDISE AND TRADING GOODS.

From what has already been written in regard to the products of the interior of Alaska, it will be seen that nearly everything necessary for life must be brought into the country by the prospective settler or else purchased from the trading companies on the ground. Generally speaking, it may be said that persons whose occupations will be such as to permit of a permanent habitation will find it cheaper and more satisfactory to purchase supplies on the outside and ship them to their destination by some of the transportation companies. But in the case of prospectors, whose movements are likely to be uncertain, it will



FORT HAMLIN, TRADING POST, 75 MILES ABOVE RAMPART CITY, ON THE YUKON RIVER.



INDIAN CACHES AT FORT HAMLIN.

probably not be advisable to bring in a large amount of food supplies, as the labor and expense of caring for them would amount to more than the extra cost of the articles when purchased from the stores on the inside. Until a paying claim is located, the prospector will find it greatly to his advantage to be ready to travel as quickly and with as little impediment as possible. With a supply of cash on hand, it will be found that almost any article which may be required can be purchased from the trading companies. The prices asked for the ordinary necessities of life by the companies are not exorbitant when the long distance of transportation and the enormous expense entailed in handling the goods are considered, and the cost of living in the country is not excessive. Small articles of personal comfort or convenience and the luxuries of life are comparatively much higher, and it will be wise for the new comer to provide himself with these articles before leaving the States.

Subjoined is a list of articles of food and clothing which experience has proved to be all that will be actually needed by one person for a year.

The prices of the same are those quoted by the trading companies at Circle City, and may be taken as the average cost of similar articles at any of the stores in the Yukon Valley previous to the year 1901. The merger of the companies which was effected in that year will most probably tend to reduce the cost of all these articles very materially in the future; at least, that is the intention and expectation of the managers of the new combination of the companies.

One year's outfit for one person in Alaska.

400 pounds flour	\$40. 00
80 pounds beans	10. 00
25 pounds peas	6. 25
25 pounds rolled oats	6. 25
25 pounds gernea	6. 25
20 pounds corn meal	4. 00
1 case condensed milk, 4 dozen 1-pound cans	18. 00
1 case cabbage or sauerkraut	12. 00
1 case roast beef, 1 dozen 2-pound cans	9. 00
1 case corned beef, 1 dozen 2-pound cans	9. 00
1 case sausage meat, 2 dozen 2-pound cans	16. 00
1 case turkey, 2 dozen 2-pound cans	12. 00
1 case tomatoes, 2 dozen 2½-pound cans	10. 00
1 case string beans, 2 dozen 2-pound cans	10. 00
75 pounds bacon	22. 00
50 pounds ham	15. 00
25 pounds dried apples	6. 25
25 pounds dried prunes	6. 25
25 pounds dried peaches	7. 50
25 pounds dried apricots	8. 75
25 pounds raisins	6. 25
100 pounds granulated sugar	25. 00

1 keg (5 gallons) pickles	\$5. 00
5 gallons sirup	12. 00
25 pounds evaporated potatoes	12. 00
15 pounds cheese	7. 50
20 pounds coffee	10. 00
5 pounds black tea	6. 25
5 pounds cocoa	5. 00
6 bottles Worcestershire sauce	4. 50
30 pounds lard	9. 00
30 pounds butter	15. 00
12 pounds macaroni	2. 00
12 pounds mince-meat	12. 00
1 case baking powder, 2 dozen half-pound cans	12. 00
15 pounds salt	1. 50
1 dozen bars washing soap	2. 00
1 dozen cakes toilet soap	1. 00
10 gallons coal oil	10. 00
4 boxes candles	24. 00
1 lamp	1. 50
4 lamp chimneys	1. 00
4 pairs moose-hide moccasins	6. 00
2 pairs native water boots	6. 00
2 pairs moose-hide mitts	6. 00
1 fur cap	5. 00
1 pair snowshoes	8. 00
1 hand sled	7. 00
1 drill parkie hood, fur trimmed	4. 00
1 Yukon stove	10. 00
1 set cooking utensils	5. 00
1 wash basin	1. 00
6 towels	3. 00
Contingent expenses	19. 50
Total	500. 00

The above list does not include the ordinary outfit of clothing, medicines, tools, rubber boots, blankets, arms, and ammunition, etc., which a man would naturally require in any locality. It should be borne in mind that the ordinary clothing worn in any of our Northern States suffices for Alaska. A fur coat is a luxury and not a necessity. For traveling a fur robe is indispensable, but can be purchased outside to better advantage than in the country.

The total weight of a year's outfit of food and clothing will approximate 1 ton. Should the intending settler decide to purchase his supplies on the outside, the original cost of the same will be from 250 to 500 per cent less than the companies' prices; but the cost of transportation will amount to \$117 per ton to land them at Circle City, which is situated in the center of the mining country, adjoining the boundary line; \$91 per ton if landed at Rampart, the center of mining operations on the lower river, or \$125 per ton to land them at Bergman, the point on the Koyukuk River nearest the diggings in that region. Even with this high rate of transportation, it will be seen that it would be a saving of money for the settler to bring all of his sup-

plies with him, if he will be able to take care of them after reaching his first point of destination. But nine out of ten men who come into the country have no settled place of habitation, and the very nature of a prospector's vocation makes it necessary for him to be constantly moving from place to place until a paying location is discovered. Under these circumstances, as has been already stated, it will be more advisable for him to bring into the country only his clothing and such articles of personal convenience as he may require, and purchase his other supplies from the stores in quantities as needed.

The class of merchandise carried by all the companies in their stores is the same as that usually found in a "general store" in the States. The quality of the goods, especially in the line of food supplies, is the the best that can be obtained, and the selection of the various articles is made by men whose long experience in the field renders them expert in the matter of placing on the market only such articles as will best meet the requirements of life in the country.

To a very large extent, business with the Indians is conducted on the basis of barter and exchange. While it is true that the natives are rapidly learning the use of money, and almost invariably demand a cash price for their furs, game, and special articles of domestic manufacture, it is equally true that when dealing with the traders they seldom receive full payment in money for their goods. If an Indian has, for example, a bearskin which he wishes to sell, he takes it to the trader and states the price for which he will dispose of it. Let it be assumed that this price is \$10. The trader agrees to the price, takes the skin, and then asks the seller "what he will have." A list of articles in trade goods is soon made up, with the assistance of the trader, and when it is filled there is seldom any change coming to the Indian from his \$10. This method of trading satisfies the native's growing desire to transact business on a cash basis, and at the same time, by placing a fictitious money value on the product of the Indian's labor, effectually prevents the purchase of his goods by outsiders for cash. This system may at first sight appear likely to work a hardship to the white settler. But in the present condition of the country it is better for the Indian that all his trading should be done with responsible firms, whose interests are common with his own, than to have him made the victim of unscrupulous and irresponsible persons who have no such interest in his welfare and prosperity. The law forbidding the sale of liquor to the Indians has always been strictly observed by the large companies, but it is feared that others who have attempted to enter into this traffic have not been actuated by the same conscientious scruples. This subject will be touched upon in another part of this report.

The articles of trade most in demand with the Indians are the staple groceries, particularly flour, tea, sugar, lard, baking powder, and

1 keg (5 gallons) pickles	\$5. 00
5 gallons sirup	12. 00
25 pounds evaporated potatoes	12. 00
15 pounds cheese	7. 50
20 pounds coffee	10. 00
5 pounds black tea	6. 25
5 pounds cocoa	5. 00
6 bottles Worcestershire sauce	4. 50
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30 pounds butter	15. 00
12 pounds macaroni	2. 00
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plies with him, if he will be able to take care of them after reaching his first point of destination. But nine out of ten men who come into the country have no settled place of habitation, and the very nature of a prospector's vocation makes it necessary for him to be constantly moving from place to place until a paying location is discovered. Under these circumstances, as has been already stated, it will be more advisable for him to bring into the country only his clothing and such articles of personal convenience as he may require, and purchase his other supplies from the stores in quantities as needed.

The class of merchandise carried by all the companies in their stores is the same as that usually found in a "general store" in the States. The quality of the goods, especially in the line of food supplies, is the the best that can be obtained, and the selection of the various articles is made by men whose long experience in the field renders them expert in the matter of placing on the market only such articles as will best meet the requirements of life in the country.

To a very large extent, business with the Indians is conducted on the basis of barter and exchange. While it is true that the natives are rapidly learning the use of money, and almost invariably demand a cash price for their furs, game, and special articles of domestic manufacture, it is equally true that when dealing with the traders they seldom receive full payment in money for their goods. If an Indian has, for example, a bearskin which he wishes to sell, he takes it to the trader and states the price for which he will dispose of it. Let it be assumed that this price is \$10. The trader agrees to the price, takes the skin, and then asks the seller "what he will have." A list of articles in trade goods is soon made up, with the assistance of the trader, and when it is filled there is seldom any change coming to the Indian from his \$10. This method of trading satisfies the native's growing desire to transact business on a cash basis, and at the same time, by placing a fictitious money value on the product of the Indian's labor, effectually prevents the purchase of his goods by outsiders for cash. This system may at first sight appear likely to work a hardship to the white settler. But in the present condition of the country it is better for the Indian that all his trading should be done with responsible firms, whose interests are common with his own, than to have him made the victim of unscrupulous and irresponsible persons who have no such interest in his welfare and prosperity. The law forbidding the sale of liquor to the Indians has always been strictly observed by the large companies, but it is feared that others who have attempted to enter into this traffic have not been actuated by the same conscientious scruples. This subject will be touched upon in another part of this report.

The articles of trade most in demand with the Indians are the staple groceries, particularly flour, tea, sugar, lard, baking powder, and

bacon; calico, drilling, cheap clothing, shoes, hats, and stockings. Around the white settlements the taste for bright-hued undershirts for the women, shirts and neckties for the men, and any kind of cheap jewelry for both sexes is rapidly on the increase. Nearly every buck purchases a watch as soon as he can do so, and all of the men are provided with rifles and shotguns. Scissors, needles, and thread find a ready sale with the women, but, strange to say, they do not take kindly to pins, except the kind known as "safety pins." In the spring, at the beginning of the fishing season, there is always a demand for twine for the manufacture of their nets, and mosquito netting and straw hats are among the novelties which are growing in favor. Among the better educated class of native women, those who have been under instruction at the missions, dark-hued fabrics only are used for clothing. The gaudy-colored garments which usually attract the savage eye can only be sold to natives living at a distance from the white settlements on the Yukon. Beads of the smallest and finest quality for embroidery command a high price, but the larger kind, which are preferred by the Eskimos of the coast, are not salable on the Yukon. Tobacco is used by both sexes, that kind known to the trade as "Indian leaf" being perhaps the most generally used.

In exchange for these articles the Indian men offer for sale the fresh meat of the moose, caribou, bear, and deer; grouse, ptarmigan, and the various kinds of fish found in the region. They also make snowshoes, sleds, toboggans, and birch-bark canoes, but, with the exception of the snowshoes, all these articles are now manufactured better on the outside and sold by the companies. The women make moosehide moccasins, gloves, and mittens, tastefully decorated with beads; fur caps and socks, and a variety of small articles, such as purses, watch fobs, etc., which are also decorated with beads, but are valuable only as curios. The art of woven basketry is not pursued by these people, and would furnish them a remunerative means of earning a living if it could be learned.



ARRIVAL OF A PARTY OF TRAVELERS AT FORT SHOEMAKER.

Observe the size of the load on the nearer sled. It probably weighs over 600 pounds and has been hauled 35 or 40 miles a day by 5 dogs.

CHAPTER III.

WINTER TRAVEL.

DURATION.

Winter travel begins on the river as soon after the close of steam-boat navigation as the ice is sufficiently strong to bear the weight of a sled, and lasts until the warm weather of spring makes the trails impassable. It frequently happens both at the beginning and ending of winter that there is a period of time varying as to length from two to three weeks, when all travel is practically suspended. The conditions which cause this cessation of movement will be explained later. In general it may be stated that winter travel on the river trails begins about the middle of October and ends by the 1st of May.

The overland trails into the interior are not fit for travel until the ground is well covered by snow, which is usually some two or three weeks after the river is frozen over, and by the middle of April these trails are in such bad condition, owing to the rapidly melting snow, that progress by sled is very difficult, and only short trips are undertaken except in cases of extreme necessity.

AMOUNT OF TRAVEL.

Under ordinary circumstances one may spend weeks on the trails away from the immediate vicinity of the river without encountering a single human being outside of one's own party. An occasional party of Indians may be seen on their way to their hunting grounds after the Christmas holidays, or returning to the river with moose meat for sale at the settlements, or a wandering prospector may be encountered on his way in for supplies after spending the summer on some interior creek. But as a usual thing, after the main trail which follows the Yukon is left by the traveler, he can not expect to see many strange faces. Even on the main trail travel is very light during the greater portion of the winter. With the exception of the mail carriers, who pass up and down the river once a week, there are no regular travelers. Occasionally a wood agent of one of the trading companies on his annual tour of inspection, an officer of the court bound on some errand

of the law, a party of Government officials on a reconnoissance, or a special courier from some far-away mining camp on his way to the outside with the news of some important "strike," passes along the trail, stops long enough at the different places of call to exchange items of news and then trudges on again and is lost to view in the midst of the dreary expanse of ice-covered river. At times information of rich discoveries of gold which have been made in new fields causes a stampede to take place from the settlements, and until the excitement subsides the trail may take on the appearance of a busy highway. During the great stampede to Nome, which took place during the winter of 1900, the Yukon River trail from January 15 to April 1 was the road over which thousands of eager gold seekers made their way to the newly discovered diggings. There was at this period an almost continuous line of travelers, with their dog teams and loaded sleds stretching from Dawson to the sea. The constant passing of the sleds wore the surface of the trail down as level as a table; there were frequent brushes between rival teams for the right of way; the road houses at night were crowded with a clamorous throng of adventurers of both sexes from all over the world, and the hungry bands of dogs howled and fought outside throughout the night. These were busy days and restless nights on the trail, and while they lasted were full of interest to the onlooker. But as a usual thing the sight of a solitary traveler winding his way through the fields of ice hummocks and followed by his team of steaming dogs, looking like a procession of black ants crawling slowly over the white surface of the river, is an event of sufficient importance to attract the attention of every unemployed person in a settlement. The cry "that some one is coming" never fails to cause a crowd of interested spectators to gather at the point where the newcomer must stop to communicate, and excitement runs high until, with much barking of dogs and jingling of sleigh bells and cries of the driver to his team, the outfit finally pulls into camp and the identity of the traveler is revealed.

MEANS EMPLOYED IN WINTER TRAVEL.

Up to the present time dogs and sleds furnish the only means of transportation throughout the interior of Alaska during the winter season. At some of the settlements, and to a very limited extent on well-made trails, horses have been employed in packing goods and in the various kinds of work in which the services of draft animals are required, but it can not be said their use for ordinary purposes of transportation has been altogether successful as yet. With the building of wagon roads throughout the country will come, no doubt, the opportunity to use horses and mules, and as experiments have already proved that they can be safely wintered in the country, it is only the lack of good roads which prevents their general use.



A WINTER TRAIL ALONG THE MAIL ROUTE OF THE YUKON VALLEY.



TYPE OF NATIVE-MADE TOBOGGAN, FOR USE OVER DEEP SNOW AND LITTLE-USED TRAILS.

Other things being equal, the relative cost of maintaining dogs and horses or mules is probably in favor of the latter. In this connection due weight must be given to the fact that with good roads horses can be used throughout the year, whereas the use of dogs and sleds is necessarily confined to the winter season.

The following facts in connection with dogs and their use as draft animals have been collected from observation of the work and behavior of some 50 or 60 dogs which from time to time formed part of the equipment of the *Nunivak* and from information obtained from all other available sources during our sojourn in the country:

The best dogs for use in the country are undoubtedly those bred from the native stock found in possession of the Eskimos on the coast. There seems to be no doubt but that these animals are the direct descendants of the wolf, which is common throughout the region, and indeed their resemblance to that animal is so strong that little room for conjecture as to their origin is left. In color the Eskimo dog varies from a perfect white or dusky gray to black. The hair is long and rather coarse and in a healthy animal stands well off from the body, and the hide is covered with a heavy but not dense underfur. The head is small, nose pointed, eyes large and intelligent in expression, legs rather long and well muscled, and the neck and shoulders exceedingly well developed. A good dog for team work should be short in the barrel, lean in the flank, and carry his tail high when in action. The feet should be large and well padded and free from an overabundance of hair growing between the toes. The weight of a good dog averages about 60 to 70 pounds, but mere weight is of secondary importance in judging the value of an animal, as many light-weight dogs do better and more satisfactory work than others that may be twice as heavy.

The introduction of dogs of all kinds from the outside by people recently coming into the country has done much to lower the standard of the native animal by allowing them to interbreed. It is claimed, not without good reason, that the dog of mixed parentage is more liable to be vicious, has less endurance, and is more subject to disease than the pure-bred native animal. For these reasons the Eskimo or Mahlemute dogs as a general thing command the highest price. The cost of dogs varies with the seasons. In the spring, after winter travel is over, good working dogs can be purchased for from \$20 to \$30. Young untrained dogs, which will be ready for sled work by fall, can be had for from \$10 to \$20. These prices advance rapidly after winter travel begins, and by Christmas a fairly good working dog will cost from \$50 to \$75, and any stringency in the local market will send the price up to \$100, and even \$125 is not considered an extraordinary price to ask for a really first-class animal. In the composition of a team there should be a least one dog trained to act as a "leader,"

and the strongest and most reliable animal is usually placed next to the sled to act as a "wheeler." All the dogs in a team should be as nearly of a size as possible, as the speed and endurance of a team will depend upon the weakest member. A good leader will pick out the trail even though it may be covered with snow and will obey signals of direction given him by the driver from the sled, but dogs which are not thoroughly broken to act as leaders will not do satisfactory work unless some one runs ahead to point out the trail. An animal trained to obey signals is called a "gee" and "haw" dog, these being the terms adopted to indicate the direction, either right or left, which it may be desired to go. One of the most important things a team should be taught is to stop at the command of the driver. Serious and even fatal accidents have happened to men alone on the trail by having their team run off and leave them without means of reaching shelter. In most of these cases the animals simply followed the leader, and never having been properly trained, paid no attention to the command "whoa" given by the driver, who may have accidentally fallen off his sled and have been too tired to catch up with the running dogs. The word in universal use throughout the country to start the dogs in motion is "mush," evidently a corruption of the French verb "*marcher*," to march or walk, and has been obtained from the old Hudson Bay voyageurs. In Alaska the term "to mush" means to travel and a "musher" is a traveler on foot. The individual character of dogs is as variable as that of human beings, and in order to get the most out of them their dispositions and eccentricities must be just as carefully studied. The most of the Eskimo dogs are exceedingly affectionate, fond of play, and easily trained. They are courageous and often pugnacious, and their disposition to fight is too well known to require more than passing mention. In a team or collection of any number of dogs belonging to one person this disposition to fight can be easily overcome, but when a strange team is met on the trail, or if the dogs belonging to a stranger venture on the ground of the home team, it seems almost impossible to prevent the two from engaging in a pitched battle, in which event even the young puppies will join. It is a singular fact, however, that these dogs seldom attack a man unless under great provocation. Their affection for their master can be easily alienated, and they have only to be fed one or two days by a new owner to be as loyal to him as though no other master had ever been known. On this account every traveler in the country makes it a point to feed his own dogs. In this way, and this way alone, can he be certain of their allegiance.

Ordinary dog teams are composed of from 5 to 7 dogs. A large number makes the team unwieldy, with hardly any additional benefit in the way of increased speed or hauling power. For very heavy work over a good trail a large number of dogs can sometimes be used



WINTER TRAVELING DRESS, COMMON THROUGHOUT THE YUKON VALLEY.

to advantage, but not so on the ordinary trails over the rough surface of the river or through the brush-obstructed trails of the interior. Here quick, snappy work is required, and the smaller the team having strength enough to haul the load the better. Under ordinary conditions of travel one dog will haul 100 pounds a distance of 40 miles per day for from three to four days without showing any amount of fatigue. If the trail is bad half that distance will be a good day's work, and in any case no team should be worked continuously more than four days without a rest of at least one day before proceeding on the journey. Great care must be taken to see that their feet are in good condition, as they are liable to become sore after three or four days' hard travel and, unless attended to, the dog may be made permanently lame. The harness used for dogs in the interior consists of a padded collar, made to slip on over the head and fit snugly around the neck, to which are attached on each side traces fitted at the ends with snap hooks. The traces are supported by loops attached to a wide band passing around the body of the dog just behind his forelegs. The harness is made either of leather or wide cotton webbing, and the dogs are invariably driven tandem. The method in vogue on the coast and in the timberless country of driving the animals two abreast would not do in the interior, where the trails are mostly through dense brush and very narrow.

Experience in handling dogs has shown that the best time to feed them is at night after the work of the day is over. They do not work so well after a full meal as they do if a sufficient time has elapsed after eating to allow the food to become thoroughly digested. And, furthermore, by following the custom of feeding the dogs at night they soon learn to recognize the fact that after being harnessed up in the morning they will not be fed again until camp is made at the end of the day's run, and this knowledge is supposed to act as an incentive for them to get through with the work as quickly as possible. How true or mistaken this belief in the intelligence of the dogs is, it is undoubtedly a fact that they invariably brighten up after a long day's travel when signs of a stopping place are seen ahead, and toward night the scent of a camp-fire smoke will be detected by the dogs long before its presence is observed by the traveler, and the leader of the team usually transmits the news down the line by a series of short, sharp barks, which seems to put new life into the entire team and to cause every drooping tail to be elevated—a sure sign with these dogs that they are feeling well. The best food for dogs in Alaskan work is composed of a mixture of dried salmon, lard, or any other kind of grease, and corn meal, to which enough water is added to make of the whole when cooked a kind of thick soup or mush. In the absence of these ingredients dogs can be fed on almost any kind of food which is used by man, but they seem to require a certain amount of fish and

the oil which it contains in order to be kept in good condition and healthy.

The principal diseases with which the Alaskan dogs are afflicted are the mange, sore eyes, and a species of rabies which makes its appearance periodically once in every three or four years. When suffering from the latter disease a dog will abstain from all food and gradually grow irritable and quarrelsome, and as a bite from the afflicted animal will transmit the disease to the object of his attack, the best means of protecting the team and to prevent the spread of the disease is to kill the dog which first shows signs of sickness from this cause. It is believed that the rabies can be transmitted through the means of excretions of the salivary glands from diseased animals being allowed to contaminate the food of the healthy dogs, and as a matter of precaution every dog in the team should be closely watched in the spring, which is the season of greatest danger, and at the first appearance of sickness which causes it to reject its food the animal should be isolated from the rest of the team and kept as quiet as possible until the cause of his indisposition can be determined. There is no known remedy for the cure of the rabies, and in the event of its appearance the most humane act to save the afflicted animal from useless suffering is to mercifully shoot it at once.

So far as known, there is no case on record in Alaska of the disease having been transmitted to man, but with the introduction of dogs from the outside it is possible that some other form of the disease may become common which will be as dangerous to man as it is known to be in the States.

Mange is the result of low and restricted diet, and sometimes becomes so virulent in character as to be incurable. As a usual thing, however, the disease yields readily to local treatment of the affected parts by application of soothing ointments, and by the administration of purging medicines to the dog, followed by a generous diet of fresh food in which a small amount of sulphur should be mixed until the patient shows signs of recovery.

During the early part of spring the dogs suffer considerably from sore eyes, which is caused no doubt by the glare of the sun's rays on the white surface of the snow during the almost continuous hours of daylight at this season. Another source of trouble in this direction is caused by the irritating effect of small particles of snow, which is as dry as sand and almost as cutting, being blown into the eyes. The annoyance of the animals from this source can be easily imagined when one observes the amount of flying snow particles whirling along just above the surface whenever the wind blows. And if more convincing proof is wanted, all one has to do is to expose the hand to the impact of the flying particles of snow. The resulting sensation will be found to be anything but agreeable.



FORT SHOEMAKER, DALL RIVER. TYPES OF SLEDS IN GENERAL USE IN THE YUKON RIVER.

On long trips, and especially in loose snow, the dogs' feet frequently become very sore and lacerated. At frequent intervals the loose hair which grows between the toes should be trimmed off even with the pad, and the feet given a good hard rubbing with a mixture of boiled linseed oil and kerosene. Dog moccasins, made of dressed moose hide and fitted with thongs for lashing them on above the first joint of the leg, are in common use throughout the country, and no prospector who has the proper care of his team at heart should ever start on a journey without a full supply of these articles.

It has been found that the native-made sleds, which are fastened together with moose rawhide, are not as well adapted for the transportation of heavy loads as those made by white men and fastened with screws and nails. On this account most of the sleds seen in use at the present day, both by the whites and Indians, have been made on the outside and shipped in for sale by the companies. These sleds are made of oak or hickory trimmed with ash, and are from 8 to 12 feet long by 17 to 20 inches wide. The runners are $1\frac{1}{2}$ to 2 inches wide, one-half inch thick, and protected from wear by thin strips of steel or brass fastened to their lower sides. The larger sleds are provided with a pair of handles at the rear for steering, and when these are not used a "gee-pole" is attached to the forward end for the same purpose. When a "gee-pole" is used the driver walks in front of the sled and steers it with one hand, and in order to allow him room to walk without interfering with the dogs a long line is used to attach the rear dog of the team to the sled.

Where the trails are not good or in deep snow, toboggans are generally substituted for sleds with runners.

The toboggans are made of long, thin strips of birch wood, which is first whip-sawed out and then dressed down to a smooth surface by the Indians, and the forward ends are bent upward and backward and held in place by a covering of rawhide secured by moose-hide lashings. The sides of the toboggans are formed of canvas or dressed moose skin, to hold the load in place. A good idea of the different kinds of sleds and toboggans in use in the country can be obtained by reference to the accompanying photographs.

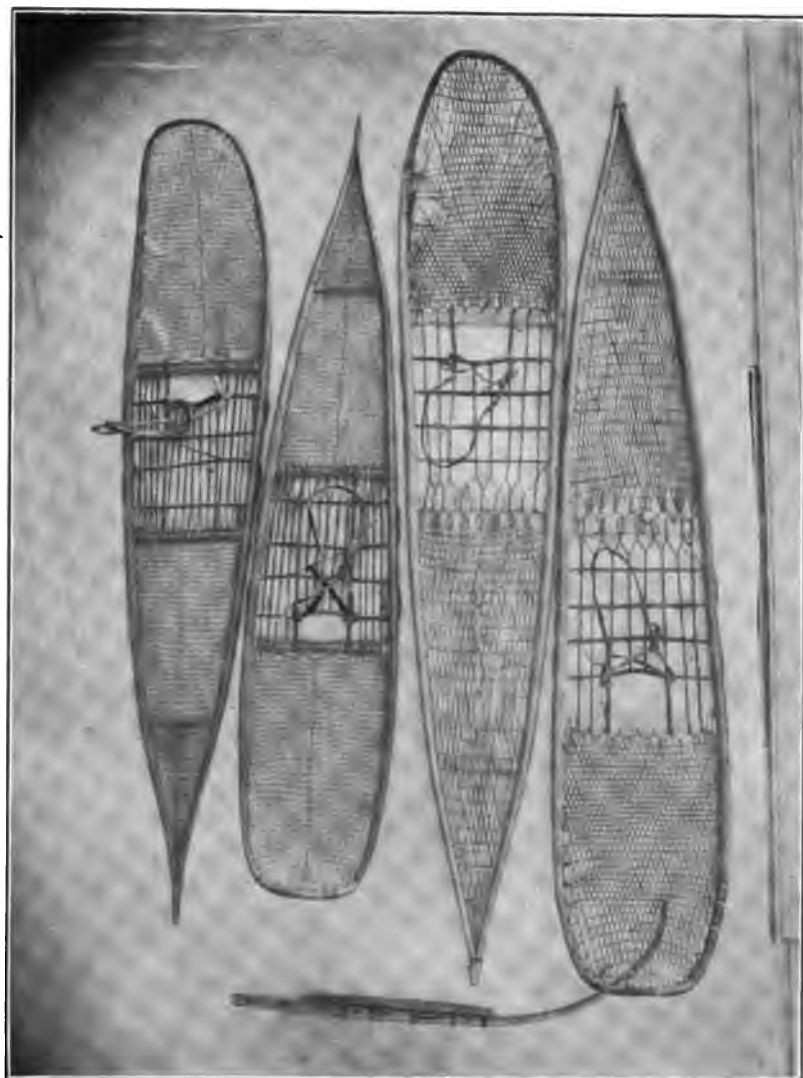
For short trips across the snow-covered country snowshoes are a necessary part of the equipment of the traveler. The snowshoes made by the natives of the interior of Alaska are probably the best articles of the kind manufactured in any part of the world. The frame is made of well-seasoned birch and is from 5 to 6 feet long by 12 to 16 inches wide. The front and rear portions of the shoe are filled in with a webbing made of very fine twisted sinew, and the middle section is formed of strong rawhide twisted together so as to furnish a good foundation for the foot. A smaller kind of snowshoe is used for

breaking trail for a dog team to follow, and is called a "trip shoe." The smaller area of the "trip shoe" allows the foot to sink deeper into the snow, and by this means packs it down into a more solid mass and furnishes better footing for the dogs. In use the snowshoe is confined to the foot by means of a thong of dressed moose hide, so arranged that it passes around the ankle and is crossed over the instep, thus holding the toes tightly against the shoe while allowing the heel to be freely moved in any direction. The novice in snowshoe practice should never venture into deep snow unless the foot lashing is so secured that it can be instantly cast off in case of necessity. Accidents sometimes happen by which a person just learning to walk on snowshoes will be thrown headlong into the deep snow. In such an event the new beginner will find it difficult, if not impossible, to free himself from the snowshoes unless the foot lashing is so secured that it can be quickly released. In case no one is present to render assistance, serious results may follow.

WINTER TRANSPORTATION OF THE MAIL.

There is no public service more arduous and hazardous and at the same time more faithfully performed in Alaska than is the transportation of the mails during the winter season. The men employed on this duty are without doubt the hardest worked public servants in the Territory, and no words can be too strong in praise of the manner in which their duties are performed.

Immediately after the cessation of steamboat travel on the river, and long before travel on the trails is either safe or practicable, the carriers begin to move the mail. The rough, boulder-strewn beaches of the river furnish the only road over which travel is practicable at this season, and as sledding is impossible under these conditions the mail is made up into packs and transported on the backs of dogs instead of being hauled on sleds. When a tributary stream of the main river is encountered the mail man frequently finds it impossible to procure a boat, and in the absence of any such means of crossing the stream the mail man must depend upon his own resources and ingenuity to get himself and dogs safely past the obstacle. If the stream is too deep to ford, a raft must be built or else a long detour made to find a shallow crossing. It is not surprising that the mail men take advantage of the first opportunity furnished by the formation of ice on the Yukon to abandon the difficult and tedious road along the river shores for the easier but much more dangerous method of travel over the level surface of the river ice. Long before it is really safe to do so, the mail men take to the river and do not abandon it until all other travel on the trails has ceased in the spring. They take desperate chances to get the mail through on time, and the wonder is that the fatal acci-



TYPES OF SNOWSHOES USED IN THE YUKON VALLEY.

The smaller sized ones are used when breaking a trail. The broken portion shows method of repairing a break in the frame.



TYPE OF MAIL MAN'S CABIN ALONG THE YUKON RIVER.

dents which sometimes overtake them are not of more frequent occurrence.

During the first part of the season the transportation of the mails is necessarily somewhat irregular and subject to delays, but after the river is fairly closed and the trails are open for travel, the arrival and departure of the carrier with the mails become events of such regularity throughout the season that their failure to appear as expected at any given point is a matter of general comment and anxious speculation. The mail route through the Yukon Valley follows the course of the river from the terminus of the White Pass Railway, at White Horse, to Kaltag, 570 miles from its mouth. At this point the trail leaves the river and crosses the tundra plains to Unalaklik, on the shores of Norton Sound, and from thence southward to St. Michael and northward around the head of Norton Sound to Nome and the other settlements to the westward.

The entire route is divided into districts or "runs" of from 50 to 75 miles in length, and a carrier is assigned to each district who is responsible for the proper transportation of the mail while under his charge. Small log cabins are located at convenient points along the route for the accommodation of the carriers when they meet to exchange the mails coming into and bound out of the Territory and to serve as storehouses for surplus supplies and material necessary for the maintenance of the service during the winter. These cabins are intended only for the use of the mail men and are otherwise unoccupied. When the carriers arrive at the stations they have to cut their own wood for fuel and prepare food not only for themselves, but also for their dogs. This work after a hard day's run is exceedingly irksome and frequently occupies their attention until late in the night. With the first appearance of daylight in the morning they are again on the way. Although ordinary travelers find it better policy to remain in camp during excessively cold weather, the feeling among the carriers that the mail must not be delayed is so strong that delays on this account are hardly worthy of consideration. In case one carrier fails for any reason to make connections on time the other one does not wait, but pushes right along until the delayed carrier is encountered. This may, and frequently does, occur late in the day at a point on the trail where there is no shelter but the woods. In that case a camp is either made in the open air or, if the weather be too cold, the mails are exchanged and both carriers return as best they may through the darkness to the nearest place where shelter can be obtained. Snowstorms which obliterate the trails, overflows which make it necessary to break a new trail, and sudden thaws which render the road impassable except during the colder hours of nighttime are among the commonest causes of delay in the winter transportation of the mail.

But in spite of the many difficulties, dangers, and hardships of the duty, there appears to be a certain fascination attending its performance which sustains the hardy men whose lives are spent in this valuable service, and once having entered into the work it seems hard for them to give it up.

The pay of the carriers is entirely out of proportion to that received by laborers in other forms of employment in the country, and it should be increased. After deducting necessary expenses for dogs, dog feed, and other supplies, the mail men seldom receive more than \$125 per month for their winter's work.

The time occupied in transit of the mails during the winter varies with the season. During the short days of midwinter the carriers make an average distance of 25 miles a day, but later on, when the trails are in good condition and the days are longer, from 35 to 45 miles are made. At Fort Shoemaker, which is situated at a point which is approximately one-half the distance from the terminus of railroad communication with the outside and the coast of Bering Sea, letters were usually received from the States in from forty to forty-three days during the midwinter months. Later on this time was reduced to an average time of thirty-five days, and letters have been received from the outside which had only been on the road thirty-one days. The time usually taken for mail to reach St. Michael from Fort Shoemaker was from twenty-eight to thirty days, and to Nome the distance was covered in about four days longer. The distance from our winter quarters to the coast by way of the trail is about 700 miles, and from that point to the upper terminus of the mail route on the river about 900 miles. A comparison of the time in transit of the mail over the two sections of the route will show that much better time is made in the upper section of the river. This may be accounted for by the fact that after leaving the river at Kaltag the trail crosses a mountain range where progress is necessarily much slower than on the level river trails, and the mail stations are farther apart, thereby making the "runs" more difficult. Special couriers with light loaded sleds have made the run from St. Michael to Dall River inside of twenty-five days, but the conditions under which this time was made were exceptionally favorable, and it can not be accepted as a standard for estimating the time required for the transportation of the mail under ordinary circumstances.

Sleds or toboggans, according to the condition of the trails, are used in the transportation of the mail during the winter. A team composed of five of the best dogs that can be procured is used to haul the load, and from 350 to 500 pounds of mail matter is the average amount of weight carried on each trip. The letters are inclosed in regular mail sacks, and only first-class mail is accepted by the carriers for

transportation in this way. All other mail intended for the interior is held at White Horse or Skagway until the opening of steamboat navigation in the spring.

It would be a great boon to the settlers of the Yukon Valley if arrangements could be made whereby newspapers and second-class mail matter could be transported during the winter months. But this measure of relief can only be afforded by an increase of the appropriation for the transportation of the mail in the Territory. Under present conditions the carriers have all the work they can possibly attend to in the transportation of first-class mail matter only.



TYPE OF LOG HOUSE COMMON THROUGHOUT THE YUKON VALLEY.

CHAPTER IV.

ECONOMIC CONDITIONS.

DWELLINGS.

The most common form of dwelling used by both the white and native inhabitants of the Yukon Valley is made of spruce logs, hewn by hand to fit together as closely as possible and made tight by chinking the crevices and seams of the wall with moss or mud. The introduction of sawmills and the manufacture of board lumber has been followed in several places by the erection of frame houses, but experience has shown that the old-fashioned log house, if properly constructed, is better suited to this climate.

The roof of a log house is formed by two or more logs laid lengthwise of the structure parallel to the ridgepole, and if a porch or vestibule is desired these roof logs and the ridgepole are cut long enough to project beyond the building so as to form the roof of the porch. Smaller trees are then split, and laid with their flat sides down across the roof logs from the eaves to the ridgepole on each side. The roof is then covered with grass or builders' paper, and over this is thrown a thin layer of dirt, which is tramped down smooth and level. This makes a warm and water-tight roof.

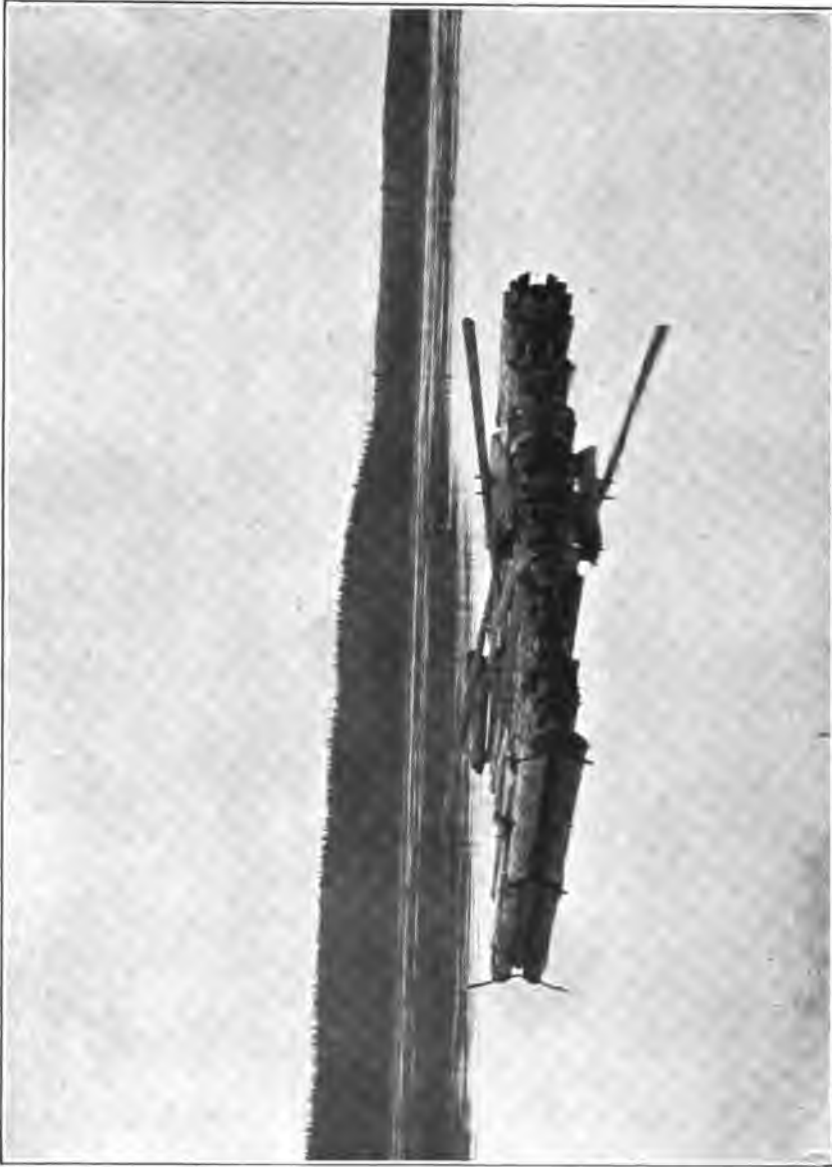
In a well-built house the large logs used to form the walls are squared on their inner side with a whipsaw, so that when the house is completed the interior presents a smooth and level surface. Light is secured by means of windows, if glass can be obtained; otherwise artificial light must be depended upon during very cold weather. Ventilation is secured in some cases by means of large augur holes bored through the logs and fitted with plugs, which can be inserted or removed at pleasure, or a square box, fitted with a slide to be worked from the interior, is built into the roof. The Indian method of securing ventilation in former years was to leave an aperture in the center of the roof, through which the smoke from the fire escaped and fresh air was admitted to the interior. Of late years, however, they have adopted the more rational plan of the white man in the construction of their houses. Many of the modern log houses are lined with wall

paper, but in former years white drilling was used for this purpose, and it is an admirable substitute, as it is much more serviceable, can be whitened with paint or whitewash when it becomes soiled, and serves to lighten up the interior much better than the ordinary colored wall paper. The doors are made from boards or hewn out of the solid timber, and should be set up at least 6 inches above the level of the floor to prevent drafts. The floors of the older houses were usually of dirt, but in the later houses they are made of boards nailed to joists. The space between the floor and the ground is filled in with dry moss packed down solid, and the outer part of the walls is banked up with dirt to a distance of a foot or two for warmth. The interior is heated by means of small wood-burning stoves, upon which all the cooking for the household is also done. A good bed can be improvised from long pliant poles secured at the ends to a frame and the whole covered with a layer of small spruce boughs. In all of the settlements modern furniture is now used, even in the houses of the natives; but the cruder methods of pioneer days can still be observed, and in fact are the rule in the wood-choppers' cabins and dwellings hastily erected by the miners while prospecting the country.

Corrugated iron has been of late years introduced and used to some extent in the construction of warehouses, stores, etc. It has not proved altogether satisfactory for use in building dwelling houses, for the reason that houses of this material are either too hot or too cold for comfort. The heat from an ordinary sheet-iron stove will raise the temperature of the interior of a house of this kind to an uncomfortable height in a very short time, and it is difficult to regulate on account of the fact that the temperature will fall to what it is on the outside if the fire is allowed to die down. Where it is possible to maintain a steady fire the corrugated iron houses are habitable in the coldest weather, but they will not retain the heat as a log house will.

The chief disadvantages of a log-built house are that the logs are liable to early decay unless they have been thoroughly seasoned before being used, and the cumbersome material does not adapt itself to anything but the crudest forms of architecture. They are comfortable, but can not be made as convenient as the lighter frame houses with the same amount of labor. The cost of frame houses at the present time is much more than that of a log house of the same size, but with the rapid growth of the country and with more sawmills in operation this feature will doubtless become one of less importance for consideration by the intending builder of a home.

It would appear from the experience of the army authorities in building their dwelling houses at the several posts in Alaska that an ideal house to suit all the requirements of life in this region is a frame structure made with double walls and floors, lined with builders' paper, fitted with double windows, vestibule entrance, and inclosed



RAFT OF LOGS FOR BUILDING PURPOSES ABANDONED BY THE OWNERS AND FLOATING DOWNSTREAM.
The owners must likely have joined some stampeding party to the gold diggings.



WINTER COSTUMES USED FOR SHORT EXCURSIONS IN THE OPEN AIR IN THE YUKON VALLEY.

The coat is made of tanned reindeer fawn skins, with a hood, trimmed with wolverine fur. It is too warm for use on sled trips.

kitchen. The space between the floor and ground should be filled with some nonconducting material, such as sawdust or dry moss tightly packed, and the exterior of the house should be banked up with sods for a distance of a foot above the level of the floor. One-story houses are preferable, on account of the difficulty of heating the upper rooms of houses having more than one story, but in the case of large buildings, such as the hotels at St. Michael and the barracks for the accommodation of the soldiers at the several posts, the upper rooms can be made perfectly comfortable during the coldest weather by heating them with stoves.

The temperature which should be maintained in houses during the winter in order to make them comfortable is largely governed by individual choice. As a general rule, it should never be higher than 60° F., and it would probably be better from the standpoint of good health to have it even lower. The houses of the natives are invariably kept too warm, with insufficient attention given to ventilation, the result being that they suffer greatly from colds and diseases of the respiratory organs. Contrary to the usually accepted belief, we found no inconvenience or difficulty in passing from a heated room directly into the open air, even during the coldest weather. In fact, it was frequently a relief to step out of an overheated room or tent into the outer air, where at times a difference of over 100° of temperature would be instantly experienced, with no bad results whatever.

CLOTHING.

It is a mistake to think that fur clothing is necessary, or even advisable, for use in the interior of Alaska. A newcomer is instantly recognized by the heavy fur coat, and sometimes other fur garments, which he wears upon his first visit to the country. A short experience will, however, convince him that such clothing is unnecessary except under special conditions, and after a short residence all fur garments will be discarded for the more comfortable clothing of civilized communities.

During the very coldest days of midwinter we found that good woolen clothing of the kind usually worn at that season in our Northern States was amply sufficient to keep us comfortable. While traveling on the trail one must be provided with heavy German wool socks reaching to the knee, a pair of fleece-lined or deerskin socks reaching to the ankle, and the whole covered with moose-hide moccasins for foot covering. The hands are protected by woolen mittens during moderately cold weather or when the blood is in rapid circulation. In very cold weather additional protection must be given the hands by using the native-made moose-hide hand warmer, which is a gauntlet-shaped mitten large enough to be drawn over the ordinary woolen one. They are usually lined with fur and attached to straps worn over the

shoulders, so that they can be thrown off or used as occasion may require. The head is covered by a cap made of some light-weight material faced with fur and having flaps attached sufficiently large to protect the ears and tie under the chin. Masks to cover the exposed portion of the face, such as are worn on the arctic coast, are not used in the interior, but in their place a small strip of fur or a silk handkerchief is folded and worn across the nose just below the eyes. In ordinary winter temperatures this protection is not necessary, and as it interferes with the sight it is not worn. In windy or stormy weather the traveler puts on over his ordinary clothing a long, hooded shirt or "parkie" made of drilling, with the edge of the hood trimmed with some long-haired fur to prevent the snow from driving in on the face. This "parkie" is made to put on over the head, and is an effectual protection against the hardest kind of wind. The photograph facing this page shows the style of winter dress in general use in the country by travelers.

In all essential particulars the natives dress as the whites do throughout the year. The native women wear short woolen or calico skirts reaching to the ankles, a lined waist, underwaist of unbleached muslin, and drawers made of some heavy material reaching to the ankles. The foot and hand covering worn by the women is similar to that of the men. Shawls or blanket coats are worn during the winter, and the head is almost invariably protected by a large handkerchief, usually of silk, which is folded diagonally and tied under the chin. Light-weight fur coats made of mink, muskrat, or tame Siberian deer skins are useful to slip on when one is going out of doors for a short walk, but for the arduous work of the trail all fur garments are too warm for comfort.

FOOD AND WATER.

At all of the settlements on the Yukon nearly everything in the shape of food products can be obtained either in cans or put up in the form of dried, evaporated, or smoked goods. The great variety of articles so put up and the excellence of the goods makes it possible, with the exercise of a little judgment, to have an almost constant change of fare. Fresh moose, caribou, deer, and bear meat is brought into the settlements by the Indians for sale to the whites regularly throughout the winter. Grouse of several varieties and ptarmigan are also shot and trapped in large numbers by the natives and sold at very reasonable prices.

Ducks and geese which are shot late in the fall can be kept frozen all winter simply by allowing them to hang in the open air. Fish treated in this way can also be kept through until spring in as good condition as when first caught.

At all of the settlements where there is a sufficiently large population of whites to warrant the importation of fresh meat from the



USUAL DRESS WORN DURING THE WINTER IN THE YUKON VALLEY FOR SHORT WALKS IN THE OPEN AIR. FOR LONG TRIPS OR SLED WORK THE HEAVY COAT IS TOO WARM.

States, depots have been established for the storage of refrigerated beef, mutton, pork, turkeys, chickens, and eggs, which are brought into the country in vessels specially fitted up with refrigerating plants. The average price of refrigerated meats on the river is from 30 to 50 cents a pound, according to the amount purchased. Turkeys and chickens cost 35 to 50 cents a pound, and eggs are sold at from 50 cents to \$1.50 a dozen.

Moose meat is an excellent substitute for beef, and one does not grow tired of it, as in the case of most kinds of wild meat. Caribou is very tender and sweet, but is too gamey for a steady diet. The flesh of the muskrat is much esteemed by the natives, but is repulsive to most civilized palates, more on account of association of ideas than from anything objectionable either in the taste or odor of the meat. When properly prepared it is really delicious and without the slightest disagreeable feature. The Indians sell all of their meats at prices varying from 25 to 75 cents a pound, according to the local demand. Fresh potatoes can be kept in good condition throughout the winter by allowing them to freeze solid and keeping them in this condition. Only sufficient for immediate use should be thawed out at a time, as they will spoil soon after thawing unless they are cooked.

Some kale which had been planted in a box on the upper deck of the *Nunivak* was found to be fresh and in good condition in the spring, after it had been exposed to the intense cold of winter with no other protection than that afforded by the covering of snow, which had not been disturbed. The opportunity of making further experiments did not occur, but it would be a valuable fact to know that such vegetables as kale and cabbage can be preserved through the winter by banking them up with straw and allowing them to remain covered with snow until spring.

It will be seen by the above enumeration of the different articles of food which can be obtained during the winter in Alaska that no one need suffer from a monotonous fare who has the means of purchasing what is wanted and who is within reach of any of the settlements. The traveler by dog team, however, must restrict himself to the purchase and consumption of only what is absolutely needed to sustain life while on the trail. Every additional pound of weight is a hindrance to progress, and for this reason the fare of the traveler during the winter season is necessarily of the plainest kind. Beans, bacon, tea, sugar, flour, dried fruit, germea, condensed milk, salt, and baking powder are essentials. Anything else is a luxury, and seldom finds place in the outfit of the experienced traveler.

Water for household use is somewhat difficult to obtain both winter and summer in the Yukon Valley. The river water during the season of open navigation is too muddy for use until it has been allowed to settle, and this takes a long time. The small brooks and tributary

streams furnish all the good drinking water along the river, but these can not be utilized at the settlements for sanitary reasons, and in the absence of wells all the water for household purposes must be either caught in barrels when it rains or else hauled from the nearest stream of clear water that is free from contamination. During the winter season the water in the Yukon becomes as clear as a mountain brook, and it is used exclusively by everyone within reach of the river. When the ice forms in the fall a hole is cut in it and kept open until spring. This is a work of considerable magnitude, as the ice reaches a thickness of 6 or 7 feet, and if the hole is not kept constantly open by cutting away the new ice it will close up entirely in a very short time. Water from the ice hole is hauled on sleds to the house, and in an ordinary establishment this necessitates two or more trips each day.

While on the trail water is obtained by melting ice or snow. The former is preferable on account of the much larger bulk of snow required to produce the same amount of water. It is astonishing how thirsty one gets while on the trail, and it frequently happens that a stop must be made to build a fire so as to get a drink of water.

SERVANTS.

Intending settlers in the interior of Alaska must either make up their minds to do their own work or else must import their servants. The natives do not take kindly to domestic service, and outside of the missions, where such work is considered as a part of their education, I have never seen a single native who was steadily employed in this vocation. They are not devoid of intelligence in domestic matters and readily imitate the customs of the whites in the manner of keeping house, but they are too independent to act as servants, and probably never will be different.

A few white women are to be seen in some of the larger settlements acting as waitresses at the restaurants and as housekeepers for families, but as a rule there are no household servants in the country except those who have been brought in for that purpose from the outside.

At St. Michael the servants of the Northern Commercial Company's hotel are all white, while those of the hotel conducted by the North American Transportation and Trading Company are all Chinese. The pay of a servant of any kind is from \$40 to \$60 per month, and that of a good cook is from \$75 to \$100 per month.

COST OF LIVING.

Board may be obtained at the hotels at St. Michael at \$4 to \$6 per day for transients. Special rates are given to anyone desiring board by the month, and it may be stated that the cost of living under these circumstances is about the same it would be at any first-class hotel in the smaller cities of the States.



A SUMMER ENCAMPMENT OF NATIVES IN THE YUKON VALLEY.

This form of dwelling is used exclusively throughout the region from May until October.

The charge for single meals at the restaurants in Rampart City averages \$1 each, while monthly board without lodging costs from \$50 to \$75 per month. In the case of persons who do their own cooking the cost of living, exclusive of house rent, can not be reduced much below \$40 per month. A saving of from 25 to 35 per cent can be made by two or more persons living together and combining their stores.

These estimates do not include other expenses necessarily incurred if any traveling is done. In this event dogs must be obtained, and the additional expense for dog feed amounts to an average cost of 50 cents a day for each dog. A prospector can hardly travel any distance away from his base of supplies with less weight than 500 pounds on his sled, and in order to make anything like reasonable progress he must have at least one dog for each hundred pounds of weight carried. Referring to the estimated cost of a year's provisions for one man in Alaska, previously given, and adding the cost of dogs, dog feed, tools, etc., it will be seen that the cost of living for one person for one year, if any traveling is to be done, will be as follows:

Cost of one year's living in Alaska for a prospector.

One year's provisions	\$500
Five dogs, at \$40 each	200
Six months' dog feed for 5 dogs	450
Miner's outfit of tools and implements	25
Arms and ammunition.....	30
Tent, blankets, and clothing	100
Add for incidental expenses, including medicines, fresh meat, etc.	50
Total.....	1,355

The estimate for dog feed covers only the portion of the year in which traveling by sled is possible. After that time the prospector will have no need of dogs, and they may be disposed of at an average loss of 75 per cent on their cost. It is cheaper for the ordinary individual to sell his dogs at the end of the season even at a loss of 100 per cent than to keep them over summer. It will be seen by the above estimate that no one should enter the country for the purpose of engaging in no other form of employment than that of prospecting with a capital of less than about \$1,500.

Day laborers around the settlements are paid at the rate of \$5 per day. In the mines laborers are paid from \$5 to \$8 per day, with board. Packers average 25 cents per pound for distances less than 100 miles. Over that distance the cost of packing during the winter season is based on a figure that will net the packer \$10 per day.

CHAPTER V.

HOME LIFE AND SOCIAL CONDITIONS.

SOCIAL DISTINCTIONS.

