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ALASKA AND THE SIGNAL CORPS

The pioneering role of the U.S. Army Signal Corps in the development of the 49th State

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Now that Alaska is our 49th State, the important contribution of the U.S. Army Signal Corps in its development and protection for more than 75 years is of particular interest.

Congress, by a joint resolution approved in February 1870, authorized the Signal Service — as the U.S. Army Signal Corps was then known — to organize a meteorological observing and forecasting service on a national scale. In the first year of the weather service it was a matter of pride to General Albert J. Myer, the Chief Signal Officer, that from his office he could have telegraph communication with Canada, the West Indies, South America, the Pacific Coast, and the eastern coasts of China and Japan.

By the close of 1871, he was making use of these lines to receive weather reports from observer stations as far west as the Pacific Coast and as far north as Canada. The service was extended to the West Indies the following year. In 1873, reports were being received by wire three times daily from 93 observer stations, of which only 78 were within the United States. By 1875, a Pacific

coast chain of meteorological observation stations extended from San Diego to Portland, with a station in the Aleutian Islands, Alaska.

In 1878, there were 224 Signal Corps observing stations, each making daily reports. From six to eight times a day, at fixed times, the observer read his instruments — barometer, thermometer, hygrometer, anemometer, wind vane, and rain guage. He then entered his findings on the proper forms and distributed them by mail and telegraph to specified addresses. The hours were long and the duties frequently hazardous to life and limb for the stations were not all in rented offides in the hearts of cities.

A station was established on the Island of St. Paul in the Bering Sea; the Signal Service observer performed extensive research there and filed frequent reports of the entire Alaskan and Aleutian territory. In 1871, an observer-sergeant equipped with specially selected instruments, accompanied the Polaris and North Pole Expedition commanded by Captain C. F. Hall. These were only the first of several Arctic operations by the Signal Service that were to culminate in the tragically fated Greely Expedition of the next decade.

In 1881, Alaska was the scene of a pioneering international effort in weather reporting for which the U.S. Army Signal Corps supplied the men, equipment, and scientific know-how. The purpose of this system was to establish around the North Pole a circle of meteorological stations whose observations were to be pooled and studied by all nations. This may well be considered the forerunner of the present International Geophysical Year.

To the United States Army Signal Corps, because of its mission of weather reporting, fell the honor and duty of establishing two of the meteorological stations -- one at Iddy Franklin Bay, Grinnel Land; the other at Point Barrow, Alaska.

Lieutenant Philip H. Ray commanded the expedition to Point Barrow -- a long, low, characterless point of sand, bare of all but Arctic lichens and moss, at the most northerly tip of Alaska. Beyond lay only the frigid wastes of the Arctic -- haunt of the narwhal and graveyard of many a whaling vessel. There, in a shelter built by their own hands, the men established and operated the weather station successfully for nearly two years. They returned home in October of 1882 with a record of hourly magnetic observations for 19 months and an important collection of the flora and fauna of Alaska. Not a man of the expedition had been ill or injured. Since history, like gossip, has little to say about good fortune, this successful accomplishment has received much less publicity than the more sensational Greely Expedition which was taking place at the same time.

It was the same year -- 1881 -- that the ill-fated Greely Expedition was meeting with disaster in Greenland. Ill-fated because of the suffering and death from cold and hunger of all but six of the original task force, it was still successful because First Lieutenant Adolphus W. Greely and his men, through their suffering, brought back safely an unbroken series of meteorological, tidal, magnetic, and pendulum observations of great value for international scientific

study. "It was no adventurous pole-seeking voyage as is generally believed," Greely wrote, "but a single unit in an elaborate system of international scientific research in which 11 nations and 50 scientific observatories worked in concert."

How little the importance of the Signal Corps' work in Alaska was understood and how little the difficulties of the operation were appreciated are evidenced in questioning in a congressional committee which investigated expenditures of the War Department in 1885. With reference to the Point Barrow expedition, objections were made to various expenditures including:

$1,166 for weather instruments

$385.45 for arms and ammunition

$202.50 for 45 gallons of whiskey

$125 a month for an interpreter

$60 a month for a cook

Particular exception was taken to an expenditure of $181.76 for some books of fiction with which the men whiled away their two-year isolation in the Arctic Wastes (there was no USO nor Bob Hope in those days!). Testimony before Congress was pointed:

Question: Do these books have any relation whatever to the science of meteorology?

Comptroller: Not that I am aware of ...

Question: You have some knowledge of the literature of the country, I presume?

Comptroller: Yes; in a general way, perhaps.

Question: And you know of nothing in Innocents Abroad, Roughing It, or the Leather Stocking Tales that applies to any purpose of that expedition?

Comptroller: No sir. Of course, I am not very well informed as to what the purpose of the expedition was.

A summary of the first thirty years' existence of the Territory of Alaska indicates the importance of the operations of the Signal Corps in building this vast area into a cohesive society:

At two cents an acre, Alaska was of course a bargain. The great, wild sprawling territory had been bought from Russia, in 1867, for seven million dollars. And on October 30 of that year, the American flag was raised at Sitka. Although the new territory attracted farmers, miners, fur trappers, and rugged adventurers, the affairs of Alaska were administered by the War Department. Small garrisons were established at Kenai, Kodiak, Wrangell, and other remote outposts. But indifference and apathy to the welfare of the few settlers finally led to the withdrawal by the Government of all troops in 1877. Within months, a few rebellious natives banded together to harass and terrify the white settlers. Three settlers were murdered at Sitka in 1878, and the following year the renegade Indians moved into Sitka for the announced purpose of killing every white inhabitant. Arrival of a

British warship in Sitka harbor scattered the renegades and eased the tension considerably. But our Government was shamed and embarrassed -- for failure to protect the lives of American citizens in an American territory. In April of 1879, a Navy gunboat was dispatched to patrol the Alaskan waters. Enforcing law and order, it was the sole representative of the U.S. Government until 1884, when a civil government was established, with Sitka as the capital. In 1896, gold was discovered in the Klondike, and two years later near Nome. Thousands of prospectors and miners poured into Alaska, followed by gamblers, gunmen, and other frontier characters. Gold, greed, and whiskey spawned such violence and murder that the government at Sitka was forced to call on the Army to help restore law and order.

A military department was created in 1899, with headquarters at St. Michael on Norton Sound. Garrisons were established at Fort Davis near Nome, at Fort Gibbon near Tanana, at Fort Egbert near Eagle, at Fort Liscum near Valdez, and at Fort William H. Seward near Skagway. In order to maintain military control of the vast territory, communication between the forts was essential. And the Signal Corps was assigned the mission of establishing telegraph lines between the forts and garrisons (fig. 1).

Suited for the task was Adolphus W. Greely, then a General and Chief Signal Officer, who was well experienced in ways and means of working in northern climates of snow and cold. But before Greely could begin work, he needed authority, money, and the extension of

the Canadian Telegraph System to the Alaskan border. The first and second were provided by an Act of Congress, May 26, 1900, which appropriated $450,000 "for the purpose of connecting headquarters, Department of Alaska, at St. Michael, by military telegraph and cable lines with other military stations in Alaska provided that commercial business may be done over these military lines." The third, Greely obtained for himself. Paying a private visit to the Prime Minister at Toronto, he persuaded him that Canada would profit if its telegraph lines were extended to the Alaskan border. The Prime Minister agreed, and plans were made. Greely was soon on his way north to start work on the Washington-Alaska Military Cable and Telegraph System -- WAMCATS.

Captain Frank Greene was the first signal officer of the department and he had only one assistant. When Greene was transferred to the Philippines and his successor, Major Maxfield, contracted a serious illness during an inspection trip, Greely was the only other available officer who was familiar with Arctic operations. From necessity, as well as by choice, therefore, the Chief Signal Officer took an intense interest in WAMCATS and personally planned and supervised much of the work.

Arriving in Alaska, Greely first ordered the construction of a telegraph line from Nome, on the northwestern side of Norton Sound, through Fort Davis to Port Safety, 25 miles to the east. He chose an officer and a detachment of men from the 7th Infantry

stationed at nearby Fort Davis for the work. They were fortunate. The weather was mild, and the iron poles were erected easily on the brown hills overlooking Norton Sound. The line was completed on September 15, 1900, only a few days before the cold of winter transformed water and hills into ice, snow, and frigid silence.

With telegraphic communication established between Nome, Fort Davis, and Port Safety, the remaining garrison, Fort St. Michael, on the southern shore of Norton Sound, was to be brought into the net. To do this, Greely decided to install a submarine cable between Port Safety and Fort St. Michael. The steamer Orizaba was chartered and her holds filled with 187 miles of cable. The instruments and the shore end of the line were landed at Fort St. Michael. On September 29, 1900, under the command of Greely, the ship, paying out cable, steamed north toward Port Safety. Five miles of wire were laid, when the ship ran aground on a reef. Through three gaping holes, water roared into the holds. The Orizaba was a total loss.

Greely acted immediately. Although the steamer was useless, cable in the hold could be salvaged and used. From the Alaska Commercial Company he ordered a lighter and an ocean-going paddle-steamer. When they arrived, the cable was hauled from the Orizaba's flooded holds and coiled on the lighter. Greely's plan was to lay the cable from the lighter (fig. 2) which would be towed by the paddle-steamer. But he had to act fast because of approaching

winter. By October 17, 1900, the work was done and communication established between Port Safety and Fort St. Michael — a distance of 133 miles.

The cable was in use for only a short time, however, when it was crushed by movement of the polar ice pack. It was repaired in the spring and used during the summer and autumn of 1901. But in November of 1901, it again failed to function. The following spring, the ice dragged 40 miles of the cable out to sea. Because of the treacherous ice floes, a submarine cable was impracticable across Norton Sound. But two years later, the problem was solved when wireless communication (radio) was established between Port Safety and Fort St. Michael.

Early in 1901, work was also started by Canada on the extension of the Canadian telegraph line from Dawson in the Yukon Territory, northwest to the Alaskan border. Simultaneously, from Fort Egbert, 11 miles west of the border, a lieutenant and about a dozen men of the 7th Infantry began laying a line eastward (fig. 3). This party endured great hardship when a steamer, ordered to move the detachment, left them stranded far from the nearest settlement. They were forced to abandon all their material and break trail by marching in columns of four for miles through waist-deep snow to reach safety.

On May 5, 1901, the Canadian and American lines were joined. From Fort Egbert in the Upper Yukon, the line ran to Dawson and from

there to Skagway. Finally, on September 4, 1901, the Canadians completed a line between Quesnel and Atlin City in British Columbia. Then, for the first time, the commander at Fort Egbert had a direct line to the War Department in Washington.

Greely had intended originally to build the telegraph system in Alaska using soldiers of line units under the command of signal officers. But after using men of the 7th Infantry to build the line from Fort Davis to Port Safety and the Fort Egbert to Dawson line, he realized this method had severe limitations. The work was too technical. The men had little experience. And signal officers were too few.

To remedy this, Greely formed a signal battalion of two companies. He increased the number of officers assigned to the Alaskan command from two to four. To do this it was necessary to send officers recently returned from tropical duty into the ordeal of an Alaskan winter. From the Philippines he ordered the transfer of Signal Corps detachments to act as working parties. After some training of personnel in the spring of 1901, the general tested his new organization.

As the first project, he chose the building of a telegraph line from Fort St. Michael in the far north to Fort Gibbon on the Tanana River. Eighty miles of it had been built by men of the 7th Infantry, and construction of the remaining 448 miles was assigned to a young officer just back from the Philippines — Lieutenant George S. Gibbs (later to become Chief Signal Officer, himself).

It was wild, treacherous country, and the seasons seemed to conspire against telegraph construction. The ground was almost impassably boggy in the fall, the cold intense in winter (-72° F), the snow soft and deep in spring, and in the summer there were hordes of appallingly ferocious mosquitoes. Working around the southern shore of Norton Sound, Gibbs' small construction party began laying a line toward Unalakleet in the summer. Black clouds of mosquitoes and flies rose from the soggy muskeg. Biting, buzzing, stinging, they nearly drove the men wild. But will and the sense of duty moved the men, and the line went forward. Finally, their clothing shredded by brush, their faces and hands puffed from bites and sores, maddened by insects, exhausted and unnerved, the men reached Unalakleet.