It is but natural to suppose that in a country where the inhabitants are to a great extent cut off from communication with the outside world social distinctions are not very strictly drawn. This is found to be the case in a marked degree in Alaska. Here, true hospitality, born of an instinctive desire for companionship, is seen at its best. The latchstring of every dwelling, be it the humble cabin of the lonely wood chopper or the more pretentious home of the prosperous merchant or trader in the settlements, is always hanging on the outside, and everyone is welcome to enter and share whatever comforts may be had with the owner. With the advent of so many adventurers into the country during the last two or three years, the old customs of perfect freedom of intercourse have been somewhat modified to suit existing and prospective conditions, but it is still true of Alaska to say that society is in its primitive and democratic state.

In all of the larger settlements and at the army posts the presence of refined and educated women who have followed their husbands into the country has done much to mitigate the loneliness and discomforts of life in the far-away Territory. Since their coming the bare walls of the soldiers' quarters and the rude interiors of the civilian's log house have been transformed into home-like appearance by the addition of draperies and pictures. The customary pile of tin cans and refuse which marked the abode of the batchelor has been effaced, and in its place neat little kitchen gardens are to be seen, while in every house in which a woman has come to live the windows bloom with potted plants and the rough casements and doorways are overrun with climbing vines. It is due to the influence of these good women that men who had grown careless in dress and speech again assumed the garb of respectability and once more took up the habits and customs of civilization, so that to-day the visitor at any of the settlements will see nothing extraordinary either in the dress or conduct of the better class of the community.

AMUSEMENTS AND RECREATION.

Throughout the long winter months entertainments of various kinds—amateur theatricals, readings, card parties, dances, and festivals—are not of infrequent occurrence, and while there is a certain amount of laxity in the observance of strict social rules on the part of the participants, as a general thing these affairs are conducted with the same amount of decorum as would be observed at similar affairs in respectable communities on the outside.

The weather is seldom too cold to prevent those who are fond of outdoor exercise from spending a portion of the day in the open air. Short trips are made into the hills after grouse or ptarmigan, and for those who do not fear to undergo a little hardship on the trail, hunting for large game, such as moose, bear, or caribou, furnishes abundant and exhilarating sport. Dog-team driving is a common form of recreation after the winter traveling has begun and the trails are in good condition, and it is by no means uncommon for a party of two or more congenial friends to start off in the middle of winter to pay a visit to some other settlement, perhaps entailing a journey of several days duration.

The Christmas holidays at all of the larger settlements are usually celebrated by a round of indoor and outdoor entertainments and games, in some of which the natives take a part. Snowshoe races, dog-team races, and various kinds of athletic contests suited to a cold climate take place at this season and are thoroughly enjoyed by all. During Christmas week the natives always have a big feast, to which their white friends are asked to contribute gifts in the shape of food, and the feast is usually followed by a dance, which all are welcome to attend. At this season the Indians spend whole days tossing each other in blankets, and the incautious white man who ventures too close to the scene will find that their attentions are not entirely confined to each other. But while he will no doubt get a good tossing, and afterwards may be rolled in the snow by the squaws, it is all done in such a good-natured way that it is impossible to take offense.

After the trails are worn smooth by winter travel, bicycle riding is not only possible, but thoroughly enjoyable. The smooth surface of the trails forms an ideal track, and as there is an almost continuous absence of wind during the winter season it is hard to conceive of a healthier or more exhilarating form of exercise. When ice first formed on the Dall River in the fall, we had splendid skating for several weeks until the surface was covered by snow. During this period several of the party made daily excursions into the interior on skates, and on one or two occasions extended their trips to a distance of 25 or 30 miles upstream.

I should feel better pleased if I could end at this point the description of the different methods of passing the time during the long winter months in Alaska; but candor compels me to state that there are other forms of amusement and recreation indulged in by a certain class of persons in the country which are not so innocent or harmless.

Both at Rampart and at Tanana dances frequently occur which are attended by a mixed assemblage of white men and Indians of both sexes. Respectable white women seldom or never attend these dances, and in the absence of any such restraint the conduct of the white men is too often a disgrace to our boasted civilization.

Left to themselves the native women are not essentially lewd or immoral; but in the larger settlements where they have been brought into contact with a certain class of white men, their easily influenced natures have been corrupted, and experience has shown that in the case of young native girls years of careful, tender, and Christian instruction at the missions may prove more a curse than a blessing if by means of their superior education and cleanliness they attract the attention of the lecherous and unscrupulous portion of the white community. Once having departed from the paths of virtue, the progress of the native woman is swiftly downward until the lowest depths of sordid licentiousness and repugnant vice is reached. It is no exaggeration of the condition of the relations between the whites and natives of the interior of Alaska to state that nine-tenths of the immorality and social degradation of the native women can be directly traced to the evil influences with which they are surrounded at these mixed dances.

MORALITY AND THE LIQUOR QUESTION.

There is no question which more intimately connects itself with the morality of any community than does the sale and use of intoxicating liquor, and when it is examined as a part of existing social conditions in an isolated region like the interior of Alaska it forms not only an important element, but is the very essence of the problem.

The licensed sale of liquor in Alaska has been defended by some moralists on the ground that in this way the illicit manufacture and sale of the article has been stopped. In other words, an act which was declared to be reprehensible and punishable by law if committed under certain conditions is made right and proper by legislation. I doubt very seriously the truth of this form of reasoning, and I am confident that, so far as the native population is concerned, more harm than good has been done by the enactment of the present law.

The sale of liquor to the Indians of Alaska is still strictly forbidden, but it goes on to-day in defiance—almost in contempt—of the law. The truth of this statement is evidenced by the frequent appearance on the public streets of the settlements where liquor is exposed for

sale of intoxicated native men and women. Evidence sufficiently strong to convict parties guilty of this crime is very difficult to obtain, and the singular omission in the law for the government of the Territory of any provision for the arrest and punishment of an Indian for drunkenness makes it almost impossible for the officers of the law to act.

The influence of the several church missions along the river over the Indians is good so far as it goes, and to the careful, painstaking instruction which has been given them by the Christian men and women who are devoting their lives to this service may be ascribed whatever improvement in the condition of the native tribes that has taken place since they have been in contact with the whites. At the missions and in the isolated settlements the Indians are found to be honest, good-natured, and generous as a class, but improvident, fond of pleasure, and extremely credulous. With such characteristics and dispositions, and when free from the restraining influence of the missionaries, they become easy victims of the white man's rapacity and lust.

Until very recently illicit intercourse between white men and Indian women in the country was by no means uncommon. The social position of the white trader or trapper who had a native "wife" was in no way injured by his illicit and unlawful manner of living. This condition of society, always disgraceful and demoralizing, is no longer tolerable in a community in which virtuous men and women have come to form a part. The firm hand of the law must be used to put down the lawless and degenerate element which has taken advantage of the previous laxity of public morals to attempt to perpetuate a social condition which is at once destructive of all progress and a foul disgrace to humanity.

Both at Rampart and at Tanana, the only settlements on the river where liquor is exposed for sale, drunken orgies, in which white men and native women openly participated, were of frequent occurrence during the winter months. On one occasion a native woman became so intoxicated by liquor which had been given her by white men that in attempting to reach her home, a short distance from the scene of the debauch, she left her baby on a sled in the trail and it froze to death. No one, to the best of my knowledge, has ever been arrested for complicity in this crime, nor have I ever heard that any attempt whatever was made to fix the responsibility for the death of the child. On another occasion, at Rampart, during the progress of one of the mixed dances of which mention has been made, one of the white men, whose relations with a native woman of the town were notorious, seized the woman and carried her out of the building into the principal street of the town, where he was joined by half a dozen boon companions, and with their assistance the struggling and shrieking woman was borne off to some convenient house where their revels

could be continued without fear of interruption. This occurrence was witnessed by a score of people, and was town talk for several days, but I have yet to learn that any notice was taken of it by the local officers of the law.

In a conference that I had during the winter of 1901 with the Hon. James Wickersham, who was at the time the presiding judge of the third division of the district court of Alaska, the present condition and future prospects of the natives were very freely discussed. Judge Wickersham agreed with me that the promotion of their best interests, as well as the interests of the whole community, morally and physically, demanded the immediate suppression of that portion of the white population whose vicious conduct if allowed to continue, will undoubtedly end in the ruin of the Indian and in the destruction of all law and order in the country. I am glad to be able to state that subsequent action taken by Judge Wickersham in line with the opinion above expressed had a most salutary effect throughout the Territory, and it is to be regretted that other duties called him to another field of action before the good work so well begun could be carried to successful completion.

GAMBLING.

In all communities in which the majority of the members are men of the kind that usually go to make up a mining camp, gambling of some form or other is usually prevalent. To a certain extent this is true of Alaska, although the vice has never reached a larger scale in most of the settlements of the Yukon Valley than the indulgence by a party of friends in an occasional game of cards, with moderate stakes, more with the object of passing away the time than as a means of obtaining a living. During the first rush of gold seekers to Rampart, when a large population was attracted to the place by the supposed richness of the adjacent gold-bearing country, it is true that a few professional gamblers opened establishments in that town and for a while conducted a flourishing business. But later developments showing that the area of valuable ground in the vicinity was limited, the floating population of adventurers deserted the place to seek for gold in some more promising fields, and with them departed the gamblers. At the present time the only evidence of gambling to be seen along the Yukon, in that portion of the stream covered by our observations, is an occasional table in a saloon, where cards are sometimes played for small stakes or to decide who shall pay for the drinks. The business men of the community are singularly free from the vice, and the miners who have been successful in locating a paying claim are too busy to spend their time in this form of amusement.

Public gambling on board the steamers plying the river is strictly forbidden by the managers of all the regular companies. It is sometimes seen on vessels operated by independent parties, but is by no

means a common occurrence. During the two years that I was on duty on the station I saw gambling going on openly but once on an American vessel. The occasion referred to was at the time when the authorities at Dawson compelled all of the so-called "sporting element" to leave that city, and about 200 of them took passage on one steamer for the outside. As a special concession to them, and in view of the fact that there were very few passengers outside of their class, the master of the vessel allowed games of chance to be played on the way down the river. When the matter was reported to the office of the company at St. Michael, the master and every one of the officers of the vessel who had been responsible for this leniency in enforcing the rules made by the company in regard to gambling were summarily dismissed.

CHAPTER VI.

LAW AND ORDER.

THE COURTS AND THE COURT OFFICIALS.

For the purpose of maintaining order and for the punishment of crime by civil process in the country, the Territory has been placed under the jurisdiction of the United States district court for the district of Alaska which is subdivided into three divisions, each one having its own judge, marshal, and district attorney, who are appointed by the President, and other court officers who are appointed by the judge, marshal, and district attorney, respectively, as is customary in other United States courts.

The Yukon Valley and adjacent regions comprise the third division of the United States district court for the district of Alaska. The court is required by law to hold at least one term each year at Eagle, and the judge is authorized to hold such additional terms at other places within the district over which he has jurisdiction as he may deem necessary and expedient.

Commissioners of the court and deputy marshals are appointed to act as representatives of the court at places where it is considered advisable to have a resident peace officer. The commissioners so appointed are authorized to try cases and render decisions in affairs of minor importance, and the duties of the deputy marshals are to preserve order, arrest anyone accused with the commission of a crime, and to serve the processes of the court.

The district court of Alaska is embraced in the ninth judicial circuit, and appeals from the decisions of any of its judges are taken to the United States circuit court of appeals, either at San Francisco, Seattle, or Portland, Oreg., as may be most convenient for all concerned; the only exception to this course of procedure being in the cases in which appeals may be taken to the United States Supreme Court at Washington, direct.

MINERS' MEETINGS.

Prior to the organization of the district courts of Alaska a semblance of law and order was maintained and disputes were settled between

contesting parties by resort to a sort of public tribunal called a "miners' meeting." The composition and proceedings of some of these quasi-judicial bodies were often eminently respectable and dignified, but it more frequently happened that the miners' meetings were assemblages of disorderly persons whose decisions were manifestly unjust and the whole proceedings were so irregular as to cause them to be little better than examples of mob rule. This method of settling disputes, especially as to ownership of mining claims, has always been a favorite one in mining communities on the frontier, and is still in vogue in some of the outlying settlements. Its influence is gradually becoming weaker, however, and the custom is dying out with the extension of the operations of the regular courts.

THE INFLUENCE OF THE ARMY.

The presence of army posts along the river and at all of the principal settlements has been an active factor in the preservation of good order. The policy of the army authorities has been, however, apparently to assist the civil authorities rather than to initiate proceedings for the prevention of crime, and in this way its influence has been more of a negative than a positive character. The legal status of the Army in the Territory differs from that it has in other parts of the country in this respect: The officers of the district court and their deputies, or the chief executive officer of any municipal government, are authorized by law to call upon the military authorities at any time for a posse comitatus composed of as many soldiers as may be deemed necessary to assist the civil officer in the execution of his duty. I am informed that this course of procedure is peculiar to Alaska, it being forbidden by law to use the Army as a posse comitatus in any other State or Territory of the Union. It is possible that the exclusion of Alaska from the operation of the Federal statute in regard to the employment of the Army for this purpose may have been a wise and beneficial provision to meet existing conditions at the time of the sudden influx of population which followed the discovery of the rich gold diggings of the Klondike region in 1897, and before the organization of the present form of civil government. But with the increase of population and the assumption of civic responsibilities by the people in all of the larger settlements, it is questionable if the necessity of maintaining the present status of the Army any longer exists. With more liberal appropriations for the support of the civil authority and for the employment of a larger force of civil officers for the execution of the laws, it is probable that the Army could be relieved of a duty, which, to say the least, is inconsistent with the general plan of government of the American people.

INFLUENCE OF THE CHURCH MISSIONS.

It can not be said that the influence of the several church missions along the river has, as yet, done much to elevate the moral status of the white population of Alaska. The class of people which to a large extent go to make up the population of a mining community do not as a rule take an active interest in religious matters, and in fact many persons who may have been members of the church on the outside, find it more convenient to drop all semblance of religion when they enter the country. This lax condition of public morals will no doubt be improved later on with the development of the country and the consequent increase of population. The influence of the missionaries over the Indians, however, has been far-reaching and beneficial. Long before the advent of the officers of the law, the lessons of love and forbearance taught these people by the missionaries had taken deep root in their naturally affectionate and generous natures, and wherever the Indians have been brought into contact with the missions, they have become law-abiding and peaceful. There is no fear that these inoffensive people will ever rise against the whites in any organized revolt, and even individual cases of premeditated crime are so rare among them that they may be passed unnoticed. I am informed by the prosecuting officer of the circuit court of the third division in Alaska, that out of some 50 cases of crime which were on the docket of the court at its last term, not one case was against an Indian. To the influx of white people and to that circumstance alone can be attributed the necessity for any legal restraint on the native inhabitants of the country.

GENERAL CONDITIONS.

In the first part of the gold-hunting epoch in Alaska, from the year 1885 to 1895, crime of any kind was almost unknown in the interior. But with later developments a horde of irresponsible adventurers have entered the country and there is now danger that unless the strong arm of the law is kept over it, this region, which in the past has enjoyed the reputation of being one of the most law-abiding portions of our national possessions, may yet be the scene of violence and bloodshed. There is no disguising the fact that crime of all kinds is at present rapidly on the increase. Ten years ago the contents of a cache or unoccupied cabin were inviolate, while to-day petty robberies of their contents are of common occurrence. Not only are thefts of food committed, but in many cases coming under our observation depredations on property had been committed apparently with no other object in view than to gratify the desires of some moral pervert. Numerous complaints were made to me of persons who had broken into caches

and unprotected cabins, and, after appropriating to their own use whatever they wanted, had deliberately thrown articles of food and clothing which they could not use out of doors to be ruined. The cabins of the mail carriers were frequently broken into and the supplies of food stored there for the use of the carriers stolen. In many cases after robbing the house of everything of value it contained, the robber would end his work by the commission of some act of vandalism which could be explained in no other way than as the expression of his contempt for all the laws of common decency. Dog stealing during the winter is rapidly on the increase and the Indians are the principal sufferers. In the majority of the cases the animals are enticed away from their owners by travelers who pass by the Indian settlements on their way up or down the river, and before any action by the authorities is possible all trace of the thief has disappeared.

When the river opens in the spring many of the travelers by sled are left without means of continuing their journey, and much complaint is heard of the loss of small boats. As in the case of the loss of dogs, it usually happens that before communication can be had with the authorities to apprehend the thief, he has gotten beyond reach of capture.

Wood stealing by unscrupulous masters of passing steamers has been mentioned in another part of this report. This crime was more common in the past than it is to-day, and with the more effective manner of keeping account of the wood along the river by the large companies it is becoming easier for the owners of wood to tell what steamer took it. It frequently happens that a prospector who has been unsuccessful in locating a paying claim will devote a portion of the winter to cutting wood for sale, and by this means obtain sufficient money to purchase supplies to continue the search for gold. Every effort should be made by the Government to protect this class of settler from the depredations of dishonest persons, as it is to the prospector and miner we must look for the future development of the country.

The illicit sale of liquor to the Indians is not only carried on at the settlements, but is also practiced by men who drop down the river from Dawson in small boats and peddle liquor to the natives at the several settlements and fishing camps. It is almost impossible to detect this class of lawbreakers, as the Indians will not act as informers, and as long as the law is in its present state they can not be arrested for drunkenness or punished in any way. The peddlers of liquor can not be arrested for having liquor in their possession, and the only way to check this illicit traffic is to require a more stringent observance of the law in regard to licenses for the sale of liquor in the Territory and to restrict the entry of liquor from Canadian territory in such a way as to prevent small importations. In the absence of any effective surveillance of the river at the boundary line, it is

very easy for small boats loaded with Canadian liquor to pass our custom-house without examination, and once in our part of the Territory it is almost impossible to prevent the sale of this liquor to the natives. The number of officers of the law charged with the prevention of crime in the Territory is entirely too small for the purpose. Offenses against the law committed by white men against each other are steadily on the increase, and the few deputy marshals of the courts scattered through the districts, and lacking suitable means of ready transportation from point to point, are kept too busy attending to their duties at the larger settlements to pay much attention to the isolated communities. For this reason the Indians are left at the mercy of the unscrupulous traders. In my opinion the only effective way of breaking up this traffic, which is at once a source of imminent danger to the moral and physical well-being of the natives of Alaska and a disgrace to our government of the Territory, is by the employment of a number of small steam launches stationed at various points along the river, and placed under the command of active and energetic officers of the Revenue-Cutter Service. One of these launches should have its headquarters at Eagle to guard the boundary line which crosses the Yukon near this point, and to compel all vessels and boats arriving from Canadian territory to report at the custom-house before proceeding any farther into the territory of the United States, and from two to three other launches should be stationed at convenient points farther down the river to board and examine all vessels and boats and to supervise all traffic in the districts covered by them. In addition to the examination of all vessels and boats plying on the river, these launches would furnish ready means for the transportation of the officers of the law from point to point when necessary to apprehend criminals. The length of the Yukon River and its many small tributaries makes it impracticable for the whole station to be properly patrolled by one vessel, and this duty could be much better and more economically performed by small launches.

Up to the present time the Federal laws requiring that all holders of public lands shall be citizens of the United States, or shall have declared their intention of becoming citizens, have not been enforced in Alaska. It is probable that the precedent established by the Canadian authorities in permitting locations of its mining ground in the Klondike region to be made by persons without regard to their citizenship created a sentiment in favor of a similar concession to be made to the prospectors who entered our territory during the earlier days of the search for gold. If this sentiment ever prevailed to any extent it is now rapidly dying out, and public opinion is now decidedly in favor of the strict enforcement of the United States land laws governing the acquisition of parts of the public domain.

It is probably not an exaggeration to state that fully 75 per cent of the litigation over mining claims in Alaska, and especially so in the Nome district, has been caused by disputed ownership of claims which were originally located by aliens. Since the year 1865 the laws of the United States required all holders of the public lands to be citizens of the United States or to have declared their intention in due form of becoming such. Congress has by numerous subsequent acts of legislation confirmed and emphasized the intention of the Government to retain for its citizens all of the public domain. But the Supreme Court has recently rendered a decision which for the time being practically nullifies the evident intention of the law as far as Alaska is concerned. In the case of *Tornanses v. Melsing et al.*, being a question of ownership of a claim in the Nome district, the circuit court of appeals decided that the fact that a locator of a mining claim is an alien can not be made the basis of an action against him by a subsequent locator to recover possession of such claim, the question of the effect of his alienage on the validity of his location being one which can not be raised between private persons to which the United States is not a party. In the present condition of affairs in Alaska it is not likely that the question of title to a mining claim will ever be brought up for settlement by the courts in such a way as to make the United States a party to the case. This would only come up where a survey and actual title in fee to the land would be desired, but the very nature of placer mining makes such title unnecessary. A possessory title obtained by observance of the regulations in regard to the location of mining ground is all that is sufficient to permit anyone to hold the property in undisturbed possession until all of the valuable material can be extracted, when the land may revert to the United States. It is believed that conditions in Alaska have now arrived at the state as to make it no longer necessary to encourage immigration by a relaxation of the laws in regard to citizenship, in order to develop the country, and the more thoughtful portion of the community agree in the opinion that some action on the part of the Government is now necessary to protect its interests and the interests of its own citizens from the encroachments of alien adventurers.

Alaska is a country of unknown possibilities. Its mineral resources are inconceivably great and as yet but hardly touched. Throughout the length and breadth of this wide domain almost every stream carries its burden of gold and its mountains are seamed with nearly every precious metal known to man. In the short space of four years marvellous changes in the way of increased facilities for transportation have taken place and the end is not yet in sight. In a year's time Nome and the settlements of the great Yukon Valley will be in telegraphic communication with the rest of the world. New trails are being cut through the dense forests, and wagon roads are

being built in every direction; and where a few years ago even a summer's trip through this country was undertaken with fear and trembling, men now start from their homes in the outside world at any season of the year and journey into the very heart of Alaska with as little inconvenience or discomfort as they would encounter on a trip through Mexico. Already a railroad has been built and is in operation over the snow-crowned summit of the Alaskan Alps, and others have been projected to cross the bleak stretches of barren country which lie between the coast and the great interior valleys. It requires no effort of the imagination to predict that within a very few more years thousands of people will be able to reach any part of the country, where gold can be found, in a few days, where it now takes weeks to make the journey. The population of the country will undoubtedly rapidly increase with the improvement in the methods of communication and transportation, and with that increase there will come the necessity for better and more stringent laws, to be enforced by intelligent, upright, fearless, and incorruptible public officials.

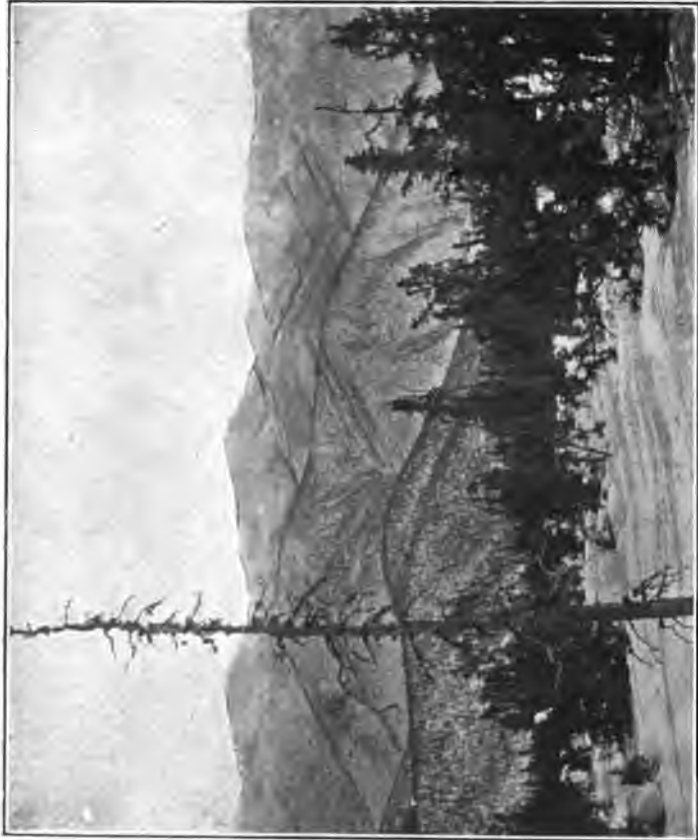
Would it not be advisable to anticipate this necessity and to have the machinery of the law on the ground and in good working condition before the field is occupied by the element which requires this legal restraint?

PART III.

MINES AND MINING.

CHAPTER I. MINERALS: OCCURRENCE AND DISTRIBUTION.

CHAPTER II. METHODS OF LOCATION OF CLAIMS, ETC.



CHARACTERISTIC VIEW OF MINERALIZED REGIONS OF THE YUKON ANTICLINE.

CHAPTER I.

MINES AND MINING.

MINERALS.

Gold, silver, copper, and coal are the minerals which have been found in Alaska in sufficient quantity to pay for the labor and expense of extraction. Platinum, isinglass, argentiferous galena, and cinnabar are known to exist, but the field has not yet been sufficiently examined to show whether these are in sufficient quantities to pay for the work of development. Within the field of observation covered by this report gold is the only one of the above-named minerals which has seriously attracted the attention of prospectors up to the present time. The distribution of this metal and the methods used for recovering it from the mineralized sands and gravels throughout the Yukon Valley may not be out of place in this report.

OCCURRENCE AND DISTRIBUTION.

The mineralization of the Yukon anticline, where the ancient schists with their inclosed quartz veins are found, is intense and widespread. Exploration of this vast region has shown that gold deposition in paying quantities has occurred chiefly in the districts drained by the Klondike, White, Stewart, and Fortymile rivers, all of which flow in the Yukon east of the international boundary line between the United States and Canadian territory, and in the districts drained by Birch and Minook Creeks, the northern side streams of the Tanana, and the upper waters of the Koyukuk River, flowing into the Yukon within the territory of the United States. Recent exploration by prospectors of the Seward Peninsula shows beyond a doubt that almost the entire portion of this part of the territory is intensely mineralized, and the latest authentic reports from the districts contiguous to the Arctic Ocean in the vicinity of Good Hope Bay would point to the fact that some of the creeks in this locality are likely to prove as rich as any which have made Nome, on the southern side of the peninsula, so famous. The Kougaruk River, which flows into the eastern extension of Port Clarence harbor and drains a large portion of the northern

part of the peninsula, has proved to be a well mineralized district, and gold in paying quantities has been found on nearly all of the creeks which flow into Golofnin Bay in the eastern part. Good prospects have also been obtained from the creeks which flow into Bering Sea in the vicinity of Cape York, but owing to the difficulty of getting supplies into the region, and the fact that more flattering prospects were reported from other portions of the country shortly after the Cape York district was opened up, but little has been done in this locality to develop these claims.

During an exploration made by the writer in the year 1884 of the Kowak River, which flows into the Arctic Ocean at Hotham Inlet, gold was discovered in the sand bars of the river by the party and reported. Subsequent search for the precious metal on this stream has shown that the northern side streams carry gold in considerable quantity, but like other remote regions it has not been well prospected. The upper waters of the Kuskokwim have recently attracted considerable attention among the mining prospectors, and during the winter of 1901 a stampede to this region took place from St. Michael and the Yukon Valley. But little prospecting was done at that time, and the suffering of the stamperers was so great that for a time nearly everyone deserted the region. Later reports from the few remaining prospectors on this stream state, however, that very good prospects have been found on the upper waters of the north fork of the river in the foothills of Mount McKinley, and there is a well-defined belief among those who are familiar with the country that this region will ultimately prove rich ground for the placer miner.

A glance at the map will show from the above summary that the distribution of gold in central Alaska is known to embrace all that portion of the territory included between the sixty-third and sixty-sixth degrees of north latitude, and the one hundred and thirty-eighth and one hundred and sixty-eighth meridians of west longitude. Within this region there are many localities where geological conditions are similar to those in which gold has been found but which as yet have not been prospected owing to the lack of transportation facilities. There seems to be no reason why these localities should not under different conditions prove to be as richly mineralized as the districts adjacent to Nome or the Klondike. On the contrary, there is every reason to suppose that with the growing up of the country many of these districts which are now inaccessible will prove to be immensely rich in the precious metal.

In support of this statement the present and past conditions in the Koyukuk River region may be cited as an example. Long before the discovery of gold on the Klondike a few hardy prospectors had found gold in the sands of the Koyukuk, but in such small quantities that the richer fields of the Upper Yukon had caused almost everyone to



CHARACTERISTIC VIEW OF THE HIGHLANDS OF THE YUKON ANTICLINE



CHARACTERISTIC VIEW OF THE HIGHLANDS OF THE YUKON ANTICLINE.

abandon the Koyukuk diggings and stampede to the newer fields. The more persistent ones who remained worked on with very little encouragement and in the face of obstacles which would have appalled any but the most determined and courageous seeker after the hidden wealth. After almost ten years of search news has just been received that coarse gold has been at last discovered on some of the creeks and tributaries of the middle fork of the Koyukuk lying well within the Arctic Circle, and from authentic sources comes the report that in one or two districts, notably so on Hammond and Emma creeks, a large number of claims have proved to be as valuable as any claims in any other portion of the territory.

METHODS OF PROSPECTING AND LOCATING A CLAIM.

Except in a few favored localities, the labor of prospecting for gold in Alaska is arduous in the extreme, and should not be attempted by anyone who is not physically able to undergo a prodigious amount of hardship and exposure. Contrary to the usually accepted belief, the intense cold of the Arctic winter months is not the chief obstacle to be overcome by the prospector. As a matter of fact, travel across the country is more difficult and arduous during the summer months than it is in winter. It is almost impossible to make any progress over the moss-covered tundra plains of the Seward Peninsula or any of the districts contiguous to the coast except where trails have been made, and in the interior the most of the country is traversed by small streams, dotted with innumerable shallow lakes and overgrown by impenetrable thickets, which makes traveling even without a load extremely difficult. For this reason, travel during the summer season is almost exclusively confined to movement by water. As will be explained later, the most favorable localities for prospecting are, as a general thing, situated on the small tributary streams and in the vicinity of the head waters of the large rivers, and in order to reach these places and at the same time carry in a sufficient quantity of supplies to enable the prospector to spend some time on the ground he must journey to them during the winter season.

It is neither safe nor advisable for anyone to go on a prospecting trip of any extent alone. A partner is not only desirable but is almost a necessity in this country, where the slightest kind of an accident is likely to prove fatal unless immediate help is at hand. For this reason prospecting in Alaska is usually done on the cooperative plan, and the party may consist of from two to a dozen members. Having settled upon the district within which it is proposed to search for gold, the party starts for the scene of its labors as early in the winter as possible, so as to be on the ground before the short days of midwinter set in.

The first thing to do after reaching the district in which work is to be done is to build suitable houses for the shelter of the party and to serve as a base for future operations. Then the real work of prospecting the ground begins. This is usually deferred until the cold weather sets in and freezes up the streams and springs solid. Selecting the most likely looking locality for operations, a hole is sunk through the frozen muck and gravel to bedrock, generally near to the banks of some stream where a good supply of water can be obtained for washing out the sand and gravel in case good "pay dirt" is discovered, and as the work of excavation goes on samples of the excavated dirt are examined from time to time by thawing it out and washing it by hand in a miner's pan. If sufficient gold is recovered in this way to indicate that the ground will pay to work, a claim is staked out by each one of the party as hereinafter described and the rest of the winter is spent in getting out as much of the "pay dirt" as possible before the opening of spring unseals the streams and renders further work on the "dump" impossible. Should bedrock be reached without discovering sufficient gold in the dirt to make it a paying proposition, another location is selected and the work of excavation and examination of the ground is continued. Success in this kind of work does not always follow because one is simply persistent. There is probably no other profession in which the element of chance or good luck enters so largely as in that of the prospecting miner; but, on the other hand, failure to find gold in paying quantities in the first location made should not be accepted as proof that no gold exists in the immediate vicinity. The richest claim on little Minook Creek was not developed and its possibilities discovered until after some forty holes to bedrock had been sunk by the locaters. In this case sheer persistence and indefatigable labor won fortune for the prospectors, but on the same stream and but a short distance separated from the paying claim other parties worked equally hard and apparently with an equal amount of good judgment and never obtained enough gold to pay for their "grub stake."

If a prospector desires to lay claim to placer mining ground, he must first of all satisfy himself that gold is present, as this is a necessary legal qualification in order to insure title to same. Having satisfied himself in this particular he proceeds to set stakes at the four corners and at the center of the claim, as required by law, to define its limits, and within thirty days after the original location he must enter the claim at the nearest land office, giving an exact description of the locality as far as may be possible, and must produce witnesses to prove all of the statements made by him as to the location, date of discovery, actual presence of gold, etc. After paying the fees demanded by the recorder of the district he will be in a position to hold his claim for one year after the 1st of January next after the date of his location,



MINERS STARTING OUT ON A PROSPECTING TRIP IMMEDIATELY AFTER THE ANNUAL BREAK-UP OF ICE IN THE SPRING OPENS THE RIVER TO BOAT NAVIGATION.



PROSPECTING FOR GOLD ON A RIVER BAR IMMEDIATELY AFTER THE SUBSIDENCE OF THE SPRING FLOODS.



TYPICAL MINERS' WINTER QUARTERS ON A MINERALIZED GULCH OF THE YUKON ANTICLINAL
The photograph is a view of Wolverine Gulch in the Tanana country.



TYPE OF SMALL RIVER STEAMER, USED BY PROSPECTORS, IN WINTER QUARTERS.

without any further work on the claim. If, however, he neglects to put a certain amount of development work on the claim after the lapse of the time specified, his title to it becomes forfeited and the claim is open to reentry or, in other words, it may be "jumped."

The original discoverer of gold on any stream is allowed to enter two claims in his name, but all subsequent locators are allowed only one claim in any mining district. The original locator's claim is called "discovery claim," and the others are numbered 1, 2, 3, etc., "above discovery" or "below discovery," as the case may be. Besides his own claim, any person is entitled by law to enter claims for others by power of attorney, and as the number of claims that may be entered in this way by one person is unlimited, the custom has given rise to an immense amount of dissatisfaction to the mining fraternity in Alaska owing to the abuse which has been made of the privilege.

In order to form a mining district there must be at least six persons present duly qualified by law to locate mining ground. If six or more persons desire to form a district, a recorder must be chosen from among the persons present, a set of books opened, and all the requirements of law as regards the entering of claims for title observed in the same way as if the proceedings were held before the recorder of a regularly established land office.

The size of claims in any mining district is determined by the majority of the miners forming the district, but in no case can they be larger than allowed by the Federal statute, nor can any regulation made by the miners as regards the holding of title to or working the claims which will conflict with the United States laws be legally enforced. As a general thing a placer mining claim is 1,000 feet long, measured along the bed of the stream, and its end lines extend from "rim rock" to "rim rock" across the valley of the stream upon which the location is made. Bench claims are situated on the sidehills above the valley claims, and are numbered consecutively up and downstream from discovery claim to coincide as to length with the latter.

The amount of development work which a locator must do each year on his claim is determined by the miners themselves, but must not be less than an amount which will cost \$100. In some cases the development work includes the labor and cost of building houses and other necessary work outside of actual development of the ground, while in other places a miner must sink one or more holes to bed rock each year in order to hold possession of his claim.

As has been already stated, travel overland during the summer season is attended by so many difficulties that summer prospect work throughout the country is almost exclusively confined to those sections which are accessible by boat. The best time for this kind of prospecting is immediately after the subsidence of the spring freshets in the streams has left the bars and beaches bare for examination. When

this period arrives, the prospector, after loading a boat with supplies to last him during the trip, enters the stream to be prospected and works his way upstream by pulling or poling his boat against the current, meanwhile carefully "panning out" the sands and gravels found on the bars and beaches for evidences of gold. As a usual thing if the region drained by the stream is mineralized, gold in the form of minute particles or "colors" will be found mixed with the fine sand after it has undergone the process of washing in the pan. Some of these "colors" are hardly larger than a pin point and the novice might easily allow them to pass off with the waste material as worthless. Other small particles of scarcely appreciable thickness, which from their small bulk as compared with their surface subside very slowly when suspended in water, are readily carried off by the action of the current or the movement of the water in the miner's pan, and so are lost. This is called "scale" or "float" gold by the miners, and is very difficult to save except by the use of quicksilver. If "colors" continue to be seen as progress is made upstream and the size of the particles increase, it is safe to assume that the prospector is on the right path which will ultimately lead him to the locality from which the gold originally started on its journey downstream. If, however, the "colors" disappear from the sands of the main stream, some other source of its origin must be sought. The tributary streams entering the main river immediately above the position where "colors" were discovered should now be examined, and if they are found to be "blank," or barren, the prospector must bring to his aid any knowledge of geology which he may possess in order to account for the presence of gold in the main stream. Local conditions must be carefully studied, and it is possible that an examination of the local topography will result in the discovery of some old channel of the river far removed from its present bed and that an investigation of its old sand and gravel beds will show that the greater portion of the mineralization of the region took place prior to the change in the course of the river. In this connection it must be borne in mind that the occurrence of gold in the sands of a river does not necessarily mean that its origin is close at hand. As a matter of fact it may be of somewhat remote derivation. Many of the old gravel terraces and glacial deposits contain gold, and when these are dissected it finds its way into the river bars and is concentrated in the usual way. As the river channels have been subject to various changes of position throughout the ages of geological evolution and the old terraces often bear no relation to the present system of drainage, it is evident that the mere presence of gold in the bars can not be accepted as conclusive evidence that the region drained by the present river channel is mineralized.

A fair knowledge of geological conditions, past and present, is undoubtedly of value to the prospector, and while it is true that in the

search for gold a person perfectly ignorant of the subject may and frequently does stumble on a rich deposit of the metal, while his more intelligent competitor may never discover anything of value, this should not deter anyone from acquiring knowledge of certain well established geological laws, and in the end the better informed searcher will prove the more successful in his work, other qualifications being equal.

The best conditions for the deposition of gold in placers are usually found in the narrow valleys of mountain streams, where the work of erosion has been most thorough, and where the more rapid movement of the water has carried off the lighter portions of the eroded material and left the heavier particles of mineralized matter deposited on the floor or "bedrock" of the valley. In time these intensely mineralized deposits are covered with successive layers of silt and debris, which act as constant screens or sieves through which the heavier portions of later accretions are gradually sifted to the bottom. The rapid current of the torrential streams which are strong enough to carry down the channels large bowlders naturally also bears away with it all but the coarsest kind of gold. This in time is either formed into "nuggets" of a more or less rounded shape, which find lodgement in the crevices and reefs of the bed of the stream, or else is reduced by attrition into the form of "dust," and is finally deposited on the bars and beaches of the larger and less rapidly flowing rivers. The fact that gold is never found in the sands of rivers where the current is sluggish is proof positive that its origin is in the quartz veins of the mountain ranges, and it is simply a waste of time for the prospector to search for gold except in the near vicinity of the more elevated portions of the country.

In prospecting a stream it follows, from what has been stated in regard to the action of the current in bearing away the eroded material which has been derived from the adjoining hills, that the actual bed of the stream is not likely to contain any gold except the very heaviest kind of nuggets. It is therefore customary to sink holes to bed rock through the muck and gravel deposits which form the banks of the stream where indications of the presence of gold have been discovered. If the character of the gold is coarse enough to warrant a search of the bed of the stream, its course may be changed by a method called "wing damming," which will be hereafter described. The character of the gold found on bed rock of a stream will show the experienced miner what it is likely to be in its channel bed, and from this he will be able to determine the advisability of undertaking the labor of recovering the precious metal by diverting the channel in the manner indicated.

Throughout Alaska two chief kinds of mineralized deposits are found, namely, auriferous quartz veins traversing slates of Silurian age

which are in close relation with masses of diorite and other eruptive rocks, and gold-bearing drifts of Pleistocene date derived from the degradation of the older strata. In the gold-bearing sands and gravels, magnetic quartz, platinum, garnet, hematite, and chromic iron are commonly found, and in most of the alluvial deposits the remains of the mastodon and other mammalian fossils are often discovered at depths of from 40 to 60 feet below the surface. On some of the sea beaches, notably so at Nome and Topkok, the mechanical action of the ocean waves on the comminuted material which has been derived from the adjacent hills has resulted in the formation of well-defined strata, from one-half to two inches thick, composed almost entirely of garnet or the so-called "ruby" sand, carrying a large percentage of free gold, while the overlying and underlying strata of common sand are devoid of mineral. So much has, from time to time, been said in regard to proposed plans for dredging the bottom of the sea in the vicinity of the gold-bearing beaches of Nome, that it may be as well to state that there seems to be no doubt that the presence of gold in the sands of the beaches at this place can be accounted for in no other reasonable way than that it has been brought down from the interior by the streams flowing into the sea, and as the land in the vicinity is gradually increasing in elevation instead of decreasing, there is no good reason for supposing that there is any gold whatever beyond the reach of the present stages of low water. The fact that the gold-bearing sands are only found fronting the present and past flood plains of the Snake River is additional proof that the gold originated in the hills and mountains drained by that stream and its tributaries. It is therefore my opinion that any project for dredging the bottom of the sea in the vicinity of the gold-bearing beaches will result in failure to secure any appreciable amount of the metal.



PROSPECT HOLE ON THE BANKS OF A MINERALIZED STREAM.

CHAPTER II.

PLACER MINING.

LOCATING THE "PAY-STREAK."

After locating a placer mining claim and securing title to it by having it properly recorded, the first work to be done is to locate the "pay streak" or deposit of mineralized material which will pay the miner for the necessary work of extraction. This is done by sinking a hole from 4 to 6 feet long by 3 feet wide to bed rock, or until a stratum of gold-bearing sand or gravel is reached which is rich enough to satisfy the miner, who then proceeds to excavate all of the rich material by digging lateral tunnels or "drifts" from the shaft and hoisting the excavated material to the surface and depositing it in what is called a "dump." Frequent resort is had to the miner's pan as the work progresses to test the richness of the "pay dirt," and by this means the relative value of the excavated material can be ascertained, and also whether the miner is still working in the proper direction, or if, as frequently happens, the "pay streak" has become too small to be of any value, or "pinches out." When this happens a new direction is taken, or, if bed rock has not been reached, the shaft is sunk still lower until another pay streak is discovered or bed rock is reached.

As the heavier particles of gold invariably sink toward the bottom of the material which forms the contents of the valley in which it is found, it follows that the richest pay streak is at or near bed rock. This may be 4 feet and may be 100 feet from the surface, but in the interior of Alaska the average distance to bed rock is about 35 feet. The material through which the shaft must be sunk, however, varies in different localities to such an extent that the mere thickness of the superposed layer of soil is not of so much importance as the ease with which the excavation can be made.

SINKING A SHAFT.

As a rule the soil of all the placer mining ground throughout Alaska is superposed by a covering of moss, grass, and decayed vegetation, which must be first cleared away or "stripped" before actual work of excavation can be begun. When this has been done and the first

layer of earth removed the soil, at a distance of from 2 to 3 feet beneath the surface, will be found to be frozen solid, and some means of thawing it out must be employed before further progress can be made. In the early days of mining in this region the frozen ground was softened by heat obtained from burning wood. At the end of the day's work a pile of dry wood was first laid on the ground, a fire started, and the pile covered over with green wood so as to retain as much of the heat as possible and left to burn until the miner was ready for work the next day. The remains of the fire was then removed and the softened earth thrown or hoisted out of the shaft. This process was repeated day by day until a "pay streak" or bed rock was reached. If it was ascertained that the first "pay streak" encountered was sufficiently rich to warrant working it out before going deeper, a tunnel or "drift" was excavated and the "pay dirt" hoisted to the surface by alternately heating and digging the thawed material along the course of the "pay streak" by the same means as were employed to sink the shaft. Latterly this tedious and expensive process has been almost entirely superseded by the use of steam instead of fire as a means of thawing the frozen ground. A portable boiler for supplying steam is set up on the claim as near the position of the proposed shaft as possible, and by means of pipes the steam is applied to the frozen surface until it is sufficiently softened to admit of being handled with the pick and shovel. An ingenious contrivance by which the steam from the main pipe is divided into several jets or "points" is now in common use, and by this means not only is the area of operations more definitely defined, but the operator has a greater control over the thawing agent than is possible when heat is supplied by burning wood. The work of excavation can be carried on much more rapidly, and the accumulation of noxious gases is entirely avoided.

VENTILATION AND LIGHTING.

If the "pay streak" extends any distance from the shaft the air in the tunnels is liable to become dangerous from the emanations of poisonous gases from the earth and foul from the exhalations of the workmen themselves. Ventilation is secured by sinking additional shafts to intersect the line of the tunnel in which work is going on, and as the workings are seldom in very deep ground, this method of securing a supply of pure air is usually effective.

The tunnels are lighted by candles, which are secured to the walls by means of the ordinary iron candlesticks in common use by the miners in other localities while working underground.

HOISTING GEAR.

The excavated material is hoisted to the surface in buckets by means of a hand windlass, or by the use of steam-hoisting machinery in case this can be obtained.



PROSPECTORS WHIPSAWING LUMBER FOR SLUICE BOXES.



PARTY ABOUT TO LEAVE THEIR PERMANENT WINTER QUARTERS ON A PROSPECTING TRIP.

PERIOD OF UNDERGROUND OPERATIONS.

The excavation of the gold-bearing sand and gravels is begun as soon after the freezing cold of winter weather has sealed up the streams and subterranean springs as possible, and is continued until the coming of warm weather in the spring with its attendant floods effectually puts a stop to further work in this direction. Before the larger streams which are to furnish the necessary water for washing out the "dump" are clear of ice, the subterranean springs generally force the miners to discontinue work in the shafts and tunnels by flooding them, and there is a period of from two to three weeks intervening between this time and the time when the "clean-up" is made. The miners take this opportunity to build their flumes and sluice boxes, and in placing them in position for future operations.

SLUICE BOXES.

Two kinds of sluice boxes are in common use in Alaska. On small claims and for experimental work those made of three pieces of lumber fastened together in the form of an open trough, from 10 to 12 feet long by 12 inches wide, and fitted with transverse cleats or "riffles" nailed to the bottom, are most generally seen. But for more effective use preference seems to hold with the Hungarian sluice box, which has a row of poles laid lengthwise on the bottom of the box and separated from each other a distance of about an inch. Underneath the poles, at the upper end of the box, there are placed transversely a few small "riffles" to catch and hold the finer portions of the washed material as it runs down the sluice. The boxes are about 12 feet long and have one end slightly smaller than the other in order that they may be joined together into a long line or "string." Trestles are built for supporting the boxes, and an inclination of about 1 inch to the foot of length is given the "string" to insure a rapid movement of the water. In order to secure a supply of water a flume must be built leading from some distance upstream to the head of the sluice, or a portion of the stream itself can be diverted by "wing-damming" so as to flow into the boxes. The "riffles" will ordinarily catch all of the heavier particles of gold, but in order to save the very fine "dust" and "float gold" metal plates coated with quicksilver are placed at a slight inclination against the upper side of the "riffles," and by this means nearly all of the valuable material may be saved.

THE "CLEAN UP."

By the first week in May, the mountain streams are clear of ice and the accumulated pile of "pay-dirt" in the "dump" is thawed out by the warm sunshine so that it can be easily handled. Water is turned into the sluice and the work of washing the gold from the sand and

gravel begins. Men stand at the dump and shovel the dirt into the upper box of the "string" and others keep the sluice clear of the larger sized bowlders by "forking" them out and throwing them aside. When the "riffles" are filled with the concentrated gold-bearing sands, the work of "shoveling in" ceases long enough to enable the miners to remove the contents of the boxes, and then it is resumed until another "clean-up" is necessary or the material in the "dump" is exhausted. The material recovered from the boxes is then still further concentrated by panning until only the pure gold remains, and this in the form of "dust" is ready for shipment or for use as currency.

ROCKERS.

Where the quantity of sand or gravel to be washed is too small to warrant the construction of sluice boxes, the miner has recourse to a double-bottomed box fitted with two rockers and a handle by which the mineralized material can be agitated and the gold separated from the worthless portion with which it is mixed. There are many different kinds of rockers in use, but the general principle of their construction is the same in all the different types. The upper bottom or tray of the appliance is the receptacle into which the dirt is thrown, accompanied by a liberal amount of water, and the whole is kept in a continual state of agitation by means of an upright handle. This movement causes the heavier portions of the contents of the tray to sink and pass through perforations in its bottom onto an inclined platform fitted with "riffles" which catch and hold the gold in the same way as is done in the sluice boxes. The rocker is especially adapted for use by two men working together, but is too slow a process and too wasteful of material to be used except as a makeshift or where it is impossible for any reason to construct a regular sluice.

PANNING.

The miner's pan is perhaps the most important part of his outfit in the field, as without it and a knowledge of how to use it, but little can be done in the way of prospecting. It is generally made of thin iron plate and is from 14 to 16 inches in diameter and about 3 inches deep, with flaring sides. In practice the pan is filled with "pay-dirt," and during the first part of the operation of washing the material the pan is held just below the surface of the stream and by a peculiar gyratory and tilting motion, which is hard to describe, the miner gradually causes all of the lighter portions of the dirt to be washed out of the pan, leaving only the gold and heavier portions of the sand at the bottom. He now lifts the pan from the water and with just enough water in it to enable him to keep the contents in motion he skillfully separates

the particles of gold from the rest of the material until with a quick motion the latter is floated over the edge of the pan and the gold alone remains. During the winter season when water is scarce and it is necessary to use the pan to ascertain the value of the sand and gravel which is being taken out of a claim, the frozen material must be taken into the miner's cabin or tent and first thawed out. Considerable skill is necessary to get the best results, or even to make a satisfactory test of the dirt with the small amount of water which is available under these circumstances. As it is sometimes impossible for the novice to discover the presence of gold in dirt which may be very rich in the mineral, owing to the minute size of the particles, it would be well for the prospective gold seeker to acquire some knowledge of panning before he ventures into the country.

GROUND SLUICING.

In "shallow ground," or where the pay dirt is found to be very near the surface, it sometimes happens that local conditions make it possible to wash the sand and gravel without having to first sink shafts and tunnel the pay streaks. This is done by cutting channels across the claim and turning water into them, and so washing the worthless material away and leaving the gold in the form of a deposit at the bottom of the ditch. Ground sluicing, however, is never resorted to when it is practicable to build sluice boxes and wash out the gold in the regular way.

STRIPPING.

The preliminary work of clearing off the moss, grass, and muck which is usually found to overlie all of the gold-bearing deposits in Alaska is technically called "stripping" the claim.

DRAINAGE.

In many localities there are subterranean springs encountered in the shafts and tunnels which do not freeze up, even in the very coldest weather. These springs are generally called "glaciers" by the miners, and sometimes are of such extent as to seriously interfere with the prosecution of the work of development of the claim. In the absence of any pumping machinery it is sometimes found to be necessary to run a tunnel in from some point downstream from the seat of operations at the level of the bed rock and use this means to drain the upper levels of the mine.

CROSS CUTTING.

In prospecting a claim, if gold is not discovered when bed rock is reached, the most thorough manner of determining the location of the pay streak, if there be any, is to start from the bottom of the shaft

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and run a tunnel at the level of the bed rock directly across the claim. This is known as "crosscutting" a claim, and it is without doubt the hardest work which falls to the lot of the miner, but it is the surest and quickest way of determining the value of his claim.

ASSAY VALUE OF GOLD DUST.

The term "dust" in mining regions is taken to mean particles of gold from the size of a pin head up to the largest kind of nuggets, and its assay value differs considerably in different localities. As a general thing the "dust" taken from the claims in American territory is more valuable than that found in the Klondike. This is due in part to the fact that the Klondike "dust" is more or less impregnated with magnetic sand which it is difficult to get rid of in the ordinary manner, but, aside from this, the metal itself does not have as high assay value as that found either at Minook or at Nome. The Minook "dust" passes as currency throughout Alaska for an average of \$2 per ounce more than that from the upper river, and that at Nome is probably slightly more valuable than "dust" found at any other portion of the territory. In exchange, the Minook "dust" is valued at \$18 and the Klondike "dust" at \$16 per ounce. A large quantity of low-grade "dust," popularly known as "tramp dust," is in circulation in the country and is valued at \$14 per ounce. Gold found on the Koyukuk and Tanana rivers is generally classed with Minook gold as to value, but it is not so clean or bright as the latter except in the smaller-sized particles. Much of the gold taken from the claims at Nome is so discolored by iron stains that it would be readily overlooked by the inexperienced prospector, but the stain is superficial and the true color of the metal is easily ascertained by slightly scratching the surface.

A PAYING CLAIM.

After panning out a sufficient amount of dirt on a claim to ascertain the average value of the gold contained in one pan of material, the question of whether it will pay to develop it is one which must largely depend upon the locality in which the ground is situated. The cost of supplies and transportation, amount of timber and water available, and the amount of gold-bearing material probably in place will have to be considered before the prospector finally makes up his mind to work the claim. In all places where provisions can be obtained throughout the year with a reasonable amount of certainty within 100 miles' travel of the claim it is customary to call dirt which will average 5 to 10 cents to the pan "good pay." Miners' wages in unsettled districts are generally reckoned at \$10 per day, and if the dirt which a miner can wash out in one day will not average at least that amount it will not pay him to work his claim. On the other hand, with improve-



GENERAL VIEW OF AN ALASKAN PLACER MINE DURING THE PROGRESS OF THE SPRING CLEAN UP.

ments which are constantly being made in mining methods, and a better knowledge of local conditions which experience has given, it is now claimed that a claim which turns out dirt averaging 3 cents to the pan can be worked at a good profit. It must not be understood from the above that a miner can afford to wash out such low-grade dirt by hand. In order to make wages by handling material which does not run higher than 10 to 15 cents to the pan, the most efficient methods of recovering the precious metal must be used—that is to say, by the use of sluice boxes, with an abundant supply of running water.

WAGES OF HELPERS.

The rate of pay of men employed in the mines depends to a large extent upon local conditions, but will average about \$10 per day, or from \$6 to \$8 per day and board. In the case of a claim where the work of development has shown that it contains, beyond a reasonable doubt, a sufficient amount of mineralized material to warrant the owner in employing help to work on regular wages, this course is generally pursued. But if the claim is one in which development work has not been carried so far, or where the amount of the mineralized material in place is a matter of doubt, it is customary for the owner to enter into an agreement with his helpers whereby a certain portion of the claim is assigned to each individual for development, the proceeds of which after the "clean-up" is made to be divided between the owner and each individual on terms previously agreed upon. When a claim is worked in this way each subdivision is called a "lay," and the helper is known as a "layman." The terms under which a "lay" is worked vary in different localities and are naturally subject to various local conditions. As a general thing the "laymen" are allowed from 40 to 60 per cent of the net proceeds of the gold which is recovered from the portions of the claim which have been developed by their labor.

QUARTZ MINING.

Up to the present time but little attention has been paid to the development of the quartz-mining industry in the Yukon Valley. This feature of mining will doubtless be taken up after the rich placers have been exhausted and the facilities for the importation of mining machinery into the country have been increased. Already prospectors have located ledges of gold-bearing quartz at several points adjacent to the Yukon which give promise of good returns in the future, and with later developments there is every reason for believing that the country will ultimately support a large and stable population engaged in this form of employment.

PART IV.

ETHNOLOGICAL NOTES.

CHAPTER I. HABITS AND CUSTOMS.

CHAPTER II. LANGUAGE.



ESKIMO FAMILY AT WORK CARVING IVORY AND SEWING FUR CLOTHING, ST. MICHAEL.

CHAPTER I.

HABITS AND CUSTOMS.

FIELD OF OBSERVATIONS.

The cruising ground of the *Nunivak* extended from St. Michael, on the coast of Norton Sound, to Dall River, a northern tributary of the Yukon which enters that stream about 1,000 miles upstream from its mouth. The nature of our duties made it necessary to take the vessel to St. Michael for a short visit each year during the season of open navigation, at which time the Eskimos of the coast were encountered and their habits and customs noted by the officers of the command; but by far the greater portion of the year was spent in the region traversed by the Yukon River, where we were brought into contact with the Indian inhabitants of that river and of its tributary streams.

The Eskimos with whom we came into contact number in all about 300 people, distributed in several small settlements from St. Michael along the coast southward to the Aphoon mouth of the Yukon River and up that stream a distance of from 300 to 400 miles, where they disappear and are replaced by the Ingalik or Indian tribes of the interior.

The Eskimos eke out a miserable and precarious existence, catching fish and seal during the months of open navigation and in hunting and trapping what game can be found on the tundra plains adjacent to the coast during the winter. At St. Michael a few of the Eskimos add to their scanty means of support by manufacturing articles of native clothing and trinkets—mostly carved out of ivory and bone—for sale to the whites, and to a very limited extent by employment as laborers with the trading companies doing business in the country.

Their habitations are squalid, ill-ventilated, and evil-smelling abodes, made by excavating a portion of the ground and covering the space with a roof formed of driftwood, over which is placed a thick layer of loose earth and moss or grass. During the winter season, while absent from their regular villages on their hunting trips, they live in tents or temporary shelters made of snow, called igloos. Their condition is almost without exception one of continuous hardship and expo-

sure, and their lives are spent in an environment of wretched and hopeless poverty.

The recent influx of white people into the country has done nothing to improve their moral or physical well-being, but, on the contrary, by bringing them into competition with a more energetic and better equipped race in the pursuit of game, this source of obtaining a livelihood is threatened with extinction, and unless some means of relief is had in the near future it is feared that the very existence of these people will be seriously imperiled.

In former years all these northern tribes have suffered from periodic epidemics of disease, which, for the time being, rendered whole communities helpless and exposed them to the horrors of starvation. Latterly these epidemics appear to have increased in frequency, and during the last two or three years it has not been an uncommon occurrence for whole villages to be completely wiped out by the ravages of disease and the effects of starvation combined. Mention has already been made in this report of the suffering of the natives from an epidemic of measles and pneumonia during the summer of 1900 and the advisability of some sort of governmental intervention for their relief. In my opinion much of the suffering from sickness among the natives has been caused by the introduction of disease by the immigrating white population, and relief can not be afforded except through the adoption of some systematic plan by the Federal Government.

The habits and customs of the Eskimos have been so well described by other writers whose opportunities for observation were so much better than my own, that it would seem to be a work of superogation to attempt to add in this report anything to the stock of knowledge which we already possess on this subject, and for that reason I will confine myself to a description of the tribes living in the interior, whose comparative isolation from the ordinary routes of travel, and the fact that in the course of our duty we were more intimately brought into contact with them, make it more probable that a description of their daily life may not be uninteresting.

After the vicinity of Holy Cross Mission has been reached on the Yukon the character of the country changes from that of a flat and treeless region, which is the characteristic feature of the delta lands of the lower river, to that of a semi-wooded and mountainous country traversed by many small streams more or less well stocked with fish and game. At this point the native population of the country is distinctly different in character from that of the coast, and notwithstanding the fact that for ages these two peoples have been in constant communication with each other for the purpose of interchanging their respective commodities, their racial peculiarities have remained unchanged. The condition of the Indian tribes of Alaska is much better than that of the Eskimos of the coast, and the readiness with



GROUP OF ESKIMOS, NORTHWEST COAST OF ALASKA.



ESKIMO GIRL OF COAST OF NORTHWEST ALASKA, SHOWING TATOO
MARKS ON FACE.

which they adopt civilized methods of living encourages the hope that with proper instruction and protection these people may yet be brought within the pale of a comparatively high state of existence and become useful and prosperous citizens of our northern province.

ORIGIN.

While it is hardly within the scope of this report, nor is it my intention to attempt to add to what is already known of the origin of the native inhabitants of the interior of Alaska, it may not be out of place to state that similarity of language, traditions, and racial characteristics furnish strong evidence of the fact that all the Indian tribes at present inhabiting the great interior valleys of the Yukon anti-clinal belong to that great American linguistic stock known as the Athabaskans, of which the Apaches, Chepewyans, Sioux, and in fact nearly all of the western and northern tribes of North American Indians form subfamilies. The ease with which migrations might have been made into this region from the eastward and southward, when compared with the difficulties of travel which would have been encountered by the wandering tribes in traversing the bleak and almost impassable heights of the Alaskan Alps which separate the Yukon Valley from the coast of northwest Alaska, makes it highly improbable that any extensive population of the region under consideration was made by migrations from this direction.

But mere speculation of the origin of the native tribes, while undoubtedly of some value in the consideration of plans for their betterment, is not of so great importance in a work of this character as is information of their present condition and environment, and for this reason I will confine myself to that particular aspect of the subject.

POPULATION, PHYSICAL CHARACTERISTICS, HABITS, AND CUSTOMS.

The Indians of the Yukon Valley coming within the range of our observations live in small communities or villages of from 25 to 300 people, situated for the most part on or in the near vicinity of the shores of the principal rivers, where the prospects of hunting and fishing are most favorable, and number in all about 3,500 souls. Their largest fixed settlements are at or near the different church missions and stations of the trading companies along the river, but owing to their semi-nomadic manner of living it is exceedingly difficult to obtain accurate statistics in regard to their actual numbers. The figures given are taken from the report of the last Government census, made in the year 1900, and they agree fairly well with our own estimates, which were necessarily made under conditions which were not so favorable for accuracy of enumeration.

In appearance the Indians of the interior are superior to the Eskimos of the coast, and the farther up the river one proceeds the more noticeable becomes this superiority. This fact is to a great extent attributable to the adoption by the Indians of civilized methods of living and to the general use by them of civilized articles of wearing apparel, while the Eskimos cling persistently to the native-made fur garments, which are frequently much the worse for wear, clumsy in design, and seldom becoming.

The features of the Indians are also more pleasing and conform more nearly to our ideas of physical beauty than do those of the Eskimos. This is especially noticeable in the case of the younger women and children, among whom one frequently sees individuals who are really beautiful. In both tribes the signs of old age rapidly appear, and the rigors of the arctic climate and the trying vicissitudes of a life spent in a constant struggle for existence leaves on the faces of all the inefaceable traces of suffering and hardship. Obesity, as a trait of old age, is almost unknown among these people. After the active period of life has passed they appear to lose flesh, and as a rule the very old are extremely thin and wasted looking, the result, no doubt, of the gradual decline of their powers of recuperation after periods of suffering from lack of a sufficient quantity of nourishing food, which, owing to their general habits of improvidence in times of plenty, are of frequent and regular occurrence.

HABITATIONS.

Throughout the river region the Indians now live in well-constructed log houses, heated by sheet-iron stoves and lighted by coal-oil lamps and glazed windows. The houses are no longer built partly underground, as in former years, and in fact do not differ materially from those occupied by the white population of the country. They are universally made with one room, which is occupied by the entire family as a living and work room. The furniture usually consists of one or more roughly made platforms, upon which are laid fur robes or blankets to serve as beds, benches for seats, and a table upon which the food is placed for eating.

The natives of the Yukon Valley have adopted in their entirety the white man's method of cooking and preparing their food, and their repugnance to anything in the way of food which is objectionable from the point of view of civilized people is in strong contrast with some of the disgusting habits of the Eskimos of the coast and delta region of the river.

The Indians remain in their winter villages until the days grow long enough in February to permit them to travel over the little-used trails leading from the river into the hills, when they leave their winter quarters and start out on their annual hunting and trapping trips in



TYPE OF ESKIMO WOMAN OF THE COAST OF NORTHWEST ALASKA.



TYPE OF ESKIMO BOY, COAST OF NORTHWEST ALASKA.

the interior. During this period and until the coming on of the succeeding winter they live in thin cotton drilling tents or temporary shelters made of brushwood covered with birch bark to exclude the rain.

SETTLEMENTS.

As has been previously stated, the principal Indian settlements are situated at or in the vicinity of the white settlements, but there are a number of small villages situated at somewhat remote places on some of the sloughs of the main river, where the conditions in regard to abundance of fish or game make the site particularly desirable. In no case, however, coming under our observation do the Indians lead solitary lives. They are exceedingly gregarious by nature and seem to have a deep-rooted objection to living apart from their fellows. Numerous cases came to our knowledge of single families who gave up comfortable log houses and went to live in tents during the very coldest weather of midwinter in order to be near their friends, and in one case an old man and his wife who were living near our station at Dall River, and whose movements were hampered by the care of a helpless son, who was slowly dying of consumption, put the invalid on a sled and hauled him over the trail a distance of 20 or 30 miles to a hunting camp in the hills rather than be left alone. In this case the sick man was receiving the daily attention of our surgeon, and the whole family was being supported by voluntary contributions of food from the *Nunivak*, but neither of these inducements nor any arguments which we could make to deter them were sufficiently powerful to induce the Indians to give up their ill-advised project. We afterwards learned that the sick man died soon after leaving home, and there is no doubt that the exposure hastened if it did not actually cause his death.

The native settlement at Dall River consisted of a dozen or more comfortable log houses, and the Indians seemed to be desirous of keeping them as clean and orderly and as nearly like our own quarters were kept at Fort Shoemaker as it was possible for them to do with their limited facilities. There was a steady demand for soap by the women, in exchange for the articles of native manufacture which they brought to us for sale, and under the stimulating influence of our medical officer, who made frequent inspections of their quarters while attending to the sick, they soon fell into the habit of giving the interior of their houses a thorough scrubbing from time to time, and seemed to take a real pleasure in imitating the methods which they had observed were practiced in this particular on the *Nunivak*.

AMUSEMENTS.

During the enforced inactivity of midwinter, when the Indians are gathered together in their winter villages, the time which is not taken up in the routine work of the household is spent by them

in dancing and, if food is plentiful, in the giving of feasts. As a usual thing there is in each village one house which is somewhat larger than the rest, which may ordinarily be occupied by two or more families, but which by common consent is made the meeting place of the whole community, sometimes as often as three or four times a week, for the purpose of having a dance. Among the young men there is generally one or two who have learned to play indifferently well on the violin or accordion, and as a variety of tune is not so much a desideratum as volume of sound and a certain amount of attention to the marking of time in the performance, the "music" afforded in this way seems to be all that is required by the assemblage to keep up the dance throughout the night. Dances of native origin have been almost entirely discontinued and superseded by those learned by the younger generation at the white settlements. The "lancers" and several other quadrilles with more or less involved figures appear to be most popular with the natives, and the amusement is always conducted with the utmost decorum and good order. A description of the native "woman's dance," which was the only native performance witnessed by our party during its residence in the country, has been already given in another part of this report.

Card playing to a limited extent is indulged in by the women among themselves, but aside from the relative value of the cards they do not appear to have any knowledge of even the simplest games. In playing the cards are first divided equally between the players, and the highest card played, irrespective of the suit or color of the one which has been led, takes the trick. When all the cards have been played the player who has succeeded in taking the greatest number of tricks wins the game. Simple as this pastime is it furnishes them with an endless amount of amusement and recreation.

Among the men, and especially so with those who have lived for any length of time in contact with the whites, a knowledge of gambling has been acquired and is to some extent prevalent. It is to be said of them, however, that these natives are not nearly so addicted to any games of chance in which stakes are played for as are the Indians in other sections of the United States. There are no native gambling games or implements made for this purpose at present in vogue among these tribes, and I can not find any record of there having ever been any such forms of amusement in the past.

The women spend much of their spare time visiting each other, and no people are fonder of gossip, nor is it possible to believe that anyone could be more averse to criticism or censure.

The presence of the *Nunivak* and other vessels in Dall River during the winter season was a never-ending source of entertainment to the inhabitants of the native villages in the vicinity of our winter quarters. Hardly a day passed that we did not receive a visit from a half dozen



YUKON RIVER INDIANS, SHOWING MANNER OF CARRYING A SMALL CHILD.



YUKON RIVER INDIANS.

or more members of the community. They are intensely fond of instrumental music, and would often sit on the floor of the officers' quarters for hours at a time perfectly quiet and apparently listening with the keenest enjoyment to the performance by some of the party of simple melodies on the piano or other musical instruments with which we were supplied. A small graphophone which was on board was also a never-failing source of interest and amusement to them, and they could be entertained by the hour by being shown the illustrations in the magazines and in listening to the explanations of the pictures.

ATHLETIC SPORTS.

Snowshoe races, wrestling, jumping, and running races are indulged in to a very limited extent by the young men, but as the greater portion of their lives are spent in out-of-door employment there is not the same inducement for them to take this form of exercise for mere health sake, and as personal encounters are almost unknown among the Indians the question of physical superiority is one of secondary importance and of very little interest.

EDUCATION.

At the present time there are five schools for the instruction of the native children in the portion of the Yukon Valley covered by our observations, namely, at Russian Mission, Koserofski, Anvik, Nulato, and Tanana. The school at Russian Mission is in charge of the priests of the Russian Church at that place and is partly supported by an appropriation made for this purpose by the Russian Church authorities, whose headquarters in the United States is at San Francisco. Those at Koserofski and Nulato are under the supervision of priests of the Roman Catholic Church, and the teachers are Sisters of Charity of the order of St. Anne, a Canadian organization having headquarters at Quebec, Canada. Of these the school at Koserofski is better known as the Holy Cross Mission, and that at Nulato is called the Mission of St. Peter Claver.

The school at Anvik and the one at Tanana are partly maintained by the board of missions of the Episcopalian Church and partly by the payment of a small annual tuition fee for the care and board of the pupils. The average annual cost of caring for one scholar is about \$100. At Anvik the establishment is called Christ Church Mission and at Tanana St. James Mission. "The aim of these schools is to teach the children such habits of industry as shall help them to grow up into self-supporting men and women and to give them enough instruction in the English language as will enable them to read and understand for themselves the Holy Scriptures; to make them intelligent citizens and Christians, and to free them from the superstitious

beliefs that hinder their progress." Such, in brief, is the object of the teachers of the Episcopalian schools as defined by Rev. J. W. Chapman, who is in charge of Christ Church Mission at Anvik, and who has spent many years of tedious and almost unrecognized toil among these people in the furtherance of the objects mentioned. From the same source of information I also learned that the children readily acquired knowledge of the usual branches of a primary education, except in the study of mathematics, in which they were slow. It is especially desired that the children shall not lose sympathy with their own people, and those who are more advanced are encouraged to teach those who are younger or who have fallen behind. The young men who show some ability to resist the superstitions prevalent among the older generation are encouraged to build their homes near the missions, and in this manner it is hoped in time to form a large native Christian community which will be entirely self-supporting and happy and will serve as an object lesson to the less thrifty and intelligent members of the tribe.

At the present time it is probable that not more than 6 per cent of the native children receive the benefits of schooling throughout the Yukon Valley, and when we take into consideration the fact that they are essentially a receptive people, anxious to learn and capable of being raised to a much higher plane of education and refinement than almost any other of our native Indian tribes, it is earnestly hoped that the Government will at once make some provision whereby assistance will be given to the different church missions along the river, who are all doing excellent work, but whose means are entirely inadequate for the purpose of caring for the number of children who are in need of and certainly deserve to receive the benefits of education.

RELIGION.

For years the missionaries in the field have devoted their lives and service in the work of elevating these people from a condition of barbarism to a comparatively high state of civilization, but whatever has been the good moral effect of their teachings—and no one can doubt that it has been most beneficial—it can not be said that a true understanding of religion has as yet gained much ground among the Indians. They are by nature simple and childlike, but their reasoning powers on matters of abstract theories show neither a very high order of culture nor capacity, and it is extremely doubtful if their minds are sufficiently imaginative or emotional ever to permit them to grasp the subtleties of a religion founded on the basis of faith and inspiration.

There is no doubt whatever that they respond readily to suggestion and are capable of attaining a high moral state through the influence of good example, and this they have in their present teachers. It only remains for the Government to give some much-needed assist-



YUKON RIVER INDIANS, PILOT "SAM" AND HIS WIFE "JENNIE."



YUKON RIVER INDIAN WOMAN WHO HAS BEEN EDUCATED AT ONE OF THE MISSIONS.

ance whereby the influence of the missions may be extended to those who are now out of reach of this influence, and to protect the Indians from the vicious encroachments of depraved members of the white population, to enable this little tribe of interesting people to become a community of valuable and prosperous citizens.

SUPERSTITIONS.

Long contact with the whites has had the effect of destroying many of the old superstitions which we know were at one time prevalent among these people. At the present time it is exceedingly difficult to obtain any information on the subject; and although the older generation may still have certain superstitious beliefs, their fear of ridicule is so great that they will not discuss the subject with a white man.

They do not appear to attach any importance whatever to signs or portents, and I have never seen anything like an amulet or charm in their possession. They have no special forms or ceremonies for observance before leaving home on any important mission or hunt, and the opening and close of navigation on the Yukon, which is a matter of supreme importance to whites and Indians alike, comes and goes as a matter of course, although I was informed by one of our Indian neighbors that "a long time ago" this event was the occasion of a great deal of joy to the native tribes, who celebrated it by singing and dancing and by certain offerings made to some mythical spirit. My informant also told me that once, when his grandfather was a very little boy, the Yukon remained closed by ice throughout the summer. I asked him if he thought that was caused by the failure of the Indians to give up their customary offerings? And after a few moments of thought he replied: "I don't know. Maybe them fellows tell plenty big lie long time ago."

SHAMANISM.

Among the Indians of the Yukon region there are still members of some of the tribes who live in the isolated settlements who claim to be possessed of occult powers for good or evil and able to hold communication with the spirits of the dead. But the influence of these so-called "medicine men" over the natives is gradually on the wane, and, with the exception of the Indians who are seldom brought in contact with the white people, it may be considered of no importance whatever. At times, when some of the members of some little community dies, the medicine man, or shaman, comes forward and sings a doleful chant over the remains, showing that in the presence of death there is still a lingering superstitious belief in his powers to promote the happiness of the departed spirit; and in spite of the fact that the people as a whole are inclined to doubt his supernatural powers, it

sometimes happens that the claimant of these powers is a man of exceptional ability as a leader of men, and his advice is listened to with attention. If, as it is most likely to be, the advice is of a character to alienate the native from the teachings of his white friends, it may prove dangerous and pernicious. For this reason it is just as well in dealing with these people to keep a sharp eye on the local shaman, if there happen to be one present, and to suppress him if he attempt to give them bad advice.

TRADITIONS AND LEGENDS.

Among the older natives there are still extant a large number of traditions and legends which have, in the absence of any written records, been handed down from father to son through ages of unwritten history. But, as in the case of the native superstitions, it is extremely difficult to obtain any accurate information on the subject.

The most authentic traditions indicate that at no very great length of time in the past there was a large population in the regions which at the present day are almost devoid of inhabitants, and that the present paucity of population is the result of frequent wars which in some cases was carried to the point of almost total extermination of one or both of the contending parties. The inhabitants have also suffered from periodic visitations of epidemics of smallpox and scarlet fever, which tradition and actual written history made since the occupation of the territory by the whites agree in stating were at times so violent that whole villages would be wiped out and districts almost depopulated by the ravages of the scourge.

One of the traditions which are still related by the Indians is to the effect that, in order to put a stop to the continuous wars which were being waged between the tribes inhabiting the region known to-day as the Yukon Flats, a mythical character of immense size and superhuman strength, by the help of the land otters, successfully dammed up the Yukon somewhere in the vicinity of what is now the site of Rampart City and in this way converted the region above this point into an immense lake. All of the inhabitants, with the exception of one man and his sister, were drowned in this lake, and subsequently, when the mythical giant tore down the dam, he scattered the débris for hundreds of miles along the valley, and in this way the thousands of islands in this portion of the Yukon were formed. The two survivors of this flood built a raft, and, embarking on the subsiding waters, were carried downward through the country, and from them sprang into existence a new and more peaceful race. It is rather interesting to note, in connection with this tradition, that all geologists who have made a study of this region unite in stating that sometime in the remote past there was an immense lake covering the country in this vicinity; and although all signs of ancient habitations have long



GROUP OF YUKON RIVER INDIAN CHILDREN BEFORE ATTENDING SCHOOL.



HALF-BREED RUSSIAN TRADER AND FAMILY.
His wife was educated at the Holy Cross mission.

since disappeared, other evidences that the region was once densely populated have been found in the shape of stone and obsidian arrow and spear heads and domestic utensils which have long since gone out of use among the present native inhabitants.

The further adventures of the two survivors of this flood form the basis of many traditions among the natives, and a collection of these folklore stories would make a very interesting chapter in the history of these people; but, as has been previously stated, it is almost impossible to induce any of them to talk on the subject, and the information can only be obtained piecemeal, and it would require a long time and a perfect knowledge of the Indian dialects to acquire the information in the shape which would make it of value to the ethnologist.

FORMS AND CEREMONIES, MARRIAGE, DIVORCE, FAMILY RELATIONS, ETC.

At the present day but little remains of the ancient forms and ceremonies which it is most likely were at one time common among these people. Even the old mortuary customs, which appear to survive longest among a people whose general habits are undergoing a change by contact with a more civilized race, have to a very large extent fallen into disuse, and to-day the birth, death, and burial of a native of this region are events which are unmarked by the observance of any ceremonies which are not common to the white race. There are, it is true, a few exceptions to this rule, but they are usually found among the older natives or in communities where comparatively little communication has been had with the whites. At several places along the river one may still see a collection of small mortuary buildings in which the remains of the natives have been placed for sepulture in the past. The site of these structures is usually on the cleared top of some conspicuous bluff from which a commanding view of the surrounding country can be obtained, and the graves are marked by tall poles from which long streamers of parti-colored cloth are suspended. Articles which have belonged to the deceased and, in some cases, gifts from friends are sometimes found deposited in a box made for this purpose and left near the body. But even these poor tokens of regard and remembrance are gradually disappearing before the predatory march of civilization, and perhaps for the reason that the effects of the dead even are not safe from the thieving hands of the class of white men who are coming into the country, as well as the general tendency of the natives to adopt the Christian method of burial, the bodies of the dead are now interred in graves dug in the earth, and the place is marked by the erection of a small cross.

When a young man wishes to marry he selects a girl to whom he is not related by any ties of kinship and proposes to her parents or guardians that she shall become his wife. If the proposal meet with the approval of the parents, and there be no objection on the part of

the girl, she simply changes her place of abode from the house of her parents to that of the suitor, and henceforth they are considered as man and wife. If the services of a minister to perform the ceremony can be obtained, the marriage takes place before him, but in the absence of a minister the simple fact that the couple have mutually consented to live together is considered sufficiently binding to cause both parties to assume all the mutual obligations and responsibilities of husband and wife.

Polygamy is no longer practiced among the natives of the Yukon Valley. Instances of a duality of wives are still known to exist in remote parts of adjacent regions, like the upper waters of the Koyukuk and Tanana rivers, but the custom is fast disappearing.

Divorce is very rare, but not unknown. When a man finds that his wife has been unfaithful to him, there is an unwritten law among the natives that she may be compelled to return to her own family and the injured husband is no longer responsible for her support. The stigma of disgrace which attaches to the female in such an event is keenly felt by the erring one, and so strong is the feeling among the men on this subject that it is seldom that a divorced woman succeeds in marrying the second time. It can not be said that this high moral standard of virtue has as yet been reached by the men, nor can it be said that the women exact it.

Upon the death of the husband the widow shows her grief by allowing her hair to become unbraided and wears it in this condition for a year afterwards as a sign of mourning. This custom, which seems to be general throughout the region, is one of the few ancient native customs which have survived since their contact with the whites.

Large families are rare among the Indians, but this is not so much caused by lack of prolificacy in the women as it is the result of an abnormally large infant mortality. Girls frequently marry at the age of 15 to 16 years, and from that time until they are 30 years of age they bear children with more or less regularity at intervals of from eighteen months to two years. In many cases, however, the children are not weaned until they are from two to three years of age, and in consequence of this it is not an uncommon occurrence to find a young mother nursing two children of different ages at the same time. Suffering at times for the lack of food herself, and always compelled to perform a large part of the household drudgery, it is hardly to be expected that the mother can furnish sustenance for two growing children. The result is that many of the children in their second or third year succumb to the disorders natural to them at this period of life, and it is only the very hardiest ones who survive.

Among no people, perhaps, can there be found a greater amount of devotion and affectionate regard for their young than is displayed by these Indians. For a year or two after the birth of a child the mother



TYPE OF MIDDLE-AGED YUKON RIVER INDIAN.

In the background are shown dressed moose skins ready for manufacture into gloves, moccasins, etc.



TYPE OF MIDDLE-AGED WOMAN OF THE YUKON VALLEY.

seldom leaves it for more than a few moments at a time. On the trail during the winter it is securely wrapped in a blanket or fur robe to protect it from the cold and carried on the back of the mother, and in the summer, when most of the work of catching fish falls to the lot of the women, the baby has always a comfortable place fixed for it in the boat where it can be constantly under the mother's watchful eye. Should it become sick, the mother's anxiety is pitiful to see; and if the disorder show no sign of diminution or the condition of the child grow worse, she shows her grief in no unmistakable way, and for a time she is unconsolable. This parental love is not confined to the mother. The father is equally affectionate, and, although not so demonstrative, he shares the mother's anxiety and for the time being assists her in the care of an ailing child.

The frequency of death among the children, however, has doubtless caused these people to look upon this event as a necessary evil, and after the first effects of grief caused by the sickness of a child has subsided they appear to recover their usual good spirits and wait with a strange kind of resignation for the actual coming of death, even going so far as to make the shroud and coffin for the little one long before it finally dies. The cases of recovery from serious illness of infants is apparently so rare that the grief of the parents is exhausted when the child is attacked, and when death comes it has no power to further move them.

The children of an Indian family lead happy lives, free from care or responsibility, and apparently exempt from labor of any kind until they voluntarily assume some of the duties of the camp or household. They have their toys, which are usually miniature articles of domestic use, and apparently give their parents very little trouble after they are old enough to walk about and amuse themselves. Corporal punishment is a thing unknown among these people to govern their children, and, indeed, I never saw an instance in which it seemed at all necessary.

HUNTING AND FISHING.

Shortly after the close of navigation on the river the Indians gather in their winter villages and begin the work of preparation for winter hunting and trapping. Sleds, toboggans, snowshoes, and dog harnesses are now taken from the caches where they have been stored during the summer months, and any repairs necessary to put them into condition for use are made. Before the river finally freezes over all boats are hauled up and placed in a position where they will be safe from injury from running ice during the spring freshets; steps are cut leading down the steep banks of the river from the houses to the water's edge for the convenience of the community in traveling to and fro; the roofs and walls of the houses are given a general overhauling

to fit them for occupancy during the winter, and a general season of tinkering and carpentering keeps the male portion of the community busy until the cold weather sets in and hunting begins.

As soon as the river is completely frozen over the fish traps are set in the channel and henceforward each trap is visited at frequent intervals by the owner, to keep the hole in the ice open, through which the traps are lifted and their contents removed from time to time until the opening of navigation.

October in the Yukon Valley is usually a month of beautiful weather. After the somewhat tedious summer of almost continuous daylight, with its attendant plague of mosquitoes and gnats, the cool, clear days and nights of October seem to possess the qualities of a tonic, and by the 1st of November, when winter may be said to have fairly set in—if all has gone well and no unusual sickness or disaster has occurred to change their plans—the Indian hunters are ready and anxious to start off for the hills to hunt for moose and other large game and to set their traps for the smaller fur-bearing animals.

The fall hunt is of short duration and is seldom participated in by the women, who remain at home with the children and the old people, and spend the time making winter clothing, moccasins, mittens, caps, etc., and in snaring rabbits, ptarmigan, and grouse in the vicinity of the village.

By the first week in November the country is well covered with snow and winter travel begins. The hunters return from the hills, and those who have been successful in killing moose, bear, or deer, after a short rest to recuperate from the effects of the hardships of the trail, set out again with their dog teams to bring in the meat which meantime has been left cached in the woods. It frequently happens that the entire family will accompany the successful hunter on the return trip for game, and if there is a large quantity of it the party will probably make a temporary camp at the cache and spend a week or more feasting off the product of the hunter's skill, and will not return to the river until driven to do so by the excessive cold weather of approaching winter. Although most of the drudgery of the camp falls to the lot of the women after the hunter has provided the food—and he does little else than sit in the tent and smoke and eat—the women seem to enjoy these outings, and invariably come back from them apparently in much better health and spirits than when they set out on the trip.

Soon after the fall hunt is finished the population of the winter villages is increased by the arrival of all the hunters, who now come in from the hills and prepare to pass the time as best they can until the dark days of midwinter are over and the season of spring hunting begins.

During the short days of December and January, when there is an



"JOE," A NATIVE GUIDE AND PACKER OF THE KOWAK RIVER.



TYPE OF YOUNG YUKON RIVER INDIAN GIRL, SHOWING INFLUENCE OF CONTACT WITH THE WHITES IN THE MATTER OF DRESS.

average of about four hours of daylight during the twenty-four, snowshoe trips are made by the Indians over the adjacent country hunting for grouse, ptarmigan, and rabbits, and looking after their traps which have been set to capture foxes, wolves, wolverines, otter, lynx, mink, and marten, which comprise the list of fur-bearing animals found in this region.

About the first week in February the days begin to lengthen appreciably, and the population of the winter villages begins to be gradually diminished by the departure at intervals of a few days of small hunting parties, consisting of one or two families, who now start out for the mountains on their regular spring hunt for moose, caribou, and other large game. The event is looked forward to with the greatest amount of interest by the entire community, and hardly any misfortune is considered as great by old and young alike as to be deprived of the pleasure which they all take in this great annual picnic. It is the last remaining trait of barbarism among these people, and when we see how eagerly they adopt other civilized customs and methods of living it is interesting to note the tenacity with which they cling to this purely savage mode of existence. The condition of the weather as regards the temperature is not a matter of consequence if other conditions are favorable for a start, and several cases came under our observation of men and women who were actually too sick to be able to walk, but who begged to be put on the sleds and hauled off to the hunting ground, maybe hundreds of miles away, rather than be left behind.

By the 1st of March the winter villages along the river are practically deserted and remain so until the succeeding fall. Occasionally a party of hunters will journey in from their camps with a sled load of moose or caribou meat for sale to the white settlers or to exchange it for supplies at the trading posts, but the Indians as a whole remain away from the river, hunting and trapping until the coming of warm weather in the spring melts the snow and the annual break-up of the ice-bound rivers occurs.

At the first appearance of open water in the small lakes and ponds which dot the lowlands of the river valley myriads of ducks and geese begin to arrive on their annual migration from the south, and the natives forsake the moose and deer grounds and begin to hunt the water fowl. Some of the families, however, remain in the mountains until the snow has entirely disappeared from the trails and travel by sled back to the river becomes impracticable. Under these circumstances they construct a boat by covering a roughly made frame with the skins of the animals which they have killed, and, choosing the most convenient waterway near their camp in the hills, they embark their entire outfit of camp equipage, sleds, dogs, and remains of the meat left on hand, with their families, in this makeshift vessel and float down with the current to the main river.

The winter houses are at this season uninhabitable by reason of dampness and mold, caused by long disuse and the melting of snow on the roofs, and for a few weeks the natives live in tents set up in some dry and elevated situation near the river bank and spend the time remaining before the opening of the fishing season in hunting muskrats in the open water of the small streams and lakes, and in getting their boats and nets ready for the expected run of salmon, which takes place immediately after the Yukon is clear of ice and the fish can come in from the sea.

When this takes place the natives again separate into small family parties, and, selecting some favorable locality along the river banks, they make their summer camps, set their nets, and spend the rest of the summer in catching and drying fish. Their principal article of diet at this season is fresh fish, to which is added later on quantities of wild edible berries, which grow in abundance in the region, and such articles of civilized food as can be obtained by trade or purchase from the trading posts. The surplus fish taken are dried on racks set up along the shores of the river and afterwards stored in caches ready for future use.

This, briefly stated, is the life of the Indians in pursuit of food throughout the year. It is extremely regular, and in spite of the rigors of the climate it is a healthy and comparatively easy form of existence, and on the whole the people are fairly prosperous and by no means unhappy. With an abundance of game in each season and with freedom from severe epidemics of sickness they are amply able to support life without assistance. But as they are exceedingly improvident and careless, any untoward accident which prevents them from pursuing their usual vocations almost invariably results in bringing on a period of suffering and distress.

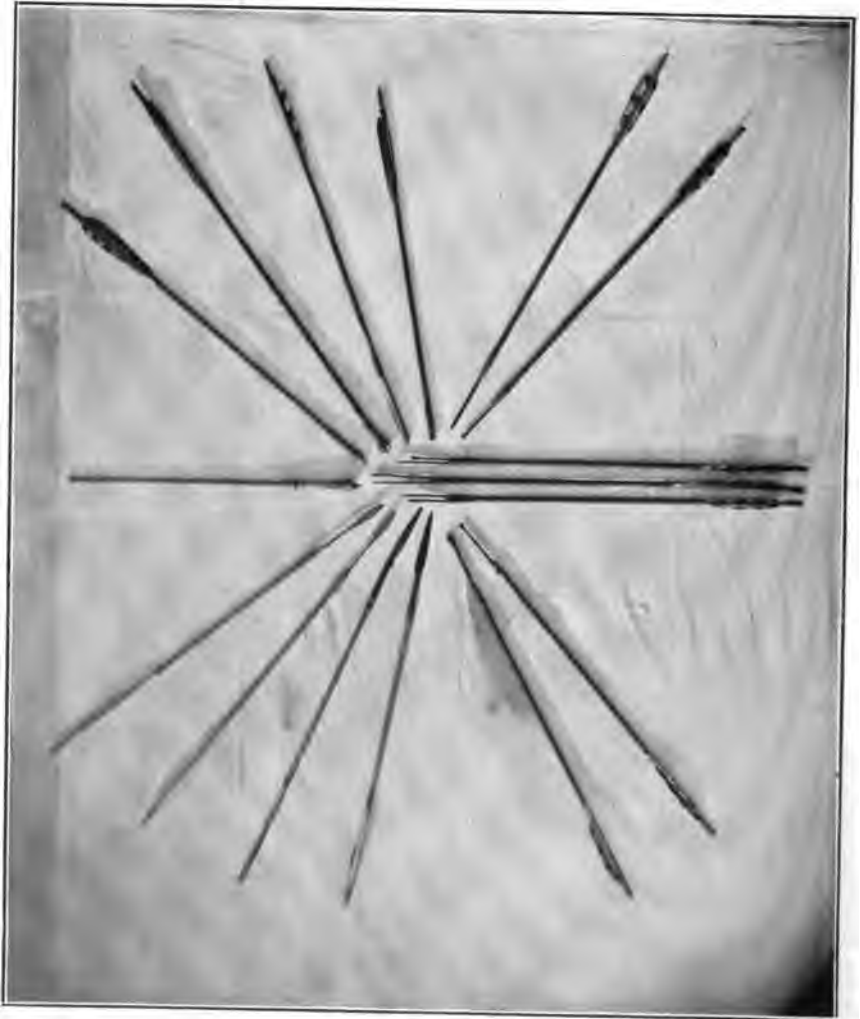
TRADING.

During the latter part of the summer and early part of winter the Indian women carry on quite a lucrative trade with the trading posts and passing white travelers in the sale of moose-skin moccasins, mittens, fur caps, and various other articles of winter clothing, and throughout the year the men sell their surplus fresh meat, fish, etc., wherever a market can be obtained. At the stores they receive for these articles sums varying in amount with the local demand, which may be paid in cash or, as is more generally the case, an equivalent in trade.

As a general thing the natives are shrewd traders, and soon learn the prices and quality of the various articles offered for sale or barter by the trading companies. The furs which the natives obtain by trapping are disposed of in the same way.



JOHN MINOOK, A HALF-BREED YUKON RIVER INDIAN, DISCOVERER OF GOLD ON MINOOK CREEK.



NATIVE-MADE ARROWS, YUKON RIVER INDIANS.

They are essentially honest as regards the keeping of contracts, but apparently do not consider it wrong to foist off on an inexperienced or unwary purchaser an inferior article for one that is supposed to be first class. They do not understand the laws of supply and demand, and a price of an article having once been fixed, becomes a matter of general knowledge in a remarkably short time, and it is very difficult to change. They are rather fond of going into debt, and the amount of material which they will take on credit is in the majority of cases only limited by the traders' discretion and judgment of the natives' ability to meet their obligations. During our residence in the country we were frequently called upon to advance supplies of food to the Indians living in our immediate vicinity, to be paid for at some future time by the delivery of fresh meats or fish, and it can be said to their credit they never failed to pay their debts.

They understand the use of money, and in disposing of their wares they usually demand a part at least of the purchase price in cash. Apparently this desire to handle money is not for the purpose of hoarding it, for as a general thing they end in spending the last cent they have obtained from the trader before leaving the store. Instances of the accumulation of money or wealth of any kind are comparatively unknown.

The prices at which the articles generally sold by the natives were fixed during our stay in the country were about as follows: Beaded moccasins, from \$2 to \$5; without beads, \$1.50. Fur caps, from \$2.50 to \$10, according to the quality of fur used. Mittens, from \$2 to \$10, according to the amount of beadwork put on them. Dog moccasins were held at 50 cents each, and any other work which was done by the women in the way of repairs usually was charged for at the rate of about \$1.50 per day for labor and material. Fresh meat sold by the hunters brought from 50 cents to \$1 per pound; grouse and ptarmigan were 25 cents each. Dried salmon cost on the average 25 cents each, but when there was a scarcity of the article the price rose to 50 cents. Native-made snowshoes were from \$8 to \$12; birch-bark canoes cost from \$5 to \$15, basket sleds from \$20 to \$30, and fur robes were held at prices varying from \$15 for one made of muskrat or rabbit skins to \$50 and \$75 for a first-class one made of red fox or wolf skins.

The prices asked by the Indians for their furs were generally about the same as those for which similar articles can be purchased in the States for cash. For instance, a wolf skin was valued at from \$6 to \$8; martin from \$2 to \$6, according to quality; red fox, \$2 to \$3; lynx, from \$2 to \$4; bear, from \$8 to \$12; muskrat and rabbit skins sold for 25 cents each, and silver-gray fox, which is the most valuable of all the furs found in the country, commanded a price of from \$75 to \$200.

From the above it will be seen that, even at the high rate at which goods are held by the trading companies, the prices paid for the products of their labor are such as to furnish the natives with ample means of support if they could be taught to practice only the simplest methods of economy, and if they can be protected to a certain extent by law from the encroachments of the whites in the prosecution of their native employments.

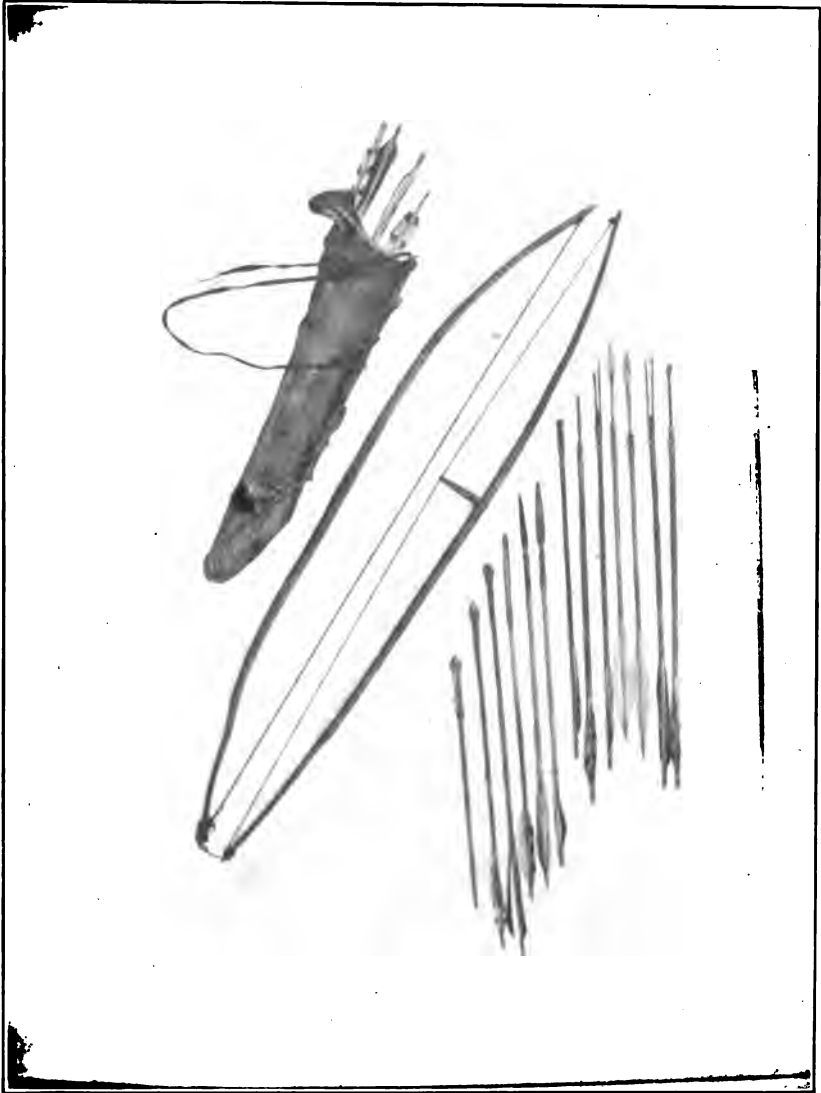
NATIVE MANUFACTURES.

One of the most noticeable features of native life in the Yukon Valley is the gradual substitution by them of articles of domestic use made by the whites for similar articles made by themselves previous to their contact with civilization. In this particular they differ in a remarkable degree from the Eskimos of the coast, who still cling in a large measure to their original methods of living.

Among the articles of common use which experience has shown to be best for use in this country, and which are still manufactured by the natives, the following are the most important: Snowshoes, canoes, basket sleds, toboggans, fish traps, bows and arrows, snares for small game, and paddles, which are made by the men; and moccasins, mittens, gloves, fur socks, caps, sinew thread, and rawhide lashing material called "remni" are the articles of principal manufacture by the women.

In the manufacture of snowshoes the men first make the frame out of half-seasoned birch and bend it into shape by lashing the two shoes together sole to sole and then forcing the front portion of the shoes outward to the desired angle by means of a wedge-shaped block of wood and then allowing them to dry over a moderately hot fire or by hanging them overhead in the house near the stove until they will retain their curved shape. The women then take the frames and "string" them with deer sinew and fill in the foot space with remni. The forward and back sections of the shoe are filled in with a very fine mesh made of twisted deer sinew, and when completed it is as tight as the webbing of an ordinary tennis racket, but much finer. The square space in the middle section of the shoe is filled in with a much coarser netting of heavier material made of rawhide, and finally soft-tanned moose hide foot lashings are added and the shoes are ready for use. With the exception of snowshoes all other articles of native manufacture are made separately by the men or women, as above stated.

The beadwork of the native women is not as fine as that of some of the Indian people living farther south, and the designs are as a rule simple reproductions of conventionalized flowers or plants, and except in the matter of selection of colors of the beads used show but little variation or originality. In doing this kind of work the women first



NATIVE-MADE BOWS, ARROWS, AND QUIVER, YUKON RIVER INDIANS.



NATIVE-MADE GLOVES, MITTENS, MOCCASINS, ETC., YUKON RIVER INDIANS.

cut out a pattern of the design from a piece of stiff paper or cardboard and lay it down on the smooth surface of the moose skin, and carefully trace the outline of the proposed design on to the skin with a pencil or small piece of charcoal, after which the design is filled in by sewing on the beads. In some cases a considerable amount of skill is shown by them in getting the parts of a design in well-balanced order and symmetrically placed, and there is a wide variation in the amount of skill manifested by individuals in the work of sewing on the beads, but on the whole their work shows lack of artistic instruction in the making of designs and carelessness of execution in the work itself.

In sewing, the women invariably use what is commonly known as the "backstitch," and work in an opposite direction from that to which we are accustomed, but although at first it appeared to us as being an awkward method of working, and we attempted to show them how white women sewed, while they were always very much interested, they could not be induced to change, and with later knowledge of the quality of the work they did we came to the conclusion that one way was as good as another as long as the object to be accomplished was equally well performed.

The preparation of the moose hide for the manufacture of the several articles of domestic use falls to the lot of the women entirely. After being removed from the animal the skin is first allowed to soak in water and is then rolled up and allowed to sweat until the coarse hairs can be readily removed. Next it is scraped on the flesh side of the hide until the remaining hair and under fur can be plucked out, and after this is done the skin is hung over a pole set up in a horizontal position and is thoroughly scraped with a round-bladed knife or bone scraping implement. When the skin is soft and pliable it is tanned by smoking it over a smudge fire made of decayed wood, which causes it to become a delicate straw color, and it is then ready for use in the manufacture of moccasins, mittens, gloves, etc.

The art of tanning by the use of acids is not practiced by these Indians at the present day. The only way in which they preserve their fur pelts is by drying them in the sun.

Birch-bark canoes are made by covering a lightly constructed frame with strips of birch bark, which have been previously soaked in water to render them pliable, and sewing them to the frame with a kind of lashing stuff made from the inner bark of spruce or willow trees. The seams are made water-tight by applications of melted spruce gum. Baskets made of grass and a kind of twine made by twisting together the young roots of spruce and willow trees are still to be seen on the lower river, but in the upper portion of the stream where birch bark is obtainable the natives do not practice the art of weaving baskets at all.

Their fishing nets are made of cotton seine twine purchased at the trading stores, the floats being made of wood and the sinkers of stone wrapped in birch bark or secured to the nets with twine. The natives still hold to their original methods of making their toboggans and one form of sled, locally known as a "basket sled," which has a light frame held together by means of rawhide lashings and is much lighter and better for ordinary use than the more rigid and heavier sled made on the outside and imported into the country by the whites. The latter sleds are, however, better suited for the transportation of heavy loads, and are coming into more general use with each year's improvements, which are being made in their construction to suit them to local conditions.

CONCLUSIONS.

In the manufacture of the several articles used by them the natives show a considerable amount of structural skill in the handling of materials, and readily acquire the use of mechanical tools. The ordinary saw, plane, hammer, files, and chisel have been almost universally adopted by the men, and the women use scissors instead of their native knives for cutting out their work, and sewing machines are rapidly coming into general use. The use of measuring rules, squares, and levels is not so common, and in the construction of their houses the lack of knowledge of the use of these tools is seen in the rather poorly finished joints of door and window frames and, in fact, wherever exact measurements are required to finish a piece of work in a workmanlike manner. The readiness with which all these people learn the use of tools and the anxiety they display to acquire this knowledge would seem to make it highly desirable that some means be taken by the Government to give them the necessary instruction in manual training. The mission schools are not sufficiently well equipped for this purpose, and it would be a matter of trifling cost to the Government to place at each of these institutions a small but complete outfit of tools and all the equipment necessary to carry on the work of instruction of the pupils. I would also recommend that the same sort of help be extended to the native women, so as to enable them to learn the art of basketry, of which they are at the present time comparatively ignorant, but which would undoubtedly furnish them with a most profitable means of support. Unless the natives are taught some such forms of industry, it is feared that the day is not far distant when they will lose their identity as a people and become a community of paupers and beggars, as almost every field of labor which has in the past yielded them a means of support is being filled up by the more energetic and better equipped white population, which is steadily on the increase. The Government owes it to these



TYPES OF WOVEN BASKETS MADE BY ESKIMO WOMEN OF THE LOWER YUKON.



TYPE OF SUMMER INDIAN DWELLING AND CACHE, YUKON RIVER.

people, first, to protect them as far as possible from competition in the fields of labor which are their natural heritage, namely, in the pursuit of game and the fur-bearing animals of the Territory; and, second, to extend to them the benefits of our educational system, especially on the lines of manual training. If, in addition to this form of help, the laws governing the intercourse between the Indians and whites are strictly enforced, I believe that the condition of these simple and harmless people will be vastly improved, and that ultimately they will be raised to a high plane of civilization, and instead of becoming a source of annoyance and trouble they will be a blessing and a help in the upbuilding of the Territory.



TYPE OF INDIAN WOMAN OF THE YUKON VALLEY.

CHAPTER II.

LANGUAGE.

DIALECTS.

The language of the Indian inhabitants of the Yukon Valley is composed of numerous dialects more or less similar in construction, and an examination of the several vocabularies (vide Appendix D) will show that most of the words in common use are so much alike that there seems to be little reason for doubting the theory of a common origin. Verbal variations and the introduction of foreign words in certain localities have, however, made such changes in the original language that at the present time each well-defined section of the river has its own dialect, which as a general thing is not thoroughly understood by the natives of the other localities.

Roughly speaking, the river region may be divided into six linguistic districts, which, beginning at the mouth of the river for the sake of convenience, may be enumerated as follows:

The first district is that part of the river from the coast to the head of the delta, and its upper limit is in the vicinity of the Russian mission. Within this region the Egomute dialect of the Eskimo language is used, and in spite of the fact that these people have for centuries been in close contact with the Indians of the interior while carrying on their intertribal traffic, their language has remained unchanged, and even at the present time the services of an interpreter is needed when the two tribes meet to transact business. After leaving the lower portion of the river the language of the Eskimo entirely disappears and is replaced by successive forms of the native Ingalik or Indian tongue. The second linguistic district may be said to begin at Koserefski and extends to Anvik, the third from Anvik to Nulato, the fourth from Nulato to Tanana, the fifth from Tanana to Fort Yukon, and the sixth from Fort Yukon to the international boundary line.

With the exception of the language spoken by the Eskimos of the delta region, the several native dialects of the river are undergoing the process of gradual assimilation, more rapid during the last decade on account of the more constant communication between the different tribes, and in the course of time a form of speech will doubtless be

adopted which will be common throughout the region. This will probably take place before English is generally adopted as the language of the natives, as it has been observed that they seem to prefer to use their own language when conversing among themselves, although all of the parties to the conversation may understand English perfectly.

The grammatical construction of the Indian dialects is very complete, and I have been informed by Father Ragaru, at Nulato, and Mr. J. W. Chapman, at Anvik, both of whom have devoted years of study to this subject, that the verbal variations of the native language are sufficiently complex to express even the finest shades of meaning. Our own experience while in contact with the Indians at Dall River, while not long enough to enable us to do any more than acquire the use of a limited vocabulary and a few phrases to express simple ideas, still showed us that in conversing with each other the Indians never seemed to lack words to express their ideas on any kind of subject. This was particularly noticeable when they were engaged in looking over our stock of magazines and listening to the explanations given in English of the various subjects therein illustrated, and in noting the apparent ease with which these explanations could be translated by some of the Indians who understood English to the rest of the party. This is rather remarkable when the extent of the field of information which was covered by this means is considered. Some of these impromptu language lessons extended over a period of several hours, and I very seldom heard the interpreter make use of an English word to express his meaning when he was engaged in the work of translating into the Indian dialect what was read or spoken to him in English.

The sound of the native dialects is not at all unpleasant or harsh. In fact in some cases, as, for instance, in their songs, it is distinctly musical. The native dialect at Dall River was rather difficult to acquire on account of the many elided sounds, particularly of the letters n, l, g, and m. The sounds of the letters m, b, and v were frequently confused, and it was found that different members of our party who sought to acquire a correct pronunciation of the Indian words were frequently at variance with each other as to the proper pronunciation of certain words in which these letters occurred. It is probable that the Indians themselves used the sounds of m and b indiscriminately. Our efforts to properly pronounce some of the native words was a never-failing source of amusement to the Indians, and in the case of a particularly hard combination of semi-elided sounds and gutturals, which sometimes barred the way toward linguistic progress, the children at the village took delight in a constant repetition of the difficult word or phrase whenever we chanced to visit their houses, and were highly entertained by our efforts to imitate their pronunciation.

The language of the natives of the interior is an inflective one, and



TYPE OF INDIAN DWELLING IN THE VICINITY OF THE WHITE SETTLEMENTS, YUKON RIVER.

in this way it differs radically from that of the Eskimos, which is agglutinative. This difference of form alone is sufficient evidence that the two forms of speech are of an entirely separate and distinct origin.

SIGN LANGUAGE.

Among the Indians living in the vicinity of our winter quarters, and with whom we were brought in contact, were several deaf mutes, and all communication between them and the other Indians was maintained by a system of signs which we soon learned to understand, and as the knowledge was general among the natives of the locality these signs were frequently made use of by our party to converse with the Indians when our stock of native words was found to be inadequate for the purpose. In fact, this system of arbitrary signs had come into such general use by the natives at this place that we found it more satisfactory in many cases to communicate our ideas and receive information by this means than to attempt to do so by means of verbal conversation.