Toward the Yukon Valley the terrain changed. There was only a grey plain of boggy tundra before them. No trees for poles. They had to provide heavy iron poles, which were dragged across the wasteland. Since the tundra was a permanent bed of ice, erecting the telegraph poles was a problem. However, Gibbs provided his own solution. First, he blasted a hole five feet deep in the ice, then set a pole and packed it in with mud. The mud froze and embedded the pole as solidly as cement. And pole after pole was installed as the new line to the Yukon Valley moved slowly eastward.

East of Kaltag, the terrain changed again. Scrub, brush, muskeg, and tundra disappeared. In their place appeared huge,

forests of massive trees. Gibbs cut a right of way along the bank of the Yukon (fig. 4). In places, the thicket was so dense that perpendicular walls of vegetation lined the clearing and mosquitoes attained new heights of ferocity. The line reached Nulato, crossed the mouth of the Koyukuk River, then moved eastward along the Yukon to Fort Gibbon. On November 18, 1901, the work was completed.

For three days messages were sent from Fort Davis to Fort Gibbon over a telegraph line of 605 miles. Then the submarine cable connecting Port Safety and Fort St. Michael snapped for the second time. To maintain communication, something had to be done. Although most communication at the turn of the century was accomplished either visually or by means of the telegraph and permanently installed wire lines, a new kind of communication — wireless telegraphy — was developing rapidly. Wireless telegraphy had been used successfully between stations up to about 40 or 50 miles apart. But the new equipment had not been used by the Signal Corps for communicating over longer distances. Faced with the problem of maintaining communication between Port Safety and Fort St. Michael, Greely decided to test the merits of wireless telegraphy across the treacherous Norton Sound — a distance of nearly two hundred miles.

At that time, the Signal Corps relied heavily upon commercial companies for both equipment and techniques of communication. Greely negotiated a contract with Queen and Company to bridge the ice-bound waters between Port Safety and Fort St. Michael. The plan was to

use Fessenden equipment, and the company was to receive no remuneration until the wireless link was in operation for at least ten consecutive days. The firm made a valiant attempt, but after more than a year conceded defeat. It was then up to the Signal Corps — to develop, install, operate, and maintain the equipment necessary for communication. While suitable bases, buildings, and towers were being constructed at the two sites on each side of Norton Sound, commercial wireless equipment was purchased, tested, and modified to suit the needs of the Signal Corps.

Captain Edgar Russel supervised the construction of the buildings at Port Safety and Fort St. Michael. In a small building, he installed the transmitter, receiver, batteries, and a power unit consisting of a six-horsepower gasoline engine, driving a three-kilowatt, sixty-cycle alternator. Outside each building, he erected a tower about two hundred feet high. The equipment was a composite system developed in the United States by another Signal Corps officer, Captain Leonard D. Wildman, who combined the best features of the Fessenden, De Forest, and Marconi systems — plus a few improvements of his own. Tests of the equipment between Fort Wright and Fort Schuyler in New York were successful, and the equipment was shipped to Alaska.

On the morning of August 7, 1903, the first message was transmitted from the station at Fort St. Michael and received by the station at Port Safety. From the time of its installation, thanks to the pride and unremitting effort of the men of the Signal Corps,

this system worked for more than a year without an hour's interruption. Captain Wildman, remaining at Nome by his own request throughout an Arctic winter, supervised the operation, invented a new receiver, and prevented interruption of service on one occasion by replacing broken Layden jars by air condensers, which he resourcefully constructed. Through Wildman's foresight, duplicates of important equipment had been provided. This precaution prevented three serious breakdowns from accidents, of which he wrote:

> "The first accident occurred on January 25, when a part of the roof of the engine house was blown off, filling the room with snow and putting out the fire in the stove. The water jacket surrounding the cylinder froze before it could be emptied, and cracked the cylinder. This occurred at 4 o'clock in the morning while the men were asleep, and at 9 o'clock that morning, at the usual hour for opening the office, a temporary roof had been constructed, the snow drifts cleaned out, the dynamos dried, and the spare engine connected up.
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> "The second accident occurred in February, when the belt broke durihg the sending hour, ripping out all the pipe connections and putting the engine out of line. The other engine was started within two minutes and the service was not interrupted.

"The third accident occurred in March, and was caused by cracking the spark plug. While this would have necessitated shutting down for only an hour, that short delay was avoided by the fact that the other engine was in readiness."

Wildman encouraged his men to use their own ingenuity and incorporated many of their suggestions as improvements to his original invention. Sergeant McKenney devised a key that increased sending capacity from fifteen to thirty words per minute. In a single hour, over this section, 2,000 words were transmitted without error or interruption. The system continued to work admirably, and was used regularly as an important link in the communication network in Alaska. Commercial traffic was permitted over this link. Consequently, this was the first commercial wireless telegraph system to operate regularly on the continent of North America.

In 1901, the capital of Alaska had been moved from Sitka to Juneau. The primary reason was to foster closer cooperation between military and civilian authorities. Also it placed the capital closer to Skagway, a terminus of the Canadian telegraph line. Juneau could be tied into this net by a submarine cable. In June of 1901, Greely was authorized by Elihu Root, the Secretary of War, to contract for the work.

The private company that won the bid found the work comparatively easy. The cable was laid up the 124-mile Lynn Canal, which cut through the Coast Mountains and connected the two towns. On August 25, 1901, the cable was placed in operation. But a few days later it was broken by strong currents. With the arrival of winter, all repair work stopped. The following year work was resumed. But it was not until June of 1902 that a message could be sent directly to the many forts and towns of the Yukon.

While construction continued along the Yukon during 1900, Greely had planned another telegraph line from Valdez and Fort Liscum, on Prince Edward Sound, to Fort Egbert. In command of Captain George C. Burnell, a construction party began operations in the fall of 1900, moving northward toward the Klondike. The party consisted of 13 men, 2 escort wagons, 8 mules, signal supplies, and provisions for existence in the desolate wilderness of Alaska. Construction camps were established about ten miles apart. And a camp was moved only when the line was extended about five miles beyond the camp. The line was constructed of galvanized wire strung on poles made from trees felled on the spot. Where no trees existed, iron poles were carried by mule from Valdez. Until the middle of October, it rained incessantly. The wagons foundered and were abandoned. Supplies and equipment were packed on the backs of the mules over trails so rough an animal could barely travel 15 miles a day. The men, in overalls and rubber boots, worked on, sleeping

at night in old-fashioned round tents. The rain gave way to snow, and the wild viciousness of winter in Alaska beat down upon the wiremen as they placed pole after pole over rugged mountain trails (fig. 5). The elements proved a grim enemy. Glacier streams changed their courses overnight, demolishing roads and telegraph lines. Work was slowed to less than two miles a month. Finally, on June 30, 1901, when the Copper River Valley turned into a sea of muskeg, operations were stopped completely. Only 37 miles of telegraph line had been laid from Valdez. In the fall of 1901, Captain Burnell and his party began work again — pushing the line northward through the wilderness toward Fort Egbert.