Among the signs in general use by the natives of this community the following were noted as being the most important and generally used:

Sleep: Place the open palm against the side of the face, incline the head as if to rest it on the hand, and close the eyes.

Death: Grasp the throat with the thumb and index finger of one hand, place the other hand fully extended over the chest, close the eyes, and allow the lower jaw to become relaxed and fall to one side.

Hunger: Place both hands, with fingers just touching, over the pit of the stomach and press inward to indicate that the stomach is empty.

Fatigue: Grasp the muscles of the legs with the hands and with the compressing movement used in massage rub each leg alternately from the groin to the knee several times.

Pain: Touch the affected part with the tips of the fingers, close the eyes, contract the muscles of the mouth and eyebrows, and at the same time draw in the breath with a sibilant sound through the partially closed lips.

Pleasure: Slowly nod the head and smile.

Sorrow: Place the tips of the index and middle finger under the eyes and slowly draw them downward to the chin, at the same time slowly move the head from side to side.

Assent: Slowly nod the head.

Negation: Shake the head from side to side with a quick, energetic movement of dissent.

Do you understand? Touch both temples with the tips of the fingers.

I do not understand: Touch the ears with the tips of the fingers and give the sign of negation.

Salutation: Lift one hand above the head and wave it to and fro.

Caution: Lift one hand above the head, palm to the front, and hold it perfectly motionless for an instant.

Moose: Place the balls of the thumbs on the sides of the head above the ears and extend the fingers upward, to simulate the horns of the animal.

Caribou: Make sign for moose, then bring one hand held in vertical plane directly in front of and close to the forehead and drop it downward in a slight curve to the front, to indicate the shovel horn of the caribou.

Bear: Place the closed hands on the chest, flex the knees, and slowly turn the head from side to side.

Rabbit: Lift the hands, palms downward, with the thumbs close to the fingers and move hands forward and back through a slight curve in a horizontal plane, to simulate movement of the animal when running.

Dog: Hold both hands in front of body, palms down and thumbs close to the fingers, then move each hand alternately forward and back with a slight up-and-down motion, to simulate the movement of a dog trotting.

Fish: Hold one hand with the fingers in a vertical plane at the height of the waist and close to the body, then slowly move it forward in a sinuous line made by slowly flexing the fingers, to simulate the movement of a fish in the water.

Goose: Partly extend the arms with palms of hands down and simulate movement of wings of bird in flight.

Duck: Hold the hands at height of the chest and close to the body and simulate rapid movement of bird in flight by rapidly flexing the hands at the wrists.

White man: Grasp the chin with one hand and draw the fingers and thumb downward to simulate the action of a man in stroking his beard.

Indian: Pass the open hand over the face to indicate the absence of a beard and simulate action of depilation, which was a common practice among these people.

Indian woman: Make sign for Indian; then place the palms of the hands on the forehead, with the tips of the fingers just touching in the center, and draw them downward to the ears, to indicate the manner of arranging the hair by the native women.

Baby: Flex both arms to indicate manner of holding a child and slowly sway the body from side to side.

Steamboat: Hold the open hands in front of the body slightly overlapping each other; then give them a rotary motion to simulate the movement of a wheel turning.

Canoe: Hold the arms at full length close to the body; then swing



YUKON RIVER INDIAN BOY AND YOUNG MAN.



TYPICAL INDIAN FAMILY AND DWELLING.

them forward and back through parallel vertical planes to indicate the shape of the sides of a canoe.

To travel by canoe: Make sign for canoe; then simulate action of a person paddling first on one side then on the other of the body.

Snowshoe: Extend one foot and indicate outline of a snowshoe by moving the extended hands forward and inward until they touch in front of the foot.

Steel trap: Hold the hands vertically with palms together; then, still keeping the wrists together, open the fingers and bend the hands backward to indicate the appearance of a trap that has been set.

Native trap or deadfall: Hold the hands fully open in a vertical plane and place one across the other at right angles.

Far: Hold the hand at height of the eye with palm down; then slightly flex the fingers at short intervals to indicate movement of progression over distant hills.

Near: Hold the open hand in a vertical plane a short distance in front of the body; then move it several times toward the body with a short, sweeping motion.

Deep water: Lift the hand to the height of the eyes, with index and middle fingers extended downward; then move the hand downward almost to the knees and back again to its original position.

Shallow water: Hold the hand with palm down in front of the body and slowly move it in a horizontal plane from left to right several times.

A fathom: Place the hands together on the chest and then extend the arms outward horizontally as far as possible.

Snow or rain: Hold the hand palm down at the height of the eye; then simulate appearance of falling snow or rain by a fluttering motion of the open hand as it is allowed to descend to the height of the knee.

To see: Touch both eyes with the tips of the index finger.

To speak: Touch the tongue with the tip of the finger.

To hear: Touch one ear with the index finger.

To listen: Place the open hand behind the ear.

Tea: Hold the left hand palm up and slightly flexed; then simulate action of picking up some small particles in the palm of this hand with the fingers of the other.

Sugar: Hold the left hand partly closed to simulate a cup and use the index finger of the right hand to indicate the movement of a spoon in stirring sugar in a cup.

Butter: Hold the left hand in horizontal plane, palm up, and with the index finger of the right hand simulate action of spreading butter over the palm of the left hand.

In addition to the above signs, which is only a partial list of those in common use by these natives, they had many others which were

used among themselves when communicating with the deaf mutes, and which, for obvious reasons, were not always understood by us.

Written sign language: The total absence of anything like a system of written sign language is a remarkable characteristic of these people. In no way did I see any evidence of the employment by them of this means of communicating information. In this respect they are inferior to the Eskimo, who preserve records of their hunting trips, convey information generally, and to some extent perpetuate their legends and superstitions by means of graphic art in the shape of carvings and etchings. But aside from a few examples of the use of written characters learned by them in the mission schools, I observed nothing which would lead me to believe that the natives of the interior ever had any form of written language.



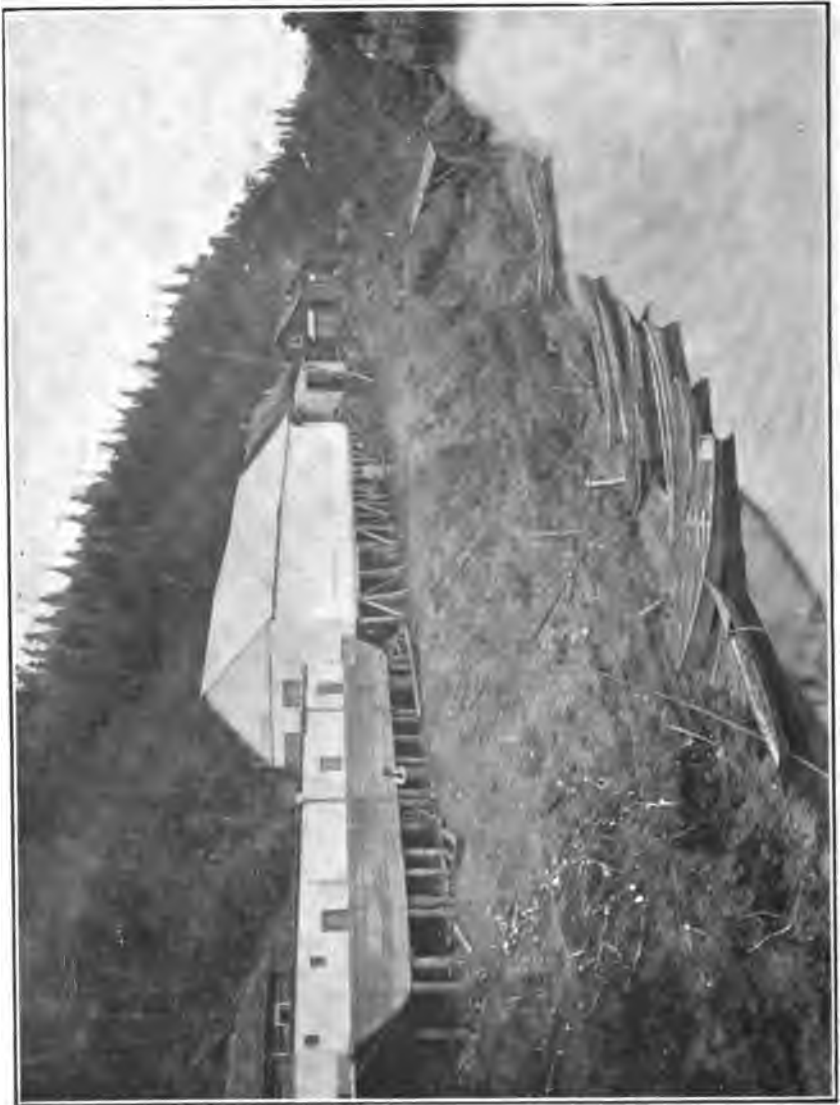
TYPICAL INDIAN DWELLING, YUKON RIVER.
The owners cache is shown on the right.

PART V.

EXPLORATIONS.

PAPER I. Reconnaissance of the Koyukuk River, Alaska. By Second Lieut. B. H. CAMDEN, R. C. S.

PAPER II. Reconnaissance of the Dall River-Koyukuk Trail. By Third Lieut. EUGENE BLAKE, R. C. S.



BETTLES TRADING POST ON THE KOYUKUK RIVER.

PAPER I.

RECONNOISSANCE OF THE KOYUKUK RIVER, ALASKA.

By Second Lieut. B. H. CAMDEN, R. C. S.

U. S. S. NUNIVAK.

Fort Shoemaker, Dall River, Alaska.

SIR: Herewith is inclosed a report of the reconnoissance of the Koyukuk River made by me in obedience to your orders of June 5; also, the names and conditions of the vessels boarded on that river and all the information pertaining to the mining region that I was able to obtain.

Very respectfully,

B. H. CAMDEN,

Second Lieutenant, Revenue-Cutter Service.

First Lieut. J. C. CANTWELL, R. C. S.,

Commanding U. S. S. Nunivak.

SIR: In obedience to your orders of June 5, I took passage on the Alaska Commercial Company's steamer *Leah*, Captain Young commanding, bound for the headwaters of the Koyukuk River, with passengers and freight from Dawson, Northwest Territory.

The following morning we stopped at Koyukuk Station, one of the company stations, 6 miles below the mouth of the Koyukuk, on the Yukon River, and loaded the vessel and two barges in tow with wood. Pilot Hastings and two Indians came on board to pilot the steamer up the river to her destination.

At noon we cast off and steamed up the Yukon, entering the mouth of the Koyukuk about two hours later. The first view of the river is disappointing, the water being muddy and the current sluggish, while the banks are low and marshy. After the first day, however, the surrounding country became more attractive and interesting, although the scenery does not equal that along the Yukon.

The second day after entering the river, June 8, we met the British steamer *Florence S.* coming down the river, returning from a trip to

Peavy, where she had landed passengers and freight from Dawson under the supervision of Special Custodian S. Pond. I hoisted a revenue flag, called her to the bank, and went on board. After satisfying myself that she had complied with the law, and upon receiving Mr. Pond's statement that he had no complaint to make, the vessel was allowed to proceed to Circle City.

On our way up the river we were forced to land two or three times each day to take on wood, which appeared to be scarce and piled in small quantities; hence we were unable to procure much fuel at one place.

June 10 we passed Arctic City, reported as having been the previous year the most populous and thriving camp on the river. Two vessels in winter quarters near there loaned their electric light plants to the settlement, so that the 200, more or less, inhabitants had their cabins and streets lighted by electricity.

The camp is now deserted; its departed glory and prosperous days are only attested by an array of 14 deserted cabins of fair size and structure.

Two hours later we arrived at Bergman, 5 miles above Arctic City, the metropolis of the river. At this point a store owned by the firm of Pickart & Bettles supplies the inhabitants of the surrounding country with provisions, etc. The population of Bergman is variable, but averages about 15 whites and 100 Indians.

The steamers *Victoria* and *Edith M. Kyle*, 15 tons, were tied up to the bank here, the latter vessel being out of commission. Upon boarding the *Kyle*, I learned that she had been bought the previous day by Pickart & Bettles, and was in charge of a licensed master, but that her papers had expired. Mr. Charles Pickart stated that the vessel had been inspected at Nulato the previous year by the Government inspectors, who had promised to send her papers by the first mail, which was then on its way to Bergman, but that it was not their intention to run the vessel, as they had purchased her for her machinery, which they desired for mining purposes. They requested permission to run her, light, up the river as far as possible and there gut her of her machinery. This I gave them permission to do, provided that only licensed men were employed to run the vessel and that they took no passengers or freight.

At 11 p. m. on the 10th instant, it now being broad daylight during the entire twenty-four hours, we cast off from Bergman and headed up the river, with the steamer *Victoria* ahead to act as pilot, her draft being but 20 inches, while the draft of the *Leah* was 5 feet. Although we were favored with an unusually high stage of water, yet, on account of the sinuous channel and many submerged bars, we grounded many times before reaching Peavey, 50 miles above Bergman, once remaining on a bar five hours, where we were forced to leave our

two barges. However, we landed at Peavey the next evening. The camp, consisting of some 15 to 20 cabins, is deserted, with the exception of the land office, which is occupied by Mr. Rose, the land commissioner. Peavey is 1 mile from the river on Peavey Slough.

While the *Leah* was taking on wood at the junction of the Middle and South forks of the Koyukuk, I visited Union City, situated on the south fork about 2 miles from the junction. The settlement, which is deserted, consists of several good, substantial houses and one sawmill.

After leaving Peavey our objective point was Bettles, the new station where Pickart & Bettles have a store, 28 miles from Peavey, up the Middle Fork of the Koyukuk River.

The river at Peavey had now narrowed to 150 feet in width, or less, with numerous short and sharp bends, while the current ran fully 6 miles an hour, making it almost impossible for the vessel to make any progress upstream and also rendering her most difficult to manage. For four hours we made strenuous efforts to stem the current—dashing from one side of the river to the other, smashing into snags and bars—but only made 5 miles. At last we reached a point where the river made an abrupt turn and the current increased, which proved our Waterloo.

We tied up to the bank to await the return of the *Victoria* from an expedition upriver to ascertain the depth of water, to make a reconnaissance of the channel, and to judge of the advisability of making the attempt to proceed farther with the *Leah* in case she succeeded in stemming the current. The *Victoria*, on account of her size and light draft, was able to make the sharp turns of the channel and also keep closer to the shore and avoid the swiftest water.

On June 13 the water dropped rapidly, leaving the *Leah* hard aground in 3 feet of water, her draft being, as I have mentioned, 5 feet.

The same evening a canoe came down the river with a message from Captain Hill of the *Victoria*, saying that the *Victoria* was stuck fast 15 miles up the river and unable to move. Captain Young then decided to make no further effort to reach Bettles, and notified the passengers, numbering 110, of his intention to land them, their effects, and all his cargo, consisting of 160 tons of provisions, on the bank where the vessel was then tied up.

This was accomplished the following day, the passengers putting up tents, so that by evening quite a village was standing on the shore. This settlement was called Youngs City, in recognition of the ability shown by Captain Young in reaching this advanced point on the river, many of the miners not expecting to get above Bergman, 56 miles below. From Youngs City it will be necessary for the miners to pole in small boats to their destinations, about 75 miles.

Mr. Bettles, owning the store at Bettles, from which station the miners procure their provisions and supplies, stated that their stock of provisions was very nearly exhausted at Bettles, there being only a sufficient quantity to last the miners then in the country until July 1 (about two weeks). In order to prevent this scarcity of food he requested that the *Dorothy*, a small steamer of light draft, lying about 22 miles above Peavey, abandoned and placed in his hands for sale, be allowed to transfer his stock landed by the *Leah* to Bettles. To this request I acceded, stipulating, however, that the vessel should only make the necessary number of trips to transport his cargo, and that they should not carry passengers for hire.

At midnight on the 18th instant the water rose rapidly, rising 2 feet in four hours, and floated the *Leah*. We cast off, but were obliged to back down the river below Peavey before the river widened sufficiently to permit us to turn the vessel's head downstream.

Stopping at Peavey, I boarded the American steamer *James Dietrich*, New York, laid up in charge of the land commissioner, Mr. Rose.

Just below Bergman the *Leah* cracked her shaft, and for the remainder of the trip was forced to steam slowly with the current.

A steamer built to be employed on the Koyukuk River should not be over 100 feet in length, with a draft of not over 2½ feet loaded, and should have extra rudder power. Provision should also be made for clarifying the water for the boilers.

The following vessels are laid up on the Koyukuk River: American steamers *Edith M. Kyle*, Boston, Bergman; *Dorothy*, Boston, 22 miles above Peavey; *Luella*, Chicago, 30 miles above Peavey, sunk—frozen to the bottom; *James Dietrich*, New York, at Peavy.

The American steamer *City of Paris*, owned and operated by the Alaska Commercial Company, is the only steamer plying on the Koyukuk at the present time.

THE KOYUKUK RIVER.

Upon entering the mouth of the Koyukuk River, after steaming up the Yukon, one is inclined to believe that the vessel has headed up a slough, for the water is muddy, narrow in width, and the current sluggish. However, notwithstanding its appearance, the river drains a large extent of territory, the area of which is approximately 30,000 square miles. Its course is constantly changing, frequently turning through 180° and heading in a parallel but opposite direction, so that the river is not only difficult to navigate, but very tedious to follow on account of the many sharp turns in the channel. At one point on the river (see Part 1, chart,) the river makes a 3-mile bend and the two channels approach within 50 feet of each other, only a narrow high-cut bank intervening. This is only one of its many similar turns, as a glance at the chart will show.

The width of the river varies from a quarter to a third of a mile at the lower end, widening to a half mile in a few places, and gradually narrows to 150 feet at Peavey, nearly 600 miles from the mouth.

The depth of water can not be relied upon, as the river is subject to many rises and falls during the summer, especially on its upper portion. I was informed by a man of experience that a vessel drawing 4 feet of water could safely count on reaching Bergman at any stage of the water. All that I can add to this information is that during low water no vessel drawing over 3 feet of water should attempt to go through the cut-off (Part II, chart), as the depth of water at either end will not exceed that. The water being high at the time we started up the river, the *Leah* went through the "cut-off," which I was assured was about 50 miles long, and cut off about 54 miles, or, in other words, the distance by the Suskita channel was 104 miles. Mr. James Adamson, C. E., a passenger on the second trip of the *Leah*, at which time the Suskita channel was followed, sketched the river and sent me his notes. From this data, after connecting the two channels, I find that the lengths of the cut-off and Suskita channel are 35 and 47 miles, respectively, so that while the percentage of distance saved by the cut-off is considerable, yet on account of the narrow and winding channel—the width of the cut-off being not over 150 feet—I am of the opinion that the Suskita channel is preferable for steamboats of any size, judging from the information and data sent by Mr. Armstrong.

The current in the lower part of the river is very sluggish, the strength varying from 1 to 2 miles per hour, but increases rapidly after passing through the cut-off until it has attained a velocity of 6 miles at Peavey.

The cut banks, some of which are glacier, as a rule indicate the channel. Generally speaking, to follow the channel a vessel must keep close to the cut banks and avoid the points.

One of the most noticeable features of the Koyukuk River is the formation of its bars, which are, almost without exception, composed of gravel, differing materially from those of the Yukon River, which are sand. Gold is reported to have been taken in quantities from some of these bars, the most noteworthy of which is Hughes Bar, near Mountain City, at the upper end of Part III, as shown in the chart, where it is said three men took out \$9,000 in one summer. As we passed the bar I saw the sluice boxes, but the camp was deserted. Considering the latter fact, I am inclined to believe the gold scales were inaccurate.

Mastodon Bank, or, as it is sometimes called, Stink Bank (Part I), is of glacial formation and seems to be the graveyard of quite a number of mastodons, for the natives have found many teeth and bones belonging to that animal, while in warm weather an unpleasant

odor (to put it mildly) pervades the atmosphere, due to decaying carcasses. It is probable that a herd of mastodons was overtaken by some disaster, the remains being preserved in the ice in which they are embedded and the carcasses becoming exposed from time to time by the current cutting into the bank during an unusually high water. I could not make a close examination of the bank, as we did not stop, but I saw a projecting bone, while the odor needed no closer investigation to prove its existence.

The timber along the river consists of spruce, birch, cottonwood, and willow. Below the cut-off the timber is of sparse growth, and consequently fuel is scarce, although this is probably due in some measure to the small number of natives living on the river and to their inborn reluctance to wield an ax. Cord wood is worth from \$10 to \$15 per cord. On the upper river spruce is more abundant, and fuel is much easier to obtain.

The principal tributaries along the navigable portion of the river are: On the right bank, the Manillaratsitah, Gissakakat, Cotillakakat, Hodatic, Dogitskakak, Hosyekakat, Little Hogatsikakat, and Hogatsikakat rivers; on the left bank, the Dulebekakat, Katillakakat, Kotachikakat, and the Batskakak rivers.

Upon comparison with the general chart of the Koyukuk River, I find that there is quite a difference in the names and locations of a few of the rivers. The Batskakak River, as pointed out to me by the native pilot, flows into the Koyukuk on the left bank, while the general chart shows it on the right bank of the river. The pilot also informed me that this river heads in the Melozikakat range of mountains, which is on the left bank. I have made no attempt to make the two charts agree and have spelled the names phonetically.

"Kakat," the termination of the names of most of the rivers, is a native word signifying "the mouth of;" thus, Dulebekakat means the mouth of the Dulebe.

The Koyukuk River skirts the Manillaratsitah, Malamute, Suskita, and Kowak ranges of mountains lying in the northwest and the Yukon Hills and Melozikakat to the southeast of the river valley. The elevations of these mountain ranges vary, approximately from 2,000 to 4,000 feet.

The Suskita Range has a cone-shaped mountain in its range which has a very sharp peak; this mountain is approached nineteen times by the river before it is finally rounded.

Red Mountain (upper end of Part III, chart) contains some iron formation from which its name is derived. The town of Bergman is painted with paint made from a mineral substance obtained from this mountain, and it is said to make an excellent red paint.

The low ground adjacent to the river is marshy and is dotted with lakes and sloughs, which are, in the open season, the homes of num-

berless ducks and geese; large game, such as bear, moose, caribou, and wolves, is plentiful, the caribou being most numerous in the country contiguous to the Melozikakat Range, entered through Spellacy Gulch (noted on Part III, chart).

No authentic reports of the discovery of quartz or coal along the navigable portion of the river have been received, although Pilot Hastings claimed to have discovered a coal mine about 3 miles above the mouth of the Batskakat River, on the right bank, which I was informed by other parties was not coal, but slate.

The ice breaks about the same time as the Yukon ice, but does not run out with any great force, I imagine, and so it would very likely be a good place to winter a vessel.

The natives along the river do not differ from the Yukon natives, except in their language. The total population residing on the river is not over 300. Fishing in the summer and hunting and trapping in the winter is their chief occupation and means of subsistence.

THE CHART.

In sketching the inclosed chart I have endeavored to make it as accurate as the instruments employed—viz, a watch, liquid compass, and a United States Coast and Geodetic Survey sketchbook—would permit.

The distances are calculated from the revolutions of the wheel, making due allowances for the depth of water and the current, which I observed frequently.

The sketch is, however, sufficiently accurate to enable anyone with a knowledge of river navigation to follow the channel, providing it has not shifted, and avoid the larger shoals and obstructions to navigation.

The map is drawn to a scale of seven-eighths of an inch to 1 mile and shows the channel followed by the *Leah* and its magnetic bearings, the natural bends of the river, the names and mouths of its tributaries, the names, approximate positions, and distances of the adjacent mountain ranges and lakes, the prominent landmarks, the location of all points obstructing or dangerous to navigation, the distances between all points on the navigable portion of the river and their distances from the mouth, the names and locations of the various settlements along the river, including deserted mining camps and Indian villages, the comparative quantity and kinds of timber, the location of wood yards, the width of the river, the depth of the water in shoal places, and the strength of the current.

The notes and information concerning the country were gathered from Mr. Hastings, pilot (to whom I am much indebted), the Indian pilots, and the experienced miners on the river.

Table of distances.

[From mouth of river through the Cut Off channel—add 12 miles to obtain the distance by way of Suskita channel.]

	Miles.
"A" (sheet 1, break in river)	139
Whirlpool (sheet 1)	196
Cut Off (sheet 2, lower junction)	240
Cut Off (sheet 2, upper junction)	275
Hog River (sheet 2)	300
Batskakat River (sheet 3)	374
Argonaut City (sheet 3)	422
Mountain City (sheet 3)	457
Arctic City (sheet 4)	498
Bergman (sheet 4)	504
South Fork Junction (sheet 4)	556
Peavy (sheet 4)	560

Total length of river by chart, 572 miles via Suskita channel.

THE KOYUKUK MINING DISTRICT.

The mining district includes all the territory lying north of Bergman and south of the Davidson Mountains, drained by the Allenkakat River and North, Middle, and South forks of the Koyukuk River and their tributaries. The accompanying chart and data were compiled from information received from one of the most experienced miners of this territory—a man who has considerable interests in the country and is thoroughly familiar with the explored portion of this region.

The "prospects" here given were found previous to or during the spring of 1900.

The Davidson Mountains extend from the headwaters of the Kowak to the Mackenzie River, their elevation being from 3,000 to 7,000 feet. North of this range no mineral indications have been discovered, although a few miners crossed the range last summer to explore and prospect the valleys of the Colville River and its tributaries. Along the southern border of these mountains is a clearly defined channel; its surface is of washed gravel and its elevation about 400 feet. This washed gravel has been traced from Rapid City, on the Allenkakat River, to the North Fork of the Koyukuk, where it is subdivided into four divisions, as shown by the dotted lines on the chart.

A careful study and examination of this peculiar formation has led to the general adoption of the theory that the now elevated channel once formed the bed of a river, changed by some upheaval of the earth. From its general direction it is believed to have flowed into Bering Sea near Cape Nome, the new gold field of Alaska.

Most of the prospects found and most of the development work performed have been in this channel.

The following creeks and bars have been prospected and worked to some extent:

Tributaries of the Allenkakut River.—On Rocky Bottom Creek a 75-cent nugget was found. Also good prospects on Sudden Creek. The Little Malamute River, Rocky Bottom Creek, and Dead Dog Creek have not been prospected or even explored at their headwaters, which rise near the center of the district.

Tributaries of the Middle Fork.—On Wild Creek good prospects were found running from 1 to 2 grains of platinum to 15 grains of gold. Bettles has a coal mine on this creek. Tramway Bar is a high point in the washed gravel channel, and the latest reports are that Bettles is extracting considerable gold with a hydraulic plant. On Myrtle Creek 200 men were at work last summer making good wages. Slate Creek is also considered good property and is being developed. The amount of gold taken from these two creeks is unknown. Two Swedes jumped "No. 9," Myrtle Creek, and, it is said, took out \$5,000 before the return of the owner. Later this claim was abandoned, as the pay streak ran into a glacier.

Tributaries of the North Fork.—Alder and Florence creeks are being developed; the prospects found considered good enough to warrant the work. Bettles has a quartz claim on Chicken Creek.

Tributaries of the South Fork.—Gold Bench and Eagle Cliff bars are similar in formation to Tramway Bar. Development work last summer showed 6 cents to the pan. On Davis Creek 10 cents to the pan was found before reaching bed rock, but was abandoned on account of the scarcity of food.

In June, 1900, the number of miners at work on these creeks was estimated to be 360. This number was probably increased to 500 during the summer. The result of their work is not yet definitely known, although very encouraging but not thoroughly reliable reports have been received from there this winter, and many parties have started from Fort Yukon by the Chandeleur route to verify them.

The great obstacle to be overcome by the miners of this district is the scarcity of food and other supplies. Up to the present time the Alaska Commercial Company is the only company that has made an effort to supply the miners of this district with provisions. On account of the remoteness of the gold-bearing creeks, the nearest source of supplies, Bettles, is some 75 miles away. The cost to the Alaska Commercial Company of getting these provisions to this station is enormous, and hence flour, bacon, and the actual necessities of life must not only be hauled 75 or 100 miles by the miner to his camp, but can only be purchased for an enormous sum.

As soon as this obstacle is removed it is possible that the Koyukuk mining district will rank with any of the gold fields known in Alaska at the present time.

Respectfully submitted.

B. H. CAMDEN,
Second Lieutenant, R. C. S.

First Lieut. J. C. CANTWELL, R. C. S.,
Commanding U. S. S. Nunivak.

PAPER II.

RECONNOISSANCE OF THE DALL RIVER-KOYUKUK TRAIL, ALASKA.

By Third Lieut. EUGENE BLAKE, R. C. S.

U. S. S. NUNIVAK,

Fort Shoemaker, Dall River, Alaska.

SIR: I have to submit the following account of the proceedings of the expedition from this vessel, for the exploration of the Dall River trail, during the months of January and February, 1900.

In accordance with your verbal instructions the expedition left the *Nunivak* about 9 a. m. on the morning of January 11, all preparations having been previously made. First Assistant Engineer H. N. Wood, R. C. S., of this vessel, and myself made up our party, and accompanying us were Messrs. Godley and Dyer, two prospectors bound for the Koyukuk, who had been stopping aboard for several days. It was intended that we should travel together and be of mutual assistance to one another in any difficulties that might arise. None of us had ever been through this part of the country before, but as much information as possible had been obtained from the natives in this vicinity, and as there had been considerable travel over the trail during the early winter, little trouble was anticipated in being able to follow it.

The outfit, which was limited to such articles as were absolutely necessary, consisted of an ordinary amount of camping gear—tent, cooking utensils, Yukon stove, etc. (the stovepipe being fitted to telescope and stow inside the stove, together with the cooking utensils), a sleeping robe apiece, one sack of extra clothing each, rifles, shotgun and ammunition, two pairs of snowshoes, and provisions for two men and five dogs for twenty-one days. The different articles of provisions were each placed in a separate sack, made for the purpose, and the whole stowed in a mess chest made to fit the sled. A small pocket compass, an aneroid barometer (pocket), and a thermometer were the only instruments taken. The weight of the sled when loaded was about 450 pounds.

After five hours of exceedingly heavy traveling over a rough and crooked trail, we are compelled to camp on account of darkness, at a point not more than seven miles from the ship. One of the steering handles of the sled had been broken off soon after the start, in consequence of the heavy heaving to which it had been subjected; and the sled was otherwise badly strained. Mr. Godley reported soon after camping that he had broken a runner during the day, and that it would be necessary for him to return to Dall River for repairs before he could proceed farther.

The following morning was cold, the thermometer having fallen to 46° below zero. The day was spent in making such repairs to the sled as were possible with the tools and materials at our disposal.

The thermometer showed a temperature of 56° below zero the next morning, January 13, and in view of this extreme weather it was deemed best not to break camp. Not wishing to remain idle, however, and since we had found our load rather bulky for the size of the sled, about 150 pounds of provisions were gotten together and conveyed to a point 10 miles out the trail and there cached. Mr. Godley returned with his sled to Dall River.

On January 14 the cold weather showed no signs of breaking (thermometer, -55°), and I decided to return to the *Nunivak* with the sled in order to replace the provisions that had been consumed during this unlooked-for delay. Upon my arrival at the ship I reported to you what had been done, and received your orders to return to camp the next morning, secure the tent and cache the supplies, and to bring in the whole party to await some change in the weather. This was accordingly done, and at 5 p. m. on January 15 the party returned to the *Nunivak*.

On January 16, 17, and 18 the coldest weather of the winter was experienced, the thermometer never getting above -52°, and reaching a minimum temperature of 63° below zero.

The weather broke on the 19th instant, and on the 21st Mr. Wood and I left the vessel at 9 a. m. with four dogs and the empty sled to pick up our camp and proceed with the expedition. Mr. Godley and his partner had in the meanwhile become discouraged by the recent unfavorable reports of the Koyukuk country, and had brought in their outfit and departed in another direction.

We experienced the same difficulty in keeping the trail as we had on our first start, and on the morning of the second day out rigged a "gee pole" to the sled. This is a sort of shaft lashed to the sled and by which the sled is steered; one man being harnessed ahead with the dogs. It is in general use in this part of the country, and we found that it greatly facilitated the handling of the sled.

On the morning of the third day after leaving the *Nunivak*, we reached the point where the trail crosses the Dall for the first time

after leaving its mouth. Between the mouth and this point we had followed, in a general north-north-westerly direction, a system of lakes, 13 in number, separated by distances varying from a few hundred yards to 2 or 3 miles. The trail from lake to lake is generally well blazed and easy to find, there being enough timber to prevent its drifting badly. After crossing the Dall the trail again follows a succession of small ponds and sloughs, too numerous to be taken into account, which finally end in a large lake, on the right of which the first foothills commence to rise. The course of the Dall can be easily traced on the left by the dense growth of timber along its banks.

The whole region between the river and the large lake is evidently dotted with hot springs. We passed quite a number, the water from which had glaciated over the trail, forming a slush under the snow wherever it could gain its covering, but, of course, freezing where exposed. I noticed the same effect produced by the overflow of water near the heads of streams, and we were inconvenienced not a little by this later on. The most remarkable of these springs had formed, where it crossed the trail, a stream about 6 feet in width, and registered a temperature of 40° above zero, although there was no appreciable current and notwithstanding the recent severe weather to which it has been subjected. The source of this stream was evidently at some distance. The end in sight disappeared under the snow, which had formed a natural bridge over it, and the other wound its way through a dense growth of willows toward the foothills on our right. As such phenomena are common in high latitudes, I did not consider it necessary to investigate further.

About 5 miles beyond the large lake the trail again descends into the bed of the Dall and follows it for a little over a mile. After leaving the river we commenced to ascend a low divide, or, rather, sidehill, and on the other side of this we again crossed what we took at the time to be the Dall, but subsequently proved to be the right or north fork of that river. At the top of the divide mentioned we had come to a point where the trail forked, and had followed the one which showed the latest signs of travel. It happened that the expedition that had preceded us had taken the wrong trail, and we naturally made the same mistake. They had been good enough, however, to leave some signs in the trail, and on reaching these we immediately saw that something was wrong and camped to investigate.

The next morning, January 25, we spent in locating ourselves, and it was not until late in the afternoon that we had made sure of our position. Feeling reasonably certain that we were on the north fork, and as it had been included in my orders to look into this creek on my way back from the main divide, I decided that it would be best to finish this matter at once, being already a number of miles upstream and a day's travel from the main trail.

January 26, 27, and 28 were devoted to exploring this creek. We found a number of prospectors' holes on the right-hand branch (see chart) and some traces of quartz and ruby-bearing rock, but had no means of ascertaining anything definite. At the "forks" of the other branch we found two prospectors. They were not very enthusiastic over their winter's work, and intended to return to Fort Hamlin as soon as they reached bed rock in the hole they were then sinking. We obtained from them what information we could regarding the Koyukuk trail, and confirmed our supposition that the side trail on the divide was the correct one.

On the morning of January 29 we set out to return to the main trail, intending to follow the north fork until we should strike the Dall proper, but we were prevented from doing this by the water which had glaciated over the ice, and were finally compelled to back track and take the side trail down the divide.

The main trail, after leaving the north fork, follows the bed of the Dall, making only a few portages. We were inconvenienced very much by water and our progress was slow. At a number of points the trail forked, and some time was wasted in each case in determining which was the right one. Four days after leaving our camp on the north fork we entered what is known as the "Box Canyon" of the Dall. The name is misleading, there being nothing in the nature of the surroundings to warrant the designation "canyon," the place itself being merely what is locally known as a "draw" in the hills. At the entrance of this so-called canyon the river divides, forming an island about a mile in length, on which are two cabins formerly occupied by prospectors. The water was very much in evidence all along the trail above this point, but the cold snap of the night of January 31 had made it passable in most places. At 1.30 p. m., having traveled up this draw about 8 miles, we reached a cabin, the fourth since entering the "canyon" and last on this side of the divide, and decided to camp there for the night and go the remaining 13 miles, which we estimated separated us from the top, in the morning,

The next morning, February 2, as soon as it was light enough to see the trail we started out on snowshoes, leaving our outfit secured in the cabin. The day was comparatively warm (thermometer $+5^{\circ}$), with a strong easterly wind, which increased as we got above the timber line to a strong gale, whirling the snow in clouds and thus making any observations of the country through which we had passed impossible. About 11 a. m., having reached a point within a mile or two of the top, we were both suddenly made to realize what would have to be faced to return to camp by being almost simultaneously knocked down by the wind. We then decided that it would be unwise to proceed farther, particularly as nothing more could be seen than from our present point of observation. We climbed the side of the gulch on our left,

hoping to get some general idea of the lay of the mountains, but could see nothing of importance. The aneroid showed an elevation of 900 feet above our last camp, and from subsequent comparison with the instrument on board, an elevation of 1,500 feet above the Yukon at the mouth of the Dall.

There was still a strong breeze the next morning, with every appearance of another stormy day, and as our provisions were not sufficient to allow us to wait for better weather, to make another attempt, we set out for the *Nunivak*.

The return trip was without incident worthy of note. We had become by this time hardened to the unusual exertions necessary to "mushing," and had gained some knowledge of how to travel and handle a sled. Knowing the character of the ground ahead of us, we were able to travel longer than we otherwise would have done, and we reached the ship on the evening of February 5, three days after leaving our camp in the cabin at the head waters of the river.

The weather throughout the trip had been comparatively good. We had been bothered by snow a little at times, but the day on the divide was the only one that could be complained of. The thermometer had ranged from a few degrees above zero to 50° below.

No large game whatever was seen. Ptarmigan were plentiful, and enough were shot from the trail while traveling to furnish fresh meat for ourselves and dogs every day. Several coveys of grouse were seen, and a few shot.

A chart of the trail is at present in preparation, and will be submitted to you as soon as it is finished.

Very respectfully,

EUGENE BLAKE, JR.,
Third Lieutenant, Revenue-Cutter Service,
in Charge of Expedition.

First Lieut. J. C. CANTWELL, R. C. S.,
Commanding U. S. S. Nunivak.

PART VI.

REPORT

OF THE

MEDICAL OFFICER OF THE U. S. STEAMER NUNIVAK,

YUKON RIVER, ALASKA,

MADE UNDER THE DIRECTION OF FIRST LIEUT. J. C. CANTWELL,

R. C. S., COMMANDING.

BY

Surg. JAMES T. WHITE, R. C. S.

1901.

PAPER III.

REPORT OF THE MEDICAL OFFICER U. S. STEAMER
NUNIVAK.

By Surg. JAMES T. WHITE, R. C. S.

U. S. S. NUNIVAK,

St. Michael, Alaska, September 30, 1901.

SIR: In obedience to verbal instructions, I respectfully submit the following report for the year ending June 30, 1901, taken from the records of the dispensary as kept on this vessel.

Respectfully, yours,

JAMES T. WHITE,

Surgeon, Revenue-Cutter Service.

First Lieut. J. C. CANTWELL, R. C. S.,

Commanding.

SIR: Upon the arrival of the U. S. S. *McCulloch* at St. Michael, June 25, 1900, in obedience to Department orders (dated May 21, 1900), I reported for duty on board this vessel, and the following day relieved my predecessor, Dr. H. E. Pratt.

Everyone on board was busy attempting to restore order out of the confused mass of provisions and ship chandlery that had been dumped on our decks from the cutters bringing our supplies. This, with the granting of discharges and shipping new men, kept all hands well occupied until the vessel was placed on quarantine duty.

In the latter part of June of 1900, during the height of the rush to Nome, two vessels arriving there from Seattle, the *Oregon* and the *Ohio*, were found to have smallpox on board. The passengers on the former vessel were landed before the fact was discovered, but the latter vessel was detained by the authorities and three of the passengers, who showed symptoms of the disease at the time, were placed on Egg Island. The vessel, with the remaining passengers on board, was kept in quarantine until all danger of other cases developing had passed. Egg Island, where the smallpox patients were placed, is a

small rocky islet in Norton Sound, some 10 miles from St. Michael. Here a camp of tents was established and placed in charge of a physician. Within a week following the arrival of the last-named vessel smallpox appeared in the town of Nome.

At this time numbers of people, disappointed with their prospects, were returning to St. Michael on their way to the several places on the Yukon River, and, the reports from Nome becoming so alarming, it was feared the disease would be brought to St. Michael and from here spread to the interior. Should smallpox once have become established on the river, with the then existing complications of measles and influenza, it would have swept the Yukon Valley like wildfire, and not only would the natives have suffered, but also the several mining camps of white people. To prevent any such spreading of this disease, the general commanding the Department of Alaska, by order (July 2, 1900) established a quarantine against all vessels from Nome and all other points on the coast to the westward. The army authorities at this time having no boat which could be utilized to efficiently board incoming vessels, the commanding officer of the *Nunivak* tendered the services of his command to General Randall for this duty, and his offer was accepted. The *Nunivak* was accordingly anchored in a position where all vessels or boats entering the harbor could be observed, and a constant surveillance and patrol of the port were maintained as long as the quarantine lasted. The steam launch of the *Nunivak* was used in boarding vessels and overhauling small boats, and when occasion made it necessary to lay the launch up for repairs it was replaced by pulling boats and by the Alaska Commercial Company's steam launch, which was kindly loaned for the purpose by the manager of that company.

At first the length of time that vessels were to be restrained in quarantine was left to the surgeon of this vessel, and was by him placed at fourteen days, but on July 21, by order of the General commanding the department, the time was reduced to eight days, just long enough to cause considerable inconvenience to commerce and insufficient to prevent the landing of smallpox. This order was met with a protest from myself, and which was sustained by the commanding officer of the *Nunivak*. Fortunately, however, at this juncture the disease had been so far controlled at Nome, and as no new cases appeared on the vessels detained at Egg Island, the quarantine was raised and the *Nunivak* resumed her usual duties.

At Nome the disease at first appeared to spread and at one time 18 cases were reported, but through the efficient and untiring efforts of the authorities there all fear of an epidemic was soon allayed, and no new cases having developed for some time, the quarantine against Nome was raised July 24. But in the meantime reports were received that smallpox had appeared in Dawson, Y. T., among people arriving

from the States via Skagway, whereupon all boats from up the river were ordered to be inspected. Only one vessel from this point was boarded, the steamer *Cudahy*, having on board a number of people belonging to a variety troupe bound for Nome. Her bill of health showed that the Dawson authorities were taking all precautions necessary, so on the evening of July 25 quarantine against all points was raised and pratique given to all vessels.

The quarantine had existed twenty-four days, and during that time all vessels entering St. Michael Harbor, 39 in number, were boarded, and 21 of these were detained at Egg Island. The first vessels to arrive from Nome after the establishment of the quarantine were crowded with passengers, and all were clamorous to get ashore. No one, however, was permitted to land, and all communication with St. Michael was absolutely forbidden. No smallpox appeared among those detained on the quarantined fleet and none was reported in the town. There was but one suspect case, which was soon proven to be measles. All mail originating at Nome or that had lain in the Nome post-office was fumigated on board this vessel before being delivered to the St. Michael post-office, the fumigation being accomplished by first perforating the letters and then subjecting them to the fumes of burning sulphur, burned in a box with a crated bottom for want of a better apparatus. In this way four lots of mail was fumigated.

The summer of 1900 was an exceptionally warm and dry one throughout the Bering Sea and arctic coasts. Having no records at hand, comparisons with former years can not be made, but the records kept on board this vessel while in St. Michael this summer (1900) give a mean temperature of 54.71° F. for the month of July, with a maximum of 72° F., and for the first two weeks of August at the same place a mean of 50.60° F., with a maximum of 62° F. At first glance these figures would appear to indicate rather cool weather, but it must be considered that St. Michael is in latitude $63^{\circ} 28'$ north, and on a coast exposed to a continuous arctic current, so that the mean temperature would be rather low. The precipitation for the month of July was 1.17 inches, which was said to be considerably below the average.

Early in the summer influenza appeared among the natives at St. Michael and those living around Norton Sound. This soon became epidemic in character and the death rate was very high, for in some cases the influenza was followed by a fatal attack of pneumonia. The epidemic rapidly spread, and finally included the white population as well as the native. Following closely on this, about the 1st of July, measles in a mild form appeared among the natives and rapidly spread through their quarter of the settlement, a few cases among the infants proving fatal. At first the measles was confined to the native population, but on August 11 it appeared among the white people.

It was difficult to keep a record of cases on board this vessel at this time, as the crew was changing from day to day. Most of those who had served during the past winter were leaving and new men being enlisted. But during our stay in St. Michael there were on board but four cases of influenza and one of measles, though there were a number of cases of sore throat at the same time. The one case of measles was peculiar in that the patient, though of Caucasian parentage, was born at Andreaofsky, on the Yukon River, not far from its mouth.

About the middle of July reports were brought in of great destitution, sickness, and death among the natives of the surrounding country. From Surgeon Hawley, of the U. S. S. *Bear*, it was learned that this same condition existed along the coast as far north as Cape Prince of Wales and on the Siberian side from Indian Point to within the neighborhood of Cape Serdze Kamen; that on St. Lawrence Island the natives were dying so fast, and so many of the remaining were sick, that the dead were left where they lay or simply removed out of doors, out of the way, and there left to the mercies of the dogs. Reports of about the same nature also came to us from the Yukon River and from the coast south of the delta.

Similar epidemics have appeared in past years among the coast natives, each time leaving them fewer in numbers than before. The natives claim that the present epidemic is due to the unusually dry and warm season, and this, no doubt, is the principal factor. It does not seem reasonable to believe, as some claim, that the cause is to be found in the sudden influx of white people to this region, for influenza in epidemic form is not new to these people.

The number of deaths among the coast tribes could not be ascertained. At St. Michael 30 were reported to August 12. Many bodies were found out on the tundra and along the beaches unburied. In one instance 8 bodies were found together on the tundra within half a mile of the settlement. Across the harbor were two or three camps containing some 15 people. These I attended at different times, but most of the cases were looked after by the army post surgeons and the physician in the employ of the Alaska Commercial Company.

The necessity for this vessel remaining at St. Michael no longer existing, preparations were begun for the trip up the Yukon River and for the arctic winter to come. Considering the nature of the reports from that part of the country through which we would pass, it was deemed advisable to take an extra supply of provisions to be distributed among such people as we might find in want, and numbers of such were found before we reached our winter quarters.

Everything now being in readiness, the *Nunivak* left St. Michael on

the evening of August 13, and after an uneventful trip across Pastolik Bay entered the Aphoon mouth of the Yukon River.

The first natives met with on the river are families of Eskimo living on the coast, but who in summer come into the delta for the salmon, seal, and waterfowl which are here in great numbers. This great treeless tundra of the delta, a desolate waste cut up into islands of every size and shape by sloughs that run in every direction, was once well peopled, but is now almost deserted. Some have moved to the coast and some up the river, but most of the former inhabitants have died.

At Kwikpak Crossing we found a fishing camp of 11 people, mostly children. Their story was the same as that told by the natives at St. Michael. They had all been too sick to fish and they were now without food. We found $\frac{1}{2}$ of the men quite sick with pulmonary congestion following influenza, and learned that 6 had recently died.

This was a typical Eskimo fishing camp—a camp that may be seen in summer on any part of the coast from Point Barrow south. The tents are made of white drilling, in shape usually like our wall tents. A few boards, if they can be found, are laid on the ground inside, and on these are laid straw mats or deerskins. This is their workshop, their loafing place, and their bed. Around the sides of the tent and piled up in the corners is a miscellaneous assortment of domestic and hunting implements and boxes of all sizes filled with treasures valuable only to an Eskimo. In front of the entrance is a smoky fire of driftwood, almost smothered with black, soot-covered kettles. On one side are frames where salmon hang drying in the sun. Near by is the family omiak, or large skin boat, turned on its side and used partially as a storehouse. On the beach is a kayak or two. Here and there, hanging up to dry, are fish nets and lines, and sometimes a dozen or so yards of seal entrails are hung up with them. And everywhere, mostly under foot, are dogs and children, and in seasons of plenty the latter are lively, noisy, fat, and greasy.

Andreaofsky, on the Swetlarechka River, about 2 miles from its mouth and some 125 miles from the mouth of the Yukon, is one of the oldest trading posts on the river. This is the inland border of the tundra. In the ravines are a few spruce, the first straggling outpost of the forests, but around the mouth of the river are the same willow-covered flats as before.

At one time Andreaofsky was quite a settlement, but now there are only two traders, their families, and a few native assistants, some 25 in all. Nearly all of these were suffering from either influenza or measles. Measles had only recently appeared and was of rather a mild type, but influenza appeared early, before the fishing was half over, and in quite a severe form.

According to Mr. Fredricks, agent of the Alaska Commercial Company, the spring and summer had been excessively dry and hot, the temperature going as high as 80° F. in the shade on several occasions—a degree almost unknown in this country so near the coast—and to make it more sultry and oppressive, the country was covered with smoke, though no fires could be seen.

Six deaths were reported up to this time (August 16), one occurring the day after our arrival. Mr. Fredricks being quite ill himself, and having no one to assist him, at his request the carpenter made a coffin, and a detail of men was sent ashore to attend to the burial.

While here a native came in a kayak from the village at Petkas Point, some 3 or 4 miles down the Yukon, requesting us to come to their assistance, for, as he put it, "Everybody sick; plenty people die; one man die pretty soon, I think."

At Petkas Point is a village of some 65 people, and named after Petka, a Russian creole, as the Russian half-castes are known in this country, who is the headman, church deacon, and trader. This village is one of the worst we saw on the river. The people appear to be in abject poverty, their houses and tents are filthy, and no effort seems to be made to have either order, cleanliness, or comfort. On the point is a large encampment of people who have come from the delta and from the coast to the south, and whom we were told were here to get away from sickness then prevailing in their homes; but they had not bettered themselves, for they were all sick. They had had measles and were then suffering mostly from pulmonary complications. At this village 12 had died to date (August 17), including the visitors.

In one very small tent we found a man very sick with pneumonia, and covered up beside him was the body of another native who had been dead several days. No arrangement for the burial of the body had been made, and it was only after considerable coaxing and threats that two boys were induced to assist in the work of giving the body burial.

The houses here are one-room structures built of logs. Along two sides, built against the wall, are wide shelves or platforms, on which they sit, "tailor fashion," to do their sewing, mending, or carving in the daytime and which serve as their beds at night. Several families live in the same house, and these shelves are divided into spaces by boxes, trunks, or bags containing the personal property of the occupant. These spaces are not long enough for an adult to lay at full length, so these people sleep doubled up. The beds consist of a straw mat laid on boards that have been hewn from logs, and are none too smooth or even, and their bed covering is usually a blanket of rabbit skin. The floor is the hard, well-trodden earth, and in the center is the open fireplace where all the cooking is done. The ceiling is low, and the rafters are hung with dried fish and other food stuffs, so low

that they brush against one's head unless great care is observed in moving about the house. At the back is usually a framework on which is piled the miscellaneous implements and utensils of the household.

At this place there is a native bath house, often called a Russian bath, not an uncommon object in all the villages of the lower river, for these people delight in taking steam baths during the winter. This house was built of logs and covered with turf, the only openings being a smoke hole in the roof, which is usually covered with a skin, and the entrance a low doorway that can be tightly closed. Along the sides are shelves built against the wall at about the height of a table, with a log underneath for a foot rest. In one corner is the fireplace, built of stones and covered over with a pile of slabs of shale-like rock. Under this a fire is built, and when the stones become heated buckets of water are thrown over them, filling the room with vapor. The bathers sit or lie on the benches, and when they have had enough steaming wash themselves with soap and water. At some of the places it is the custom, after being thoroughly steamed, to rush out of doors and rub off with snow, when they return and resume the steaming. We were told that they used soap, and in fact we saw some in this bath house, but from the general appearance of most of those seen in the village soap and water baths had not been particularly popular for some time.

A young woman who was said to belong to the coast south of the delta was observed to be wearing labrets in the lower lip. Among the Eskimos north of here this form of personal adornment is confined entirely to the men, but it is said that between the delta and Bristol Bay the labret is worn only by the women. In this case the labret consisted of a string of four beads fastened to a brass button which was inserted into a hole in the lower lip, one string on either side, about halfway between the corners of the mouth and the median line.

About 20 miles above Pitkas Point we stopped at a village of 5 houses occupied by 20 people, most of whom were sick with either influenza or measles. In one small house were found 5 or 6 people, some of whom were very sick. The place was dark, damp, and dismal, the fireplace was cold, and an odor of rotting fish permeated everything. The inmates were lying about on their beds, some covered, some uncovered. In one corner was a girl of about fourteen years, entirely nude, whose body was covered with the red rash of measles. Food and medicines were left for the use of these poor people, and we hurried on.

A quarter of a mile above here was another village of 3 houses and some 10 people. All of these were sick with measles and influenza, and many had died. The surviving members of this community were half starved and helpless, and after burying the dead and leaving food and medicines for the living we were compelled to proceed on our way up the river. During the evening of August 18 we met the steamer

Louise bound down the river. Medical assistance was rendered a white man suffering with pulmonary tuberculosis who had been "prospecting" the country and who was a passenger on board.

At Ikogmute is a mission under the charge of the Russian Church. This is one of the oldest places on the river, the old church having been built in 1851. There were only some 35 or 40 people here when we stopped, but in the winter the place has about 250 inhabitants. Most of the people at this time (August 19) were away fishing at various places on the river. The fishing usually lasts until the latter part of September, and though salmon have been very plentiful this season, the great amount of sickness prevented the people from taking advantage of the run. Fish is the customary and best-liked food, though the abundant supply of game in this region is also utilized as food. A variety of woodland caribou, a smaller animal than is found either up the Yukon or on the more southern rivers, is hunted by these natives, and also a small black bear, which is quite numerous in the neighborhood, especially in the late summer, when it comes down from the mountains to the rivers for berries and fish.