Greely had planned to have a second construction party work southward from Fort Egbert so that the two parties could meet and complete the line somewhere along the proposed route. But there was no report of progress by the party in the north. Greely summoned one of his young lieutenants from the Philippines and sent him to Alaska to investigate the situation. Lieutenant William (Billy) Mitchell entered at Skagway and traveled by sled through deep snow along a trail made by the gold seekers of 1898. He arrived at Fort Egbert in the dead of winter, interviewed the commander, and reported to the commanding general of the department that the fort commander considered the assignment to build a telegraph line too hazardous — particularly in winter.

In reply, the general turned over to Mitchell several wagons, reels of galvanized wire, and a handful of men competent for line construction. Equipped with snowshoes and heavy winter clothing borrowed from the natives (fig. 6), Mitchell, in command of the construction party, moved southward toward Valdez. On August 24, 1902, the two Signal Corps parties met at Tanana Junction on the Tanana River — and the two halves of the telegraph line between Fort Egbert and Valdez were joined.

A few miles north of Valdez, where the line crossed the coastal range of mountains, high winds and storms in the passes broke the wire almost as soon as the line was completed. Maintenance was a serious problem. At least once a year, snowslides so vast that the roar could be heard for 15 miles would pour down into Keystone Canyon and Thompson's Pass and tear out long sections of the line. In 1903, these sections were replaced by submarine cable — and that problem was solved.

Meanwhile, work was in progress on the final link between Fort Gibbon and Fort Egbert that would connect the principal outposts of Alaska in a single network. The valley of the Tanana River — a natural right of way — was used for the telegraph line. Two construction parties were required — one working southward from Fort Gibbon, one working northward from some point along the Valdez-Fort Egbert line.

The section through the Tanana Valley was marked on existing charts as unexplored region. There was no accurate map until reconnaissances were made by the Signal Corps. Originally, Greely had planned to connect with the Fort Egbert line at Tanana Junction -- and he so indicated his intentions on a map drawn in 1902. But the point of connection with the Fort Egbert line was changed to Ketchumstuk after a survey of this unexplored area by Mitchell. Airminded Mitchell ascended a hundred feet in a box kite at one point to survey the surrounding terrain.

Gibbs was in charge of the construction party that moved southward from Fort Gibbon in February. Mitchell was placed in charge of the party moving north and west from Ketchumstuk. On June 20, 1903, near Salchak on the Tanana River, the two parties met and the line between Fort Gibbon, Fort Egbert, and Valdez was completed.

Greely had complied with instructions of Congress and the War Department. He had connected the headquarters of the Department of Alaska -- Fort St. Michael -- with every other military station in Alaska by military telegraph and cable lines.

For the men of the Signal Corps, however, the task of maintaining and operating the lines was not enough. The battle had to be waged over and over again. In winter as much as 60 feet of snow buried the lines. Or sleet storms and high winds broke them down. In summer, forest fires -- fed by thousands of square miles of timber --

destroyed a total of a hundred miles or more of line. Or floods uprooted the poles and washed away the cabins built for the men whose job it was to restore any interrupted service.

In these cabins — 40 miles apart throughout the uninhabited, howling wilderness — detachments of one Signal Corps repairman and two infantrymen led a special and solitary existence. When a break occurred, a crew of two men set out from each side of the break — traveling usually by dog sled. The first crew to reach the break repaired it, then awaited the arrival of the other crew. Contact established, both crews returned to their cabins. The procedure was strict for the protection of the men, and they were forbidden to travel alone. At temperatures of 60° below zero, a man disabled by even a minor injury was doomed unless help was near.

To guard against starvation, every station was furnished with food and other supplies for at least a year. But sypplying the men with the barest necessities was a difficult task. In all the areas crossed by the lines, there were less than twenty miles of wagon road. All supplies, including food for the dog teams, had to be sledded in midwinter, or mule-packed in summer — except for stations on the lower Tanana and lower Yukon, which could be reached by boat for a few weeks of the year (fig. 7). Equipment replacement ranged from difficult to impossible. In one six-month period, 220 tons of supplies and material were sledded or packed into the interior.

Even so, rations were not lavish. One station was without meat for 11 months. (How welcome K-rations and aerial resupply by paradrop would have been in those days!) In 1905, note was taken of this deficiency by the Ordnance Corps, who issued the men shotguns with which to shoot game, and by the Quartermaster Corps, who authorized extra allowances of butter, milk, and syrup if the detachment consisted of less than four men. The solitude and the silence were almost more than a man could bear. Not even the natives were seen for months at a time. The only visitor was an occasional inspecting officer (fig. 8) — and so great was the shortage of officers that at least one station was not inspected for two years.

Repair trips were perilous even in summer weather (fig. 9). In one year three Signal Corps men — of the 105 serving in northern Alaska — were killed or died of injuries sustained while repairing the lines. In addition, two infantrymen lost their lives and many were injured. But the men met the hardships, privations, and peril as their comrades were meeting them on other fronts — with courage and without complaint.

The network of a few scattered telegraph lines and a cable between Juneau and Skagway, called WAMCATS, was destined from the start to grow and expand. But in 1903, it had one drawback. All messages between Alaska and Washington were transmitted over lines of the Canadian Telegraph System — via either Fort Egbert or Juneau. Both Greely and Root agreed this was not a desirable

policy of state. Presenting the case before Congress, early in 1903, the Secretary of War secured an appropriation for a submarine cable to connect Juneau, Sitka, and Seattle.