Edible berries are very plentiful, especially the red raspberry, in every way like the cultivated fruit, the red and black currant, and the salmon berry. These are all gathered in great quantities by the natives and eaten fresh. They do not appear to have any method of preserving these berries for use in winter. A few of the plants are used as medicines, the virtues of which were taught them by the Russian priests, and this is the only place on the river, so far as our observation showed, where the natives use any of the plants as drugs. The astringent fruit of the high-bush cranberry is eaten to stop hemorrhage from the lungs, and the stems, in winter, are made into a tea which is drunk for the same purpose. They also use a variety of camomile for colic in children, making a tea of the green leaves, and the dried petals are used as an astringent dressing for wounds.

Most of the native houses are of good size and are occupied by two or more families. They are built of logs, the front being finished with the logs smoothed and placed perpendicularly. In the center of this front, about 2 feet above the ground, is the entrance, an oval hole just large enough to admit one's body. Neither the sides nor the roof are tight. The wind blows through and the rain comes in, and they are wet and cold, dark, evil smelling, and decidedly uncomfortable. The rafters are hung with the usual assortment of dried fish, dried entrails, strings of thong, and other valuables. On either side are the benches on which the family beds are made. In the center of the dirt floor is the fireplace, over which hang kettles and pots, black with ages of accumulated soot and grease. In some of the houses, however, the fireplace was occupied by a modern cook stove.

The summer here, as elsewhere, had been one of the hottest known,

and the great amount of sickness was attributed in a great measure to this. The natives all had measles early in the season, but in quite a mild form, and there were but few deaths resulting. Father Korchinsky, the parish priest, was of the opinion that the measles was introduced by the whites, as the centers of contagion from which it spread along the river were the more important places where all the boats stopped, but so far as is known no case of measles arrived at St. Michael on the steamers from the outside. When we were there influenza with its various complications was raging. Besides this there were seen 3 cases of pulmonary tuberculosis, 5 cases of chronic conjunctivitis, 3 cases of purulent conjunctivitis, 1 deaf and dumb man due to an injury received in infancy, and 2 cases of hemiplegia due to injury. Both of these cases were women, one being a cripple through the brutality of her husband. During the month previous to our arrival there were 24 deaths, only 4 of which were children, for, as at other points on the river, the worst cases and the majority of deaths were among the older adults. During our short stay there were 3 deaths, making 27 in all to date.

Fifteen miles above Ikogmute is Dog Fish, the most miserable little village imaginable. There were only 8 people here, all that were left of 30 or 40, the original population. The rest had either died or moved away. These 8 all claimed to be too sick to move about and attend to their own wants, but this inability to work was not alone due to sickness, but also to discouragement, a giving up, a generally demoralized condition.

In one house were some half dozen people lying on their beds, or benches which serve as such, apparently awaiting their end. They seemed utterly indifferent to our presence, and did not appear to care whether they were helped or not. Some food left for them was placed on the floor, when one of the men called us back and asked us to move the stuff onto a shelf, for, as he said, it might get wet where it was. In another house was a family of four, all lying on their beds, wet and dirty, too sick or discouraged to move or even build a fire. What they had eaten recently we did not know, for nothing cooked could be seen and the only food in the house was some moldy dried fish. In a little tent, wet and cold, was a man alone and very sick, the last of his family. After all of the others had died he moved out of his house to end his days in this miserable little tent, without fire or wood or even food. When we gave him some flour and bacon he smiled and asked us how he was going to eat it, for he had no way to cook, and of course none of his neighbors would assist him, even if they were able to do so, as they never do. In many of the houses and caches were salmon, recently caught, but from want of care they were rotting.

We did not learn how many had died during the summer; but 5 had died recently, and had remained unburied until the steamer *Margret*

came, when the crew performed that office. Most of the graves made by the natives were very shallow, and the dogs played sad havoc with the bodies. On the beach was a human foot, where the dogs had left it; and on the hillside were found various pieces that had been disinterred by these animals.

At Koserefsky, 75 miles above Russian Mission, are some 150 natives; and about 300 more in the immediate vicinity, most of these latter living on Shagaluk Slough. Located here is Holy Cross Mission, under the charge of the Jesuit Fathers and the Sisters of St. Anne. The mission occupies a small sheltered valley facing the river, and here have been built some very comfortable houses. The most attractive part of the mission to a traveler, however, are the gardens. The fields of cabbages, cauliflower, potatoes, and turnips show what may be done in this country in the way of raising the more hardy vegetables. One of the sisters had a garden of old-fashioned flowers, to remind her of home, as she said. In it were blooming sweet peas, petunias, marigolds, asters, pansies, and candytuft.

Measles and influenza were particularly severe here, and the mortality was great, with all the care given to the natives by the mission people; and then following this were a number of severe cases of dysentery. There had been, to the time of our arrival (August 22), 12 deaths, and 45 more in the neighboring villages, some of these latter being almost depopulated. About 15 miles above here is a small village where some of the Fathers went to attend the sick, and there found 15 unburied bodies. Many similar cases were reported to us from other villages.

The following cases were seen: One case pulmonary tuberculosis, 2 cases dysentery, 2 cases pneumonia, 1 gunshot wound of foot (amputated), 1 injured hand, caught in sawmill (amputated two fingers), 1 boy totally blind from some purulent inflammation in infancy.

Forty-seven miles beyond Koserefsky the Anvik River flows into the Yukon, and just within its mouth is Christ Church Mission, under the auspices of Grace Church of New York City. Here they have a schoolhouse, dormitories for both boys and girls, a church, and a sawmill. This last has lately brought the mission considerable revenue. There are some 150 natives here, including both those at the mission and in the village opposite. They had all been sick, and many were so when we were there. In the mission hospital were 10 girls with measles in all stages, and 3 boys, 2 convalescent from measles and 1 with pneumonia. In the village were 3 cases of pneumonia. Measles appeared about the middle of July, followed by influenza and in many cases by pneumonia. There had been but 5 deaths reported to the time of our arrival (August 23)—2 from old age and 3 from influenza, being one of the smallest death rates for any of the villages, and due in a great measure to the cleanliness of both the mission and the native village.

At Grayling, 22 miles above Anvik, were only 32 people, though the census gives 65 as the population. This place is more of a rendezvous where the natives from the surrounding country come in summer to fish and in winter to trade. Measles and influenza appeared among them early in the season, and after several deaths had occurred the natives became alarmed. The shamans advised them to leave, telling them that if they did not they would all die; so many moved over to Shagluk Slough; but they did not appear to fare any better there, for reports were received saying there were a great many sick and without food and in a bad way generally. At Grayling we found 10 sick—2 with dysentery, 3 acute conjunctivitis, and the remaining suffering from pulmonary complications following influenza. There had been 6 deaths to date (August 23).

Grayling is one of the central way stations for native travel, and there is always quite a transitory population here; but it is in the winter that the big gatherings take place. As in all villages in this section of the country, they have a kazhim or village club. It is not used in summer, but the men live in it during the winter, sleeping and working, the married men sometimes going to their homes for their meals and sometimes having them brought to them here. Only men are admitted, women, girls, and boys being excluded except on certain festive occasions when dances are held. Here the custom is, during the winter when the kazhim is being used, for the married men to sleep in it one night and in their own houses the next, and so alternating through the winter. This custom is general throughout the country.

The kazhim at this place was about 15 feet square and 6 feet high on the sides, rising to 10 feet in the center. It was built of logs calked with moss, and with a roof of split logs covered with a layer of straw, and on top of this about a foot of earth. The floor was of bare earth, smooth and hard from the pressure of many feet. In the center was a hollow, some 4 feet square and about 2 feet deep, for the fireplace, and in which a roaring fire is kept all winter. Around the three sides are wide transoms or benches, made from hewn logs, blackened by smoke and dirt and grease, and polished by generations of trouser seats or naked bodies. They also use the kazhim as a bath house if they have no other. When a bath is desired large stones are placed in the fire, and when they become heated water is thrown over them and the usual steam bath ensues.

Some 60 miles above Grayling we stopped at a small village of 14 people, living in tents and makeshift houses of split logs. Measles had just appeared among them, and there were 7 sick—4 measles, 2 bronchitis, and a baby with ophthalmia neonatorum. The number of deaths could not be ascertained.

Here we saw examples of the only native therapeutic measure observed—puncturing and bleeding—resorted to on any and all occa-

sions. One woman had her neck and shoulders covered with scars, and a young man was scarred all over his chest. In puncturing the skin is pricked rather deep with a knife, or more usually with a sharp stone, and the wound kept open by frequent irritations until the patient is well. When bleeding is resorted to a vein is opened with a similar instrument. In performing these operations they appear to have no method, but puncture or bleed over the part affected. They use no plants or roots as medicine, and in cases of sickness their chief reliance is placed in the incantations of the shamans.

The tattoo marks seen here on the women differ from those found among the coast Eskimo. Instead of two or more narrow lines they have here a broad band from a quarter to half an inch wide, extending from the edge of the lower lip to the point of the chin.

About 10 miles farther on we stopped at another village of 18 people. Here we found 11 sick—5 with measles, 2 with bronchitis, 1 with pneumonia, 1 with corneal ulcer, and 2 blind. The number of deaths could not be ascertained.

At Nulato a Roman Catholic mission (St. Peter Claver's) is located, where there is a church and a school for boys and another for girls. There were about 50 people here at the time of our visit (August 28), 20 of whom were sick, most of the sickness being dysentery and pulmonary troubles. Nearly all had had measles, which appeared early in July, and most of the cases seen were relapses, due to the careless regard of even the simplest laws of health on the part of the patients. A detachment of the Signal Corps of the Army was here, and the hospital steward attached had been attending the natives, and was kept busy. Our short stay prevented our seeing all of the sick, but the following were among the principal cases attended: One case pulmonary tuberculosis; 4 cases dysentery, quite severe; 1 purulent conjunctivitis; 1 hernia of iris from injury; 1 vesico-vaginal hernia in a girl of 4 years, caused by a kick from some male member of the family; 2 cases of acute vaginitis in girls of 3 and 4 years, said to be quite common and due to exposure, want of cleanliness, and a scrofulous condition generally; 1 case hemiplegia in a boy of 18, due to spinal injury when an infant.

There had been 27 deaths to date (August 28).

On leaving Holy Cross Mission we took with us Rev. Ragaru, who has been connected with the missions of the Roman Catholic Church on this river for the past thirteen years. During the trip it was our pleasure to consult him regarding the distribution of food and medicines, and before leaving us at Nulato he made certain suggestions, as may be noted in the following letter:

NULATO, *August 21, 1900.*

Over 800 Indians are attended by St. Peter Claver's Mission, Nulato. About 600 of these are dependent upon Nulato for their supplies. This summer the grip, shortly afterwards followed by the measles, spread among the natives from St.

Michael and up the Yukon, diseases imported, as it were, by the steamers coming up the river.

On account of sickness the natives have been unable to work, and will be destitute this winter. Up to date there have been 27 deaths at Nulato, and over 220 are now sick. Some of them are expected to die. This proportion will probably hold for all neighboring villages. The general sickness has been so prevalent and so prostrating that at Nulato the white men have had to dig the graves and bury the dead for the Indians.

In some neighboring villages it is reported that the dead are left unburied, as none of the tribe are physically able to perform such office. As an illustration, the villages around Holy Cross Mission (some 200 Indians) had 49 deaths to date. And in a village 15 miles above Holy Cross Mission a father and two brothers had to make a trip from Holy Cross to the village in order to bury 13 corpses that the surviving Indians were unable to care for.

The worst feature of the situation is that now should be the time for the Indians to catch and cure their yearly supply of fish, and to fix up their winter houses and make them habitable, and being thus prevented by disease they are looking forward to a winter without food, clothes, or suitable houses.

Of course some few have been catching fish, and they will catch some more during the winter, but this will be totally inadequate to support them and their families.

Twenty-five per cent has been the average of deaths at Holy Cross. Ten per cent has been the average of deaths at Nulato.

The needs are as follows, to be forwarded as soon as possible: Food—Flour, tea, lard, sugar, bacon, milk (for infants), rice, pilot bread. Clothing—Drilling, blankets. Shotgun ammunition for breach and muzzle loading guns.

As to distribution, the only practical way it seems would be to have the supplies sent to the different missions.

1. Ikogmut, Russian mission.
2. Holy Cross Mission, Koserefski, Catholic mission. Over 300 destitute people, including Shageluk (partially) and Pimut.
3. Anvik, Episcopalian mission, Rev. J. W. Chapman. About 200, including some of Shageluk.
4. Nulato, St. Peter Claver's. Over 450 destitute people, including villages located 70 miles below Nulato up to 70 miles above Nulato and some Koyukuk River Indians.
5. Kokrine's Station, connected with Nulato mission. (No report yet received from this place.) About 220 Indians. Some supplies could be sent there as an annex to Nulato if necessary.
6. Tanana, Episcopalian mission.

ALOYS A. RAGARU, S. J.

At Big Bend is a village of 65 people, fully 50 of whom were sick. There were 16 cases of measles, 1 of pneumonia, and the rest were either convalescent or suffering relapses. One medicine they knew, several asking for it, and that was castor oil. These people suffer from constipation and any cathartic medicine is welcome, but they are especially partial to castor oil and will drink all they can get of it.

It was here we saw a man and a girl with blood smeared over their foreheads. The only explanation given was "because sick."

They appeared to have plenty of fish at this village and, though so many were sick, they seemed in a more prosperous condition than at most of the villages on the river. This village, for a strictly native one, was the cleanest we had seen.

Not far above Big Bend we stopped at a woodcutter's camp, where we found three Tanana Indians sick and destitute. One little girl had just broken out with measles and an old man had influenza.

At both Tanana and Rampart there are military posts, and the surgeons attached to the two commands treated such of the natives as needed their services, so we did not make an inspection of the native villages. Considering the number of Indians living in the two places, there was little sickness and few deaths. In fact, the neighborhood of Nulato seemed to be about the limit for the epidemic that had so ravished the lower river.

At Tanana is St. James mission, of the Episcopal Church. Living here and in the neighborhood are some 200 Indians. Late in the year we received from Mr. Selden, attached to the mission, the following: There had been, to December 1, 11 deaths—2 consumption, 3 pneumonia, 2 dysentery, 2 measles, 1 woman in childbirth, 1 child frozen, and, as was noted elsewhere, the proportion was 7 adults to 4 children.

At Rampart there is another mission of the Episcopal Church—St. Andrews. Here there are some 100 Indians, and to June 1, 1901, there had been 16 deaths, including 3 white men. Few were sick last fall, most of the deaths occurring early this spring.

Opposite the mouth of Mike Hess Creek is the Pioneer Coal Mine, and here we found a number of women and children in camp while the men were away hunting. Six were sick—2 with influenza, 2 pulmonary tuberculosis, 1 pneumonia, and 1 infant suffering from starvation, the mother not having sufficient milk to feed it. This is not an uncommon condition among these people, as we afterwards found.

At Fort Hamlin, where we arrived September 12, we saw the first white person with measles since leaving St. Michael. He had come from some place down the river, probably Rampart, some two weeks before, and was then cooking at the Alaska Commercial Company's station. Fortunately there were no natives living at Fort Hamlin then, and no measles appeared in this section, though many suffered from severe attacks of influenza.

When we first came to Dall River we found a number of the natives sick, all with some pulmonary complication following influenza. Up to that time (September 13) there had been 7 deaths out of a population of 60. Later in the year there were more deaths due to other causes.

We arrived at Sixmile on September 26. There were only 15 people there then, though the population is something over 40. Nearly all of these 15 were sick, 3 women being seriously so with pneumonia. There had been 3 deaths—2 children and 1 man.

On the 27th of September we came into Dall River and tied up to the bank, when all hands were at once made busy getting the boat

ready for the eight months' winter siege to come. The trip up the river had been a most interesting and instructive one. We had visited 20 villages and stations with a total population of 925, and had personally attended 245 sick people, both native and white. Treating natives medicinally is most unsatisfactory in many respects. In the first place, not speaking their language, it is hard to make them understand what you wish to convey. In reply to your questions the answer would be almost always, "Me sick inside." They expect to be cured with the first dose of medicine they take, and if the medicine is not to their liking they will refuse to take it, or if it is agreeable to their palate they will empty the bottle at a dose. Great care must therefore be taken not to give them any drug that might be injurious in large doses. But the greatest difficulty is to overcome their superstitious belief in the power of their shamans, or medicine men, a superstition which still exists, notwithstanding the teachings of the missionaries. It was decided that, instead of leaving any considerable amount of supplies with the natives, to leave such food and medicines as they might need with the missionaries, the agents at the several trading posts, and with others equally responsible. In this way we rendered assistance to some 2,500 natives residing on or near the Yukon River, and we were assured by many this spring that if we had not done so the suffering and destitution would have been many times greater than it was.

Fort Shoemaker is on the Dall River, 1 mile above its confluence with the Yukon, in latitude $66^{\circ}.01'$ north and longitude $149^{\circ}.14'$ west, about 30 miles south of the arctic circle. The winter of 1900-1901 was one of average severity for this region, the lowest temperature being -65° F. in January, lasting some ten days, and -50° F. was quite frequent. The climate is not as severe as these temperatures would indicate, for there is very little wind at any time and none at all when the temperature is very low.

As soon as the vessel had been made ready for the winter the crew were set at work building two log cabins. The first was the "club-house" for the use of the men, where they could spend their idle time in any form of amusement they chose and make as much noise as they pleased, disturbing no one. The other cabin was designated the "gymnasium." Here were placed various homemade pieces of athletic apparatus, and until the wood chopping began the men made good use of this place. Then, besides the wood chopping and the necessary daily work about the vessel, a regular weekly routine of drills and inspections served to maintain the necessary discipline on board; and it can be said, to the credit of all, that no serious breach of discipline or disorderly conduct occurred that required more than a simple reprimand to correct. To this constant employment is due in a great

measure the most excellent health of the crew throughout the winter. No serious cases of illness occurred among them, and there were but few accidents.

The quarters on the *Nunivak* assigned to the crew were poorly constructed for living in during an arctic winter, and in fact the whole boat was so arranged that to go from one part of it to another one had to go out of doors. The crew's quarters were in the after end of the boat, and though piped and furnished with radiators the steam could not be driven through them. The radiators in the wash room, bathroom, and after port side of the berth deck froze and had to be cut out.

The radiator in the dispensary could be kept but moderately warm, and unless it was drained once in twelve hours would freeze. All the medicines except the solids and the alcoholic preparations froze. Had this boat wintered at any part of the river where the wind blows as it does in many places it would have been uninhabitable.

The clothing furnished by the Government is all that could be desired so far as it goes, but there are many articles of wearing apparel necessary in this country that were not included in the list. Should a revenue cutter be kept on this station the clothing locker should contain, besides the usual underclothing, socks, and uniform trousers and shirts, German socks, moccasins, mittens, parkas made of drilling, and caps with ear flaps and nose pieces. To compel the crew to pay Yukon prices for these necessaries imposes a hardship they can ill afford. The all-fur caps usually sold to people coming into this country are too warm, and when worn will heat the head and often cause dizziness. A cloth cap made after the pattern of those used by the Army, but having fur only over the forehead, across the occiput, and over the ears, was found by us to be all that was necessary, and by far the most comfortable. The moccasins and mittens should be of the best moose skin, the mittens to be lined with soft woolen flannel. The parka should have a hood fringed with either wolf or wolverine fur. For those living near the coast parkas made of reindeer skin and "muckluks" or native water boots are necessary.

The question of foods and the serving of them is a most important one to those living in the interior of Alaska. Undoubtedly most of the dysentery that has caused so many deaths and compelled so many people to leave the country is due to improperly cooked food, and in some cases to poorly preserved canned goods. It is a notorious fact that some of the firms supplying this country ship their oldest and poorest goods when filling an Alaska order, not forgetting, however, to charge the highest prices therefor. The consignee is at their mercy, for he must have the goods to live during the winter, poor as they may be. He can but pay the bill and try and do better next time.

The rations furnished this vessel, though better than those supplied to most of the revenue cutters, do not contain enough meat, especially

for men living in this climate and performing the work as is required of this crew. Should a new ration list be made it should contain an extra amount of flour, sugar, tea, and hard bread, with which the caterer could purchase from the natives fresh moose and caribou meat, to be issued in place of the canned and salt meats at stated intervals; twice a week would be sufficient. The ration should also contain more fresh potatoes and onions than it does. Evaporated potatoes and onions are good and may be cooked in many ways that is agreeable to the palate, but they do not take the place of the fresh article either as a food or as an antiscorbutic. Potatoes, onions, and cabbages, providing they are of first quality and in good condition when purchased, will keep all winter. Freezing does not hurt them so long as they are kept so, but they must be cooked as soon as they have thawed.

The continuous living on preserved foods, whether salted or canned, brings on various disorders of the digestive organs, and, too, will cause a condition resembling a mild form of scurvy, as was seen on this vessel early this last spring. The men at first complained of constipation and headaches. Following this there appeared a skin eruption, red blotches over the trunk and limbs, accompanied in most cases with diarrhea. This condition was so general that it was deemed advisable to purchase fresh moose meat and issue it as an extra ration. One living in a country where fresh foods are to be had every day of the week can not appreciate the feelings of those living in a country where such things are not to be had; that craving for green stuffs, especially in the spring. Among these last a common remark is: "If I only had some green grass."

As has been stated, the crew of the *Nunivak* remained in most excellent health all winter, and there are few cases from the dispensary report worth noting. In the latter part of November, following the first real cold weather, there were a number of cases of sore throat, the throat being simply inflamed and irritable, and due, it would seem, to inhaling the cold air. This same condition of the throat was noted after each cold spell that we had, and was not confined to the white people, but the natives complained of it as well. Several times during the winter the temperature would suddenly rise, making it feel quite warm, comparatively speaking. Following each one of these warm spells most of the crew would suffer from colds in the head. Catarrhal conditions of the nose and throat became worse during the winter, and one or two cases became quite aggravated. Frostbites of the nose, cheeks, and ears were common, but no frostbites of a serious nature occurred in our neighborhood. One of the most common complaints, however, was from chapped skin. The skin of the hands and face would become hard and rough and then crack, sometimes causing very painful sores. A common complaint among

those traveling on the trail is what might be termed "frosted knee." In such cases the knee joint, from want of proper protection, becomes chilled. After the day's run, and the owner has retired, the knee often causes intense pain, and the next day it is stiff and very sore. There is little to do for this after it is once acquired except rest. The proper preventative is to wear fur or flannel pads over the knees while traveling. Snow-blindness was almost unknown, there being but one case coming to our notice, though no one wore smoked glasses or eye shades. There was but a very short time in the spring that the glare from the snow was at all irritating to the eyes.

The first signs of the coming spring were seen early in April in the shape of green moss buds under the snow, but it was not until May 15 that the ice in Dall River broke and it was some two weeks later that the Yukon cleared. The trip down the river was uneventful. We stopped at the more important villages, but most of the natives were away preparing to catch the salmon that would soon come up the river. At Nulato there were three cases of whooping cough and as we proceeded down the river the number of cases became greater. At Anvik nearly all of the mission children were suffering from it. At Koserefsky was seen a young boy whose feet had been frozen the winter previous, necessitating a secondary amputation of four toes on one foot and three on the other.

It was impossible to get any data regarding the death rate of the previous winter, but from what we could learn it must have been very great. The conditions of the natives this spring, however, were very encouraging and there was every prospect of a good and profitable season ahead of them.

Respectfully, yours,

JAMES T. WHITE,

Surgeon, Revenue-Cutter Service.

First Lieut. J. C. CANTWELL, R. C. S.,

Commanding U. S. S. Nunivak.

PART VII.

APPENDIX.

- A. TABLE OF DISTANCES BETWEEN SETTLEMENTS ON THE YUKON RIVER.
- B. SCHEDULE OF FREIGHT AND PASSENGER RATES ON THE YUKON RIVER.
- C. LIST OF VESSELS ENGAGED IN COMMERCE ON THE YUKON RIVER.
- D. COMPARATIVE VOCABULARY OF THE ESKIMO AND INGALIK TRIBES INHABITING THE REGION.
- E. COMPONENT PARTS OF THE RATION ISSUED TO THE CREW OF THE NUNIVAK WHILE ON THE STATION.
- F. NATURAL HISTORY:
 - 1. LIST OF BIRDS.
 - 2. LIST OF MAMMALIA.
 - 3. LIST OF FISHES.
 - 4. LIST OF PLANTS.
 - 5. LIST OF FOSSILS.
- G. METEOROLOGICAL RECORD.

APPENDIX B.

Freight and passenger tariffs No. 2, Northern Navigation Company, Yukon River points between St. Michael and Dawson, July 1, 1901.

FREIGHT SCHEDULE—UPSTREAM.

[Rates in dollars per ton of 2,000 pounds, or 40 cubic feet, ship's option.]

	Kotlik.	United States Survey Camp.	Andreafski.	Russian Mission.	Koserefski.	Anvik.	Greyling.	Coal Mine No. 1.	Nulato.	Koyukuk.	Bergman.	Nowi.	Tanana.	Rampart.	Fort Hamlin.	Fort Yukon.	Circle.	Eagle.	Fortymile.	Dawson.	
Distances from St. Michael to Dawson	90	140	217	354	439	484	508	559	684	708	1,308	784	874	949	1,024	1,224	1,309	1,499	1,549	1,601	
St. Michael	17	21	22	30	31	34	35	38	43	44	85	46	51	51	54	63	77	84	85	85	
Kotlik	9	10	15	18	20	21	23	28	30	71	32	37	37	38	38	47	60	66	68	68	
United States Survey Camp			9	13	16	17	18	21	25	28	68	29	34	34	38	40	54	61	62	64	
Andreafski			10	13	15	16	18	23	25	66	26	31	31	32	32	37	51	58	60	64	
Russian Mission			9	9	10	12	17	19	60	21	25	25	28	29	34	48	57	59	59	59	
Koserefski			9	9	9	10	15	16	57	18	23	23	28	29	34	48	54	56	56	56	
Anvik			9	9	9	9	13	15	51	16	21	21	28	32	47	53	54	54	54	54	
Greyling						9	12	14	54	16	21	21	26	32	45	62	54	54	54	54	
Coal Mine No. 1							10	11	52	13	18	18	24	29	43	49	51	51	51	51	
Nulato								9	45	9	13	13	19	24	38	44	46	46	46	46	
Koyukuk									48	9	11	11	17	22	36	43	44	44	44	44	
Nowi										10	11	11	17	21	34	41	43	43	43	43	
Tanana											9	10	16	29	36	38	38	38	38	38	
Rampart													9	11	28	33	35	35	35	35	
Fort Hamlin														13	26	32	33	33	33	33	
Fort Yukon															17	22	24	24	24	26	
Circle																17	16	16	16	17	
Eagle																	13	13	13	16	
Fortymile																			13	13	13

Minimum charge, \$10.

PASSENGER SCHEDULE—UPSTREAM.

[Rates in dollars.]

	Local distances.	Kotlik.	Andreafsky.	Russian Mission.	Koserefsky.	Anvik.	Greyling.	Nulato.	Koyukuk.	Novikaket.	Fort Adams.	Tanana.	Rampart.	Fort Hamlin.	Fort Yukon.	Circle.	Eagle.	Forty Mile.	Dawson.	
Distances from St. Michael to Dawson	M	90	217	354	439	484	508	684	708	784	864	874	949	1,024	1,224	1,309	1,499	1,549	1,601	
St. Michael	0	10	20	30	35	40	40	55	60	65	70	70	75	80	95	105	120	125	125	
Kotlik	90		15	20	30	35	35	50	55	60	65	65	70	75	90	100	115	120	125	
Andreafsky	127			15	20	25	25	40	40	45	50	50	55	60	75	90	105	110	115	
Russian Mission	137				10	15	15	25	25	30	40	40	45	50	70	80	100	105	110	
Koserefsky	85					10	10	25	25	30	35	35	40	45	65	75	90	100	105	
Anvik	45						5	20	25	30	35	35	40	45	60	70	90	95	100	
Greyling	24							15	25	30	35	35	40	45	60	70	90	95	100	
Nulato	176								5	10	20	20	30	40	55	65	85	90	100	
Koyukuk	24									10	15	20	25	35	50	60	80	85	95	
Novikaket	76										10	15	20	30	45	55	75	85	95	
Fort Adams	80											5	10	20	35	50	70	80	85	
Tanana	10												10	15	30	45	65	75	80	
Rampart	75													10	25	40	60	70	75	
Fort Hamlin	75														20	35	55	65	70	
Fort Yukon	200															20	40	50	60	
Circle	85																20	30	40	
Eagle	190																	10	20	
Forty Mile	50																			10

Second class, three-fourths above rates; dogs, one-fourth above rates; excess baggage, 5 cents per pound. Each passenger allowed 150 pounds baggage.

Freight and passenger tariffs No. 2, Northern Navigation Company, Yukon River points between St. Michael and Dawson, July 1, 1901—Continued.

FREIGHT SCHEDULE—DOWNSTREAM.

[Rates in dollars per ton of 2,000 pounds, or 40 cubic feet, ship's option.]

Distances from Dawson to St. Michael	Local distances.													Anvik.	Koseroofsky.	Russian Mission.	Andraoofsky.	Kotlik.	St. Michael.
	M	Forty Mile.	Eagle.	Circle.	Fort Yukon.	Fort Hamlin.	Rampart.	Tanana.	Fort Adams.	Noviakaket.	Koyukuk.	Bergman.	Nulato.							Greyling.
M	52	102	292	377	577	652	727	737	817	893	1,493	917	1,093	1,117	1,162	1,247	1,384	1,511	1,601
Dawson	0	10	12	15	20	28	29	30	34	36	94	37	42	43	44	46	48	54	70
Forty Mile	52	10	13	18	26	27	28	28	31	33	91	34	39	40	41	43	45	51	67
Eagle	50	10	15	23	24	25	25	28	30	30	88	31	36	37	37	40	42	48	64
Circle	190	10	18	20	22	22	25	27	28	28	85	28	33	34	35	37	39	45	61
Fort Yukon	85	10	12	14	15	18	20	20	20	20	78	21	26	27	27	32	34	36	42
Fort Hamlin	200	10	12	12	14	16	16	16	16	16	74	17	22	23	23	30	32	38	55
Rampart	75	10	11	13	15	15	15	15	15	15	73	16	21	22	22	29	31	37	53
Tanana	75	10	11	14	14	16	16	16	16	16	72	15	20	21	21	28	30	36	52
Fort Adams	10	10	13	13	13	13	13	13	13	13	71	14	19	20	25	27	29	35	51
Noviakaket	80	10	11	11	11	11	11	11	11	11	68	11	18	19	24	26	28	34	50
Koyukuk	76	10	11	11	11	11	11	11	11	11	58	10	17	18	23	25	27	33	49
Nulato	24	10	17	17	17	17	17	17	17	17	10	17	22	24	26	26	32	48	
Greyling	176	10	15	15	15	15	15	15	15	15	10	15	20	24	28	30	36	52	
Anvik	24	10	15	15	15	15	15	15	15	15	10	15	20	24	28	30	36	52	
Koseroofsky	45	10	15	15	15	15	15	15	15	15	10	15	20	24	28	30	36	52	
Russian Mission	85	10	15	15	15	15	15	15	15	15	10	15	20	24	28	30	36	52	
Andraoofsky	137	10	15	15	15	15	15	15	15	15	10	15	20	24	28	30	36	52	
Kotlik	127	10	15	15	15	15	15	15	15	15	10	15	20	24	28	30	36	52	

Minimum charge, \$10.

PASSENGER SCHEDULE—DOWNSTREAM.

[Rates in dollars.]

Distances from Dawson to St. Michael	Local distances.													Anvik.	Koseroofsky.	Russian Mission.	Andraoofsky.	Kotlik.	St. Michael.
	M	Forty Mile.	Eagle.	Circle.	Fort Yukon.	Fort Hamlin.	Rampart.	Tanana.	Fort Adams.	Noviakaket.	Koyukuk.	Nulato.	Greyling.						
M	52	102	292	377	577	652	727	737	817	893	919	941	1,117	1,162	1,247	1,384	1,511	1,601	
Dawson	0	10	10	20	25	30	35	40	40	45	50	50	55	55	60	65	70	70	70
Forty Mile	52	10	20	25	30	35	40	40	45	50	50	55	55	60	60	65	65	65	70
Eagle	50	15	20	25	30	35	35	40	45	45	45	45	50	55	55	60	60	60	65
Circle	190	10	20	25	30	30	30	35	40	45	45	45	50	50	55	55	55	60	65
Fort Yukon	85	15	20	25	25	25	30	35	35	40	40	45	45	45	50	50	50	50	55
Fort Hamlin	200	10	10	10	10	10	10	10	10	10	15	20	25	25	30	35	40	45	50
Rampart	75	10	10	10	10	10	10	10	10	10	15	15	20	20	25	30	35	40	45
Tanana	75	5	10	10	10	10	10	10	10	10	15	15	20	20	25	30	35	40	45
Fort Adams	10	5	10	10	10	10	10	10	10	10	15	15	20	20	25	30	35	40	45
Noviakaket	80	10	10	10	10	10	10	10	10	10	15	15	20	20	25	30	35	40	45
Koyukuk	76	5	10	10	10	10	10	10	10	10	15	15	20	20	25	30	35	40	45
Nulato	24	10	15	15	15	15	15	15	15	15	15	15	20	20	25	30	35	40	45
Greyling	176	10	15	15	15	15	15	15	15	15	10	15	20	20	25	30	35	40	45
Anvik	24	10	15	15	15	15	15	15	15	15	10	15	20	20	25	30	35	40	45
Koseroofsky	45	10	15	15	15	15	15	15	15	15	10	15	20	20	25	30	35	40	45
Russian Mission	85	10	15	15	15	15	15	15	15	15	10	15	20	20	25	30	35	40	45
Andraoofsky	137	10	15	15	15	15	15	15	15	15	10	15	20	20	25	30	35	40	45
Kotlik	90	10	15	15	15	15	15	15	15	15	10	15	20	20	25	30	35	40	45

Second class, three-fourths above rates, dogs, one-fourth above rates; excess baggage, 5 cents per pound.

Each passenger allowed 150 pounds baggage.

APPENDIX C.

List of vessels engaged in Yukon River trade, including harbor boats and lighters at St. Michael, Alaska, during the season of 1900.

Name.	Class.	Official No.	Gross tons.	Net tons.
ALASKA COMMERCIAL CO.				
Sarah	Steamer	116856	1,211	728
Susie	do	115855	1,211	728
Hannah	do	96428	1,211	728
Louise	do	141572	717	451
Margaret	do	92980	520	260
Leah	do	141556	477	235
Alice	do	107253	400	200
Bella	do	3759	370	185
City of Paris	do	127219	300	189
Victoria	do	161820	55	30
Luella	do	141540	52	46
Saidie	do	116831	328	197
Florence	Tug	121068	90	51
Anna E. Fay	do	107339	97	66
Rosalie ^a	Launch		7	
St. Michael, No. 2	Barge	57984	228	228
St. Michael, No. 3	do	57985	228	228
St. Michael, No. 4	do	57986	479	479
St. Michael, No. 5	do	57998	350	350
St. Michael, No. 6	do	58051	240	240
St. Michael, No. 7	do	58094	240	240
St. Michael, No. 9	do	58053	366	366
St. Michael, No. 10	do	58054	240	240
St. Michael, No. 11 ^a	do			
St. Michael, No. 12 ^a	do			
St. Michael, No. 13 ^b	do			
St. Michael, No. 14 ^a	do			
St. Michael, No. 15 ^a	do			
St. Michael, No. 16 ^a	do			
Nome ^a	do			
Somoa ^a	do			
Illinois ^a	do			
NORTH AMERICAN TRANSPORTATION AND TRADING CO.				
T. C. Power	Steamer	145790	819	481
Portus B. Weare	do	150646	400	200
Charles H. Hamilton	do	127290	595	297
John Cudahy	do	77334	819	481
Klondyke	do	161114	406	242
Jno. J. Healey	do	77238	450	241
John C. Barr	do	107853	546	315
Will H. Ison	do	81758	983	619
Michigan	Barge	51303	450	450
New York	do	67380	450	450
Jno. H. Dwight	do	46537	375	375
Jno. J. Mitchell	do	46538	80	80
Charles L. Hutchinson	do	34331	80	80
Erie	do	36957	899	899
Ontario	do	53314	899	899
Huron	do	42857	899	899
ALASKA EXPLORATION CO.				
Leon	Steamer	141533	692	631
Arnold	do	107353	692	631
Linda	do	141561	692	631
F. K. Gustin	do	121071	718	409
Herman	do	96398	456	387
May D	Tug	92853	66	48
C. H. Bradley	do	127254	29	20
Argonaut	do	107403	15	7
Meteor	do	93031	68	40
Cub	do	127373	19	11
Clara Belle ^a	Launch		4	
Otter	Barge	53289	289	289
Lynx	do	48626	539	539
Seal	do	57959	289	289
Bear	do	31593	539	539
Fox	do	37573	539	539
Mink	do	51287	539	539
Skunk ^a	do			
Wrecking barge ^a				
Garbage barge ^a				
Water barge ^a				

^aNot documented.

^bGarbage; not documented.

List of vessels engaged in Yukon River trade, etc.—Continued.

Name.	Class.	Official No.	Gross tons.	Net tons.
EMPIRE TRANSPORTATION COMPANY.				
St. Michael.....	Steamer.....	116816	718	409
Seattle.....	do.....	116817	718	409
Tacoma.....	do.....	145773	718	409
Victoria.....	do.....	116811	718	409
Alaska.....	Tug.....	107458	60	19
Empire.....	do.....	136574	115	65
Carola.....	Launch.....		5	
Ohio.....	do.....			
Munook.....	Barge.....	51296	383	355
Dawson.....	do.....	35541	383	355
Tanana.....	do.....	59482	277	249
Yukon.....	do.....	65058	277	248
No. 3.....	do.....	31577	363	334
No. 4.....	do.....	31578	160	160
SEATTLE-YUKON TRANSPORTATION COMPANY.				
Rock Island.....	Steamer.....	111177	523	386
Seattle No. 3.....	do.....	116854	548	326
D. R. Campbell.....	do.....	157509	718	409
Milwaukee.....	do.....	92865	396	219
Josephine.....	Launch.....		2	
Admiral.....	Barge.....			
Seattle No. 1.....	do.....	116853	445	445
Seattle No. 4.....	do.....	57992	600	600
INDEPENDENT.				
Casca.....	British steamer.....			363
Mono.....	do.....			200
Glenora.....	do.....			250
J. P. Light.....	do.....			409
Lightning.....	do.....			350
Tyrell.....	do.....			408
Louise.....	British barge.....			552
Jean.....	do.....			621
Margaret.....	do.....			556
Rideout.....	British steamer.....			267
Lavelle Young.....	Steamer.....	141529	506	396
Arctic Boy.....	do.....	107411	74	74
St. Joseph.....	do.....	116863	69	69
Pilgrim.....	do.....	150778	718	409
May West.....	do.....	92896	134	69
Monarch.....	do.....	92855	463	269
Robert Kerr.....	do.....	111180	718	409

a Not documented.

b Estimated.

APPENDIX D.

Comparative vocabulary of Ingalik and Eskimo tribes.

Stock.....	Ingalik.....	Eskimo.		
Family.....	Dall River.....	Tanana.....	Nulato.....	Egomutes.
One.....	Chaylkay.....			Atowchuk.
Two.....	Natuka.....			Mahlru'kh.
Three.....	Torka.....			Pingalen.
Four.....	Dunchay.....			T'stamen.
Five.....	Chets'l tenalo.....			Telemute.
Six.....	Nik'l a torka.....			Agulnuleet.
Seven.....	Dorna natuka.....			Maloodinullit.
Eight.....	Nik'l a dunchay.....			Pinganullit.
Nine.....	Nine.....			Kullnolit.
Ten.....	Chayk'l tatornay.....			Kullnak.
House.....	Yukht.....	Nohatukuna.....	Kunnah.....	N'nuh.
Tent.....	Howlneyah.....			
Outdoors.....	Klahtait.....			
Bed.....	Doryu quotontan.....			Atlekhka.
Chair.....	Stullisht.....			
Window.....	Hordor ne datorny.....			Tarak.
Door.....	Hordor ta torny.....		Kotorneet honah.....	Annuk.
Stove.....	Belada.....			
Lamp.....	'Nkass beyutalquina.....			
Table.....	Butklay kwachetsl.....			

Comparative vocabulary of Ingalik and Eskimo tribes—Continued.

Stock	Ingalik			Eskimo.
Family	Dall River	Tanana	Nulato	Egomutes.
Knife	Syah	Klaka dohna	Klaka dohna	Chiwik.
Fork	Jessa quilsch			
Spoon	Skolt			
Plate	Klosh lostah			
Cup	Chelushcha			
Bucket	Noloi		Noloi	
Kettle	Taynicht		(See Bucket)	G'hun.
Box	Yasicht		Tenadakuna	
Fire	Kwotalkwun	Takuna	Takuna	Kanuk.
Smoke	Klut.		Hkhlit	Apsik.
Firewood	Stick		Stits	
Matches	Chuwishcha			
Candle	Chuwichcha			
Coal	Lo ohna latkwina			
Coal oil	Gas			
Key	Cheluth			
Ax	Klak klaisch	Mk'le kiala	Mukle kiala	Kolkabuk.
Hammer	Bacha kwotalkun			
Saw	B. etahdolt			
Auger	B. hotitoll			
Gimlet	B. holwuilt			
Plane	B. hounta doish			
Rule	Stellus			
Square	B. hok dahlisch			
File	Hukwo			
Grindstone	Nagl Butkala			
Nail	Jetsukah			
Window glass	Stak lo			
Day	Dut zin	H'lut	K'lut	Okhtuk.
Night	Klah tah	K'ltahah	Kleetakhle	Oonuk.
Yesterday	Kwotorna	Kohtohna	Kuhtohna	Ikpukusk.
Day before	Kwotorn Kwotorna		Kuletohnakuh	
To-morrow	Kwotor 'ntah			
Day after	Kwotorn ho kwo torn'ta			
By and by	Klah klah			Atata.
Afternoon	Syneetsuk			
Morning	Mendorna			Oonma kun.
Forenoon	Yolkwoitah			
This year	Du kwosh	Ohutlan	He abghuh	
Last year	Or kwah		Oghuh	Towunga.
Next year	Or oo tah		Oghutlah	
Now	Kwah tait			
Winter	Hoidah	Nakhalut	Hwutaghuh	Hwat ow.
Summer	Sant	Sanuh	Santagha	Ooksuk.
Rain	Chuhn	Ookhl'kohu	At khun	Keek.
Snow	Satl	Nutagah	Nutagha	Ibizhuh tuk.
Ice	Chuh	T'un	T'un	Unyuk.
Water	Tu	Tu	Tu	Cheekuk.
Cold	Aglay	Atzuh	Azu	Muk.
Warm	Klahbah	Honalkoh	Atzun kulla	Ningluktuk.
Fog	Orkh			
Clouds	Ee yo kwullit	Yoh	Sodah uh	
Thunder	Nuti'tuna	Nichletuna	Nich'tuna	
Lightning	Kwuhn			
Aurora	Yuro kwohlit		Yo ikokhte tan	Igoghi uk.
Star	Kluhn		Klu un	Aghi at.
Sun	Saw			Okokhtuk.
Moon	Saw		Tukhtun	Aghi aluk.
River	Huhneh		Kakhat	
Lake	Wuhn		Meenu Kut	Nanimuk.
Sea				Emuk.
White man	Gessuk			
Indian	Nunkwat tenah			Innuyet.
Man	Tenah	Tenanyu	Tenanyu	
Woman	Salta	Soltana	Soltana	Okhannuk.
Boy	Sakyah	Yukioza	Kulioza	Tanigowiluk.
Girl	Salta			Okanokmiuk.
Baby	Sok we na chun			
Father	Aytah	Tuhkalah	Tuhkalah	Atakah.
Mother	Aynah	Nukalah	Nukalah	Ahkuk.
Brother	Suhchitlah	Sihultana	Su gha	Kingukshuk.
Sister	Sutatsah	Stahtsah	Statah	Anligut kuh.
Aunt	Ee tabuatsah			
Uncle	Sel ah			
Head	Tenah klisb		Tenah likh	Nashkok.
Hair	T. Kluwah		T. lughuh	Nuyut.
Forehead	T. takaddah		T. kaduh	
Nose	T. sisch		Siket chuk	Kanuk.
Mouth	T. lohit	Tenah loht	T. loht	
Eye	T. agah	T. nogah	T. nogah	Eekhka.
Lips	T. tabana			Kankah.

Comparative vocabulary of Ingalik and Eskimo tribes—Continued.

Stock	Ingalik			Eskimo.
Family	Dall River	Tanana	Nulato	Egomutes.
Teeth	T. wuh	T. woh	T. lottah	Hudinka.
Tongue	T. kiulah		T. lula	Ooluka.
Ear	T. 'teegah		T. serah	Cheeuulik.
Chin	T. yutah	T. l nuh		
Neck	T. kwohlt		T. kukhtle	Wee akuk.
Throat	T. lagbah			
Shoulder	T. jetlah			
Arm	T. kwoinah	T. konah	T. konah	Takhlik.
Chest (the)	T. taht clinah	T. t Slenah		
Stomach	T. but		T. mit	
Back	T. nenah	T. nunah		P'koke.
Leg	T. lenah	T. tle'nuh	T. na	Erukha.
Foot	T. koh	T. kuh	T. kuh	
Toe	T. kalsayah		T. kalwugha	
Heel	T. kaltolchit		T. kah	
Hand	T. aloh			
Finger	T. lohtsalah		T. ilot lukah	Ikunka.
Eyeshash	T. notuchlah	T. notaka		Kununkayak.
Eyebrow	T. sutah	T. all'tohuga		
Thumb	T. lochek		T. kutle	Kungeluk.
Elbow	T. suts	T. sus	T. sus	
Knee	T. kwoht	T. luka	T. kut	
Ribs	T. chowkah			
Cheek	T. namouts	T. nakluh		
Cap	Kliäkatalona		Klakataluohna	Natchuk.
Coat	Bee atsussea abssa			Atkuk.
Trousers	Kahtsclsh			Kukhlik.
Shirt	Dah asch			
Undershirt	Chayl kay yah			
Socks	Sul chah		Alokhtlgho	Koleruk.
Moccasins	Kahtsult			
Mittens	Jets		{Tenan kutchin. {Chutz	{Arewtik. {Azigak.
Gloves	Meetagha	Tozswintaga	Meetagha	
Vest	Zaylechah			
Blanket	Sutah	'Tsutah	'Tzudah	Ooluk.
Button	Say kah			
Pin	Chets say kah			
Bear	Suss	Yukuki		Takokuk.
Moose	Tenacha	Tenekah	Tenekoh	
Wolf	Tai kwoina	Kuhkowna	Nikona	Kigalunuk.
Fox	Nakitlah	Koholkoi	Kohulkoi	Kamyuk.
Beaver	Kah kah	Noyuh	Noyuh	Malutak.
Martin	Sucha (l)	Suhkuh	Kohkyoza	Kagu ishok.
Mink	Tabsh usa	Takinya	Takhinah	Magmuktik.
Otter	Muzay yah	Melazin	Melazina	Chinnikuk.
Wolverine	Nutsailt	Nilitsikh	Nitsikhtl	
Muskrat	T'zun			
Rabbit	Koh	Koh	Nuohneegah	Kuyuthluk.
Ermine	Chowiznah	Kowoznin		Cheeket.
Deer	Mutsikh	Mitzikh	Anoyah	Tuntuk.
Dog	Klaisch	Klikh'k	Klikh'k	Kitmuk.
Salmon	Tokak	Totkakh	Khak	Takhiuk puk.
White-fish	Nulagna		N'lagma	
Moose meat	Nulano			
Goose	Tutsunah	Tutsunah	Tutsunah	Ting'um yuk.
Duck	Nintala	Nintala	Nintala	Ooksuhtuk.
Ptarmigan	Takho	Telkumah	Telkumah	Okuziguk.
Grouse	Toltoya	Toltoya	Toltoya	
Louse	Ee yuk			
Mosquito	Kleh	Klih		Muhko khi.
Money	Tencha			
Arrow	Kho	Koh	Koh	Khot.
Canoe	S s s sisch	Medoya	Medoy	
Snowshoes	Ohsh		Osh	Tun'g'yuk.
Large	'Nehoh	Nutsoghur	N'koh	Onguk.
Small	'Ntsutla	Kityoza	Nukutsta	Meekuk.
None	Kallah	M'kulla	M'kulla	Peetuk.
Plenty	Bokhulan		T'sahluh	
'Ar	Neeloh	Neeloh	Neeloh	Yaksikhtuk.
Near	Neelkwohtsah	Nihlultzar	Likhkuta	Ooguksi khtuk.
Tree	Tshwah			Naput.
Laugh (to)	Enjetsukluk			
Cry (to)	Atsuk		{(Coward). {Atsik	
Sorry (to be)	Sokwetantalon	Honallkah	Kuluh	Kanukuk.
Frightened	Nulehet	Nelukut	Nelukut	Alingu
Sew (to)	Togh'see	Okhtle'seh		
Sleep	Leetan			

Comparative vocabulary of Ingalik and Eskimo tribes—Continued.

Stock	Ingalik			Eskimo.
Family	Dall River	Tanana	Nulato	Egomutes.
Sick or to be in pain.	Abah	Amahlan	Amah	Obnikhtuk.
Strong	N'utl		N'kkl	T'huk.
Weak	N'utl kallay			
Good	Nazun	Nazun	Nazun	Asukhtuk.
Bad	'Tzoinklakah	Tazokunioza	Tzutklakahulan	Assetuk.
You	Neh	N'neh	N'neh	Ikhlwit.
Me	See	Sih	Sih	
Flour	Baychu		Klatz	
Butter	Mastlah			
Sugar	Sakahlah			
Tea	Chia			
Tobacco	Takwina		Takuna	Taghwuk.
Where	Hoti		Hoti	
Who	Tabah			Keenuh.
What say	'Totenni	Tohtenni		
What for	Jennyun			
Yes	Oh ho	Ah	Hoh	Hwokah.
No	Ah nah	N'tyahoh	N'tyahoh	Peetuk.
Don't know	Wuh lah	W'isus nilga	Tustina	Nutlokai.
Perhaps	Wilhay	'Rulhay	'Rulhay	
Same (the)	Klaw ut zun	Kuythluku kantah	Kantah	
Come here	Ohni	Ohni	Ohni	
Sit down	Leetoh	Teetoh	Seetoh	Akum.
Go away	Anay	Anee	Anee	Ayee.
Thank you	Bassay	Suwa tsuh tusin-tuh.	Marsee	Speseeba.
My wife	So oht	So oht	So oht	Nuhlikuh.
My girl	So chahah			
My boy	So tenuh			
My sweetheart	Tetchekli neh			

Conversational phrases in the dialect of the Dall River Indians.

Are you hungry? Ma amkat?
 I will give you something. 'Nklaw je tekl' chekl'.
 Are you sick? Hokleet abah in lanni?
 Where is the pain? Antanay abah in lan?
 I want to see you. 'Nklansik aht.
 Come to my house. Ohni sek leetoh.
 Come again. Chukwotk wotin neh dohsh.
 It will be warm by and by. Klak kwil tinohl chin.
 Do you like me? See kat dah intah hay?
 I like you. Nuh kat'stah.
 I think so. Kuhn' Tah.
 How many days? Tohkwenanut at enzinn?
 How much? 'Ntahts ah kukah?
 What have you got? Jenay aytai?
 What do you want? Jenay kat aintah?
 Let me see. Nohtl'anay.
 Do you understand? Huitl' entenay?
 Hurry up. 'Ntuhwuh.
 Take off your hat. Nohtsuk tintohsh.
 Take off your coat. Nochay lilyah.
 Sit in the other room. Yu chut an yucht leetoh.
 Come back. Sonen neh doschen.
 I am going to my house. Kwotan notez dohlt.
 Are you afraid? Nayn le chetay?
 Give me your hand. 'Nlo nehtah.
 Give (it) to me. 'Ntah.
 That is nothing. (Of no consequence.) Sy lah.
 That is not true. Kwuhnzaht.
 Take it. Inl'chuyit.

APPENDIX E.

Special ration issued to the crew of the Nunivak.

The following is a list of the component parts of 5,082 rations furnished for the subsistence of the crew of the *Nunivak* while on the Yukon River station for the year ending June 30, 1901. In addition to the articles enumerated, fresh moose meat and fresh fish were issued to the men from time to time, when these articles could be obtained, in lieu of the salt portion of the ration.

Salt beef.....	pounds..	1,050	Biscuit, ship's.....	pounds..	500
Salt pork.....	do.....	784	Rice.....	do.....	450
Salt fish.....	do.....	750	Rolled oats.....	do.....	350
Roast mutton, canned.....	do.....	544	Corn meal.....	do.....	375
Corned beef, canned.....	do.....	788	Sugar, granulated.....	do.....	1,400
Roast beef, canned.....	do.....	704	Coffee.....	do.....	275
Sausage, canned.....	do.....	544	Tea.....	do.....	40
Ham.....	do.....	615	Cocoa.....	do.....	30
Bacon.....	do.....	550	Butter.....	do.....	650
Flour.....	do.....	4,350	Condensed milk.....	do.....	400
Apples, evaporated.....	do.....	450	Cheese.....	do.....	250
Peaches, evaporated.....	do.....	450	Lard.....	do.....	275
Cranberries, canned.....	do.....	450	Baking powder.....	do.....	65
Raisins.....	do.....	175	Salt.....	do.....	100
Beans.....	do.....	650	Pepper.....	do.....	10
Peas, split.....	do.....	150	Mustard.....	do.....	20
Soups, canned.....	do.....	500	Pickles.....	do.....	350
Potatoes, evaporated.....	do.....	260	Vinegar.....	gallons..	20
Potatoes, fresh.....	do.....	4,480	Molasses.....	do.....	40
Tomatoes, canned.....	do.....	1,150	Onions, fresh.....	pounds..	600
Sauerkraut.....	do.....	700	Tobacco.....	do.....	250

NOTE.—All perishable articles, such as biscuits, cereals, butter, cheese, etc., were packed in hermetically sealed cans of convenient size for use. The ham and bacon were packed in salt; the sauerkraut and pickles were in wood containers and kept in warm storage during the winter. The rest of the supplies, including the fresh potatoes, were allowed to freeze, and were thawed out as required.