Greely set to work immediately — planning for the construction of the cable before December, when Congress next convened. But first, there were numerous problems to be solved. And some of them seemed quite formidable. The only military cable ship — the Burnside — was in the Philippines. The ocean floor between Juneau and Seattle had never been surveyed. The work could only be done between May and September. There was no civilian cable engineer willing to work for the Signal Corps. There was a shortage of cable technicians. Machinery for making and laying the gutta-percha covered cable did not exist in the United States. Foreign manufacturers reported they could not supply the cable in the required time, or at the price Congress was willing to pay.

Greely set out to overcome each problem and difficulty that affected the laying of a 1,300-mile submarine cable — the longest ever undertaken in the Western Hemisphere — from Seattle to Juneau. From its station at Manila, Greely ordered the Burnside to proceed to Sitka under command of Captain Charles de F. Chandler, with skilled Filipino cablemen aboard. Instead of using imported cable with gutta-percha covering, he selected seamless rubber cable, then being developed in the United States. For the sum appropriated by Congress, he negotiated with a New York manufacturer for all the

cable required. And there was enough money left over to pay for transporting it 16,000 miles around Cape Horn to Seattle.

Overcoming the shortage of cable engineers, Greely recruited electrical engineers and trained them as cable specialists. Cable technicians were trained in four months. For the important operation, Greely placed Colonel James Allen in command — assisted by Captain Edgar Russel.

The Burnside reached Sitka and proceeded south to Seattle — surveying the ocean floor en route. Cable offices were set up in Sitka, Juneau, and Seattle. At Seattle, the Burnside was overhauled and loaded with cable. The cable ship left Seattle on September 14, 1903, with Colonel Allen in charge. On the 22d it was at Juneau — where the first cable was to be laid between Juneau and Sitka. Forty miles of cable were laid the first day — then, 40 miles below Admiralty Island, the ship struck a submerged iceberg. Although there was some damage, the ship limped back to port for repairs — laying cable all the way to lighten the load. After brief repairs, the Burnside again plowed through northern waters — linking Juneau and Sitka by cable (fig. 10). Continuing southward down Frederick Sound, the ship moved westward into Chatham Strait, down the Strait to the tip of Baranof Island, and then northward to Sitka.

On October 2, 1903, the cable end was drawn ashore at Sitka (fig. 11). Root and Greely sent messages of congratulation to

Allen, Russel, and their men. But they also congratulated one another. A section of the cable was ready for operation two months before Congress was due to convene.

The Burnside remained only one day at Sitka. On October 3, the cable ship, heading southward along the west side of the Alexander Archipelago, began laying cable to Seattle. But by the 16th, when 140 miles of cable had been laid, Colonel Allen reluctantly ordered a halt. From across the Bering Sea, violent storms of ice and snow bore down on the ship. The cable end was buoyed in 600 fathoms, and the Burnside headed for Seattle and the Philippines. The laying of the Sitka-Seattle cable would have to wait until the next year. The Arctic elements had won — temporarily.

On May 15, 1904, the Burnside returned once more to Seattle from the Philippines. Aboard her, cable-laying machinery was overhauled and made ready. Cable newly arrived from New York was stored in the holds. And, on June 18, with Colonel Allen again in charge, the cable ship headed north towards the anchor buoy. But there was no buoy. Winter storms had carried it off. The cable, dragged miles off its path, had to be recovered by grapnels. It meant starting all over again.

Once more the ship headed south from Sitka. It was summer and the weather should have been conducive to a tranquil and even enjoyable operation. But it was not to be so. From the very day it left port, the cable ship fought heavy seas and howling gales.

She pitched, she rolled, she creaked, she groaned — but somehow managed to pay out cable. On August 28, 1904, the cable end was brought ashore at Seattle, and the installation from Sitka to Seattle was complete (fig. 10).

The need for direct communication between Washington and military stations in and near Nome and in the valleys of the Tanana and the Yukon was apparent before the cable between Sitka and Seattle was in operation. Since an overland telegraph line was too difficult and too costly to construct through that region of Alaska, the solution to the problem was a cable between Sitka and Valdez.

Again, Greely approached Elihu Root, who explained the matter to Congress and obtained an appropriation for construction of the 640-mile cable. Again, the Burnside was pressed into service and equipped with cable and machinery for the operation. The ship was loaded far in excess of normal capacity to eliminate the need for a second trip to resupply. And on September 18, 1904, the Burnside started north. Four miles of cable were laid between Fort Liscum and Valdez (fig. 12). After a short delay at Valdez for provisions, the Burnside started for Sitka on September 29. Steadily and surely, the ship ploughed southward across the Gulf of Alaska. On October 3, 1904, the port of Sitka was reached and the cable end was drawn ashore. Three days later, with a salute from the Burnside to speed them on their way, the first messages were transmitted over the cable. It was an historic event (fig. 13). The United States at last had

an all-American cable and telegraph system to all of its military outposts in Alaska. Of this system, Greely wrote:

> "The undertaking is unique in the annals of telegraphic engineering, whether one considers the immense extent of territory, its remoteness from the United States, the winter inaccessibility of the regions, the severity of the climate, the uninhabited and trackless districts, or the adverse physical conditions. If plotted on a map of the United States this system would reach from Wyoming to the Bahamas, off the coast of Florida. The cables used would reach from Newfoundland to Ireland, and the land lines from Washington to Texas.
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> "Its totality also comprises elements not elsewhere combined in a single system — submarine, land, and wireless methods, all worked as one component and harmonious system."

From 1904 until 1914, new cables were added, and the routes of some telegraph lines were changed. And beginning in 1907, wireless telegraphy began to replace many of the cables and land lines. But the basic pattern of the system created by Greely remained practically unchanged for almost a decade.

Many of the minor changes were motivated by economic or technical causes. In 1904, the construction of the Alaskan Central

Railway from Seward to Fairbanks turned Valdez into a secondary port. Seward became the principal port for central and northwest Alaska. And a cable was laid, in 1905, to connect Seward with the system. Similarly, the development of the Alexander Archipelago resulted in the extension of the Juneau-Sitka cable in 1906, to the ports of Wrangell, Hadley, and Ketchikan. In 1909, copper made Cordova famous. And this port was joined to the Valdez-Seward cable in the summer of that year.

There were also changes and modifications in the land telegraph lines. In 1905, a new line was constructed between Fort Gibbon and Rampart. In 1909, a second line was constructed between Valdez and Fairbanks. By 1912, the Washington-Alaska Military Cable and Telegraph System provided a communications network designed and devised to serve both the military and civilian population of the territory (fig. 14).

Beginning in 1907, improved wireless telegraph equipment was available for installation and operation at many of the outposts in Alaska. Because of the simplicity of maintenance, the new medium of communication was fast coming into great importance throughout the territory. By 1908, there was a ten-kilowatt station at Fort Gibbon at Nome. Stations with three-kilowatt power were in operation at Fort Egbert, Circle, and Fairbanks (fig. 15). By the middle of 1910, there was a one-kilowatt station at Wrangell, Petersburg, and Kotlik. During 1911, the output power of the stations at Fort

Egbert and Circle was increased to five kilowatts. By relaying messages through Circle, more dependable communication was assured between Fairbanks and Fort Egbert. In 1912, large and more efficient spark transmitters — with a power of ten kilowatts — replaced the older spark sets at Nome and Fort Gibbon. By the end of 1915, the entire Washington-Alaska Military Cable and Telegraph System totalled 848 miles of land line, 2,637 statute miles of submarine cable, and 10 wireless stations.

Remote from the World War I hostilities in Europe, WAMCATS continued operation during the war years on a peacetime basis. In 1919, the system consisted of 2,675 miles of submarine cable, 799 miles of land lines, and 12 radio stations. A force of 250 officers, enlisted men, and civilians operated and maintained the system. And revenue from traffic, both commercial and military, had reached an annual peak of more than a half million dollars.

During the spring of 1919, the first major interruptions in service occurred — due to underwater damage to the submarine cable. At some points, where the sea bottom was rocky, constantly shifting tides had worn through the insulation of the cable. At other points, the cable was damaged by the anchors of ships and fishing vessels. To overcome these difficulties, new sections of cable were laid along less vulnerable routes during 1919 and 1920. Also, several new radio stations were installed to supplement the cable service and to replace many of the overland telegraph lines.

But maintenance and repair of the submarine cable network became more and more difficult. By the spring of 1921, it was evident that a completely new cable was required in order to handle the large volume of communication traffic without costly interruptions. A new cable ship was also needed to replace the aged Burnside.

Following a plea before Congress by Colonel J. D. L. Hartman, in charge of the WAMCATS, $1,500,000 was appropriated for rehabilitation of the system. Although rubber-insulated cable had originally been used, experience demonstrated that gutta-percha cable was preferable where long life was desired. Since American manufacturers were not interested in supplying such cable, a contract was let to a British concern for 1,900 nautical miles of gutta-percha cable. From the Shipping Board, the steamship Dellwood (fig. 16) was obtained by the Signal Corps and converted into a cable ship. In the spring of 1924, the Dellwood traveled from Seattle to London and returned with the first section of the new gutta-percha cable. After Navy destroyers surveyed the route with sonic depth finders, cable-laying operations commenced in May of 1924 under the direction of Colonel George S. Gibbs. By October the work was completed, and a new cable connected Seattle with Ketchikan and Seward.

In 1925, the Signal Corps operated — in addition to its submarine cables — a system of 20 radio stations and 840 miles of land telegraph line with 44 officers. Many of the radio stations

had been owned by the Navy, the Alaskan Railroad, the Bureau of Education, and private canneries and other organizations, but were integrated into the territorial communication system of the Signal Corps.

By 1928, the Signal Corps discontinued most of its land wire communication facilities — except for a telegraph line along the Alaskan Railroad between Seward and Fairbanks. In that year, there were in operation 6 cable stations, 24 radio stations and 4 combination cable-radio stations. Typical of the remote radio stations in the undeveloped wilds of Alaska was the station near Seward (fig. 17) that communicated with Seattle. In the same year, the Chief Signal Officer stated in his annual report:

> "The Washington-Alaska Military Cable and Telegraph System has shown a remarkable increase in traffic in the past year, considering there has been no increase in population of the territory. It is eveidence of the increasing dependence of the population upon the Signal Corps communication system for its social and commercial existence. It also indicates the growth and stablilsation of certain industries, especially the fishing and canning industries in southeastern Alaska. Thirteen newspapers including seven dailies are published in Alaska, and every word of press dispatch news from the outside world comes to them over the Signal Corps system."

By 1930, all telegraphic facilities — except the line along the Alaskan Railroad — had been discontinued and replaced by radio circuits. Funds were appropriated by Congress, in 1930, for replacement of the submarine cable system with radio equipment. Transmitting and receiving stations were installed at Seward, Ketchikan, Wrangell, Juneau, Haines, and Skagway during 1931, and from that time the underwater cable was used only for emergency communication. The staunch cable ship Dellwood was turned over to the Shipping Board which, in turn, sold it to one of the Alaskan cannery companies.

Meanwhile, through the Army Radio Net, direct and reliable communication was being established between station WAR, in Washington, and the principal military installations in the United States (Seattle, San Francisco, San Antonio, Omaha, Chicago, Atlanta, Columbus, and Boston) as well as military posts in Panama, Hawaii, and Manila, and military transports at sea. By 1931, the system was extended through Alaska via radio stations of the WAMCATS.

By 1935, radiotelegraph communication was the chief means of contact between stations of the WAMCATS. Except for a small section of underwater cable between Haines and Skagway, the once-extensive cable system was no longer operative — due to deterioration for lack of maintenance and repair. One by one, the cable sections — and almost of the land telegraph facilities — had been replaced by radio circuits between the principal cities and towns of Alaska.

With almost complete conversion to radio operation, the WANCATS was renamed the Alaska Communication System in 1936 (fig. 18). Ketchikan and Juneau, in southeastern Alaska, were linked directly with Seattle, and controlled stations at Sitka, Wrangell, Petersburg, Haines, Skagway, and other towns in that area. Also linked directly with Seattle, Anchorage was the control point for all stations in northwestern Alaska — including Kodiak, Seward, Kanakansk, Fairbanks, Nome, Point Barrow, and other remote outposts. When the Government established an experimental colony in Matanuska Valley in 1935, a radio station was installed at Palmer by the Alaska Communication System.

In July of 1937, the first direct radiotelephone communication was established between Juneau and Seattle, which made possible telephone conversation between Washington and Alaska. Two years later, another radiotelephone link between Ketchikan and Seattle was placed in operation.