APPENDIX F.

BIRDS OF THE YUKON RIVER.

PODICIPIDÆ (Grebes).

1. *Colymbus holboellii*..... Holboell's Grebe.
2. *Colymbus auritus*..... Horned Grebe.

GAVIIDÆ (Loons).

3. *Gavia imber*..... Loon.
4. *Gavia adamsii*..... Yellow-billed Loon.
5. *Gavia lumme*..... Red-throated Loon.

LARIDÆ (Gulls).

6. *Stercorarius pomarinus*..... Pomarine Jaeger.
7. *Larus glaucus*..... Glaucous Gull.
8. *Larus glaucescens*..... Glaucous-winged Gull.
9. *Larus Philadelpha*..... Bonaparte's Gull.
10. *Sterna paradisea*..... Arctic Tern.

ANATIDÆ (Ducks, geese, and swans).

11. *Merganser serrator*..... Red-breasted Merganser.
12. *Anas boschas*..... Mallard.
13. *Mareca Americana*..... Baldpate.

14. *Nettion carolinensis* Green-winged Teal.
 15. *Querquedula discors* Blue-winged Teal.
 16. *Dafila acuta* Pintail.
 17. *Clangula clangula* Golden-eye.
 18. *Charitonetta albeola* Buffle-head.
 19. *Harelda hyemalis* Old Squaw.
 20. *Histrionicus histrionicus* Harlequin Duck.
 21. *Arctometta fischeri* Spectacled Eider.
 22. *Chen hyperborea* (?) White Brant.
 23. *Anser albifrons* White-fronted Goose.
 24. *Branta canadensis* Canada Goose.
 25. *Branta nigricans* Black Brant.
 26. *Philacte canagica* Emperor Goose.
 27. *Olor columbianus* Whistling Swan.

GRUIDÆ (Cranes).

28. *Grus mexicana* (?) Sandhill Crane.
 29. *Grus canadensis* Little Brown Crane.

PHALAROPODIDÆ (Phalaropes).

30. *Crymophilus fulcarius* Red Phalarope.
 31. *Phalaropus lobatus* Northern Phalarope.

SCOLOPACIDÆ (Snipe).

32. *Gallinago delicata* Wilsons Snipe.
 33. *Macrorhamphus scolopaceus* Long-billed Dowitcher.
 34. *Tringa canutus* Knot.
 35. *Tringa maculata* Pectora Sandpiper.
 36. *Tringa minutilla* Least Sandpiper.
 37. *Limosa hæmastica* Hudsonian Godwit.
 38. *Totanus flavipes* Yellow-legs.
 39. *Helodromas solitarius* Solitary Sandpiper.
 40. *Actitis macularia* Spotted Sandpiper.
 41. *Numenius hudsonicus* Hudsonian Curlew.

CHARADRIIDÆ (Plovers).

42. *Squatarola squatarola* Black-bellied Plover.
 43. *Charadrius dominicus* Golden Plover.
 44. *Aegialitis semipalmata* Semipalmated Plover.

APHRIZIDÆ (Surf birds and turnstones).

45. *Arenaria interpres* Turnstone.

TETRAONIDÆ (Grouse, partridges, etc.).

46. *Canachites canadensis* Canada Partridge.
 47. *Bonasa umbellus* Ruffed Grouse.
 48. *Lagopus lagopus* Willow Ptarmigan.
 49. *Pedioecetes phasianellus* Sharp-tailed Grouse.

FALCONIDÆ (Hawks, etc.).

50. *Circus hudsonius* Marsh Hawk.
 51. *Accipiter atricapillus* Goshawk.
 52. *Falco rusticolus* Gyrfalcon.
 53. *Falco columbarus* Pigeon Hawk.

BUBONIDÆ (Horned owls, etc.).

54. *Asio accipitrinus*.....Short-eared Owl.
 55. *Scotiaptex cinerea*.....Great Gray Owl.
 56. *Nyctea nyctea*.....Snowy Owl.
 57. *Surnia ulula*.....Hawk Owl.

ALCEDINIDÆ (Kingfishers).

58. *Ceryle alcyon*.....Belted Kingfisher.

PICIDÆ (Woodpeckers).

59. *Dryobates pubescens*.....Downy Woodpecker.
 60. *Picoides americanus*.....American three-toed Woodpecker.
 61. *Colaptes auratus*.....Flicker.

TYRANNIDÆ (Tyrant flycatchers).

62. *Contopus borealis*.....Olive-side Flycatcher.

CORVIDÆ (Crows, jays, magpies, etc.).

63. *Perisoreus canadensis*.....Canada Jay.
 64. *Corvus corax*.....Raven.

ICTERIDÆ (Blackbirds, orioles, etc.).

65. *Scolecophagus carolinus*.....Rusty Blackbird.

FRINGILLIDÆ (Finches, sparrows, etc.).

66. *Pinicola enucleator*.....Pine Grosbeak.
 67. *Acanthus hornemannii*.....Hornemann's Redpoll.
 68. *Acanthus linaria*.....Redpoll.
 69. *Passerina nivalis*.....Snowflake.
 70. *Calcarius lapponicus*.....Lapland Longspur.
 71. *Ammodramus sandwichensis*.....Sandwich Sparrow.
 72. *Zonotrichia leucophrys*.....White-crowned Sparrow.
 73. *Zonotrichia coronata*.....Golden-crowned Sparrow.
 74. *Spizella monticola*.....Tree Sparrow.
 75. *Passerella iliaca*.....Fox Sparrow.
 76. *Junco hyemalis*.....Slate-colored Sparrow.

HIRUNDINIDÆ (Swallows).

77. *Petrochelidon lunifrons*.....Cliff Swallow.
 78. *Hirunde erythrogaster*.....Barn Swallow.
 79. *Tachycineta bicolor*.....Tree Swallow.
 80. *Tachycineta thalassina*.....Violet-green Swallow.
 81. *Clivicola riparia*.....Bank Swallow.

AMPELIDÆ (Waxwings, etc.).

82. *Ampelis garrulus*.....Bohemian Waxwing.

LANIIDÆ (Shrikes).

83. *Lanius borealis*.....Northern Shrike.

MNIOTILTIDÆ (Wood Warblers).

84. *Helminthophila celata* Orange-crowned Warbler.
 85. *Dendroica aestiva* Yellow Warbler.
 86. *Dendroica coronata* Myrtle Warbler.
 87. *Dendroica striata* Black-poll'd Warbler.
 88. *Seiurus noveboracensis* Water Thrush.
 89. *Wilsonia pusilla* Wilson's Warbler.

MOTACILLIDÆ (Wagtails).

90. *Anthus pensilvanicus* American Pipit.

PARIDÆ (Nuthatches and Tits).

91. *Parus cinctus* Siberian Chickadee.
 92. *Parus hudsonicus* Hudsonian Chickadee.

TURDIDÆ (Thrushes, Solitaires, Stonechats).

93. *Hylocichla aliciae* The Gray-cheeked Thrush.
 94. *Hylocichla ustulata* Russet-backed Thrush.
 95. *Merula migratoria* American Robin.
 96. *Hesperocichla nævia* Varied Thrush.

List of mammalia of the Yukon River region.

CARNIVORA.

FELIDÆ.

- Felis canadensis* Canada Lynx.

CANADÆ.

- Canis familiaris* var. *borealis* Eskimo Dog.
C. lupus Gray Wolf.
C. lupus var. *occidentalis* Timber Wolf.
Vulpes fulvus Red Fox.
V. fulvus var. *decussatus* Cross Fox.
V. fulvus var. *argentatus* Silver-gray Fox.
V. lagopus Arctic Fox.

MUSTELIDÆ

- Mustela americana* Marten.
Putorius vison Mink.
P. pusillus Least Weasel.
P. erminea Ermine.
Gulo luscus Wolverine.
Lutra canadensis Otter.

URSIDÆ.

- Ursus Richardsonii* Barren Ground Bear.
U. americana Black Bear.
U. americana var. (?) White-faced Black Bear.

RODENTIA.

SCIURIDÆ.

- Sciurus hudsonicus* Red Squirrel.
S. niger Black Squirrel.

Castor fiber	Beaver.
Arctomys prinosus	Marmot.
Fiber zibethicus.....	Muskrat.

MURIDÆ.

Hesperomys leucopus.....	White-footed Mouse.
Arvicola gapperi.....	Red-backed Mouse.
A. rubricatus.....	Western field Mouse.
Myodes hudsonicus.....	Hudson's Lemming.

HYSTRICIDÆ.

Erithizon dorsatus epixanthus.....	Porcupine.
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LEPORIDÆ.

Lepus timidus.....	Arctic Hare.
L. Campestris.....	Polar Rabbit.

UNGULATA.

CERVIDÆ.

Alces machlis.....	Moose.
Rangifer tarandus groenlandicus.....	Reindeer

CAVICORNIA.

Ovis montana.....	Mountain Sheep.
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INSECTIVORA.

SORICIDÆ.

Sorex pachypus.....	White-sided Shrew.
S. Cooperi.....	Tiny Shrew.

List of fishes of the Yukon River.

SALMONIDÆ.

Oncorhynchus tshawytscha.....	King Salmon.
O. kisutch.....	Silver Salmon.
O. gorbuscha.....	Humpback Salmon.
O. nerka.....	Blue-back Salmon.
O. keta.....	Dog Salmon.
Coregonus quadrilateralis.....	Round White-fish.
C. Nelsonii.....	Humpbacked White-fish.
C. kennicotti.....	Broad White-fish.
Argyrosomus pusillus.....	Small White-fish.
Salvelinus malma.....	Red-spotted Trout.
Thymallus signifer.....	American Grayling.

ESOCIDÆ.

Esox lucius.....	Pike.
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LOTA.

Lota maculosa.....	Burbot or "Losh."
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List of plants.

[NOTE.—The following plants were collected by the author, and have been identified by Miss Alice Eastwood, Curator of Botany in the California Academy of Science. Owing to our absence from the river region during the months of July and August of each year, the list of indigenous plants is only partially complete.]

Phegopteris Dryopteris, Fée	Saxifraga Hirculus, L.
Sitamom jubatum, J. G. Smith	Poa pratensis, L.
Equisetum pratense, Ehrh	Potentilla.
Erigeron	Potentilla anserina, L.
Solidago	Papaver alpinum, L.
Geum triflorum, Pursh	Echinosperrnum Redowskii, Lehm.
Sanguisorba	Aspidium fragrans, Swartz.
Beckmania cruceiformis, Hort	Gentiana propinqua, Rich.
Chrysanthemum bipinnatum, L	Lupinus.
Spiranthes	Parnassia palustris, L.
Bupleurum	Dracocephalum parviflorum, Nutt.
Galium	Potentilla fruticosa, L.
Galium boreale, L	Achillea millefolium, L.
Epilobium spicatum, Lam	Mertensia paniculata, Don.
Aconitum delphinifolium, D. C	Hedysarum auriculatum, Eastwood.
Iris setosa, Pall	Arnica.
Carex mertinsii, Presc	Zygadenus elegans, Pursh.
Poa arctica, R. Br	Hedysarum Mackensii, Rich.
Juncus stygius, L	Arnica alpina, Olin.
Rubus arcticus, L	Aster.
Nasturtium palustre, L	Empetrum nigrum.
	Myosotis Palustic, Hoff.

List of fossils.

PROBOSCIDEA.

ELEPHANTIDÆ.

Elephas primigenius	Mammoth.
Mastodon giganteus	Mastodon.

NOTE.—Some confusion seems to exist among naturalists as to the exact differentiation between the two species of Elephantidæ above noted, but a comparison of the fossil remains of the two animals which are common throughout Alaska would seem to prove that both species were at one time inhabitants of the region.

UNGULATA.

CAVICORNIA.

Bos crassicornus	Ox.
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NOTE.—The fossil remains of several species of Cavicornia have been reported as having been discovered in various parts of Alaska. The skull and horns of the specimen above noted were discovered in one of the placer mining claims on Little Minook Creek during the winter of 1900 at a depth of 45 feet below the surface, and when examined by the author was in an excellent state of preservation. There is little doubt as to its proper identification.

MOLLUSCA.

- | | |
|---------------------------------|-----------------------------------|
| 1. <i>Trigonia leana</i> . | 5. <i>Ostræ</i> , sp. |
| 2. <i>Chione varians</i> . | 6. <i>Octaeonella oviformis</i> . |
| 3. <i>Mactra ashburneri</i> . | 7. <i>Cucullea truncata</i> . |
| 4. <i>Homomya concentrica</i> . | |

NOTE.—The above fossils were collected at a point on the right bank of the Yukon River, a short distance above Nulato. They have been identified by Prof. F. M. Anderson, of the University of California, as belonging to the Upper Cretaceous (Chico) fossils, and are chiefly interesting from the fact that the Chico fauna of Alaska has not yet become known to geological science, and this serves to illustrate its similarity to that of Oregon and California.

METEOROLOGICAL RECORD.

The state of the weather is indicated by the following letters (Beauforts notation):

- | | |
|----------------------|-----------------------------------|
| b Blue sky. | p Passing showers. |
| c Clouds (detached). | q Squally. |
| d Drizzling rain. | r Rain. |
| f Foggy. | s Snow. |
| g Gloomy. | t Thunder. |
| h Hail. | u Ugly (threatening) appearances. |
| l Lightning. | v Visibility. |
| m Misty. | w Wet (dew.) |
| o Overcast. | z Hazy. |

Record of the weather kept on board the U. S. S. Nuniuk, Yukon River, Alaska.

SEPTEMBER, 1899.

[Astronomical time used.]

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Rampart City 65° 32' N., 150° 10' W.	bc	bc	bc	bc	bc	oc	oc	oc	bc	bc	bc	bc
2	do	bc	bc	bc	bc	bc	bc	bc	bcf	bcf	bcf	bc	bc
3	65° 40' N., 149° 55' W.	bc	bc	bc	bc	bc	o	o	o	oc	bc	bc	bc
4	66° 00' N., 149° 15' W.	bc	bc	o	bc	bc	bc	bc	bc	bc	or	or	or
5	do	bc	c	bc	bc	bc	bc	bc	bc	o	o	bc	bc
6	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bcf	bc	bc
7	Rampart City	bc	bc	bc	bc	bc	b	b	bc	bc	oc	oc	bc
8	do	bc	bc	bc	bc	oc	oc	oc	o	o	or	o	or
9	do	o	o	o	o	o	o	o	o	o	bc	bc	bc
10	do	bc	bc	bc	o	o	o	o	o	o	oc	oc	oc
11	do	bc	bc	bc	bc	bc	bc	bc	bc	rf	f	bf	bc
12	do	bc	bc	o	o	bc	bc	bc	bc	bc	bc	bc	bc
13	do	bc	cp	bc	bc	bc	cr	cp	cp	cp	cp	or	or
14	do	orh	bc	bc	bc	bc	o	cp	o	bc	bc	bc	bc
15	do	cp	bc	bc	bc	bc	o	cp	op	op	bc	bc	bc
16	do	bc	bc	o	o	o	o	o	o	os	os	os	o
17	do	os	os	os	os	o	o	oh	oh	o	os	os	os
18	Coal mine 65° 40' N., 149° 55' W.	os	osd	os	os	os	os	o	o	bc	o	o	bc
19	do	bc	bc	bc	l	l	c	c	c	c	o	os	os
20	do	os	os	os	osp	os	os	os	os	os	os	o	os
21	Between coal mine and Dall River	bc	bc	bc	bc	o	o	o	bc	os	o	bc	bc
22	Dall River 66° 00' N., 149° 15' W.	bc	bc	bc	o	bc	bc	bc	bc	bc	bc	bc	bc
23	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
24	do	bc	bc	o	o	o	bc	bc	bc	bc	bc	bc	bc
25	do	o	os	os	os	os	os	os	os	os	os	bc	bc
26	do	bc	bc	bc	bc	o	os	os	os	os	o	o	or
27	do	or	o	o	of	of	o	of	of	fr	f	cp	om
28	do	os	os	os	bc	bc	bc	bc	bc	bc	bc	bc	bc
29	do	bc	bc	bc	b	b	b	b	b	b	b	b	b
30	do	b	bc	b	b	b	b	b	b	b	b	b	b

Record of the weather kept on board the U. S. S. Nuniwak, Yukon River, Alaska—Cont'd.

OCTOBER, 1899.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Dall River.....	b	b	bc	bc	bc	o	o	o	bc	bc	o	o
2	do.....	oc	oc	oc	os	os	os	os	bc	os	bc	bc	bc
3	do.....	bc	bc	o	os	o	os	os	os	os	os	os	os
4	do.....	o	o	o	os	b	b	bc	b	o	bc	bc	bc
5	do.....	os	os	bc	bc	o	bc	bc	o	o	bc	bc	bc
6	do.....	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
7	do.....	bc	bc	bc	os	os	bc	bc	bc	bc	bc	bc	bc
8	do.....	bc	bc	bc	os	os	bc	bc	bc	bc	bc	bc	bc
9	do.....	bc	bc	bc	b	b	bc	bc	bc	bc	bc	bc	bc
10	do.....	o	o	o	o	o	o	o	bc	o	o	os	o
11	do.....	b	bc	bc	o	o	o	o	bc	os	os	bc	bc
12	do.....	bc	bc	os	os	os	os	os	os	os	bc	bc	bc
13	do.....	bc	os	os	os	os	os	os	b	bc	os	os	os
14	do.....	bc	bc	bc	bc	b	b	o	o	o	os	os	os
15	do.....	os	os	os	o	o	o	bc	bc	b	bc	bc	bc
16	do.....	os	o	o	b	b	b	of	o	o	bf	bf	bc
17	do.....	b	b	b	bc	bc	bc	bc	o	o	o	o	bc
18	do.....	bc	bc	bc	o	o	o	o	o	o	o	o	bc
19	do.....	o	o	o	os	os	os	os	bc	bc	bc	bc	bc
20	do.....	oc	os	os	os	os	os	os	bc	bc	os	os	os
21	do.....	oc	oc	oc	os	os	os	os	os	os	os	os	os
22	do.....	os	os	os	os	os	os	os	os	os	os	os	os
23	do.....	os	os	os	os	o	o	o	o	o	of	os	o
24	do.....	bc	o	o	b	bc	bc	bc	bc	bc	bc	bc	bc
25	do.....	bc	bc	bc	b	bc	bc	bc	bc	bc	bc	bc	bc
26	do.....	bc	bc	bc	b	bc	bc	bc	bc	bc	bc	bc	bc
27	do.....	bc	os	bc	os	os	bc	bc	bc	bc	bc	bc	bc
28	do.....	bc	bc	bc	o	o	bc	bc	bc	bc	bc	bc	bc
29	do.....	o	o	o	b	b	b	os	o	o	bc	bc	bc
30	do.....	os	os	os	o	b	b	os	o	bc	bc	bc	bc
31	do.....	bc	o	os	os	os	os	os	bz	os	os	bc	os

NOVEMBER, 1899.

1	Fort Shoemaker.												
2	Dall River, Alaska.	os	os	os	os	os	o	bc	bc	bc	o	os	bc
3	do.....	bc	bc	bc	b	b	b	b	bc	bc	bc	bc	bc
4	do.....	bc	bc	b	b	bc	b	b	b	b	bc	b	bc
5	do.....	o	o	o	o	bc	b	b	b	b	bc	b	bc
6	do.....	bc	bc	b	b	b	b	b	b	b	bc	bc	bc
7	do.....	bc	bc	bc	b	b	b	b	o	o	bc	bc	bc
8	do.....	o	o	bc	o	o	os	os	bc	bc	bc	bc	bc
9	do.....	bc	bc	b	b	b	b	b	b	bc	bc	b	bc
10	do.....	b	b	bc	b	b	b	b	b	b	b	b	b
11	do.....	b	bc	bf	bf	bf	bf	bf	bf	b	z	z	bc
12	do.....	bc	bc	bc	bc	bc	bc	bc	b	bc	bc	bc	bc
13	do.....	bc	b	b	b	b	b	b	b	b	b	b	b
14	do.....	bc	bc	b	b	b	b	b	b	b	b	b	bc
15	do.....	bcz	bcz	bz	bc	bc	b	bz	bz	bcz	bcz	bcz	bcz
16	do.....	bc	o	o	o	o	o	o	o	o	oc	oc	bc
17	do.....	oc	oc	bc	o	bc	oc	oc	oc	oc	oc	oc	o
18	do.....	bc	bc	bc	o	o	o	bc	bc	bc	bc	bc	bc
19	do.....	o	o	bc	oc	o	o	o	o	o	os	os	o
20	do.....	oc	os	bc	os	os	oc	oc	oc	oc	oc	oc	os
21	do.....	oc	oc	oc	bc	bc	bc	bc	oc	oc	oc	oc	os
22	do.....	bos	os	os	os	o	bc	bc	bc	oc	oc	os	os
23	do.....	bc	oc	oc	os	os	os	os	oc	bc	bc	bc	bc
24	do.....	bc	bc	bc	oc	oc	bc	bc	bc	bc	bc	oc	os
25	do.....	o	o	o	b	bc	bc	bc	bc	bc	bc	oc	o
26	do.....	o	os	os	bc	bc	bc	bc	o	os	os	os	os
27	do.....	os	os	os	os	o	o	o	o	o	o	os	os
28	do.....	o	o	o	bc	bc	bc	bc	bc	os	os	os	os
29	do.....	oc	os	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
30	do.....	bcs	bc	bc	bc	bc	bc	bc	b	b	bc	bc	bz

Record of the weather kept on board the U. S. S. Nunivak, Yukon River, Alaska—Cont'd.

DECEMBER, 1899.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker. Dall River, Alaska.	bc	bce	b	bc	b	b	b	b	b	bce	bc	bc
2	do	bc	bce	bc	bc	bc	bc	bc	bc	b	bce	bc	bc
3	do	bc	bce	bc	o	os	os	os	os	os	o	os	os
4	do	os	os	os	bc	os	os	os	os	os	os	os	os
5	do	os	os	os	bcs	os	os	bc	b	bc	bce	bc	bc
6	do	bc	bce	bc	bc	bcs	bc	bc	bc	bc	bce	bc	bc
7	do	bc	bce	bc	bc	bc	bc	bc	o	o	o	os	os
8	do	ocs	os	os	os	o	os	os	os	os	os	os	os
9	do	o	o	o	o	o	os	os	os	os	os	os	bc
10	do	bc	b	b	b	bc	bc	b	b	bc	bce	bc	bc
11	do	bc	b	b	bc	bc	bc	b	b	bc	bc	bc	bc
12	do	os	os	bc	bc	b	b	bc	bc	bc	bce	bc	os
13	do	os	os	os	os	bc	bc	bc	bc	bc	bce	bc	bc
14	do	os	os	o	bc	bc	bc	bc	bc	bc	bc	bc	bc
15	do	o	bce	b	bc	bc	bc	bc	bc	bc	bc	bc	bc
16	do	o	bce	bce	bc	bc	bc	bc	o	bc	bc	bc	bc
17	do	os	bce	b	bc	bc	bc	bc	bc	bc	bc	bc	bc
18	do	o	bz	bz	bz	os	bc	bc	os	bc	bc	bc	bc
19	do	bc	b	b	bc	bc	bc	bc	bc	bc	bc	bc	bc
20	do	bc	os	bcs	b	o	bc	bc	bc	bc	bc	bc	bc
21	do	bc	bce	b	b	b	b	bz	b	b	bce	bc	bc
22	do	bc	b	b	b	b	b	b	b	b	bce	bc	bz
23	do	b	b	b	b	b	b	b	b	b	b	b	bc
24	do	b	b	b	b	b	b	b	b	b	b	b	bc
25	do	bc	bce	bce	bc	bc	b	b	b	b	bce	bc	bc
26	do	bc	bce	b	b	bz	b	b	bc	b	bce	bc	bc
27	do	bc	bce	b	b	o	bc	bc	bc	bcs	bc	bc	bc
28	do	o	bce	bc	b	b	b	bc	bc	bc	bc	bcs	bc
29	do	o	bcs	bc	bc	b	bc	bc	b	bc	bc	bc	bc
30	do	b	b	b	b	b	bc	bc	bc	bc	bc	bc	bc
31	do	bc	bce	b	b	b	b	b	b	b	b	b	b

JANUARY, 1900.

1	Fort Shoemaker. Dall River, Alaska.	bc	bc	o	o	o	o	o	bc	bc	bc	bc	bc
2	do	b	o	b	b	b	b	bc	bc	bc	bc	bc	bc
3	do	bc	b	b	bc	bc	bc	bc	bc	bc	bc	bc	bc
4	do	bc	o	bc	bc	bc	bc	bc	bc	bc	bcs	bc	bc
5	do	b	b	b	b	b	b	b	b	b	bc	bc	bc
6	do	bc	b	b	b	b	bz	b	b	b	bc	bz	bc
7	do	bc	bce	bc	bc	b	b	b	b	b	bz	bc	b
8	do	bc	bce	bc	bc	b	b	b	o	b	bc	bcs	ocs
9	do	os	os	os	os	os	os	os	bcs	os	o	bcs	bcs
10	do	bc	o	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
11	do	bc	bce	bc	bc	bc	bc	b	b	bc	bc	bc	b
12	do	bz	bz	bz	b	bz	bz	b	b	bc	bc	bc	bc
13	do	bc	bz	bf	bz	bz	bz	bz	bz	bz	bz	bz	bz
14	do	bc	bce	bz	bz	bz	bz	bz	bz	bz	bz	bz	bz
15	do	bc	bce	bz	bz	bz	bz	bz	bz	bz	bz	bz	bz
16	do	bce	bce	bz	bz	bz	bz	bz	bz	bz	bz	bz	bz
17	do	bc	bce	bz	bz	bz	bz	b	b	bz	bz	bz	bz
18	do	bc	bce	bc	bc	b	b	bz	bz	bz	bc	bz	bz
19	do	bc	bce	bc	bc	os	os	os	os	os	o	os	os
20	do	os	os	os	os	os	os	bc	bc	bc	bc	bcs	bcs
21	do	bc	bce	bc	bc	o	o	bc	bc	bc	bc	bc	os
22	do	os	o	o	bc	bc	bc	bc	os	os	o	bc	os
23	do	os	os	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
24	do	bc	bce	bc	bc	bc	bc	bc	bc	bc	b	bc	bc
25	do	bc	bz	bz	bz	b	b	b	b	b	bz	bc	bc
26	do	b	bc	b	b	b	b	o	o	o	bc	os	os
27	do	os	os	os	os	os	os	bc	bc	bc	o	o	os
28	do	os	os	bcs	o	o	bc	bc	bc	bc	bc	bc	bc
29	do	os	os	os	os	o	bc	bc	bc	bc	bc	bc	bc
30	do	bc	bce	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
31	do	bc	bce	bz	o	o	o	o	bz	bc	bc	bc	bc

Record of the weather kept on board the U. S. S. Nunivak, Yukon River, Alaska—Cont'd.

FEBRUARY, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska.	oc	oc	o	b	bc	bc	bz	bc	b	bef	bc	bcs
2	do	bc	bc	bc	bc	b	b	b	b	os	b	bc	bc
3	do	bc	bc	b	b	b	b	b	os	os	b	bc	bc
4	do	os	o	os	bc	bc	bc	os	bc	bc	b	bc	bc
5	do	bc	bc	bc	bc	bc	bc	bc	o	oz	o	bc	bc
6	do	os	os	os	o	o	o	bc	bc	bc	bc	bc	bc
7	do	bc	o	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
8	do	bc	bcs	bc	os	os	bc	os	os	bc	bc	bc	bc
9	do	bc	o	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
10	do	o	bc	bc	o	bc	bc	bc	bc	o	o	bcs	bc
11	do	bc	bc	bc	bc	bc	bc	os	os	os	os	bc	bc
12	do	o	os	os	os	os	os	os	o	o	o	os	bc
13	do	os	o	o	bc	bc	bc	bc	ce	ce	ce	bc	bc
14	do	bc	oc	o	bc	bc	bc	b	b	b	bc	bz	bz
15	do	b	b	b	b	b	b	bz	bz	bz	of	bz	bz
16	do	b	bc	bz	bz	b	b	b	b	b	bc	bc	bc
17	do	b	b	b	b	b	b	b	b	b	bc	bc	bc
18	do	bc	bc	bc	bc	bc	bc	b	b	b	bc	b	bc
19	do	bc	b	b	b	b	b	b	b	b	bz	b	bc
20	do	b	b	b	b	b	b	b	b	b	bz	b	bc
21	do	b	bc	bc	bc	b	b	b	b	bc	bc	b	bc
22	do	os	os	os	bc	o	bc	bc	bc	bc	bc	bc	bc
23	do	bc	bc	bc	bc	bc	bc	bz	bz	bc	bc	bc	bc
24	do	bc	bc	bc	b	b	b	b	b	b	bc	bc	b
25	do	b	b	b	b	b	b	b	b	b	b	b	b
26	do	b	b	b	b	b	b	b	b	b	bz	b	b
27	do	b	b	b	b	b	b	b	b	bc	bc	b	b
28	do	b	b	b	b	b	b	b	b	b	b	b	b

MARCH, 1900.

1	Fort Shoemaker, Dall River, Alaska.	b	b	b	b	b	b	b	bc	oc	bc	bc	bc
2	do	b	b	b	b	b	b	b	b	bc	b	bc	bc
3	do	bc	b	b	b	b	b	b	b	b	b	bc	bc
4	do	b	b	bz	b	b	b	b	b	b	b	b	b
5	do	bc	bc	bz	bc	bc	bc	b	b	b	bc	b	b
6	do	b	b	bz	b	b	b	b	b	bef	bz	b	b
7	do	b	b	b	b	b	bf	bf	bf	bf	bf	b	bc
8	do	b	b	bz	b	b	b	b	b	bz	bz	b	bc
9	do	bc	b	bc	bc	b	b	b	b	b	b	b	b
10	do	b	b	b	b	b	b	b	b	bf	b	b	b
11	do	b	b	bz	bz	b	b	b	bz	bz	bz	bc	bc
12	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
13	do	os	os	os	o	bc	bc	bc	bc	bc	bc	bc	bc
14	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
15	do	bc	bc	bc	bc	bc	bc	ocp	bc	bc	bc	bc	bc
16	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
17	do	b	b	bz	b	b	b	b	b	bc	bc	bc	bc
18	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
19	do	bc	bc	bc	bc	bz	b	b	bc	bc	bc	bc	bc
20	do	bc	b	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
21	do	bc	o	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
22	do	o	bc	bc	bc	bc	bc	bc	bc	bc	osf	os	o
23	do	b	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
24	do	o	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
25	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
26	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
27	do	oc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
28	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
29	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
30	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
31	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc

Record of the weather kept on board the U. S. S. *Nunivak*, Yukon River, Alaska—Cont'd.

APRIL, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska.	os	os	bc	bc	bc	bc	o	o	o	o	os	os
2	do	os	os	bc	bc	bc	bc	os	o	o	bc	bc	bc
3	do	bc	bc	bc	bc	os	b	os	bc	os	bc	bc	bc
4	do	bc	bc	bc	bc	os	o	os	os	os	os	os	os
5	do	bc	os	os	os	os	os	bc	os	os	bc	bc	os
6	do	bc	bc	b	b	os	os	bc	bc	bc	bc	bc	bc
7	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
8	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
9	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
10	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
11	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
12	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
13	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
14	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
15	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
16	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
17	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
18	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
19	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
20	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
21	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
22	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
23	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
24	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
25	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
26	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
27	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
28	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
29	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
30	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc

MAY, 1900.

1	Fort Shoemaker, Dall River, Alaska.	bc	bc	bc	bc	b	b	b	o	o	og	os	os
2	do	o	o	bc	bc	b	b	o	o	of	og	og	bc
3	do	o	bc	bc	bc	b	b	os	os	bc	bc	bc	bc
4	do	o	bc	bc	bc	b	b	os	os	bc	bc	bc	bc
5	do	bc	bc	bc	b	b	b	bc	bc	bc	b	b	bc
6	do	bc	bc	bc	b	b	b	bc	bc	bc	b	b	bc
7	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
8	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
9	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
10	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
11	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
12	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
13	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
14	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
15	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
16	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
17	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
18	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
19	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
20	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
21	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
22	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
23	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
24	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
25	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
26	65°35' N., 149°18' W.	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
27		bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
28	65°40' N., 149°55' W.	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
29		bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
30		bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc
31	do	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc	bc

ATMOSPHERIC PRESSURES.

Readings of the aneroid barometer on board the U. S. S. *Nunivak*, Yukon River, Alaska.

SEPTEMBER, 1899.

[Astronomical time used—29+ inches.]

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Rampart City, 65°	1.20	1.12	1.10	1.10	1.08	1.05	1.03	1.01	1.00	1.00	0.99	0.98
2	32' N., 150° 10' W.	.95	.93	.90	.89	.90	.89	.88	.86	.86	.86	.84	.80
3	do	.75	.71	.67	.67	.65	.64	.65	.64	.62	.60	.56	.53
4	65° 40' N., 149°												
	55' W.	.47	.43	.40	.37	.37	.36	.35	.33	.32	.32	.29	.29
5	66° N., 149° 15' W.	.30	.29	.29	.32	.36	.34	.40	.45	.48	.50	.51	.55
6	do	.65	.57	.60	.62	.66	.67	.67	.67	.70	.68	.68	.63
7	Rampart City	.59	.50	.49	.44	.42	.40	.41	.38	.36	.36	.35	.33
8	do	.29	.26	.26	.27	.30	.31	.33	.34	.34	.33	.33	.31
9	do	.27	.25	.25	.25	.26	.30	.34	.36	.40	.45	.48	.50
10	do	.54	.56	.59	.63	.66	.70	.75	.76	.78	.80	.82	.84
11	do	.83	.81	.78	.78	.80	.80	.78	.78	.73	.74	.67	.60
12	do	.51	.43	.38	.35	.33	.36	.35	.36	.36	.37	.37	.37
13	do	.36	.38	.38	.40	.44	.48	.52	.54	.57	.57	.57	.60
14	do	.67	.70	.81	.86	.91	.95	.93	.93	.88	.87	.87	.91
15	do	.88	.83	.83	.82	.80	.83	.75	.75	.75	.77	.78	.80
16	do	.81	.79	.80	.80	.78	.76	.74	.70	.74	.74	.73	.73
17	do	.74	.74	.74	.72	.73	.74	.73	.72	.70	.68	.66	.65
18	Coal Mine, 65° 40'												
	N., 149° 55' W.	.66	.67	.69	.70	.75	.80	.81	.81	.86	.89	.91	.93
19	do	.93	.92	.92	.92	.90	.89	.87	.87	.86	.89	.60	.52
20	do	.45	.39	.34	.31	.29	.30	.32	.33	.40	.43	.47	.48
21	do	.54	.51	.57	.58	.61	.66	.70	.71	.74	.74	.73	.74
22	Dall River, 66° N.,	.74	.72	.71	.70	.67	.66	.64	.63	.62	.62	.62	.61
23	149° 15' W.	.61	.63	.64	.66	.68	.69	.66	.65	.76	.62	.76	.74
24	do	.71	.71	.68	.67	.67	.68	.67	.67	.68	.69	.69	.69
25	do	.66	.68	.69	.68	.68	.68	.69	.71	.69	.67	.67	.67
26	do	.64	.63	.60	.59	.59	.57	.58	.58	.55	.53	.53	.52
27	do	.51	.46	.44	.41	.38	.34	.34	.34	.32	.29	.33	.38
28	do	.39	.45	.42	.46	.48	.52	.58	.60	.70	.78	.82	.87
29	do	.94	.99	1.04	1.10	1.16	1.18	1.23	1.24	1.26	1.26	1.25	1.24
30	do	1.21	1.18	1.16	1.12	1.11	1.10	1.09	1.08	1.04	1.04	1.02	.98

OCTOBER, 1899.

1	Dall River	0.92	0.89	0.87	0.83	0.83	0.82	0.79	0.79	0.77	0.74	0.72	0.70
2	do	.68	.66	.64	.62	.62	.62	.64	.64	.66	.67	.63	.62
3	do	.61	.59	.60	.60	.60	.60	.57	.54	.53	.49	.44	.36
4	do	.26	.18	.20	.01	.05	.07	.10	.10	.11	.11	.07	.04
5	do	.00	.02	.08	.15	.16	.22	.30	.32	.37	.40	.44	.49
6	do	.50	.52	.54	.56	.64	.67	.70	.72	.72	.72	.72	.73
7	do	.71	.75	.77	.80	.87	.90	.93	.92	.96	.96	.99	.99
8	do	1.01	1.02	1.02	1.05	1.04	1.02	1.05	1.05	1.05	1.07	1.10	1.12
9	do	1.16	1.20	1.25	1.28	1.33	1.40	1.39	1.40	1.40	1.41	1.39	1.38
10	do	1.32	1.29	1.28	1.24	1.21	1.20	1.20	1.20	1.18	1.16	1.16	1.15
11	do	1.14	1.12	1.12	1.12	1.12	1.10	1.06	1.03	1.00	.98	.98	.94
12	do	.84	.78	.75	.71	.66	.63	.60	.58	.55	.53	.54	.56
13	do	.59	.62	.63	.72	.78	.77	.84	.88	.90	.89	.89	.88
14	do	.86	.84	.83	.84	.84	.80	.74	.75	.76	.78	.80	.83
15	do	.68	.67	.68	.68	.69	.72	.74	.75	.73	.72	.70	.68
16	do	.84	.86	.88	.89	.90	.92	.87	.91	.92	.94	.95	.96
17	do	.97	.97	.98	1.00	1.03	1.05	1.09	1.10	1.12	1.15	1.17	1.17
18	do	1.18	1.18	1.18	1.16	1.16	1.16	1.15	1.13	1.12	1.10	1.08	1.04
19	do	1.00	.96	.93	.93	.90	.90	.90	.90	.86	.81	.80	.78
20	do	.74	.75	.71	.70	.70	.66	.65	.65	.66	.69	.69	.70
21	do	.70	.70	.73	.75	.76	.76	.78	.76	.77	.77	.77	.75
22	do	.74	.74	.74	.74	.74	.73	.72	.70	.71	.71	.69	.68
23	do	.66	.65	.64	.63	.63	.62	.60	.59	.58	.58	.57	.58
24	do	.58	.56	.56	.55	.55	.54	.50	.47	.45	.45	.41	.40
25	do	.37	.34	.32	.31	.30	.30	.32	.29	.28	.22	.22	.19
26	do	.16	.14	.10	.09	.08	.07	.07	.06	.06	.06	.07	.09
27	do	.11	.12	.14	.17	.18	.19	.20	.22	.22	.23	.23	.23
28	do	.21	.18	.14	.14	.14	.12	.10	.10	.10	.10	.10	.10
29	do	.09	.06	.05	.02	.04	.06	.06	.10	.10	.12	.16	.19
30	do	.22	.25	.32	.41	.45	.51	.52	.53	.56	.56	.54	.52
31	do	.51	.50	.51	.50	.50	.50	.48	.44	.44	.44	.46	.48

Readings of the aneroid barometer on board the U. S. S. Nunivak, Yukon River, Alaska—
Continued.

NOVEMBER, 1899.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska	0.47	0.49	0.52	0.53	0.54	0.52	0.50	0.48	0.40	0.43	0.41	0.40
2	do	.38	.40	.42	.46	.50	.55	.56	.58	.62	.67	.67	.66
3	do	.73	.78	.85	.90	.94	.98	1.02	1.04	1.10	1.10	1.13	1.15
4	do	1.16	1.16	1.18	1.18	1.17	1.18	1.14	1.10	1.12	1.12	1.10	1.10
5	do	1.07	1.05	1.02	1.01	1.00	.98	.98	.94	.92	.91	.88	.88
6	do	.86	.84	.83	.82	.80	.81	.81	.82	.82	.84	.86	.88
7	do	.88	.87	.88	.90	.92	.93	.94	.96	.96	.97	.98	.99
8	do	1.00	1.04	1.06	1.09	1.12	1.13	1.14	1.15	1.17	1.18	1.18	1.22
9	do	1.20	1.20	1.20	1.16	1.18	1.15	1.16	1.11	1.18	1.08	1.05	1.06
10	do	1.05	1.03	1.02	1.02	1.03	1.02	1.02	1.09	.99	.99	.99	.99
11	do	.98	.96	.96	.97	.96	.96	.97	.96	.97	.97	.97	.98
12	do	.98	.98	.98	.98	.99	.99	.98	.93	.93	.83	.84	.80
13	do	.77	.74	.74	.70	.70	.70	.70	.70	.67	.67	.67	.65
14	do	.64	.60	.58	.57	.57	.54	.50	.46	.46	.46	.46	.45
15	do	.38	.40	.41	.40	.45	.46	.46	.48	.48	.50	.50	.48
16	do	.47	.47	.43	.42	.40	.36	.38	.25	.20	.16	.14	.12
17	do	.11	.10	.10	.10	.10	.10	.12	.12	.13	.14	.16	.17
18	do	.18	.20	.22	.23	.24	.26	.28	.30	.31	.34	.38	.41
19	do	.43	.45	.48	.49	.55	.55	.55	.58	.58	.58	.59	.59
20	do	.59	.58	.58	.58	.58	.54	.54	.53	.51	.50	.49	.49
21	do	.47	.46	.46	.47	.48	.48	.48	.48	.46	.46	.45	.45
22	do	.46	.44	.44	.44	.44	.43	.43	.41	.40	.39	.38	.35
23	do	.32	.29	.26	.25	.24	.24	.24	.26	.30	.32	.38	.44
24	do	.47	.50	.53	.58	.60	.61	.60	.58	.56	.54	.53	.50
25	do	.47	.46	.43	.42	.41	.40	.38	.33	.32	.31	.29	.28
26	do	.28	.24	.25	.25	.25	.26	.26	.24	.26	.26	.26	.26
27	do	.26	.26	.27	.26	.26	.26	.27	.27	.27	.30	.33	.38
28	do	.38	.39	.42	.43	.45	.48	.48	.44	.44	.45	.45	.45
29	do	.46	.46	.46	.47	.47	.47	.47	.47	.48	.48	.48	.50
30	do	.51	.52	.54	.56	.58	.61	.62	.62	.62	.64	.66	.67

DECEMBER, 1899.

1	Fort Shoemaker, Dall River, Alaska	0.68	0.68	0.68	0.68	0.64	0.63	0.56	0.51	0.51	0.52	0.54	0.54
2	do	.52	.50	.46	.45	.46	.47	.47	.47	.48	.48	.48	.48
3	do	.47	.44	.42	.36	.28	.21	.15	.10	.06	.00	-.04	-.04
4	do	-.04	-.05	-.01	.00	.02	.04	.10	.10	.14	.18	.24	.27
5	do	.31	.34	.37	.40	.43	.45	.48	.48	.46	.46	.48	.50
6	do	.50	.51	.53	.54	.56	.56	.57	.56	.57	.58	.60	.59
7	do	.50	.50	.60	.60	.61	.62	.61	.60	.60	.60	.60	.60
8	do	.60	.69	.61	.61	.63	.84	.66	.67	.68	.72	.74	.74
9	do	.74	.73	.74	.74	.74	.74	.74	.74	.74	.76	.80	.82
10	do	.87	.91	.97	1.00	1.06	1.11	1.18	1.24	1.29	1.31	1.39	1.41
11	do	1.44	1.46	1.48	1.48	1.50	1.51	1.51	1.49	1.48	1.46	1.46	1.48
12	do	1.46	1.50	1.53	1.56	1.60	1.64	1.68	1.69	1.70	1.70	1.70	1.71
13	do	1.68	1.66	1.62	1.60	1.57	1.55	1.53	1.48	1.46	1.42	1.37	1.35
14	do	1.30	1.28	1.26	1.24	1.23	1.23	1.21	1.16	1.14	1.09	1.06	1.05
15	do	1.02	1.01	1.03	1.06	1.06	1.07	1.07	1.04	1.00	.95	.91	.89
16	do	.83	.79	.76	.71	.67	.63	.59	.56	.55	.55	.58	.60
17	do	.61	.61	.61	.55	.51	.47	.46	.43	.41	.38	.36	.32
18	do	.27	.24	.21	.19	.18	.17	.15	.15	.16	.16	.17	.20
19	do	.18	.19	.20	.20	.19	.20	.20	.20	.16	.16	.14	.12
20	do	.17	.16	.14	.03	.01	.03	.03	.06	.08	.12	.19	.25
21	do	.26	.30	.34	.38	.43	.45	.45	.47	.52	.59	.67	.73
22	do	.76	.80	.86	.91	.98	1.03	1.04	1.05	1.06	1.06	1.07	1.07
23	do	1.03	1.04	1.04	1.05	1.05	1.03	1.02	1.00	1.00	1.00	1.00	1.00
24	do	1.00	.99	.99	1.02	1.03	1.08	1.10	1.14	1.18	1.24	1.30	1.37
25	do	1.39	1.41	1.47	1.52	1.56	1.60	1.63	1.68	1.71	1.74	1.78	1.83
26	do	1.85	1.84	1.86	1.88	1.90	1.90	1.90	1.91	1.90	1.90	1.90	1.92
27	do	1.90	1.89	1.85	1.78	1.76	1.72	1.70	1.64	1.62	1.58	1.55	1.50
28	do	1.42	1.33	1.28	1.20	1.13	1.03	.94	.86	.79	.75	.70	.69
29	do	.70	.72	.71	.73	.74	.76	.80	.84	.87	.92	1.00	1.04
30	do	1.07	1.12	1.17	1.19	1.26	1.31	1.36	1.39	1.43	1.44	1.50	1.52
31	do	1.53	1.51	1.52	1.52	1.53	1.53	1.52	1.52	1.48	1.48	1.61	1.53

Readings of the aneroid barometer on board the U. S. S. *Nunivak*, Yukon River, Alaska—
Continued.

JANUARY, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska.	1.53	1.54	1.55	1.56	1.56	1.56	1.54	1.54	1.54	1.53	1.52	1.51
2	do	1.47	1.46	1.44	1.40	1.36	1.34	1.33	1.32	1.29	1.26	1.26	1.22
3	do	1.16	1.16	1.14	1.11	1.09	1.05	1.02	.99	.94	.91	.90	.89
4	do	.86	.86	.86	.87	.88	.90	.93	.95	.96	.97	1.00	1.01
5	do	1.02	1.02	1.02	1.03	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
6	do	1.00	1.00	.99	1.00	1.00	.99	.99	.98	.98	.99	1.02	1.03
7	do	1.04	1.06	1.05	1.07	1.07	1.09	1.10	1.08	1.08	1.08	1.07	1.06
8	do	1.00	.99	.97	.91	.87	.82	.78	.73	.67	.64	.62	.60
9	do	.60	.60	.59	.62	.63	.66	.68	.68	.72	.75	.75	.75
10	do	.77	.77	.77	.77	.76	.78	.79	.80	.80	.80	.81	.81
11	do	.82	.81	.79	.79	.77	.76	.74	.76	.76	.76	.78	.80
12	do	.81	.83	.86	.86	.86	.88	.88	.89	.89	.90	.90	.89
13	do	.89	.90	.89	.93	.94	.96	.96	.99	.99	1.00	1.00	1.01
14	do	1.01	1.01	1.01	1.02	1.03	1.03	1.03	1.03	1.00	.97	.95	.95
15	do	.92	.94	.95	.97	.97	.96	.96	.94	.94	.96	.97	.98
16	do	.99	.99	1.00	1.01	1.01	1.01	1.01	1.01	.96	.92	.89	.86
17	do	.76	.72	.71	.70	.70	.69	.69	.71	.73	.75	.68	.81
18	do	.82	.83	.82	.83	.83	.82	.77	.73	.68	.65	.59	.53
19	do	.43	.33	.28	.24	.20	.18	.17	.15	.16	.17	.17	.17
20	do	.19	.22	.24	.26	.30	.34	.38	.43	.45	.48	.54	.56
31	do	.58	.59	.60	.58	.58	.58	.58	.58	.58	.57	.57	.59
22	do	.60	.60	.60	.60	.60	.60	.60	.60	.60	.61	.65	.68
23	do	.72	.77	.83	.87	.90	.95	.96	1.03	1.06	1.12	1.10	1.18
24	do	1.21	1.23	1.24	1.26	1.29	1.30	1.32	1.34	1.36	1.38	1.42	1.44
25	do	1.47	1.47	1.48	1.46	1.46	1.46	1.47	1.47	1.46	1.43	1.41	1.40
26	do	1.38	1.34	1.30	1.24	1.26	1.11	1.01	.92	.87	.80	.79	.76
27	do	.74	.75	.75	.75	.77	.79	.61	.80	.78	.77	.77	.77
28	do	.75	.75	.76	.76	.77	.78	.77	.76	.73	.72	.71	.69
29	do	.66	.64	.64	.70	.75	.81	.87	.90	.94	.95	1.00	1.02
30	do	1.01	1.05	1.10	1.11	1.13	1.17	1.19	1.19	1.18	1.18	1.22	1.23
31	do	1.24	1.27	1.29	1.30	1.30	1.34	1.33	1.30	1.30	1.29	1.28	1.26

FEBRUARY, 1900.

1	Fort Shoemaker, Dall River, Alaska.	1.22	1.21	1.20	1.17	1.16	1.15	1.13	1.13	1.11	1.09	1.07	1.06
2	do	1.07	1.07	1.07	1.08	1.08	1.08	1.09	1.09	1.09	1.10	1.10	1.09
3	do	1.06	1.04	1.00	.99	.94	.90	.85	.77	.75	.70	.65	.61
4	do	.56	.54	.53	.52	.53	.55	.57	.60	.64	.66	.66	.71
5	do	.80	.86	.88	.92	.93	.95	1.00	1.00	1.00	1.00	1.00	1.00
6	do	.99	.94	.91	.87	.83	.79	.75	.71	.66	.62	.58	.57
7	do	.50	.50	.49	.47	.47	.47	.46	.46	.42	.42	.40	.39
8	do	.38	.35	.33	.31	.29	.28	.26	.23	.21	.19	.17	.17
9	do	.13	.15	.17	.21	.26	.30	.37	.45	.51	.56	.63	.76
10	do	.81	.89	.97	1.11	1.15	1.21	1.27	1.29	1.33	1.35	1.40	1.46
11	do	1.53	1.49	1.48	1.49	1.50	1.52	1.55	1.60	1.61	1.60	1.67	1.68
12	do	1.65	1.64	1.63	1.63	1.61	1.61	1.60	1.59	1.57	1.58	1.58	1.56
13	do	1.54	1.54	1.54	1.54	1.54	1.54	1.54	1.56	1.56	1.58	1.57	1.58
14	do	1.58	1.58	1.58	1.62	1.64	1.64	1.66	1.66	1.66	1.66	1.66	1.67
15	do	1.64	1.63	1.63	1.66	1.65	1.66	1.68	1.68	1.69	1.72	1.76	1.77
16	do	1.71	1.68	1.66	1.72	1.75	1.76	1.75	1.75	1.75	1.75	1.75	1.74
17	do	1.72	1.68	1.65	1.65	1.62	1.63	1.60	1.58	1.56	1.54	1.53	1.51
18	do	1.48	1.41	1.36	1.29	1.23	1.14	1.06	.97	.92	.98	.90	.88
19	do	.85	.89	.96	1.05	1.11	1.15	1.17	1.20	1.21	1.22	1.21	1.25
20	do	1.24	1.22	1.19	1.16	1.12	1.08	1.04	1.00	.96	.93	.90	.89
21	do	.89	.90	.90	.92	.95	.96	.96	.97	.99	.99	1.00	1.03
22	do	1.02	1.00	.99	.96	.93	.89	.88	.83	.79	.76	.73	.69
23	do	.65	.43	.62	.61	.60	.60	.61	.61	.63	.63	.69	.71
24	do	.73	.75	.78	.81	.83	.86	.89	.90	.91	.91	.92	.93
25	do	.91	.89	.84	.82	.81	.83	.84	.84	.86	.87	.88	.89
26	do	.88	.86	.86	.86	.87	.88	.88	.89	.91	.96	1.01	1.02
27	do	1.04	1.06	1.11	1.14	1.15	1.16	1.16	1.17	1.19	1.22	1.24	1.29
28	do	1.29	1.29	1.28	1.28	1.25	1.26	1.26	1.26	1.26	1.26	1.26	1.28

Readings of the aneroid barometer on board the U. S. S. *Nunivak*, Yukon River, Alaska—
Continued.

MARCH, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska	1.27	1.27	1.27	1.24	1.22	1.21	1.17	1.16	1.16	1.20	1.25	1.31
2	do	1.36	1.42	1.44	1.46	1.50	1.55	1.56	1.61	1.66	1.70	1.74	1.76
3	do	1.73	1.78	1.77	1.73	1.74	1.73	1.68	1.65	1.63	1.59	1.56	1.62
4	do	1.45	1.39	1.34	1.36	1.25	1.21	1.18	1.18	1.20	1.17	1.21	1.25
5	do	1.23	1.22	1.20	1.24	1.27	1.29	1.30	1.31	1.34	1.37	1.40	1.49
6	do	1.37	1.34	1.32	1.32	1.32	1.31	1.30	1.30	1.29	1.31	1.32	1.32
7	do	1.32	1.30	1.28	1.28	1.28	1.28	1.29	1.28	1.26	1.24	1.22	1.22
8	do	1.16	1.14	1.12	1.11	1.12	1.12	1.08	1.04	1.00	.98	.96	.94
9	do	.85	.90	.77	.76	.79	.80	.82	.82	.84	.85	.89	.89
10	do	.93	.91	.90	.90	.85	.81	.78	.78	.78	.70	.75	.71
11	do	.65	.63	.61	.57	.60	.62	.66	.69	.73	.78	.85	.88
12	do	.89	.89	.89	.86	.85	.84	.84	.78	.74	.70	.64	.55
13	do	.50	.49	.49	.49	.50	.51	.51	.51	.51	.51	.53	.53
14	do	.54	.57	.61	.65	.71	.70	.73	.74	.75	.77	.83	.89
15	do	.94	.93	.96	.98	.98	.97	.94	.90	.88	.87	.84	.82
16	do	.70	.70	.74	.77	.81	.87	.92	.97	1.00	1.05	1.11	1.07
17	do	1.08	1.08	1.14	1.15	1.16	1.16	1.16	1.16	1.16	1.17	1.10	1.09
18	do	1.04	1.02	.98	.99	.97	.93	.90	.87	.84	.83	.80	.77
19	do	.75	.73	.70	.68	.70	.70	.69	.68	.68	.67	.68	.69
20	do	.64	.64	.66	.66	.68	.68	.68	.68	.67	.63	.59	.57
21	do	.56	.53	.53	.56	.57	.57	.57	.57	.58	.59	.59	.60
22	do	.60	.60	.60	.60	.59	.60	.65	.65	.68	.69	.69	.68
23	do	.66	.65	.66	.66	.67	.67	.68	.68	.69	.69	.69	.69
24	do	.67	.65	.64	.65	.69	.72	.74	.74	.74	.74	.74	.74
25	do	.71	.70	.73	.74	.76	.78	.80	.81	.83	.84	.85	.85
26	do	.84	.85	.86	.86	.88	.89	.89	.90	.90	.92	.92	.94
27	do	.92	.92	.92	.94	.96	.97	.98	.98	.98	.99	.97	.97
28	do	.92	.88	.88	.88	.86	.86	.86	.84	.84	.85	.84	.82
29	do	.80	.79	.79	.82	.84	.84	.85	.85	.85	.86	.86	.87
30	do	.86	.83	.84	.85	.85	.85	.82	.80	.78	.78	.76	.75
31	do	.70	.68	.64	.62	.60	.54	.52	.49	.48	.45	.42	.38

APRIL, 1900.

1	Fort Shoemaker, Dall River, Alaska	0.38	0.38	0.38	0.38	0.40	0.42	0.43	0.43	0.43	0.43	0.41	0.41
2	do	.42	.43	.47	.48	.53	.56	.60	.64	.67	.69	.72	.72
3	do	.72	.74	.75	.78	.78	.78	.79	.79	.77	.77	.72	.67
4	do	.60	.55	.52	.50	.50	.49	.48	.45	.45	.43	.41	.40
5	do	.36	.34	.34	.34	.34	.34	.34	.34	.34	.33	.31	.31
6	do	.30	.30	.32	.34	.36	.39	.42	.46	.46	.60	.66	.71
7	do	.75	.78	.79	.81	.84	.86	.90	.92	.94	.97	.99	1.00
8	do	.99	.98	.97	.98	1.00	1.04	1.06	1.10	1.11	1.15	1.17	1.18
9	do	1.17	1.18	1.18	1.25	1.25	1.26	1.26	1.27	1.27	1.28	1.24	1.15
10	do	1.12	1.08	1.05	1.04	1.04	1.04	1.04	1.03	1.03	1.01	1.01	.97
11	do	.94	.90	.88	.89	.89	.90	.90	.91	.91	.94	.92	.88
12	do	.83	.80	.76	.76	.77	.78	.78	.77	.76	.76	.74	.68
13	do	.68	.63	.60	.59	.61	.62	.62	.62	.62	.63	.64	.61
14	do	.59	.58	.57	.57	.60	.62	.62	.62	.62	.61	.55	.45
15	do	.42	.34	.28	.21	.17	.17	.16	.16	.17	.17	.17	.18
16	do	.18	.17	.18	.19	.21	.23	.25	.26	.26	.30	.31	.32
17	do	.33	.35	.38	.42	.46	.50	.56	.60	.61	.65	.63	.63
18	do	.64	.64	.63	.64	.64	.65	.66	.63	.60	.58	.51	.54
19	do	.34	.27	.21	.19	.17	.16	.14	.13	.12	.08	.06	.05
20	do	.05	.04	.06	.07	.08	.11	.16	.24	.26	.24	.24	.25
21	do	.22	.21	.20	.20	.23	.26	.27	.30	.32	.35	.36	.37
22	do	.36	.36	.36	.38	.36	.36	.48	.50	.53	.55	.56	.56
23	do	.56	.57	.58	.58	.61	.64	.65	.65	.69	.72	.70	.65
24	do	.60	.51	.48	.46	.44	.42	.40	.39	.39	.39	.37	.36
25	do	.35	.31	.29	.28	.30	.32	.32	.32	.36	.38	.36	.36
26	do	.36	.38	.41	.43	.45	.47	.51	.58	.56	.58	.58	.57
27	do	.56	.56	.56	.54	.54	.53	.54	.54	.56	.57	.58	.62
28	do	.64	.67	.69	.74	.78	.81	.83	.89	.91	.95	.96	1.00
29	do	1.01	1.02	1.02	1.07	1.10	1.14	1.17	1.20	1.22	1.26	1.29	1.31
30	do	1.31	1.31	1.34	1.36	1.36	1.36	1.36	1.34	1.32	1.26	1.21	1.15

Readings of the aneroid barometer on board the U. S. S. Nuniwak, Yukon River, Alaska—
Continued.

MAY, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska	1.10	1.03	0.97	0.92	0.84	0.80	0.73	0.67	0.62	0.57	0.55	0.53
2	do	.52	.50	.49	.52	.53	.54	.56	.56	.55	.57	.58	.58
3	do	.58	.57	.56	.56	.56	.56	.56	.56	.56	.55	.55	.53
4	do	.50	.49	.48	.48	.48	.50	.53	.54	.58	.60	.63	.65
5	do	.65	.66	.67	.69	.70	.72	.78	.80	.83	.86	.88	.86
6	do	.85	.84	.84	.85	.85	.85	.85	.85	.90	.92	.91	.89
7	do	.88	.88	.88	.88	.90	.90	.93	.93	.94	.94	.91	.88
8	do	.85	.83	.83	.81	.81	.81	.80	.80	.77	.77	.73	.69
9	do	.68	.63	.60	.58	.52	.57	.56	.54	.52	.48	.46	.42
10	do	.89	.86	.82	.80	.29	.28	.27	.27	.28	.29	.29	.28
11	do	.26	.25	.25	.25	.26	.28	.30	.33	.35	.39	.40	.40
12	do	.38	.37	.36	.37	.35	.36	.40	.40	.42	.42	.41	.41
13	do	.39	.38	.36	.36	.36	.38	.40	.45	.49	.51	.52	.53
14	do	.53	.53	.53	.54	.55	.57	.58	.58	.57	.55	.54	.51
15	do	.48	.45	.43	.43	.46	.46	.47	.50	.49	.51	.51	.52
16	do	.51	.52	.51	.51	.52	.53	.54	.54	.54	.54	.51	.47
17	do	.45	.45	.46	.48	.51	.53	.58	.58	.60	.62	.63	.61
18	do	.62	.60	.59	.59	.59	.59	.62	.65	.66	.65	.63	.60
19	do	.57	.54	.54	.54	.57	.61	.63	.65	.57	.54	.63	.60
20	do	.58	.57	.57	.58	.59	.60	.64	.69	.70	.....	.59	.63
21	do	.64	.64	.63	.64	.64	.66	.67	.71	.77	.78	.77	.75
22	do	.71	.73	.74	.72	.72	.72	.76	.84	.85	.87	.86	.84
23	do	.79	.73	.71	.70	.70	.70	.70	.69	.69	.66	.64	.62
24	do	.58	.55	.55	.56	.55	.58	.57	.56	.56	.56	.57	.52
25	do	.45	.44	.42	.42	.41	.40	.37	.37	.37	.36	.32	.26
26	65° 55' N., 149° 18' W.	.25	.24	.22	.28	.29	.30	.30	.31	.32	.35	.36	.35
27		.34	.34	.37	.37	.35	.41	.44	.46	.48	.48	.48	.44
28	65° 40' N., 149° 55' W.	.44	.44	.47	.48	.49	.51	.53	.55	.57	.58	.57	.57
29		.61	.61	.69	.70	.73	.79	.83	.85	.89	.90	.90	.87
30		.89	.89	.88	.88	.89	.92	.93	.99	.96	.97	.93	.92
31		.90	.91	.90	.88	.89	.89	.88	.88	.80	.78	.76	.71

TEMPERATURES.

Temperature of the air in shade observed on board the U. S. S. Nunivak (expressed in degrees of Fahrenheit's scale), Yukon River, Alaska.

SEPTEMBER, 1899.

[Astronomical time used.]

Date.	Place.	2h.		4h.		6h.		8h.		10h.		12h.	
		Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
1	Rampart City, 65° 32' N., 150° 10' W.	55	50	58	50	57	50	45	45	45	44	45	43
2	do	64	56	66	58	57	52	53	51	49	48	45	45
3	do	66	58	67	59	60	55	51	50	47	46	46	45
4	65° 40' N., 149° 55' W	65	57	66	56	61	58	55	55	53	53	50	50
5	66° 00' N., 149° 15' W	54	54	55	55	53	53	49	49	46	46	45	45
6	do	58	52	57	51	57	52	50	49	49	48	45	44
7	Rampart City	64	55	64	55	61	53	54	49	49	46	44	43
8	do	56	51	50	50	55	50	53	48				
9	do												
10	do	45	40	46	41	46	41	46	42	44	41	44	41
11	do	48	47	51	49	52	50	47	46	43	43	41	41
12	do	56	49	58	49	49	49	53	46	51	48	46	45
13	do	55	49	53	47	53	47	47	46	47	46	49	46
14	do	44	42	47	42	40	40	41	40	37	37	34	33
15	do	45	41	44	40	40	39	40	39	38	38	40	38
16	do	38	33	37	32	34	30	33	28	33	29	33	29
17	do	29	29	29	29	29	29	29	29	29	29	30	30
18	Coal mine, 65° 40' N., 149° 55' W.	31	31	32	31	32	32	33	33	34	34	34	34
19	do	39	37	39	36	37	35	34	33	33	31	31	31
20	do	32	32	32	32	33	33	33	33	33	33	33	33
21	Between coal mine and Dall River	33	32	36	35	34	33	33	32	33	31	33	31
22	Dall River, 66° 00' N., 149° 15' W.	38	34	37	34	35	33	33	32	32	31	26	32
23	do	39	34	39	35	28	32	24	27	24	24	23	23
24	do	37	33	37	34	37	32	32	32	32	31	31	31
25	do	37	35	36	34	33	33	32	32	31	31	32	32
26	do	36	36	36	36	34	34	32	32	30	30	30	30
27	do	34	34	34	34	33	33	34	34	33	33	33	33
28	do	34	34	32	32	31	31	30	29	28	28	28	28
29	do	29	28	28	28	22	23	19	19	18	18	18	18
30	do	32	31	31	30	23	30	18	25	15	25	13	24

Date.	Place.	14h.		16h.		18h.		20h.		22h.		24h.	
		Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
1	Rampart City, 65° 32' N., 150° 10' W.	45	44	45	44	46	46	48	47	54	50	59	58
2	do	41	41	38	38	38	38	44	44	51	50	59	52
3	do	45	45	46	46	45	45	47	47	53	51	59	54
4	65° 40' N., 149° 55' W	47	47	44	44	45	45	50	50	51	51	52	52
5	66° 00' N., 149° 15' W	45	45	45	45	45	45	47	47	55	52	57	51
6	do	44	44	38	38	41	41	44	43	51	50	63	56
7	Rampart City	46	43	46	43	45	44	44	44	45	44	50	46
8	do												
9	do												
10	do	44	40	41	40	41	41	43	43	44	43	47	45
11	do	43	43	42	42	41	41	44	44	47	46	54	52
12	do	48	42	39	39	39	39	44	43	40	47	55	49
13	do	49	46	48	46	45	44	45	45	45	43	46	43
14	do	36	36	36	36	40	38	41	38	43	38	44	40
15	do	39	38	37	37	34	34	35	34	36	33	36	33
16	do	33	28	32	28	26	26	26	26	32	26	29	29
17	do	30	30	29	29	29	29	30	30	32	32	31	31
18	Coal mine, 65° 40' N., 149° 55' W.	31	32	32	32	32	32	32	32	34	33	38	37
19	do	31	30	31	30	30	29	30	29	30	30	31	31
20	do	33	33	33	33	34	33	32	32	33	32	35	33
21	Between coal mine and Dall River	34	32	31	30	28	28	33	31	36	33	37	34
22	Dall River, 66° 00' N., 149° 15' W.	21	21	20	20	18	.....	22	22	34	31	39	33
23	do	22	20	17	.....	14	.....	21	21	28	28	33	31
24	do	31	31	22	22	23	23	29	28	32	31	34	32
25	do	33	33	33	33	32	32	32	32	34	33	36	35
26	do	32	32	32	32	32	32	32	32	34	34	34	34
27	do	32	32	32	32	33	33	32	32	35	35	37	37
28	do	27	27	27	27	21	20	22	20	24	23	27	26
29	do	10	.....	8	.....	8	.....	18	.....	23	23	50	30
30	do	11	.....	10	.....	9	.....	12	.....	21	21	28	26

Temperature of the air in shade observed on board the U. S. S. Nunirak (expressed in degrees of Fahrenheit's scale), Yukon River, Alaska—Continued.

OCTOBER, 1899.

Date.	Place.	2h.		4h.		6h.		8h.		10h.		12h.	
		Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
1	Dall River.....	31	30	29	28	23	23	22	22	22	22	22	22
2	do.....	29	29	29	29	27	27	27	27	27	27	27	27
3	do.....	26	26	25	25	23	33	23	23	21	21	20	20
4	do.....	24	24	24	24	26	26	26	26	25	25	25	25
5	do.....	29	29	29	29	27	28	27	28	23	23	22	22
6	do.....	34	33	31	30	26	26	27	27	26	26	23	21
7	do.....	31	30	30	30	28	28	23	23	16		15	
8	do.....	31	31	30	30	28	29	27	27		27	18	
9	do.....	32	32	37	36	27	29	23	24	21	22	24	23
10	do.....	35	35	34	33	31	33	29	31	27	27	26	26
11	do.....	30	30	30	30	28	28	27	27	25	25	25	25
12	do.....	30	30	30	30	28	29	29	28	28	28	28	28
13	do.....	28	28	28	30	29	31	29	29	29	29	27	27
14	do.....	26	26	24	24	18		22	22	24	24	22	22
15	do.....	19		19		19		18		18		18	
16	do.....	24	24	24	24	22	24	22	22	22	22	15	
17	do.....	14		11		2		3		5		5	
18	do.....	11		8		1		5		6		7	
19	do.....	2		2		1		2		2		1	
20	do.....	4		4		3		4		4		5	
21	do.....	9		8		7		6		5		5	
22	do.....	11		10		10		9		9		8	
23	do.....	12		11		11		12		12		12	
24	do.....	18		18		17		17		16		16	
25	do.....	20	20	20	20	11		5		4		2	
26	do.....	19		19		18		18		15		12	
27	do.....	27	27	28	28	28	28	28	28	28	28	24	24
28	do.....	26	26	20	22	18		10		18		17	
29	do.....	22	23	19	19	17		16		16		16	
30	do.....	21	21	24	24	24	24	18		14		5	
31	do.....	12		12		12		12		12		11	

Date.	Place.	14h.		16h.		18h.		20h.		22h.		24h.	
		Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
1	Dall River.....	20	20	20	20	22	22	25	25	27	27	28	28
2	do.....	21	21	20	20	18	18	18		21	21	23	23
3	do.....	21	21	21	21	21	21	21	21	22	22	23	23
4	do.....	26	26	26	26	26	26	25	26	27	28	28	29
5	do.....	21	21	21	21	21	21	25	25	31	31	33	33
6	do.....	21	20	23	23	22	22	21	21	26	26	33	31
7	do.....	14		12		8		11		20	20	31	31
8	do.....	23	23	19		20	20	21	21	24	24	24	24
9	do.....	23	23	23	23	20	20	17		28	30	35	34
10	do.....	26	26	26	26	27	27	28	28	28	28	28	28
11	do.....	23	23	23	23	24	24	24	24	24	25	30	29
12	do.....	27	27	28	28	26	26	27	27	28	28	28	29
13	do.....	27	27	28	28	26	26	24	24	26	26	27	27
14	do.....	0		0		12		14		17		19	
15	do.....	17		17		18		21	21	24	24	24	24
16	do.....	9		0		4		1		6		11	
17	do.....			2		0		0		5		8	
18	do.....	-5		-2		-1		-1		0		0	
19	do.....	0		0		0		0		1		2	
20	do.....	5		5		4		4		7		10	
21	do.....	5		3		5		6		8		9	
22	do.....	7		8		8		7		5		16	
23	do.....	13		14		15		17		16		17	
24	do.....	15		15		15		14		19		20	
25	do.....	-2		-2		-2		3		7		14	
26	do.....	10		18		17		22	22	26	26	28	28
27	do.....	18		22	22	25	25	20	20	26	26	28	28
28	do.....	18		20		20		18		21	21	22	22
29	do.....	16		15		15		17		15		18	
30	do.....	4		3		3		0		4		11	
31	do.....	11		1		12		17		16		15	

Temperature of the air in shade observed on board the U. S. S. Nunivak (expressed in degrees of Fahrenheit's scale), Yukon River, Alaska.

NOVEMBER, 1899.

[Astronomical time used.]

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska	15	15	15	15	15	15	15	12	12	14	15	17
2	do	18	14	13	4	-1	-2	-8	-9	-1	-1	-1	4
3	do	4	0	-4	-10	-16	-19	-23	-23	-23	-24	-18	-11
4	do	-3	-3	-2	-1	-1	-6	-16	-18	-22	-24	-22	-9
5	do	-10	-15	-18	-20	-24	-24	-25	-26	-27	-27	-22	-15
6	do	-12	-17	-18	-18	-18	-22	-24	-25	-25	-25	-20	-15
7	do	-13	-11	-16	-14	-15	-16	-16	-15	-10	-9	-9	-7
8	do	-5	-5	4	-2	-2	0	2	0	0	4	-7	-5
9	do	-2	-8	-13	-16	-18	-21	-23	-25	-26	-27	-25	-16
10	do	-19	-22	-26	-28	-30	-32	-32	-34	-34	-35	-32	-22
11	do	-22	-28	-25	-29	-28	-27	-30	-31	-30	-30	-20	-18
12	do	-15	-21	-17	-17	-17	-18	-20	-21	-20	-21	-20	-11
13	do	-12	-16	-17	-20	-20	-22	-22	-22	-25	-26	-26	-15
14	do	-15	-23	-25	-27	-28	-28	-30	-31	-32	-31	-25	-15
15	do	-12	-23	-27	-27	-9	-9	-9	-10	-10	-11	-8	-7
16	do	-9	-7	-7	-6	-5	-4	-4	-3	-2	-2	0	1
17	do	2	4	4	5	5	5	4	4	5	5	5	5
18	do	5	3	3	4	4	3	1	0	0	2	-6	-2
19	do	-1	-2	-2	-1	0	2	2	2	3	3	4	5
20	do	5	4	4	4	4	4	4	3	3	3	4	5
21	do	5	5	5	5	-1	0	0	-1	-1	-1	4	5
22	do	4	4	3	3	4	2	2	4	4	4	5	7
23	do	6	6	6	7	7	7	8	9	9	9	9	10
24	do	8	0	-2	0	5	5	5	6	6	6	4	6
25	do	6	6	5	2	2	3	3	3	4	8	11	12
26	do	12	12	13	13	13	12	12	12	12	12	11	11
27	do	11	10	10	10	9	9	9	9	9	9	9	9
28	do	9	9	9	7	7	5	0	5	0	2	4	6
29	do	5	9	6	8	9	10	9	8	7	6	5	5
30	do	5	5	4	4	2	1	1	0	0	0	-2	-4

DECEMBER, 1899.

1	Fort Shoemaker, Dall River, Alaska	-12	-19	-20	-16	-17	-20	-15	-8	-3	-7	-11	-9
2	do	-9	-5	-4	-4	-3	-7	-9	-9	-10	-11	-5	-6
3	do	-11	-15	-7	-6	-5	-1	4	7	8	13	15	15
4	do	14	13	11	9	9	8	7	7	6	5	5	6
5	do	5	5	3	2	0	3	0	-3	-8	-6	-3	-2
6	do	-2	-2	-2	-1	-1	-3	-2	-2	-2	-2	-3	-8
7	do	-8	-3	-3	-4	-3	-2	-2	-2	-2	0	-1	-1
8	do	-1	0	0	0	0	0	1	-4	-3	-1	-1	-2
9	do	-1	-1	-1	0	1	1	2	-2	3	4	4	1
10	do	-9	-16	-19	-21	-10	-8	-6	-5	-5	-16	-24	-25
11	do	-27	-32	-34	-35	-36	-37	-37	-38	-36	-27	-25	-23
12	do	-27	-18	-18	-17	-25	-27	-29	-27	-27	-24	-21	-18
13	do	-13	-12	-13	-14	-12	-11	-10	-10	-14	-11	-12	9
14	do	-7	-4	0	0	20	17	18	20	19	14	11	14
15	do	16	16	14	11	9	8	2	10	10	12	13	11
16	do	9	8	5	2	-3	-11	0	0	-3	-5	-14	-13
17	do	-15	-21	-25	-31	-31	-17	-13	-20	-20	-33	-35	-25
18	do	-22	-24	29	-30	-30	-32	-32	-31	-30	-30	-32	-35
19	do	-35	-36	-39	-36	-40	-40	-42	-39	-41	-40	-36	-33
20	do	-29	-28	-28	-34	-33	-26	-25	-33	-37	-32	-33	-32
21	do	-36	-41	-44	-46	-48	-50	-51	-47	-47	-47	-48	-52
22	do	-53	-55	-56	-56	-56	-56	-57	-57	-57	-57	-56	-51
23	do	-57	-57	-56	-57	-56	-56	-56	-56	-56	-54	-54	-53
24	do	-53	-52	-52	-52	-52	-50	-51	-49	-49	-48	-48	-45
25	do	-43	-41	-40	-39	-42	-44	-43	-45	-45	-44	-44	-43
26	do	-42	-43	-42	-41	-39	-36	-36	-36	-37	-38	-37	-36
27	do	-36	-37	-38	-36	-34	-32	-30	-29	-28	-28	-29	-25
28	do	-23	-25	-32	-35	-38	-39	-31	-29	-27	-25	-27	-24
29	do	-24	-24	-27	-34	-35	-37	-38	-38	-39	-36	-40	-40
30	do	-38	-43	-43	-41	-42	-42	-35	-34	-35	-37	-39	-39
31	do	-40	-41	42	-41	-43	-43	-43	-43	-42	-42	-42	-39

Temperature of the air in shade observed on board the U. S. S. *Nunivak* (expressed in degrees of Fahrenheit's scale), Yukon River, Alaska—Continued.

JANUARY, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska	-40	-40	-40	-39	-39	-39	-38	-37	-37	-37	-37	-36
2	do	-34	-35	-36	-36	-36	-37	-37	-36	-34	-34	-34	-33
3	do	-34	-35	-33	-33	-32	-31	-28	-28	-25	-24	-22	-21
4	do	-21	-19	-18	-17	-16	-14	-12	-22	-29	-31	-30	-32
5	do	-34	-38	-38	-40	-41	-41	-40	-41	-39	-41	-41	-39
6	do	-39	-39	-41	-41	-42	-43	-43	-42	-43	-43	-43	-40
7	do	-40	-41	-43	-43	-45	-46	-46	-47	-47	-47	-47	-44
8	do	-43	-44	-43	-44	-44	-44	-44	-32	-26	-26	-29	-13
9	do	-12	-11	-11	-12	-11	-11	-11	-11	-10	-11	-11	-11
10	do	-11	-11	-11	-15	-14	-14	-14	-14	-14	-10	8	-11
11	do	-13	-12	-12	-12	-13	-23	-30	-34	-35	-36	-37	-35
12	do	-37	-38	-39	-40	-42	-44	-45	-40	-40	-47	-47	-46
13	do	-43	-47	-49	-50	-51	-52	-54	-54	-54	-54	-53	-50
14	do	-47	-50	-51	-53	-53	-53	-53	-53	-53	-54	-55	-52
15	do	-50	-54	-56	-57	-57	-58	-60	-60	-60	-58	-58	-51
16	do	-56	-57	-57	-57	-57	-58	-58	-58	-58	-58	-58	-54
17	do	-53	-56	-56	-57	-58	57	-58	-57	-57	-58	-58	-55
18	do	-52	-58	-58	-59	-60	-60	-60	-62	-60	-63	-62	-59
19	do	-56	-51	-40	-37	-34	-31	-27	-27	-24	-22	-22	-20
20	do	-16	-16	-16	-16	-16	-16	-17	-23	-24	-27	-22	-20
21	do	-26	-34	-37	-37	-29	-24	-28	-25	-29	-33	-27	-20
22	do	-18	-17	-17	-16	-16	-16	-16	-16	-17	-17	-18	-19
23	do	-20	-21	-22	-24	-24	-24	-22	-21	-20	-21	-22	-22
24	do	-23	-27	-22	-25	-25	-27	-28	-32	-28	-30	-38	-38
25	do	-32	-38	-42	-47	-48	-49	-50	-50	-48	-48	-48	-42
26	do	-39	-40	-42	-42	-43	-41	-40	-35	-31	-27	-26	-24
27	do	-20	-19	-18	-18	-17	-17	-24	-25	-19	-19	-18	-15
28	do	-14	-12	-11	-9	-8	-8	-10	-9	-9	-9	-9	-9
29	do	-6	-4	-2	1	-2	-2	-4	-3	-8	-6	-5	-1
30	do	1	0	0	0	2	-2	-10	-14	-17	-20	-19	-17
31	do	-14	-15	-15	-12	-11	-10	-9	-9	-9	-9	-7	-5

FEBRUARY, 1900.

1	Fort Shoemaker, Dall River, Alaska	-4	-5	-7	-11	-13	-13	-14	-20	-22	-25	-23	-15
2	do	-12	-21	-25	-27	-30	-30	-34	-34	-34	-34	-28	-22
3	do	-18	-20	-26	-26	-36	-23	-10	-7	-4	-3	-2	0
4	do	1	1	1	1	-2	-4	3	-1	2	3	5	9
5	do	10	2	-5	-12	-12	-16	-19	-15	-8	-4	-1	1
6	do	1	1	1	0	1	2	-2	1	-2	-5	-7	-4
7	do	-5	-6	-4	-4	-13	-17	-17	-15	-12	-15	-16	-9
8	do	-4	0	-4	-6	-1	0	0	-1	-3	-2	1	3
9	do	4	4	4	0	-1	0	-4	-2	-2	-2	0	3
10	do	4	6	-3	-2	-9	-6	-2	-8	-3	0	1	3
11	do	5	5	4	0	-1	-4	-2	0	1	2	3	7
12	do	8	8	7	6	0	6	6	5	5	4	5	6
13	do	6	6	5	4	3	2	3	3	2	4	5	8
14	do	10	9	10	9	8	-2	-8	-12	-15	-15	-13	-2
15	do	3	-5	-12	-17	-20	-21	-20	-22	-21	-21	-18	-10
16	do	-4	-12	-1	-3	-5	-7	-9	-10	-12	-12	-10	-5
17	do	-5	-9	-21	-22	-27	-29	-31	-32	-34	-33	-23	-13
18	do	-10	-9	-9	-23	-25	-26	-28	-27	-26	-30	-19	-8
19	do	11	1	-10	-7	-17	-27	-31	-35	-37	-38	-15	-13
20	do	-10	-13	-28	-30	-35	-36	-40	-44	-47	-47	-36	-30
21	do	-19	-29	-34	-40	-43	-45	-47	-48	-48	-40	-30	-22
22	do	-21	-19	-18	-15	-11	-10	-11	-12	-10	-11	-3	-1
23	do	0	0	0	-4	-15	-18	-20	-22	-23	-22	-9	1
24	do	5	3	-9	-16	-13	-16	-21	-23	-26	-22	-20	-5
25	do	-1	-4	-15	-23	-27	-29	-32	-35	-36	-36	-22	-12
26	do	-3	-5	-19	-25	-25	-32	-35	-36	-36	-35	-22	-14
27	do	-10	-15	-19	-21	-30	-27	-32	-35	-35	-34	-19	-6
28	do	-3	-6	-15	-23	-29	-32	-34	-35	-35	-34	-17	-3

Temperature of the air in shade observed on board the U. S. S. Nuniwak (expressed in degrees of Fahrenheit's scale), Yukon River, Alaska—Continued.

MARCH, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska	-3	-2	-13	-22	-25	-27	-31	-27	-6	0	8	17
2	do.	20	18	5	-6	-10	-16	-17	-21	-24	-24	-7	-3
3	do.	4	0	-10	-15	-20	-23	-24	-26	-27	-28	-11	-1
4	do.	10	7	-5	-14	-20	-21	-25	-25	-26	-26	-5	3
5	do.	5	5	3	0	-7	-15	-18	-22	-24	-24	-4	-1
6	do.	1	-1	-11	-22	-29	-34	-36	-30	-41	-41	-22	-12
7	do.	-7	-8	-22	-31	-36	-40	-42	-43	-45	-43	-31	-13
8	do.	-5	-5	-16	-27	-33	-36	-39	-41	-42	-40	-21	-13
9	do.	-5	-3	-15	-27	-30	-32	-35	-37	-39	-37	-11	-9
10	do.	-6	-5	-11	-23	-26	-30	-35	-30	-42	-37	-19	-11
11	do.	-5	-2	-10	-24	-29	-33	-36	-39	-39	-36	-21	-8
12	do.	0	0	-3	-18	-24	-20	-20	-22	-17	-12	-2	-1
13	do.	2	3	5	5	4	4	5	5	4	7	12	12
14	do.	20	25	16	8	4	3	3	5	11	18	23	32
15	do.	37	37	39	22	17	11	15	21	19	19	29	35
16	do.	42	42	34	27	29	22	24	21	16	17	30	43
17	do.	47	46	35	23	19	15	13	10	7	14	33	41
18	do.	46	45	37	26	19	13	11	9	6	17	32	38
19	do.	42	40	35	31	27	23	21	22	21	25	41	41
20	do.	45	43	35	24	20	17	14	15	17	23	30	35
21	do.	40	40	33	27	21	16	13	15	19	25	28	31
22	do.	33	30	29	27	25	21	15	10	6	11	16	19
23	do.	23	23	10	18	14	13	11	10	11	13	15	15
24	do.	22	23	22	21	16	14	7	0	5	8	10	13
25	do.	15	16	15	13	12	8	2	-4	-5	6	11	13
26	do.	15	15	14	14	14	13	14	11	11	13	15	18
27	do.	19	19	19	19	18	15	14	10	5	14	23	27
28	do.	27	28	24	15	7	8	10	11	11	24	26	27
29	do.	20	28	22	16	11	12	11	11	11	12	16	18
30	do.	13	19	17	15	14	13	9	2	-2	12	16	20
31	do.	28	26	25	23	21	22	21	20	20	20	21	28

APRIL, 1900.

1	Fort Shoemaker, Dall River, Alaska	25	27	26	19	13	17	18	16	13	15	16	15
2	do.	15	15	14	13	11	10	10	10	5	10	14	16
3	do.	20	17	13	2	-10	-18	-19	-24	-14	-5	5	11
4	do.	13	13	10	5	2	0	-2	-2	-2	-1	1	4
5	do.	7	8	6	5	5	5	3	4	5	6	8	11
6	do.	13	14	13	10	10	10	8	6	6	4	16	11
7	do.	14	15	15	-1	-12	-14	-15	-19	-14	9	12	12
8	do.	22	23	22	17	10	4	1	2	8	15	23	27
9	do.	31	32	32	16	12	7	3	0	2	24	32	38
10	do.	44	45	43	28	20	17	11	9	9	21	34	40
11	do.	43	46	43	31	22	16	11	8	10	28	37	43
12	do.	46	48	46	43	39	34	30	24	26	34	37	41
13	do.	43	44	44	38	34	23	18	14	21	32	38	42
14	do.	44	44	43	38	34	34	35	35	35	41	47	48
15	do.	48	45	42	39	37	36	34	34	34	37	39	44
16	do.	48	47	43	33	32	34	33	32	35	41	43	45
17	do.	44	43	42	38	36	34	30	28	28	34	37	44
18	do.	40	38	37	31	28	22	18	15	22	28	35	35
19	do.	37	40	36	35	32	30	29	28	28	33	34	37
20	do.	36	37	36	35	34	33	30	26	24	25	27	29
21	do.	32	31	30	29	27	24	23	20	19	21	25	28
22	do.	28	29	30	29	28	23	19	19	20	25	31	33
23	do.	31	31	29	29	29	28	21	20	22	25	26	31
24	do.	33	34	32	30	29	29	29	28	27	28	36	37
25	do.	41	43	43	35	29	28	27	26	31	38	40	46
26	do.	49	45	46	39	29	26	24	21	28	38	45	52
27	do.	50	48	46	39	31	28	25	27	34	39	41	47
28	do.	48	48	45	42	36	34	33	34	33	35	37	38
29	do.	39	38	37	34	33	32	31	31	33	36	36	38
30	do.	39	40	40	37	28	29	22	20	27	35	41	44

Temperature of the air in shade observed on board the U. S. S. *Nunivak* (expressed in degrees of Fahrenheit's scale), Yukon River, Alaska—Continued.

MAY, 1900.

Date.	Place.	2h.	4h.	6h.	8h.	10h.	12h.	14h.	16h.	18h.	20h.	22h.	24h.
1	Fort Shoemaker, Dall River, Alaska	46	44	43	41	37	35	32	31	31	32	33	35
2	do	35	37	37	33	31	30	30	30	31	33	35	38
3	do	38	37	38	36	27	24	25	26	30	33	39	43
4	do	43	44	43	39	35	36	33	34	34	37	42	45
5	do	45	46	46	41	30	26	27	29	30	34	39	43
6	do	44	44	43	41	30	27	26	27	29	34	39	42
7	do	44	43	42	41	35	33	30	29	31	34	39	40
8	do	42	42	40	37	33	30	27	26	28	30	29	37
9	do	41	41	43	40	37	35	32	30	33	33	39	44
10	do	47	47	49	45	39	35	28	30	38	44	49	53
11	do	55	56	55	48	43	32	29	29	40	53	56	58
12	do	61	61	63	59	40	32	39	39	39	44	48	50
13	do	53	56	56	51	35	32	38	37	38	40	45	49
14	do	52	52	52	49	41	37	36	34	36	37	40	42
15	do	45	56	56	43	42	41	38	35	35	36	37	41
16	do	41	43	47	47	42	36	34	34	37	41	45	49
17	do	50	50	49	46	51	42	39	36	36	36	40	42
18	do	46	50	52	45	39	33	31	35	37	42	46	53
19	do	59	60	57	55	45	42	35	39	43	48	54	60
20	do	61	62	63	61	50	38	37	42	46	51	57	63
21	do	63	65	59	56	44	42	44	42	41	43	50	58
22	do	58	53	56	56	48	46	41	34	34	32	33	35
23	do	46	49	49	46	44	40	36	34	35	39	41	42
24	do	45	46	46	45	40	38	35	33	34	33	35	36
25	do	42	42	44	43	36	31	33	32	34	36	38	45
26	65° 55' N	45	47	47	41	36	35	34	34	34	37	40	44
27	149° 18' W	47	51	43	42	39	34	34	33	40	39	46	55
28	do	48	53	49	46	45	43	42	43	44	43	45	47
29	65° 40' N	39	38	40	39	37	36	34	33	35	39	46	51
30	149° 55' W	51	52	48	48	47	42	39	38	45	53	55	56
31	do	56	58	63	59	49	43	39	40	47	61	62	63

**MAXIMUM AND MINIMUM TEMPERATURES, PRECIPITATION, AND
MISCELLANEOUS PHENOMENA.**

Meteorological record for September, 1899.

Station, Yukon River, Alaska. Rampart City (latitude, 65° 32' N., longitude 150° 10' W.) to Dall River (latitude 66° 00' N., longitude 149° 15' W.). Astronomical time used.

Date.	Temperature.				Precipitation.			Miscellaneous phenomena.	
	Maximum.	Minimum.	Range.	Mean.	Time of beginning. ^a	Time of ending. ^a	Amount. ^b		Depth of snow on ground at time of observation.
1.....	63	43	20	53			0.00		Aurora.
2.....	68	36	32	52			0.00		Do.
3.....	70	44	26	57			0.00		Do.
4.....	68	40	28	54			0.02		
5.....	58	42	16	50			T.		
6.....	65	35	30	50			0.00		
7.....	65	44	21	54.5			0.04		Brilliant auroral display.
8 ^c							0.03		Aurora.
9 ^c							T.		
10.....	48	39	9	43.5			0.06		
11.....	57	40	17	48.5			0.05		
12.....	58	35	23	46.5			T.		Do.
13.....	56	40	16	48			0.08		
14.....	48	32	16	40			0.05		Do.
15.....	46	33	18	39.5			0.01		First snow.
16.....	40	22	18	31			0.25	2.5	Do.
17.....	34	26	8	30			T.	2.5	
18.....	39	28	11	33.5			0.08	3.3	
19.....	40	28	12	34			0.01	3.3	
20.....	36	31	5	33.5			0.09	4.2	
21.....	39	26	13	32.5			T.	4.0	
22.....	40	16	24	28			0.00	3.8	
23.....	41	13	28	27			0.00	3.5	
24.....	39	22	17	30.5			0.00	3.2	
25.....	38	29	9	33.5			0.07	3.9	
26.....	38	31	7	34.5			0.16	4.9	
27.....	37	31	6	34			0.01	4.8	
28.....	37	19	18	28			T.	4.6	Aurora.
29.....	29	6	23	17.5			0.00	4.5	Aurora; heavy frost.
30.....	35	7	28	21			0.00	4.3	Do.
Sum.....							1.01		
Mean.....									

^a See weather report.

^b Including rain, hail, sleet, and melted snow.

^c Painting and fitting shelter for thermometers.

MONTHLY SUMMARY.

Temperature.—Maximum 70°: date, September 3; minimum, 6°: date, September 29.

Precipitation.—Total, 1.01 inches; greatest in twenty-four hours, 0.25; date, September 16.

Number of days with 0.01 inch or more precipitation, 15. (See weather report.)

Remarks.—Vessel under way 4th, 5th, and 6th, and between 18th and 21st. Observations in precipitation probably inaccurate during these periods. All observations made at noon for the twenty-four hours preceding.

Meteorological record for month of October, 1899.

Station, Yukon River, Alaska; winter quarters, Fort Shoemaker, Dall River, Alaska. Latitude 66° 00' N.; longitude, 149° 15' W. Astronomical time used.

Date.	Temperature.				Precipitation.			Miscellaneous phenomena.	
	Maximum.	Minimum.	Range.	Mean.	Time of beginning. ^a	Time of ending. ^a	Amount. ^b		Depth of snow on ground at time of observation.
1.....	33	20	13	26.5	.....	.....	T.	4.3	
2.....	29	17	12	23	.....	.....	T.	4.4	
3.....	28	20	8	24	.....	.....	0.01	4.4	
4.....	29	23	6	26	.....	.....	0.05	4.9	
5.....	33	17	16	25	.....	.....	0.02	5.1	Aurora.
6.....	34	20	14	27	.....	.....	0.00	5.1	
7.....	32	7	25	19.5	.....	.....	0.00	4.9	Do.
8.....	34	18	16	26	.....	.....	0.03	5.2	
9.....	39	16	23	27.5	.....	.....	0.00	5.0	Do.
10.....	37	22	15	29.5	.....	.....	T.	5.3	
11.....	31	17	14	24	.....	.....	0.00	5.3	
12.....	34	25	9	29.5	.....	.....	0.18	7.1	
13.....	31	22	9	26.5	.....	.....	0.23	9.4	
14.....	27	0	27	13.5	.....	.....	T.	9.3	Do.
15.....	24	16	8	20	.....	.....	T.	9.0	
16.....	25	- 1	26	12	.....	.....	T.	9.0	
17.....	17	- 5	22	6	.....	.....	0.00	9.0	Heavy frost.
18.....	15	- 7	22	7	.....	.....	T.	9.1	Do.
19.....	4	- 2	6	1	.....	.....	T.	9.1	
20.....	12	0	12	6	.....	.....	0.02	9.3	
21.....	13	3	10	8	.....	.....	0.03	9.7	
22.....	11	6	5	8.5	.....	.....	0.05	10.2	
23.....	18	10	8	14	.....	.....	0.10	11.5	
24.....	20	15	5	17.5	.....	.....	0.00	11.2	
25.....	21	- 2	23	9.6	.....	.....	0.00	11.2	Aurora.
26.....	28	8	20	18	.....	.....	0.00	10.7	Do.
27.....	29	18	11	23.5	.....	.....	0.03	11.0	
28.....	34	6	28	20	.....	.....	0.00	10.7	
29.....	24	14	10	19	.....	.....	0.01	10.8	
30.....	20	- 1	21	9.5	.....	.....	0.02	11.0	
31.....	17	10	7	13.5	.....	.....	0.16	12.6	
Sum	783	332	.....	557.5	.....	.....	0.94	.....
Mean	25.2	10.7	.....	17.9	.....	.....	.....	.....

^a See weather report.

^b Including rain, hail, sleet, and melted snow.

MONTHLY SUMMARY.

Temperature.—Mean maximum, 25.2°; mean minimum, 10.7°; mean, 17.9°; maximum, 39°; date, October 9; minimum, -7°; date October 18.

Precipitation.—Total, 0.94 inch; greatest in twenty-four hours, 0.23; date, October 13; total snow on ground October 15, 9 inches.

Number of days with 0.01 inch or more precipitation, 14. (See weather report.)

Dates of killing frost, October 17 and 18.

Remarks.—Dall River closed with smooth ice from 3 to 4 inches thick October 1.

Meteorological record for month of November, 1899.

Station, Yukon River, Alaska; winter quarters, Dall River, Alaska. Latitude 66° 00' N.; longitude 149° 15' W. Astronomical time used.

Date.	Temperature.				Precipitation.			Miscellaneous phenomena.	
	Maximum.	Minimum.	Range.	Mean.	Time of beginning. ^a	Time of ending. ^a	Amount. ^b		Depth of snow on ground at time of observation.
1.....	17	10	7	13.5			0.18	14.4	
2.....	19	11	8	15			0.00	14.1	Aurora.
3.....	6	— 25	31	— 9.5			0.00	14.0	Do.
4.....	0	— 25	25	— 12.5			0.00	13.8	Do.
5.....	— 8	— 27	19	— 17.5			0.00	13.8	Do.
6.....	— 6	— 25	19	— 15.5			0.00	13.7	Do.
7.....	— 7	— 18	11	— 12.5			0.00	13.7	
8.....	7	— 8	9	— 3.5			0.03	13.9	
9.....	1	— 27	28	— 13			0.00	13.8	Do.
10.....	— 11	— 35	24	— 23			0.00	13.8	Parhelia in same altitude as sun; aurora at night.
11.....	— 18	— 31	13	— 24.5			0.00	13.8	Aurora.
12.....	— 10	— 22	12	— 16			0.00	13.7	Do.
13.....	— 8	— 28	20	— 18			0.00	13.7	Do.
14.....	— 12	— 32	20	— 22			0.00	13.6	Parhelia in same altitude; aurora.
15.....	— 8	— 27	19	— 17.5			0.00	13.4	Paraselenæ same altitude and above and below moon; aurora; parhelia at 23.30 hours.
16.....	1	— 9	10	— 4			0.00	13.3	
17.....	5	— 1	4	3			0.00	13.3	
18.....	6	— 7	13	— 0.5			0.00	13.3	11.30 h; lunar halo; 22 h parhelia.
19.....	5	— 3	8	1			T.	13.3	
20.....	5	— 3	2	4			T.	13.3	
21.....	5	— 4	9	0.5			T.	13.3	Aurora; 13.30 h lunar halo.
22.....	7	— 2	5	4.5			T.	13.3	Aurora.
23.....	12	— 5	7	8.5			T.	13.3	
24.....	12	— 5	17	3.5			T.	13.4	
25.....	12	0	12	6			0.00	13.4	Do.
26.....	14	10	4	12			0.02	13.5	Do.
27.....	12	— 8	4	10			T.	13.5	
28.....	10	— 6	16	2			T.	13.5	
29.....	10	— 0	10	5			0.02	13.9	
30.....	6	— 4	10	1			T.	13.9	Do.
Sum.....	84	— 318		— 120			0.25		
Mean.....	2.8	— 10.6		— 4.0					

^aSee weather report.

^bIncluding rain, hail, sleet, and melted snow.

MONTHLY SUMMARY.

Temperature.—Mean maximum, 2.8°; mean minimum, —10.6°; mean, —4.0°; maximum, 19°; date November 2; minimum, —35°; date, November 10.

Precipitation.—Total, 0.25 inch; greatest in twenty-four hours, 0.18; date, November 1; total snow on ground November 15, 13.4 inches.

Number of days with 0.01 inch or more precipitation, 4. (See weather report.)

Remarks.—Yukon River closed in this vicinity between November 8 and 10.

Meteorological record for month of December, 1899.

Station, Yukon River, Alaska; winter quarters, Fort Shoemaker, Dall River, Alaska. Latitude 66° 00' N.; longitude 149° 15' W., Astronomical time.

Date.	Temperature.				Precipitation.			Miscellaneous phenomena.	
	Maximum.	Minimum.	Range.	Mean.	Time of beginning. ^a	Time of ending. ^a	Amount. ^b		Depth of snow on ground at time of observation.
1.....	-3	-22	19	-12.5			0.02	14.1	Very brilliant display of northern lights.
2.....	-3	-12	9	-7.5			0.00	14.1	Aurora.
3.....	15	-15	30	0			0.11	15.0	
4.....	15	5	10	10			T.	15.3	
5.....	6	-10	16	-2			0.05	16.0	
6.....	-1	-8	7	-4.5			T.	16.1	Do.
7.....	1	-9	10	-4			T.	16.2	
8.....	1	-4	5	-1.5			T.	16.3	
9.....	4	-2	6	1			0.08	16.9	
10.....	1	-25	26	-12			T.	16.8	
11.....	-23	-38	15	-30.5			0.00	16.6	Do.
12.....	-16	-30	14	-23			T.	16.6	Do.
13.....	-10	-19	9	-14.5			0.04	17.0	
14.....	21	-11	32	5			T.	16.9	9.30 hours lunar halo.
15.....	16	2	14	9			0.00	16.8	
16.....	10	-16	26	-3			T.	16.8	
17.....	-13	-35	22	-24			T.	16.8	
18.....	-23	-35	12	-29			0.02	17.0	7 hours lunar halo; aurora.
19.....	-33	-43	10	-38			T.	17.0	Aurora; 18 hours lunar halo and paraselenæ.
20.....	-24	-37	13	-30.5			0.05	17.6	16 hours paraselenæ.
21.....	-36	-53	17	-44.5			0.00	17.6	Aurora.
22.....	-51	-59	8	-55			0.00	17.6	Do.
23.....	-50	-58	8	-54			0.00	17.6	
24.....	-45	-53	8	-49			0.00	17.6	Do.
25.....	-39	-45	6	-42			0.00	17.6	Do.
26.....	-36	-44	8	-40			0.00	17.6	Do.
27.....	-24	-38	14	-31			T.	17.6	Do.
28.....	-22	-40	18	-31			T.	17.6	Do.
29.....	-23	-40	17	-31.5			T.	17.6	Do.
30.....	-34	-43	9	-38.5			0.00	17.6	Do.
31.....	-39	-44	5	-41.5			0.00	17.6	Do.
Sum...	-458	-881		-669.5			0.37		
Mean..	-14.77	-28.42		-21.59					

^aSee weather report.

^bIncluding rain, hail, sleet, and melted snow.

MONTHLY SUMMARY.

Temperature.—Mean maximum, -14.77°; mean minimum, -28.42°; mean, -21.59°; maximum, 21°; date, December 14; minimum, -59°; date, December 22.

Precipitation.—Total, 0.37 inch; greatest in twenty-four hours, 0.11; date, December 3; total snow on ground December 15, 16.8 inches.

Number of days with 0.01 inch or more precipitation, 7. (See weather report.)

Meteorological record for month of January, 1900.

Station, Yukon River, Alaska; winter quarters, Fort Shoemaker, Dall River, Alaska. Latitude 66° 00' N.; longitude 149° 15' W.; Astronomical time.

Date.	Temperature.				Precipitation.		Depth of snow on ground at time of observation.	Miscellaneous phenomena.
	Maximum.	Minimum.	Range.	Mean.	Time of beginning. ^a	Time of ending. ^a			Amount.^{b}
1.....	-36	-41	5	-38.5			0.00	Aurora.
2.....	-33	-37	4	-35			0.00	Do.
3.....	-21	-35	14	-28			0.00	17.6
4.....	-12	-32	20	-22			T.	17.5
5.....	-34	-48	9	-38.5			0.00	17.4
6.....	-39	-44	5	-41.5			0.00	17.4
7.....	-40	-47	7	-43.5			0.00	17.4
8.....	-13	-45	32	-29			T.	17.4
9.....	-10	-13	3	-11.5			0.02	17.5
10.....	-8	-16	8	-12			T.	17.5
11.....	-11	-38	27	-24.5			0.00	17.5
12.....	-37	-47	10	-42			0.00	17.5
13.....	-43	-54	11	-48.5			0.00	17.5
14.....	-47	-55	8	-51			0.00	17.5
15.....	-60	-60	10	-55			0.00	17.5
16.....	-54	-58	4	-56			0.00	17.5
17.....	-58	-58	5	-55.5			0.00	17.5
18.....	-52	-63	11	-57.5			0.00	17.5
19.....	-20	-56	36	-38			0.01	18.2
20.....	-13	-27	14	-20			0.01	18.3
21.....	-20	-38	18	-29			T.	18.3
22.....	-16	-20	4	-18			0.02	18.5
23.....	-20	-24	4	-22			0.02	18.7
24.....	-22	-38	16	-30			0.00	18.7
25.....	-32	-50	18	-41			0.00	18.7
26.....	-24	-43	19	-33.5			0.03	19.0
27.....	-17	-25	8	-21			0.03	19.3
28.....	-8	-14	6	-11			0.02	19.5
29.....	2	-8	10	-3			0.15	21.0
30.....	2	-20	22	-9			0.00	21.0
31.....	-5	-15	10	-10			0.00	21.0
Sum...	-786	-1,164		-975			0.37	
Mean...	-25.35	-37.55		-31.45				

^aSee weather report.

^bIncluding rain, hail, sleet, and melted snow.

MONTHLY SUMMARY.

Temperature.—Mean maximum, -25.35°; mean minimum, -37.55°; mean, -31.45°; maximum, 2°, date, January 29 and 30; minimum, -63°, date, January 18.

Precipitation—Total, 0.37 inch, greatest in twenty-four hours, 0.15, date, January 29; total snow on ground January 15, 17.5 inches.

Number of days with 0.01 inch or more precipitation, 9. (See weather report.)

Remarks.—The maximum thermometer was broken in setting on January 22. The maximum temperatures after that date are taken from the highest hourly reading.

Meteorological record for month of February, 1900.

Station, Yukon River, Alaska; winter quarters, Fort Shoemaker, Dall River, Alaska. Latitude, 66° 00' N., longitude 149° 15' W.; Astronomical time.

Date.	Temperature.				Precipitation.			Miscellaneous phenomena.	
	Maxi- mum.	Mini- mum.	Range.	Mean.	Time of be- gin- ning. ^a	Time of end- ing. ^a	Amount. ^b		Depth of snow on ground at time of observa- tion.
1.....	-4	-25	21	-14.5			0.00	21.0	Aurora.
2.....	-12	-34	22	-23			0.01	21.1	Do.
3.....	0	-39	39	-19.5			0.15	22.7	
4.....	9	-6	15	+1.5			T.	22.8	Do.
5.....	10	-19	29	-4.5			T.	22.8	
6.....	2	-12	14	-5			T.	22.9	
7.....	-4	-18	14	-11			0.00	22.9	
8.....	2	-9	11	-3.5			0.04	23.4	
9.....	4	-5	9	-0.5			0.00	23.4	
10.....	6	-10	16	-2			T.	23.4	
11.....	7	-4	11	-1.5			T.	23.5	
12.....	8	4	4	6			T.	23.5	
13.....	8	1	7	4.5			T.	23.6	
14.....	10	-16	26	-3			0.00	23.4	
15.....	3	-22	25	-9.5			0.00	23.4	Lunar halo; aurora.
16.....	-1	-17	16	-9			0.00	23.0	9 paraselena.
17.....	-5	-35	30	-20			0.00	22.8	Aurora.
18.....	-8	-31	23	-19.5			0.00	22.8	
19.....	11	-40	51	-14.5			0.00	22.7	Do.
20.....	-10	-48	38	-29			0.00	22.6	Do.
21.....	-19	-49	30	-34			T.	22.6	Do.
22.....	-1	-23	22	-12			0.05	23.0	
23.....	1	-23	24	-11			0.00	22.9	Do.
24.....	5	-27	32	-11			0.00	22.9	Do.
25.....	-1	-36	35	-18.5			0.00	22.9	Do.
26.....	-2	-38	36	-20			0.00	22.9	Do.
27.....	-6	-36	30	-21			0.00	22.9	Do.
28.....	-3	-36	-33	-19.5			0.00	22.8	Do.
Sum....	+10	-653		-321.5			0.25		
Mean...+0.359		-23.321		-11.48					

^aSee weather report.

^bIncluding rain, hail, sleet, and melted snow.

MONTHLY SUMMARY.

Temperature.—Mean maximum, 0.359°; mean minimum, -23.321°; mean, -11.48°; maximum, 11°; date, February 19; minimum, -49°; date, February 21.

Precipitation.—Total, 0.25 inch; greatest in twenty-four hours, 0.15; date, February 3; total snow on ground February 15, 23.4 inches.

Number of days with 0.01 inch or more precipitation, 4. (See weather report.)

Meteorological record for month of March, 1900.

Station, Yukon River, Alaska; Fort Shoemaker, Dall River, Alaska. Latitude, 66°00' N.; longitude, 149° 15' W. Astronomical time.