Radio communication also kept pace, within Alaska, through this period. The easing of Government restrictions on commercial radio installations had encouraged the installation and operation of many such stations. By 1937, there were nearly 150 stations feeding traffic into the Alaska Communication System.

Although originally installed and operated for military purposes, as the Army gradually withdrew from administration and control of the territory, the Alaska Communication System became an increasingly

important facility for serving the civilian population as well as various agencies of the Government in Alaska. Faced with a shortage of qualified radio operators in 1941, a school was established in Seattle to train civilian recruits. In other respects, the Alaska Communication System faced the inevitability of another world war with much of the confidence it had displayed two decades earlier. This time, however, the communication system was better integrated, more efficient, and better prepared for the possibility of world conflict.

Of the several outlying possessions of the United States, Alaska was the only one with a complete and modern communication system that could be controlled by the Army in the event of an emergency. In Panama, Hawaii, and the Philippines, the Army depended for local communication on existing commercial systems. In the northernmost American possession, however, the Army owned and controlled the Alaska Communication System — pioneered by the U.S. Army Signal Corps.

The world conflict was not long in coming. At the end of 1941, while some signalmen were struggling with the intense heat of the jungles, mountains, monsoons, and floods of Asia, others were fighting the bitter cold of the frozen frontiers of Alaska (fig. 19). Within one year, Signal Corps men constructed the 2,060-mile Alaska Highway Telephone and Telegraph line from Edmonton, Canada, to Fairbanks, Alaska. The first section of the line ran from Edmonton to Dawson

Creek, British Columbia. This was operational in a mere eight days although the distance equals that from Washington to Boston. Even though the second section of the Alcan Highway required much more time, the Alaska Communication System grew rapidly, and within two years, Signal Corps personnel increased from 320 to 3,000 (fig. 20).

In the summer of 1942, the line between Anchorage and Fairbanks was rehabilitated, and new lines were started from Anchorage to Portage and Whittier. This project was carried over into the winter months, and Signal Corps problems changed with the seasons. The mud (fig. 21), hordes of mosquitoes, and drenching rains (fig. 22) of summer were replaced by the blizzards and sub-zero temperatures of winter.

In winter, the ground of the frozen North became so hard that, as seen earlier, it was practically impossible to dig holes for telephone poles — the backbone of long lines — with a pick and shovel. However, American ingenuity came to the fore once again, and this time with technological improvements, Signal Corps construction crews used compressed-air jackhammers to drill below the earth's surface. They drove perforated iron pipes into the ground and forced steam through them. This thawed the ground enough to permit the signalmen to enlarge the holes with shovels.

Even though decisive campaigns were being waged in the South Pacific, the Japanese diverted enough troops from that area to attack the northwestern possessions of the United States. On

June 7, 1942, Attu and Kiska in the Aleutian Islands fell to the Japanese. The U.S. Navy sent all available units to patrol the waters around the Aleutians to prevent Japanese reinforcements from landing.

With the coming of spring, the United States began routing the Japanese from their strongholds in the north. On May 11, 1943, elements of the 7th Infantry Division, reinforced by one battalion of the 4th Infantry and Alaska Scouts, landed at Holtz Bay and Massacre Bay on northeastern Attu. The Signal Corps was well represented in the first waves of U.S. troops attacking the fanatic Japanese defenders of Attu (fig. 23). While attending to the usual business of laying combat telephone and telegraph wires and installing radio stations, these signalmen ran into many obstacles.

The operation began in a heavy fog and rain that continued to harass signalmen at every turn. The miserable, wet weather turned the tundra into a quagmire of mud that bogged down all army vehicles. All equipment had to be carried ashore in freezing temperatures. Corrosion and short-circuits in communication equipment, caused by dampness, challenged the ingenuity of signalmen to keep the equipment functioning. Mountains on this barren island often interfered with radio transmission. In addition to fighting a desperate and fanatic enemy, Signal Corps troops installed communications, built protective housing for terminals, improvised devices to combat the weather, and invented new methods of camouflage.

The Japanese placed strong emphasis on disrupting U. S. communications on Attu. Their two favorite targets were Signal Corps linemen and exposed radio antennas that could not be hidden because of the lack of trees and shrubs. Infiltrating behind American lines, small enemy groups slashed wires at every opportunity and scraped the insulation from wires with bayonets to ground the circuits. On many occasions, field wire was cut on an average of every 20 feet, and wiremen attempting to repair breaks became targets for snipers. A grim instance of the determination of the enemy to disrupt communications was the discovery by a Signal Corps lineman of a dead Japanese with his stiffened hands clutching the wire, and a section of wire still clenched between his teeth. He had shorted the circuit by stripping off six inches of insulation.

By May 30, 1943, Attu was in possession of the United States. During the next two months, American and Canadian forces prepared for the invasion of Kiska. While the strongest amphibious force ever mounted in the North Pacific prepared for a battle much more difficult than Attu, the U.S. Eleventh Air Force bombed Kiska every time weather conditions permitted. On August 15, 1943, the Allies landed on Kiska in force, only to find that the enemy had evacuated the island during the softening-up phase of shelling and bombing that preceded the invasion.

While communications teams from the Alaska Communication System (ACS) followed the combat troops ashore in the Aleutians (fig. 24),

other ACS men installed post telephone systems and improved land lines that interconnected the main military establishments in central Alaska. The ACS also installed all of the communication facilities for the Army Airways Communication System and the Aircraft Warning Service in the Alaskan area.

In postwar years, ACS furnished new means of communications for the citizens and the military of the Territory of Alaska. In 1947, Alaska was provided with its first commercial telephone service over landlines. In addition to its headquarters at Seattle, ACS has communications installations at 44 widely-separated points throughout the Territory. Thirty-one of these installations are located in the larger population centers and provide telegraph service to governmental agencies and the general public. At 26 of the 31 ACS public service stations in Alaska, ACS, as the only long lines telephone system in the Territory, provides the public long distance telephone service.

Another advance was ACS' establishment of ship-to-shore radio-telephone service for ships at sea in Alaskan waters. ACS currently maintains 18 stations which serve the large amount of ship traffic along the 23,000 mile Alaska coastline. Due to the isolation and the competitive nature of the fishing industry, a predominant means of Alaskan livelihood, more than 1,000 of these vessels are registered and radio-equipped and rely upon ACS to provide facilities for communication with their homes and businesses and for normal communication throughout the world.