Date.	Temperature.				Precipitation.		Miscellaneous phenomena.		
	Maxi- mum.	Mini- mum.	Range.	Mean.	Time of be- gin- ning. ^a	Time of en- ding. ^a		Amount. ^b	Depth of snow on ground at time of obser- vation.
1.....	17	-31	48	- 7			0.00	22.8	
2.....	20	-24	44	- 2			0.00	22.8	Aurora.
3.....	4	-29	83	-12.5			0.00	22.8	Brilliant auroral display.
4.....	10	-27	37	- 8.5			0.00	22.8	Aurora.
5.....	5	-25	30	-10			0.00	22.7	
6.....	1	-43	44	21			0.00	22.6	Do.
7.....	- 7	-45	38	-26			0.00	22.5	Do.
8.....	- 5	-43	38	-24			0.00	22.4	Do.
9.....	- 3	-41	38	-22			0.00	22.4	Do.
10.....	- 5	-42	37	-23.5			0.00	22.4	
11.....	- 2	-42	40	-22			0.00	22.4	Do.
12.....	0	-24	24	-12			T.	22.5	Do.
13.....	12	- 1	13	5.5			0.10	23.6	
14.....	32	1	31	16.5			0.00	23.3	Do.
15.....	39	10	29	24.5			0.00	23	Do.
16.....	43	- 1	44	21			T.	23	13.45 hours passing rain shower.
17.....	47	5	42	26			0.00	23	
18.....	46	5	41	25.5			0.00	23	Aurora.
19.....	42	19	23	30.5			0.00	22.8	
20.....	45	14	31	29.5			0.00	22.5	
21.....	40	10	30	25			T.	22.5	Light snowfall.
22.....	33	4	29	18.5			0.00	22.5	Aurora.
23.....	23	8	15	15.5			T.	22.5	Do.
24.....	23	3	20	13			T.	22.5	Do.
25.....	16	- 7	23	4.5			T.	22.4	
26.....	18	10	8	14			T.	22.4	
27.....	23	4	19	13.5			T.	22.4	
28.....	28	4	24	16			T.	22.3	Halo around sun at noon; 9.30, aurora.
29.....	29	9	20	19			T.	22.2	Aurora.
30.....	20	- 3	23	8.5			T.	22.2	Do.
31.....	26	18	8	22			.04	22.6	
Sum	620	-306		158			.14		
Mean	20	-9.838		5.09					

^aSee weather report.

^bIncluding rain, hail, sleet, and melted snow.

MONTHLY SUMMARY.

Temperature.—Mean maximum, 20°; mean minimum, - 9.838°; mean, 5.09°. Maximum, 47°, March 17; minimum, - 45°, March 7.

Precipitation.—Total, 0.14 inch. Greatest in twenty-four hours, 0.10, March 13. Total snow on ground March 15, 23 inches. Number of days with 0.01 inch or more precipitation, 2. See weather report.

Meteorological record for month of April, 1900.

Station, Yukon River, Alaska; Fort Shoemaker, Dall River, Alaska. Latitude, 66° 00' N.; longitude, 149° 15' W. Astronomical time.

Date.	Temperature.				Precipitation.			Miscellaneous phenomena.
	Maximum.	Minimum.	Range.	Mean.	Time of beginning. ^a	Time of ending. ^a	Amount. ^b		Depth of snow on ground at time of observation.
1.....	27	11	16	19			0.02	22.7
2.....	16	4	12	10			0.07	23.2
3.....	20	-24	44	-2			T.	23.2
4.....	13	-3	16	5			0.01	23.3
5.....	11	2	9	6.5			0.02	23.5
6.....	14	2	12	8			0.05	24.0
7.....	15	-20	35	-2.5			0.00	24.0
8.....	27	-1	26	14			0.00	23.6
9.....	38	-1	39	18.5			0.00	23.5
10.....	45	7	38	26			0.00	23.5
11.....	46	8	38	27			0.00	23.0
12.....	48	22	26	35			0.00	22.0
13.....	44	12	32	28			0.00	20.6
14.....	48	32	16	40			r. 0.02	18.0
15.....	48	33	15	40.5			r. & s. 0.04	17.6
16.....	48	29	19	38.5			0.00	16.0
17.....	44	27	17	35.5			r. & s. T.	15.2
18.....	40	13	27	26.5			0.00	13.9
19.....	40	22	18	31			T.	12.5
20.....	37	23	14	30			0.00	11.3
21.....	32	18	14	25			T.	10.8
22.....	33	18	15	25.5			0.00	10.0
23.....	31	19	12	25			T.	9.5
24.....	37	26	11	31.5			T.	7.8
25.....	46	25	21	35.5			0.00	6.8
26.....	52	19	33	35.5			0.00	4.3
27.....	50	25	25	37.5			r. & s. T.	(c)
28.....	48	32	16	40			0.00	(d)
29.....	39	28	11	33.5			T.	(d)
30.....	44	19	25	31.5			0.00	(d)
Sum...	1,081	429		755			0.23	
Mean..	36.033	14.3		25.166				

^a See weather report.

^b Including rain, hail, sleet, and melted snow.

^c 2 to 5 inches in spots.

^d On ground in spots.

MONTHLY SUMMARY.

Temperature.—Mean maximum, 36.033°; mean minimum, 14.300°; mean, 25.166°; maximum, 52°, April 26; minimum, -24°, April 3.

Precipitation.—Total, 0.23 inch. Greatest in twenty-four hours, 0.07, April 2. Total snow on ground April 15, 17.6 inches. Number of days with 0.01 inch or more precipitation, 7. See weather report.

Remarks.—April 29, 1900, ice commencing to lift in Dall River.

Meteorological record for month of May, 1900.

Station, Yukon River, Alaska; Fort Shoemaker, Dall River, Alaska; Latitude, 66° 00' N.; longitude, 149° 15' W. Astronomical time.

Date.	Temperature.				Precipitation.			Miscellaneous phenomena.	
	Maxi- mum.	Mini- mum.	Range.	Mean.	Time of be- gin- ning. ^a	Time of end- ing. ^a	Amount. ^b		Depth of snow on ground at time of observa- tion.
1.....	46	30	16	38			s. T.	(c)	
2.....	38	29	9	33.5			s. 0.10	(c)	Heavy wet snow.
3.....	43	23	20	33			s. T.	(c)	
4.....	45	32	13	38.5			s. 0.06	(*)	
5.....	40	26	14	33			r. T.	(c)	
6.....	44	24	20	34			0.00	(c)	
7.....	44	28	16	36			0.00	(d)	5.30, parhelia.
8.....	42	25	17	33.5			s. 0.01	(d)	
9.....	44	28	16	36			r. T.	(d)	
10.....	53	27	26	40			0.00	(d)	
11.....	58	27	31	42.5			0.00		6.00, parhelia.
12.....	50	31	19	40.5			0.00		
13.....	56	31	25	43.5			0.00		
14.....	52	33	19	42.5			0.00		
15.....	56	34	22	45			0.00		
16.....	49	32	17	40.5			0.00		Yukon River broke.
17.....	50	33	17	41.5			r. & s. 0.04		
18.....	53	29	24	41			r. 0.15		
19.....	60	33	27	46.5			0.00		
20.....	64	35	29	49.5			0.00		
21.....	65	39	26	52			r. T.		
22.....	58	31	27	44.5			s. & r. 0.13		Wet snow.
23.....	49	33	16	41			0.00		
24.....	46	30	16	38			0.00		
25.....	45	29	16	37			0.00		
26.....	47	33	14	40			r. T.		
27.....	55	31	24	43			0.15		Solar halo.
28.....	53	41	12	47			0.04		
29.....	51	32	19	41.5			0.26		
30.....	56	36	20	46			0.02		
31.....	63	37	26	50			0.01		
Sum ...	1,575	962		1,270.5			0.97		
Mean ..	50.8	31.0		40.9					

^aSee weather report.

^bIncluding rain, hail, sleet, and melted snow.

^cSnow on ground in spots.

^dSnow in sheltered places.

MONTHLY SUMMARY.

Temperature.—Mean maximum, 50.8°; mean minimum, 31.0°; mean, 40.9°; maximum 65°, May 21; minimum, 23°, May 3.

Precipitation.—Total, 0.97 inch. Greatest in twenty-four hours, 0.26, May 29. Number of days with 0.01 inch or more precipitation, 11. See weather report.

Remarks.—About 7 hours, May 16, the ice in Yukon River in this vicinity broke and moved down-stream.

EUGENE BLAKE, JR.,
Lieutenant, Revenue-Cutter Service.

5661—03—39

FACE OF SKY.

The amount of clear sky is expressed in tenths, zero denoting a sky completely overcast, and ten a clear sky.

The cloud forms are indicated by the following combinations of letters:

Ci	.....	Cirrus.
Ci-S	.....	Cirro-stratus.
Ci-Cu	.....	Cirro-Cumulus.
A-Cu	.....	Alto-cumulus.
A-S	.....	Alto-stratus.
S-Cu	.....	Strato-cumulus.
N	.....	Nimbus.
Cu	.....	Cumulus.
Cu-N	.....	Cumulo-nimbus.
S	.....	Stratus.

The illustrated cloud forms of the United States Hydrographic Office have been used as a guide in making these observations.

The sign (") indicates the same entry as that of the hour immediately preceding.

Cloud forms and amount of clear sky (expressed in tenths).

SEPTEMBER, 1899.

[Astronomical time used.]

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Rampart City 65° 32' N., 150° 10' W.	4 A-Cu	1 A-Cu	0 N	0 N	1 S-Cu	5 Cu
2	do	7 A-Cu	3 A-Cu	7 A-Cu	6 A-Cu	5 Ci-Cu	8 Ci
3	do	8 Ci	5 Ci	0 N	0 N	2 Ci-S	2 A-Cu
4	65° 40' N., 149° 55' W.	3 Ci-S	1 N	4 N	2 Cu-S	0 N	0 N
5	66° 00' N., 149° 15' W.	0 N	0 N	0 N	0 N	0 N	3 Ci-Cu
6	do	4 Cu-N	3 Cu-N	7 Cu	8 Ci	8 Ci-Cu	8 Ci-Cu
7	Rampart City	9 Cu	7 A-Cu	10	9 Cu	0 N	2 N
8	do	3 S-Cu	1 S-Cu	0 N	0 N	0 N	0 N
9	do	0 N	0 N	0 N	0 N	3 Cu	2 Cu
10	do	1 S	0 S	0 S	1 N	0 N	0 N
11	do	1 S	4 S-Cu	8 Cu	3 S	0 N	3 Ci-S
12	do	2 A-S	0 N	2 Cu	8 Cu	7 Ci-Cu	6 A-Cu
13	do	0 A-S	0 A-S	0 N	0 N	0 N	0 N
14	do	3 Cu-N	7 Cu-N	6 Ci-S	0 A-S	4 Cu-N	1 Cu-N
15	do	2 Ci-Cu	0 Cu-N	0 N	0 N	1 N	2 Cu-N
16	do	1 S	0 S	0 S	0 N	0 N	0 N
17	do	0 N	0 N	0 N	0 N	0 N	0 N
18	Coal mine 65° 40' N., 149° 55' W.	0 N	0 N	0 N	0 S	0 S	2 Ci-Cu
19	do	2 S-Cu	2 A-Cu	0 S-Cu	0 S-Cu	1 S	0 N
20	do	0 N	0 N	0 N	0 N	0 N	0 N
21	Between coal mine and Dall River	2 N	5 Cu	0 N	8 S	0 N	4 S-Cu
22	Dall River 66° 00' N., 149° 15' W.	1 S-Cu	0 S	6 S-Cu	9 Ci	8 Ci-Cu	7 Ci
23	do	5 Ci-Cu	5 A-Cu	4 A-Cu	4 A-Cu	8 Ci-Cu	6 Ci
24	do	1 Ci-S	0 S	0 S-Cu	6 S-Cu	6 Ci	2 S
25	do	0 S	0 N	0 N	0 N	0 N	3 N
26	do	3 Ci-S	0 N	0 N	0 N	0 N	0 N
27	do	0 N	0 N	0 N	0 N	0 N	0 N
28	do	0 N	8 Ci-S	10	9 Ci	7 Ci	6 Ci
29	do	9 Cu	10	10	10	10	8 C-Cu
30	do	9 Cu	10	10	10	10	10

Cloud forms and amount of clear sky (expressed in tenths)—Continued.

OCTOBER, 1899.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska.....	10	6 A-S	0 A-S	0 A-S	3 A-Cu	0 N
2	do.....	0 N	0 N	0 N	5 S-Cu	5 Cu-N	6 Cu-N
3	do.....	2 Cu-N	0 N	0 N	0 N	0 N	0 N
4	do.....	0 N	0 N	0 N	6 N	0 N	0 N
5	do.....	0 N	0 N	10	10	3 Cu	5 Cu
6	do.....	2 Cu-N	2 Cu-N	2 Cu-N	0 N	1 N	2 S-Cu
7	do.....	5 Cl-Cu	8 Cl-S	8 Cl-S	8 Cl-S	4 S-Cu	8 Cl-Cu
8	do.....	2 Cl-Cu	0 N	0 N	8 S	1 S	1 S
9	do.....	8 Cu	10	10	7 S	7 Cl-Cu	4 Cu
10	do.....	0 S	0 S	0 S	0 S	0 N	0 N
11	do.....	8 Cu-N	0 N	0 N	6 A-Cu	0 N	2 Cl-Cu
12	do.....	1 S	0 S	0 N	0 N	0 N	0 N
13	do.....	0 N	0 N	0 N	0 N	5 Cl-S	8 Cl-Cu
14	do.....	4 Cl	5 Cl	10	8 S	0 N	0 N
15	do.....	0 N	0 N	0 N	0 N	0 N	0 N
16	do.....	0 N	0 N	0 N	8 Cu	7 A-Cu	6 Cl-Cu
17	do.....	10	10	10	0 A-S	2 A-S	8 Cl
18	do.....	6 Cl	8 Cl	8 Cl	0 S	0 S	0 S
19	do.....	0 S	0 S	0 S	0 S	0 S	2 Cu
20	do.....	0 N	0 N	0 N	4 S	6 Cu	6 Cu
21	do.....	4 Cl-S	0 N	0 N	0 N	0 N	0 N
22	do.....	0 N	0 N	0 N	0 N	0 N	0 N
23	do.....	0 N	0 N	0 N	0 N	0 N	0 S-Cu
24	do.....	0 N	0 N	0 N	0 N	0 N	0 N
25	do.....	2 Cu	10	7 Cu	6 Cu	7 Cl-Cu	3 N
26	do.....	1 N	2 S	7 Cu	2 S	0 S	0 N
27	do.....	0 N	0 N	2 S	2 S	2 S	8 Cu
28	do.....	5 Cu	0 S	0 S	0 S	0 S	0 S
29	do.....	0 N	0 N	0 N	0 N	1 S	3 S
30	do.....	0 N	10	10	10	8 Cl	5 Cl-S
31	do.....	0 S	0 N	0 N	0 N	0 N	0 N

NOVEMBER, 1899.

1	Fort Shoemaker, Dall River, Alaska.....	0 N	0 N	0 N	6 N	0 N	1 N
2	do.....	1 S	10	10	8 Cl	3 Cl	7 Cl
3	do.....	5 S	10	10	10	10	8 Cu
4	do.....	0 N	0 N	10	10	8 Cl-S	9 Cl-S
5	do.....	6 Cl	10	10	10	9 Cl	9 Cl
6	do.....	8 Cl	10	10	10	9 Cl	5 Cl-S
7	do.....	4 Cl-S	10	10	1 S	0 N	2 S
8	do.....	0 S	0 S	0 N	8 N	2 N	3 N
9	do.....	3 S	10	10	10	8 Cl	9 Cl
10	do.....	10	10	10	10	10	10
11	do.....	9 Cl	10	10	10	10	9 Cl
12	do.....	7 Cl	8 Cl	7 Cl	10	7 Cl	9 Cl
13	do.....	10	10	10	10	10	10
14	do.....	9 Cl	10	10	10	10	7 S-Cu
15	do.....	7 S	10	10	10	7 S	9 Cl
16	do.....	0 N	0 N	0 N	0 N	0 N	2 Cu-N
17	do.....	0 S-Cu	0 S	0 S	0 S-Cu	0 S-Cu	0 S-Cu
18	do.....	4 S-Cu	0 S	0 S	9 Cu	4 S-Cu	1 S
19	do.....	0 N	0 S	0 S	0 S	0 S	0 N
20	do.....	0 N	0 N	0 N	0 S	0 S	0 N
21	do.....	0 N	9 Cl	10	6 Cl	0 S	4 Cl-S
22	do.....	0 N	0 N	1 S	1 S	1 S	2 Cl-S
23	do.....	0 S-Cu	0 N	0 N	0 S-Cu	0 S-Cu	5 Cl-S
24	do.....	8 Cl	0 S	0 S	0 S	2 S	0 S
25	do.....	0 S	10	5 S	5 S	2 S-Cu	0 S-Cu
26	do.....	0 S	4 S	8 S	0 S	0 N	0 N
27	do.....	0 N	0 N	0 S	0 S	0 S	0 S
28	do.....	0 S	9 Cl	1 S	2 S	0 S	0 N
29	do.....	0 N	4 N	2 N	3 N	8 Cl	3 Cu-N
30	do.....	4 S-Cu	8 Cl	8 Cl	10	8 Cl	10

Cloud forms and amount of clear sky (expressed in tenths)—Continued.

DECEMBER, 1899.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska.	9 Cl	8 Cl	10	10	7 S-Cu	2 S-Cu
2	do	2 S	0 S	9 Cl	10	6 S-Cu	8 Cl
3	do	8 Cl	0 N	0 N	0 N	0 N	0 N
4	do	0 N	7 S	0 N	0 N	0 N	0 N
5	do	0 N	6 S	0 N	10	4 S	5 Cl-Cu
6	do	8 S	4 S	4 S	1 S-Cu	3 S-Cu	4 S-Cu
7	do	0 S-Cu	1 S-Cu	4 S-Cu	0 S	0 S	0 S
8	do	0 S	0 S	0 S	0 N	0 N	0 S
9	do	0 S	0 S	0 N	0 N	0 N	5 Cl-Cu
10	do	10	10	0 S	0 S	9 Cl	9 Cl
11	do	10	9 Cl	8 Cl	10	0 S	0 S
12	do	0 S	8 Cl	10	3 S	1 S-Cu	0 S
13	do	0 N	0 S	0 S-Cu	0 S-Cu	1 S-Cu	1 S-Cu
14	do	0 S	4 S-Cu	3 Cl-S	1 Cl-S	0 S-Cu	0 S-Cu
15	do	9 Cl	9 Cl	9 Cu	4 Cu	0 N	3 Cu-N
16	do	4 S-Cu	3 A-Cu	4 S-Cu	0 S	5 S	0 N
17	do	2 Cl-S	9 Cl	0 S	9 Cl	9 Cl	7 Cl
18	do	10	10	4 S	0 N	5 Cl-S	5 Cl-S
19	do	10	8 Cl-S	8 Cl-S	8 Cl	7 Cl	3 Cl-S
20	do	0 S	10	0 N	8 S	0 S	5 Cl-S
21	do	8 S	10	10	10	9 Cl	9 Cl
22	do	10	10	10	10	9 Cl	9 Cl
23	do	10	10	10	10	10	10
24	do	8 S	10	10	9 S	9 S	9 S
25	do	5 S	9 S	10	10	8 Cl-S	9 Cl-S
26	do	7 Cl-S	10	10	8 S	9 S	9 S
27	do	8 S	10	4 S	4 S	3 A-S	0 S
28	do	8 S	10	10	7 S	0 S	4 S-Cu
29	do	4 S	9 Cl	10	10	9 Cl	8 Cl
30	do	8 Cl	10	9 Cl	7 S	7 S	8 S-Cu
31	do	9 Cl	10	10	10	9 Cl	10

JANUARY, 1900.

1	Fort Shoemaker, Dall River, Alaska.	10	10	10	8 Cl-S	8 Cl-S	6 Cl-S
2	do	9 Cl	10	10	10	8 S-Cu	10
3	do	10	10	7 S	9 S	0 S	0 Cl-S
4	do	0 S	2 S	0 S	10	5 S-Cu	7 Cl-S
5	do	10	10	10	10	9 Cl	10
6	do	9 Cl	10	10	10	9 Cl	9 Cl
7	do	8 S	8 S	10	10	10	10
8	do	9 Cl	10	10	0 S	7 S-Cu	0 N
9	do	0 N	0 N	0 N	5 N	3 S-Cu	4 Cl-S
10	do	0 S	9 Cl	9 Cl	3 S-Cu	0 S	5 Cl-S
11	do	7 Cl-S	7 Cl-S	7 Cl-S	10	9 Cl	10
12	do	10	10	10	10	9 Cl-S	10
13	do	10	10	10	10	9 Cl-S	10
14	do	9 Cl-S	10	10	10	10	10
15	do	9 Cl-S	10	10	10	10	10
16	do	9 Cl-S	10	10	10	10	9 Cl-S
17	do	9 Cl-S	10	10	10	10	10
18	do	9 Cl-S	9 Cl-S	10	10	10	9 Cl-S
19	do	6 S	4 S	0 S	0 S	0 S	0 S
20	do	0 N	0 N	0 N	4 S	0 S	1 S
21	do	8 Cl-S	9 S	0 S	5 S-Cu	8 Cl-S	0 N
22	do	0 N	0 N	0 N	0 N	0 N	0 N
23	do	0 N	9 Cl-S	1 S	3 S	6 Cl-S	6 Cl-S
24	do	8 S-Cu	9 Cl-S	10	7 Cl-S	10	8 Cl-S
25	do	10	10	10	10	10	8 Cl-S
26	do	8 Cl	10	10	0 N	0 N	0 N
27	do	0 N	0 N	0 N	5 S	0 S	0 S
28	do	0 N	0 S	4 S	4 S	0 S	0 S
29	do	0 N	0 N	6 S	4 S	7 Cl-S	6 S-Cu
30	do	2 Cu	2 S	6 S	6 S	8 Cl	9 Cl
31	do	8 Cl	0 S	0 S	1 S	0 S	0 S

Cloud forms and amount of clear sky (expressed in tenths)—Continued.

FEBRUARY, 1900.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska	0 S	10	4 S	9 Cl	1 S	3 S-Cu
2	do	8 Cl-S	9 Cl	10	10	10	7 Cl
3	do	5 S	10	10	0 N	0 N	0 N
4	do	0 N	0 N	0 N	5 S	7 Cl	9 Cl
5	do	4 Cl-S	9 Cl	9 Cl	0 S	0 S	0 S
6	do	0 N	0 N	0 N	4 S	6 S	6 Cl-S
7	do	0 S	6 Cl-S	8 Cl	5 Cl-S	5 Cl-S	7 A-Cu
8	do	1 S-Cu	0 N	0 N	0 N	1 A-Cu	4 Cu
9	do	0 S-Cu	2 Cu	2 A-Cu	1 A-S	2 S-Cu	1 S-Cu
10	do	1 S-Cu	0 S	1 S-Cu	0 S	0 S	2 A-Cu
11	do	1 S-Cu	0 S	1 S	0 N	0 N	0 N
12	do	0 N	0 N	0 N	0 N	0 N	0 N
13	do	0 N	0 A-S	3 Cl-S	0 S	0 S	1 Cu
14	do	0 S	0 S	9 Cl	10	8 Cl	10
15	do	10	10	10	7 Cl-S	0 S	3 Cl-Cu
16	do	9 Cl-S	10	10	10	8 Cl-S	10
17	do	10	10	10	10	9 Cl-S	7 A-Cu
18	do	2 S-Cu	9 Cl-S	9 Cl-S	10	9 Cl-S	9 Cl-S
19	do	10	10	10	10	10	10
20	do	10	10	10	10	8 Cl-S	10
21	do	10	10	10	10	4 S	0 N
22	do	0 N	5 S	6 S	6 S	4 S	3 Cl-S
23	do	1 Cl-S	9 Cl	10	10	6 Cl-S	5 Cl-S
24	do	7 Cl-S	10	10	10	9 Cl-S	10
25	do	10	10	10	10	10	10
26	do	10	10	10	10	10	10
27	do	10	10	10	10	10	10
28	do	10	10	10	8 S	2 S	9 Cl

MARCH, 1900.

1	Fort Shoemaker, Dall River, Alaska	10	10	10	8 S	2 S	9 Cl
2	do	10	10	10	10	10	0
3	do	10	10	10	10	10	9 Cl
4	do	8 Cl	10	10	10	10	10
5	do	8 Cl	8 Cl	9 Cl	10	8 Cl	10
6	do	10	10	10	10	10	10
7	do	10	10	10	10	10	10
8	do	10	10	10	10	10	10
9	do	10	9 Cl-S	10	10	10	9 Cl-S
10	do	10	10	10	10	10	10
11	do	10	10	10	10	10	10
12	do	6 A-Cu	9 Cl-S	6 Cl-S	2 S	0 S	5 Cl
13	do	0 N	0 N	0 N	0 N	0 N	0 N
14	do	9 S-Cu	3 Cl-S	5 Cl-S	0 N	3 A-Cu	5 Cu
15	do	2 Cu	9 Cl	4 Cl-Cu	0 N	8 Cl-Cu	4 Cl-S
16	do	6 S-Cu	0 S	7 A-Cu	9 Cl-S	9 Cl-S	9 Cu
17	do	9 Cl	8 Cl	8 Cl	9 Cl-S	9 Cl-S	9 Cl
18	do	10	10	10	10	9 Cl-S	5 Cl
19	do	0 A-S	4 S	10	0 S	6 Cl-S	9 Cl-Cu
20	do	10	10	9 Cl	1 S	5 S-Cu	5 S
21	do	0 S	5 Cl-S	9 Cl-S	0 S	0 N	1 Cu
22	do	4 A-Cu	3 A-Cu	6 A-S	7 S	8 S-Cu	10
23	do	7 S-Cu	1 N	5 S	0 N	0 N	0 N
24	do	0 A-S	1 S	0 S	2 S	0 N	5 S-Cu
25	do	0 S	3 Cl-S	7 S	7 A-S	0 N	0 N
26	do	0 N	0 N	0 N	0 N	0 N	0 S-Cu
27	do	0 N	0 N	0 N	2 S-Cu	5 Cl-S	5 Cl
28	do	5 Cl-S	6 Cl-S	2 S	0 N	6 S-Cu	7 Cl-Cu
29	do	9 Cl	8 Cl	0 S	0 N	1 N	0 N
30	do	0 N	0 N	0 N	6 S-Cu	0 N	0 N
31	do	0 N	0 N	0 N	0 N	0 N	0 N

Cloud forms and amount of clear sky (expressed in tenths)—Continued.

APRIL, 1900.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska.....	0 N	8 S-Cu	1 S	0 N	0 N	0 N
2	do	0 N	0 N	0 N	0 N	2 S	4 Cl-Cu
3	do	6 Cl-S	9 Cl-S	10	1 S	4 Cu-N	5 Cu
4	do	3 Cl-S	1 S	2 N	0 N	0 N	0 N
5	do	0 N	0 N	0 N	0 N	0 N	0 N
6	do	0 N	0 N	0 N	0 N	2 N	9 Cu
7	do	9 Cu	10	10	9 Cu	8 Cl-S	6 Cl-S
8	do	7 Cl-S	2 Cl-S	0 Cl-S	2 S	0 S	7 S-Cu
9	do	8 Cl-S	10	10	10	9 Cl	5 Cl
10	do	6 Cl-S	8 Cl	7 Cl	8 Cl-S	3 S	1 S
11	do	1 S-Cu	1 S-Cu	10	9 Cl-S	10	0 Cl
12	do	5 Cl-S	0 S	3 S	2 S	0 S	4 Cl-S
13	do	5 Cl	4 Cl-S	10	8 S-Cu	8 Cu	5 Cl
14	do	3 S-Cu	0 S	0 S	0 N	5 Cu	7 Cu
15	do	3 Cl-Cu	1 N	0 N	0 N	0 N	0 N
16	do	1 S-Cu	4 S-Cu	4 S-Cu	0 S	2 S-Cu	2 S-Cu
17	do	2 Cu	1 S-Cu	0 N	0 N	7 Cu	4 Cu
18	do	2 Cu	2 Cu	10	7 Cl-S	3 A-Cu	1 S-Cu
19	do	4 Cl-S	0 N	0 S	0 S	5 Cl-Cu	3 Cu
20	do	0 N	0 N	0 N	0 N	3 Cl-Cu	4 Cu
21	do	3 Cl-Cu	0 N	0 N	0 N	0 N	0 N
22	do	0 N	0 N	6 Cl-Cu	1 A-Cu	5 Cl-Cu	4 A-Cu
23	do	4 Cu-N	0 N	0 N	7 S-Cu	8 Cl-S	9 Cl
24	do	5 Cu-N	2 Cu-N	0 N	0 N	2 Cu-N	5 Cl-S
25	do	4 Cl-S	2 Cu-N	1 Cu-N	2 Cu-N	7 S-Cu	8 Cu
26	do	4 Cu-N	6 Cu	10	9 S	8 Cl-S	7 Cu
27	do	3 Cu-N	5 Cu	5 Cu	4 S	0 S	4 Cl-S
28	do	0 S	1 S-Cu	4 S-Cu	0 N	3 Cu	3 Cl
29	do	0 Cu-N	0 N	0 N	1 Cu-N	1 Cu-N	3 S-Cu
30	do	6 Cu	9 Cu	10	10	10	9 Cl

MAY, 1900.

1	Fort Shoemaker, Dall River, Alaska.....	8 Cl	4 Cl	10	0 S	0 N	0 N
2	do	0 N	0 N	0 N	0 N	0 N	0 N
3	do	0 N	2 N	7 S-Cu	2 S	0 S	7 Cu
4	do	2 Cu	5 Cu	0 N	0 N	1 Cu-N	7 Cu
5	do	5 Cu-N	7 Cu	8 A-Cu	1 A-Cu	3 A-Cu	7 Cu
6	do	8 Cl	10	10	8 S	10	8 Cl-S
7	do	4 S-Cu	2 Cu	7 Cu	1 M-Cu	4 Cl-S	8 Cl
8	do	8 Cl	8 Cl-S	7 Cl-S	7 S	0 N	3 Cu
9	do	5 Cl	0 N	0 N	5 Cl	0 N	5 Cu
10	do	7 S	0 N	3 Cu-N	6 A-Cu	2 Cu	0 N
11	do	0 S	0 S	5 S	5 Cl	7 Cl	10
12	do	9 Cl	9 Cl	7 Cl-S	1 Cu-N	2 S-Cu	0 S
13	do	5 Cl	7 Cl-S	7 A-S	3 A-S	3 Cu	6 Cl-Cu
14	do	8 Cl	8 Cl	1 Cu-N	1 Cu-N	0 S	0 S
15	do	1 Cu-N	1 Cu-N	0 N	0 N	0 N	0 S-Cu
16	do	0 S	9 Cu	8 S	6 Cl-S	8 Cl	7 Cl-S
17	do	0 Cu-N	0 Cu-N	0 N	0 N	0 N	0 N
18	do	3 Cu-N	0 N	7 Cu	0 Cu-N	8 Cu	9 Cu
19	do	3 Cu-N	8 Cu	7 S-Cu	8 Cu	9 Cu	9 Cu
20	do	8 Cu	9 Cu	3 S-Cu	9 Cu	9 Cu	3 Cu
21	do	7 Cu	5 Cu-N	1 Cu-N	3 Cu-N	4 Cu-N	5 Cu-N
22	do	1 Cu-N	6 Cl-Cu	1 Cu-N	0 N	0 N	0 N
23	do	2 Cu-N	1 Cu-N	0 Cu-N	3 S-Cu	3 S-Cu	0 N
24	do	1 S	0 N	0 N	1 S-Cu	0 M-Cu	2 Cu-N
25	do	2 S	3 S-Cu	8 S-Cu	9 Cl	1 Cl-S	3 Cl-S
26	65° 55' N., 149° 18' W.	8 S	1 N	0 N	0 N	1 Cu-N	1 Cu-N
27	do	1 Cu-N	0 N	0 N	2 Cu-N	0 N	2 Cu-N
28	65° 40' N., 149° 55' W.	1 Cu-N	0 N	1 Cu-N	2 Cu-N	0 N	0 N
29	do	0 N	8 Cu	0 S	0 S	3 S-Cu	3 Cu
30	do	3 Cu-N	4 S-Cu	4 S-Cu	0 Cu-N	8 Cu	4 Cu-N
31	do	5 Cu-N	7 Cu	8 S-Cu	9 Cl	7 Cu-N	5 Cu-N

WINDS.

The force of the wind is estimated and is given according to the following notation:

- 0, calm.
- 1, light airs.
- 2, light breeze.
- 3, gentle breeze.
- 4, moderate breeze.
- 5, fresh breeze.
- 6, strong breeze.
- 7, moderate gale.
- 8, fresh gale.
- 9, strong gale.
- 10, whole gale.
- 11, storm.
- 12, hurricane.

Direction (magnetic) and force of wind observed on board the U. S. S. Nuniwak, Yukon River, Alaska.

SEPTEMBER, 1899.

[Astronomical time used.]

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Rampart City, 65° 32' N., 150° 10' W.....	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
2	do	Calm.	Calm.	Calm.	1 NNW.	Calm.	Calm.
3	do	Calm.	Calm.	Calm.	1 NNW.	Calm.	Calm.
4	65° 40' N., 149° 55' W.....	Calm.	Calm.	Calm.	1 NNW.	Calm.	Calm.
5	66° 00' N., 149° 15' W.....	Calm.	Calm.	Calm.	1 NNW.	Calm.	2 South.
6	do	2 SW. x S.	Calm.	Calm.	1 NNW.	Calm.	1 North.
7	Rampart City	1 North.	Calm.	Calm.	1 NNW.	4 North.	2 NE.
8	do	2 NE.	2 NE.	5 NNE.	1 NNE.	2 NW. x W.	2 NNE.
9	do	2 NNE.	2 NNE.	3 NNE.	3 North.	4 NW. x N.	3 N x W.
10	do	2 NNW.	1 N x W.	Calm.	Calm.	Calm.	2 SSW.
11	do	Calm.	1 N x W.	Calm.	1 NW.	Calm.	2 SSW.
12	do	1 NNW.	1 NE.	1 NE.	1 East.	Calm.	1 N x W.
13	do	2 SW.	1 SSE.	3 SE.	2 SSE.	Calm.	5 SSE.
14	do	4 SSW.	2 WSW.	Calm.	Calm.	5 SSW.	1 South.
15	do	2 S. x E.	Calm.	2 South.	Calm.	1 SW.	3 SSW.
16	do	3 North.	3 NE. x N.	3 NNE.	4 NNE.	5 North.	4 North.
17	do	2 NNW.	1 NNE.	3 NNE.	2 NNE.	5 North.	2 North.
18	Coal mine 65° 40' N., 149° 55' W.....	Calm.	1 NNE.	1 ESE.	1 ENE.	Calm.	2 North.
19	do	Calm.	1 NNE.	1 NW.	Calm.	4 NW.	4 NW.
20	do	1 NW. x N.	2 North.	Calm.	Calm.	3 ESE.	Calm.
21	Between coal mine and Dall River.....	Calm.	2 South.	1 South.	2 SW.	1 SE.	Calm.
22	Dall River 66° 00' N., 149° 15' W.....	1 SE.	Calm.	1 South.	2 SW.	1 SE.	Calm.
23	do	Calm.	Calm.	1 South.	2 SW.	1 SE.	Calm.
24	do	Calm.	Calm.	1 South.	2 SW.	1 SE.	Calm.
25	do	Calm.	Calm.	1 South.	2 SW.	1 SE.	Calm.
26	do	Calm.	Calm.	1 South.	2 SW.	1 SE.	Calm.
27	do	Calm.	Calm.	1 South.	2 SW.	1 SE.	1 West.
28	do	1 West.	2 WSW.	Calm.	1 West.	2 WSW.	1 WSW.
29	do	1 WSW.	2 WSW.	Calm.	1 West.	2 WSW.	1 WSW.
30	do	Calm.	2 WSW.	Calm.	1 West.	2 WSW.	1 WSW.

Direction (magnetic) and force of wind observed on board the U. S. S. Nunivak, Yukon River, Alaska—Continued.

OCTOBER, 1899.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska	Calm.	Calm.	Calm.	Calm.	Calm.	1 NE.
2	do	Calm.	1 Var.	1 Var.	2 NE.	1 NE.	1 NE.
3	do	2 North.	2 North.	2 North.	2 North.	1 North.	2 NNE.
4	do	3 NE. x E.	3 NNE.	3 NNE.	1 NNE.	1 North.	Calm.
5	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
6	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
7	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
8	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
9	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
10	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
11	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
12	do	Calm.	Calm.	2 North.	Calm.	Calm.	Calm.
13	do	Calm.	Calm.	Calm.	Calm.	1 North.	Calm.
14	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
15	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
16	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
17	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
18	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
19	do	Calm.	Calm.	Calm.	Calm.	Calm.	1 WSW.
20	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
21	do	Calm.	Calm.	1 North.	Calm.	Calm.	Calm.
22	do	1 Var.	Calm.	Calm.	Calm.	Calm.	Calm.
23	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
24	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
25	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
26	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
27	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
28	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
29	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
30	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
31	do	Calm.	Calm.	Calm.	Calm.	Calm.	1 West.

NOVEMBER, 1899.

1	Fort Shoemaker, Dall River, Alaska	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
2	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
3	do	1 Var.	Calm.	1 SW.	Calm.	Calm.	1 Var.
4	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
5	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
6	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
7	do	Calm.	Calm.	Calm.	Calm.	1 West.	Calm.
8	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
9	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
10	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
11	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
12	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
13	do	Calm.	1 NW.	Calm.	Calm.	Calm.	Calm.
14	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
15	do	Calm.	Calm.	3 North.	3 North.	2 North.	3 NE.
16	do	1 NE.	2 NNE.	2 NNE.	2 NNE.	3 NNE.	2 NNE.
17	do	3 NNE.	Calm.	1 NNE.	1 Var.	1 Var.	1 Var.
18	do	1 Var.	1 Var.	1 Var.	Calm.	Calm.	Calm.
19	do	Calm.	Calm.	Calm.	Calm.	1 Var.	2 NNE.
20	do	2 NNW.	Calm.	2 NNW.	3 North.	1 North.	2 NNE.
21	do	3 North.	1 North.	2 North.	1 North.	1 NE.	2 NE.
22	do	2 NE.	2 NE.	3 NE.	2 NE.	2 North.	2 NNE.
23	do	2 NE.	2 NE.	1 NE.	2 NE.	2 NE.	1 NE.
24	do	Calm.	Calm.	1 Var.	Calm.	1 NE.	2 NE.
25	do	2 NE.	1 NE.	Calm.	Calm.	2 NE.	3 NE.
26	do	3 NE.	3 NE.	3 NE.	3 NE.	3 NE.	1 NE.
27	do	2 North.	2 NE.	3 North.	3 North.	2 North.	2 North.
28	do	2 NE.	Calm.	Calm.	Calm.	Calm.	Calm.
29	do	Calm.	Calm.	2 NE.	2 NE.	1 Var.	2 NE.
30	do	2 North.	3 North.	3 North.	2 North.	2 North.	1 East.

Direction (magnetic) and force of wind observed on board the U. S. S. *Nunivak*, Yukon River, Alaska—Continued.

DECEMBER, 1899.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
2	do	1 NE.	Calm.	Calm.	Calm.	Calm.	Calm.
3	do	Calm.	Calm.	Calm.	Calm.	Calm.	3 North.
4	do	5 NE.	4 North.	3 ESE.	3 NE.	3 North.	2 NE.
5	do	1 NE.	Calm.	Calm.	Calm.	Calm.	Calm.
6	do	Calm.	Calm.	Calm.	1 NE.	Calm.	Calm.
7	do	1 NE.	Calm.	Calm.	1 West.	Calm.	Calm.
8	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
9	do	1 NE.	Calm.	Calm.	Calm.	Calm.	Calm.
10	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
11	do	Calm.	Calm.	Calm.	Calm.	Calm.	1 SE.
12	do	1 SE.	Calm.	Calm.	Calm.	Calm.	1 Var.
13	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
14	do	Calm.	Calm.	2 South.	1 SW.	Calm.	1 SE.
15	do	3 WNW.	3 West.	Calm.	2 South.		2 West.
16	do	1 SW.	2 West.	1 South.		2 NW.	1 West.
17	do	1 SW.	Calm.	Calm.	1 NW.	1 NW.	Calm.
18	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
19	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
20	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
21	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
22	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
23	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
24	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
25	do	Calm.	1 North.	Calm.	Calm.	Calm.	Calm.
26	do	Calm.	Calm.	1 Var.	Calm.	Calm.	Calm.
27	do	Calm.	Calm.	Calm.	Calm.	1 South.	Calm.
28	do	Calm.	Calm.	Calm.	Calm.	1 North.	Calm.
29	do	1 North.	Calm.	Calm.	Calm.	1 North.	Calm.
30	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
31	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.

JANUARY, 1900.

1	Fort Shoemaker, Dall River, Alaska	Calm.	Calm.	Calm.	1 SE.	Calm.	Calm.
2	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
3	do	Calm.	Calm.	Calm.	Calm.	1 Var.	Calm.
4	do	1 North.	Calm.	Calm.	Calm.	Calm.	Calm.
5	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
6	do	Calm.	1 Var.	Calm.	Calm.	Calm.	Calm.
7	do	Calm.	Calm.	Calm.	Calm.	1 Var.	Calm.
8	do	1 NE.	1 NE.	1 NE.	Calm.	1 NE.	4 NE.
9	do	4 North.	3 NW.	3 North.	3 North.	3 North.	2 North.
10	do	2 North.	1 North.	1 North.	1 North.	1 North.	2 North.
11	do	2 North.	2 North.	Calm.	Calm.	Calm.	Calm.
12	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
13	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
14	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
15	do	Calm.	Calm.	Calm.	1 Var.	Calm.	Calm.
16	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
17	do	Calm.	Calm.	Calm.	Calm.	1 Var.	1 Var.
18	do	Calm.	Calm.	Calm.	Calm.	Calm.	1 Var.
19	do	1 Var.	1 Var.	Calm.	1 North.	1 North.	1 North.
20	do	1 North.	1 North.	Calm.	Calm.	Calm.	Calm.
21	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
22	do	Calm.	Calm.	1 Var.	Calm.	1 SE.	2 South.
23	do	3 South.	3 South.	2 SW.	2 West.	3 SW.	1 SW.
24	do	2 South.	Calm.	1 SE.	1 Var.	Calm.	Calm.
25	do	1 Var.	Calm.	Calm.	Calm.	Calm.	Calm.
26	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
27	do	Calm.	Calm.	Calm.	Calm.	Calm.	1 NNW.
28	do	Calm.	1 Var.	Calm.	Calm.	Calm.	1 NE.
29	do	1 Var.	Calm.	2 SE.	1 Var.	1 Var.	2 North.
30	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
31	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.

Direction (magnetic) and force of wind observed on board the U. S. S. Nunivak, Yukon River, Alaska—Continued.

FEBRUARY, 1900.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska	1 Var.	Calm.	Calm.	Calm.	Calm.	Calm.
2	do	Calm.	Calm.	Calm.	1 NW.	Calm.	Calm.
3	do	Calm.	Calm.	Calm.	Calm.	1 NW.	Calm.
4	do	Calm.	Calm.	Calm.	Calm.	Calm.	1 SW.
5	do	1 SW.	Calm.	Calm.	Calm.	Calm.	Calm.
6	do	1 Var.	2 NE.	1 Var.	2 NW.	Calm.	Calm.
7	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
8	do	1 Var.	Calm.	Calm.	1 Var.	Calm.	Calm.
9	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
10	do	Calm.	Calm.	Calm.	Calm.	Calm.	1 Var.
11	do	Calm.	Calm.	1 Var.	Calm.	1 Var.	Calm.
12	do	Calm.	Calm.	Calm.	1 Var.	Calm.	Calm.
13	do	2 South.	Calm.	Calm.	Calm.	Calm.	Calm.
14	do	Calm.	2 NE.	Calm.	Calm.	Calm.	Calm.
15	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
16	do	Calm.	3 North.	4 North.	3 NE.	3 NE.	3 NE.
17	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
18	do	1 Var.	Calm.	Calm.	Calm.	Calm.	Calm.
19	do	1 Var.	Calm.	Calm.	Calm.	1 Var.	3 NE.
20	do	2 NE.	Calm.	1 Var.	Calm.	Calm.	Calm.
21	do	1 Var.	Calm.	1 Var.	Calm.	Calm.	Calm.
22	do	Calm.	1 Var.	1 Var.	Calm.	1 Var.	3 NE.
23	do	2 NE.	Calm.	1 NW.	Calm.	1 Var.	Calm.
24	do	2 NE.	Calm.	1 North.	1 Var.	Calm.	Calm.
25	do	1 Var.	Calm.	Calm.	Calm.	Calm.	1 ESE.
26	do	Calm.	Calm.	Calm.	Calm.	Calm.	2 SE.
27	do	Calm.	Calm.	1 Var.	Calm.	Calm.	1 NE.
28	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.

MARCH, 1900.

1	Fort Shoemaker, Dall River, Alaska	1 Var.	Calm.	Calm.	Calm.	1 Var.	1 WSW.
2	do	1 NW.	1 Var.	Calm.	Calm.	Calm.	2 NE.
3	do	Calm.	Calm.	Calm.	Calm.	Calm.	Calm.
4	do	1 Var.	Calm.	Calm.	Calm.	Calm.	Calm.
5	do	1 Var.	1 South.	Calm.	Calm.	1 North.	2 NE.
6	do	1 Var.	Calm.	Calm.	Calm.	Calm.	Calm.
7	do	2 NE.	Calm.	Calm.	Calm.	Calm.	Calm.
8	do	1 Var.	1 Var.	Calm.	Calm.	Calm.	Calm.
9	do	1 Var.	1 Var.	1 North.	1 Var.	Calm.	2 SSE.
10	do	2 NE.	2 North.	1 North.	Calm.	Calm.	1 SE.
11	do	2 East.	1 East.	Calm.	Calm.	Calm.	2 NE.
12	do	1 SE.	Calm.	Calm.	1 SE.	Calm.	Calm.
13	do	1 West.	Calm.	Calm.	1 SE.	1 Var.	Calm.
14	do	1 SE.	Calm.	Calm.	1 SE.	Calm.	Calm.
15	do	1 Var.	Calm.	Calm.	Calm.	Calm.	1 NE.
16	do	Calm.	2 NE.	Calm.	Calm.	Calm.	1 Var.
17	do	1 SE.	1 Var.	Calm.	Calm.	Calm.	Calm.
18	do	2 NE.	Calm.	1 North.	1 Var.	Calm.	1 ENE.
19	do	Calm.	1 Var.	Calm.	Calm.	Calm.	2 NE.
20	do	1 ENE.	Calm.	Calm.	Calm.	Calm.	Calm.
21	do	1 Var.	Calm.	Calm.	Calm.	Calm.	2 NE. x E.
22	do	3 NE.	2 NE.	2 NE.	1 NE.	1 NNE.	2 NE. x E.
23	do	2 NE. x E.	2 NE. x E.	2 NE.	2 NNW.	1 Var.	2 NNE.
24	do	2 NNE.	2 NNE.	3 NNE.	2 North.	1 North.	2 NE.
25	do	1 NNE.	1 NNE.	1 NNE.	1 Var.	1 Var.	1 NE.
26	do	2 NE.	2 NE.	2 NE.	2 NE.	1 NE.	1 Var.
27	do	1 NE.	Calm.	Calm.	Calm.	Calm.	1 East.
28	do	1 NE.	Calm.	1 Var.	Calm.	Calm.	1 NNW.
29	do	2 WNW.	2 WNW.	1 Var.	1 South.	1 South.	1 WNW.
30	do	1 WNW.	1 WNW.	1 Var.	Calm.	1 Var.	1 Var.
31	do	1 NNW.	1 NE.	Calm.	1 NNW.	2 NNE.	1 SW. x W.

Direction (magnetic) and force of wind observed on board the U. S. S. *Nunivak*, Yukon River, Alaska—Continued.

APRIL, 1900.

Date.	Place.	4h.	8h.	12h.	16h.	20h.	24h.
1	Fort Shoemaker, Dall River, Alaska	1 Var.	1 WNW.	Calm.	2 SW.	1 WNW.	4 W. x N.
2	do	3 W. x N.	2 SSW.	1 SW.	1 NNE.	1 East.	1 Var.
3	do	2 NW.	1 Var.	Calm.	Calm.	Calm.	2 North.
4	do	2 North.	2 East.	2 ENE.	2 ENE.	2 NE.	3 North.
5	do	2 N. x E.	1 North.	1 North.	1 NE.	1 NNE.	2 NNE.
6	do	1 Var.	Calm.	1 SSE.	1 SSE.	1 SSE.	3 SSE.
7	do	1 SSW.	Calm.	1 Var.	Calm.	1 Var.	Calm.
8	do	1 NNE.	1 Var.	Calm.	Calm.	1 Var.	Calm.
9	do	1 Var.	Calm.	Calm.	Calm.	Calm.	Calm.
10	do	1 NE.	Calm.	Calm.	Calm.	1 Var.	1 SE.
11	do	Calm.	1 Var.	Calm.	Calm.	Calm.	1 East.
12	do	2 NE. x E.	2 NE.	3 NE.	1 Var.	3 NE.	2 NE.
13	do	2 NE.	1 NE.	Calm.	Calm.	1 Var.	1 Var.
14	do	Calm.	Calm.	Calm.	1 Var.	1 Var.	1 NE.
15	do	2 NE.	1 North.	Calm.	1 Var.	1 Var.	Calm.
16	do	Calm.	1 Var.	1 Var.	1 Var.	1 Var.	1 W. x N.
17	do	1 WNW.	1 Var.	1 South.	1 Var.	1 W. x N.	1 Var.
18	do	1 NW.	Calm.	Calm.	Calm.	1 NW.	2 NNE.
19	do	1 NE.	2 N. x E.	2 North.	2 N. x E.	2 NE.	2 NE.
20	do	2 North.	1 NNE.	1 NNE.	2 NE.	2 NNW.	2 NE.
21	do	2 NE.	2 NE.	2 NE.	2 NE.	2 NE.	2 NNE.
22	do	1 NE.	1 NE.	1 NE.	Calm.	1 North.	2 NE.
23	do	1 Var.	1 Var.	Calm.	1 Var.	1 East.	1 Var.
24	do	1 NE.	1 Var.	Calm.	1 NE.	1 NE.	1 NE.
25	do	1 ENE.	1 Var.	Calm.	1 Var.	1 NE.	Calm.
26	do	2 SE. x S.	Calm.	Calm.	Calm.	1 South.	2 SE.
27	do	2 Var.	1 Var.	Calm.	Calm.	1 East.	1 Var.
28	do	1 Var.	1 SW.	Calm.	3 South.	3 SSE.	4 SSE.
29	do	2 South.	Calm.	1 Var.	1 Var.	1 SSW.	1 SW.
30	do	1 NW.	Calm.	Calm.	Calm.	1 Var.	4 NNE.

MAY, 1900.

1	Fort Shoemaker, Dall River, Alaska	4 North.	2 North.	2 North.	4 North.	4 North.	4 North.
2	do	3 North.	3 North.	3 North.	Calm.	1 Var.	Calm.
3	do	Calm.	Calm.	Calm.	1 Var.	1 Var.	1 SE.
4	do	1 NE.	Calm.	Calm.	Calm.	1 Var.	1 Var.
5	do	1 Var.	Calm.	Calm.	2 North.	Calm.	1 NE.
6	do	1 NE.	Calm.	Calm.	Calm.	1 North.	3 NE.
7	do	2 NNE.	1 Var.	1 North.	1 North.	2 NE.	2 NNE.
8	do	2 NNE.	2 NE.	2 NE.	2 NE.	2 NE.	3 NNE.
9	do	2 NNE.	2 NNE.	2 NE.	1 NNE.	1 Var.	Calm.
10	do	1 NE.	1 Var.	Calm.	Calm.	Calm.	Calm.
11	do	Calm.	1 Var.	Calm.	Calm.	Calm.	2 South.
12	do	Calm.	1 Var.	1 Var.	1 NE.	Calm.	1 NE.
13	do	1 Var.	Calm.	Calm.	Calm.	1 Var.	1 NE.
14	do	1 NE.	1 NE.	1 NE.	2 North.	1 NE.	1 NE.
15	do	2 NE.	1 NE.	1 NE.	1 NE.	1 NE.	1 NE.
16	do	2 NE.	1 NE.	1 NE.	1 NE.	1 NE.	2 NE.
17	do	2 NE.	2 NE.	2 NE.	1 NE.	1 NNE.	1 North.
18	do	1 NNE.	1 Var.	Calm.	Calm.	Calm.	Calm.
19	do	1 NE.	1 NE.	Calm.	Calm.	1 NE.	1 NE.
20	do	1 ENE.	1 Var.	Calm.	Calm.	Calm.	Calm.
21	do	1 North.	Calm.	Calm.	1 NE.	Calm.	1 SE.
22	do	1 SW.	1 Var.	Calm.	2 NE.	2 NE.	1 North.
23	do	1 NE.	Calm.	2 NNE.	2 NNE.	2 NNE.	1 NNE.
24	do	2 NE.	1 NE.	2 NE.	2 NE.	2 NE.	3 NW.
25	do	3 NNW.	2 WNW.	1 NE.	1 NNE.	2 NNW.	4 NW.
26	65° 55' N., 149° 18' W.	3 NNW.	2 NE.	2 NNE.	1 NNE.	1 NNE.	2 NNW.
27	do	3 NNW.	Calm.	2 ENE.	1 ENE.	1 NW.	2 NW.
28	65° 40' N., 149° 55' W.	2 NNW.	2 WNW.	1 WNW.	Calm.	2 NW.	3 NW. x N.
29	do	2 ESE.	1 Var.	1 Var.	1 Var.	1 Var.	2 NNW.
30	do	Calm.	Calm.	Calm.	Calm.	Calm.	2 NW.
31	do	2 SE.	1 SSW.	1 Var.	1 West.	1 NE. x E.	2 SE.

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