Supplementing the ACS network of stations are over 300 "bush" stations located throughout the remote and isolated regions of Alaska, which provide the only means of communication in these areas. Many of these stations are owned by individual miners, salmon canners, trappers, and settlers. Some 75 stations are operated by the Department of Communications, a Territory-supported agency created to provide essential communication in the remote communities and villages where from a half dozen to fifty or one hundred families live. Another 75 stations, operated by the Bureau of Indian Affairs, are primarily located in the remote Bering Sea and Arctic Ocean areas and afford the only means of communication for the Eskimo villages in these areas. These bush stations communicate with the nearest ACS stations by means of small radiotelephone sets of from 20 to 100 watts in power, handling both telegrams and telephone calls as the occasion demands.

On 11 December 1956, in cooperation with the American Telephone and Telegraph Company, the ACS inaugurated its newest communication facility. Stretching from Port Angeles, Washington to Skagway, Alaska, it is the most up-to-date submarine cable system available today. Constructed at a cost of 20½ million dollars (5½ of which was expended by ACS), it is capable of handling 36 telephone conversations at once, and each telephone channel can be used for 18 telegraph circuits. These circuits, which connect to Central Alaska by landlines through Canada operated by the Northwest Communications System, are the equal of any toll communications circuits available to customers in the United States.

Today, the Alaska Communication System provides communications from the most remote points of Alaska to the United States, Canada, and the world. It serves the general public, governmental agencies, and the Department of Defense; offers press services to newspapers and radio broadcast stations; provides money transfer service; exchanges all classes of commercial and government traffic with connecting lines in Seattle, Washington, and throughout the Territory of Alaska; and engineers, installs, and maintains the terminal equipment in Alaska necessary to provide these many and varied services.

Under pressure of the Cold War, Alaska's importance as a location for Distant Early Warning radar sites increased. To provide communications for remote radar sites, the Department of Defense initiated the DEW Line and White Alice projects. The DEW and White Alice networks are operated and maintained by civilian organizations under contracts with the government. Since they provide not only for the communication needs of the Department of Defense but also for those of government agencies and civilian communities, the problem of integrating these new facilities into the networks already serving the Territory gave rise to the concept of an Integrated Communications System, Alaska (ICSAL). The ACS, Civil Aeronautics Administration, and U.S. Army Alaska are all participating members of this integrated system under the over-all leadership of the Commander in Chief, Alaska. This extension of communications channels to the far-flung AC&W (Air Control and Warning) sites in the northernmost reaches of the Territory

has given Alaska one of the most modern and extensive communications systems that exists anywhere in the world.

Under the command of Colonel Carl H. Hatch, over 600 officers and men are on duty at ACS stations from Ketchikan to Point Barrow. Utilizing a thoroughly modern plant, the descendants of the original WAMCATS operate 19 radio stations and approximately 850 miles of open wire lines and 750 miles of submarine cable. 30,000 telephone poles, alone, are maintained winter and summer by the men assigned to the ACS.

"Whoever controls Alaska controls the world" was the prophecy of an ex-WAMCAT, General "Billy" Mitchell. Ever mindful of this admonishment, the modern-day ACS, operating but minutes away from Russia, stands ready to continue its present mission of serving the Department of Defense and the general public in Alaska.

Today, as during its near 80-year history in Alaska, the U. S. Army Signal Corps is pioneering the development and defense not only of our new 49th State but also of our older 48 States.

The names of many of the early communication pioneers in Alaska are commemorated at Fort Monmouth, New Jersey -- Home of the U.S. Army Signal Corps: Myer Hall, Enlisted Men's School; Greely Field, Parade Ground; Gibbs Hall, Officers' Club; Russel Hall, Post Headquarters; and Allen Avenue, Residential Thoroughfare. But Alaska, our 49th State, is an even greater tribute to the men and ideals of the U.S. Army Signal Corps.

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(Note: It is of interest to know that the Signal Corps' mission of providing photographic services for the Army -- in addition to its other acticities -- has resulted in 16mm motion picture films that

that give an historical record of many recent activities in Alaska. These films are available for non-profit, public showing, and may be obtained by writing to the Central Film and Equipment Exchange of any of the six Army Areas. Some of them are listed below:

AFIF 59 ALASKA (21 min. — 1954 — B & W) Historical background, social, economic, and military status — Extensive development by armed forces' activity — Strategic significance due to proximity of Soviet land masses and polar air routes — Military tests, exercises, and maneuvers.

MF 31-7724 EXERCISE SWEETBRIAR (29 min. — 1950 — B & W) Combined American and Canadian defense tactics against "agressor" invaders of Alaska and Canada — Agressors routed, forced to abandon attack, and driven off continent — Advantages of using air power for logistics, tactics, and strategy in cold weather operations.

MF 20-7725 ARCTIC INDOCTRINATION SCHOOL — WINTER 1950 (15 min. — 1950 — B & W) Army's Arctic indoctrination school at Big Delta, Alaska, winter 1950 — Student troops at school — snowshoe and ski technique — Bivouac in snow — Constructing various types of shelters — Mining a frozen lake surface to impede mechanized attack — Demonstration of penetration power of small-arms fire into snow and ice.

MF 20-7513 EXERCISE YUKON (30 min. — 1949 — B & W) Tactical operation — Four objectives — Testing air transports in Arctic — Defending Arctic airfields — Developing methods of training ground force units — Reporting data for further Arctic operations.

MF 5-1344 TASK FORCE WILLIWAW (41 min. — B & W) Cold weather personnel and equipment in Aleutian climate.

MF 5-959 ALASKA HIGHWAY (36 min. — 1944 — Color) Construction of 1,500 miles of Alaskan Highway — From felling the first tree to final completion of the highway.

MF 11-1006 REPORT FROM THE ALEUTIANS (40 min. — 1943 — Color) American soldiers in the battle of the Aleutians — American airmen drop bomb loads on Kiska and Japanese installations.

MF 11-7803 YOUR JOB IN THE SIGNAL CORPS (20 min. — 1951 — B & W) Portion of film on: Responsibility of U. S. Army Signal Corps for communications in Alaska.