DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, Director

PRELIMINARY REPORT

ON THE

CAPE NOME GOLD REGION

ALASKA

WITH MAPS AND ILLUSTRATIONS

BY

FRANK C. SCHRADER AND ALFRED H. BROOKS
ASSISTANT GEOLOGISTS

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LETTERS OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
Washington, February 1, 1900.

SIR: I have the honor to acknowledge receipt of the resolution of the Senate, dated the 3d ultimo, as follows:

Resolved, That the Secretary of the Interior be, and he is hereby, directed to submit to the Senate of the United States a report on any investigations that may have been made by the Geological Survey in the Cape Nome district of Alaska.

In response thereto I transmit herewith a copy of a letter from the Director of the Geological Survey, dated February 1, 1900, to whom the resolution was referred, inclosing a report covering the information desired.

Very respectfully, E. A. HITCHCOCK,
Secretary.

The PRESIDENT PRO TEMPORE OF THE UNITED STATES SENATE.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, February 1, 1900.

SIR: I have the honor to acknowledge the receipt, by reference of the Hon. Thomas Ryan, Acting Secretary, of a copy of a resolution of the United States Senate, dated January 3, 1900, and reading, "That the Secretary of the Interior be, and he is hereby, directed to submit to the Senate of the United States a report on any investigations that may have been made by the Geological Survey in the Cape Nome district of Alaska," with instructions to consider and make an early report.

The report is sent herewith. The delay in transmitting it has been due to the serious illness of Mr. A. H. Brooks, one of the geologists who worked in the Cape Nome district.

I am, with respect, your obedient servant,
CHAS. D. WALCOTT, *Director.*

The SECRETARY OF THE INTERIOR.

WASHINGTON, D. C., *February 1, 1900.*

SIR: In accordance with your instructions, we have hastily prepared the following brief report of the Cape Nome gold region of Alaska. It is based upon observations made during a short visit to the region last October. We fully realize its incompleteness, but believe it contains information of immediate use to those who may visit the region in the near future. With the view of making it of practical rather than of scientific interest, we have omitted theoretical discussion and avoided technical terms as far as possible.

Very respectfully,

FRANK C. SCHRADER,
ALFRED H. BROOKS,
Assistant Geologists.

Hon. CHAS. D. WALCOTT,
Director United States Geological Survey.

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PRELIMINARY REPORT ON THE CAPE NOME GOLD REGION, ALASKA.

By F. C. SCHRADER and A. H. BROOKS.

INTRODUCTION.

The following report is based on a few weeks' examination of the recently discovered Nome gold-mining region, made by us in October, 1899. We collected such topographic and geologic data of this important region as the climatic conditions would permit and our limited time would allow, the trip to Nome being a hurried utilization of a delay while waiting for a steamer for Seattle after the completion of the regular field work in the Yukon Basin.

As boats, tents, and camping outfits had been left in the Yukon country, the party was dependent upon such accommodations as could be procured at Nome, or from the miners on the creeks and in the gulches. The topography was done, under direction of Mr. T. G. Gerdine, by Mr. D. C. Witherspoon, using Nome as the base of supplies, because of the severity of the climate and absence of timber for camping purposes; while the geology and photography were done by us. With our packs of sleeping bags, instruments, and provisions, we made a several days' trip into the mountains and gulches to examine the formations and diggings. On account of the cold weather and freezing up of the creeks, most of the gulch diggings had already closed down early in October and the operators had departed. Wherever we found the miners, however, their hospitality was generously extended. We would express our indebtedness to Dr. F. P. King and members of the Pioneer Mining Company on Anvil Creek for many accommodations, and to Messrs. Davidson and Ashford, United States deputy surveyors, for the magnetic variation which they had recently determined at Nome; also to many prospectors and other citizens of Nome who furnished us with valuable information about those portions of the region which we were not able to examine in person.

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GEOGRAPHY AND TOPOGRAPHY.

The Nome mining region is an ill-defined area in northwestern Alaska, lying near the entrance to Norton Sound, a northeast arm of Bering Sea. It is named for an unimportant promontory on the southern margin of the Seward Peninsula,[1] which forms the northwest extremity of our continent, lying between the Arctic Ocean and Bering Sea. (Map 1.) Captain Cook discovered it over a hundred years ago, and, skirting its shores west and northward, charted mountains, headlands, and rivers, naming a number of them. Since then many vessels, and in recent times particularly those of the United States Revenue Service, have visited the coast and extended the exploration and mapping. At present the United States Coast and Geodetic Survey is completing this work on the coast.

The interior of the peninsula is as yet but little known except for the winter trail from Norton Bay to Eschscholtz Bay, in common use by the natives and frequently traversed by white men. Lieutenant Bertholf, U. S. R. S., crossed by this route when going to the relief of the starving whalers at Point Barrow. Aside from this, but a few prospectors had pushed their way into the interior, and some of the larger rivers had been ascended. Up to 1899 no attempt had been made at systematic mapping.

Thus only the most general topographic features of the interior of this land mass are known. Map 1 (frontispiece) shows the watershed between the Arctic Ocean and Bering Sea as nearly bisecting the main mass of the peninsula. As far as is known, the mountain ranges that form the backbone of the peninsula trend a little north of east. Another important general feature, as shown by Maps 1 (frontispiece) and 3, is the smaller peninsula cut off from the southern part of the greater by the waters of Golofnin Bay on the east and Port Clarence on the west. Between these is a wide depression, a broad valley with a very low divide. This minor peninsula has its own distinctive rivers and mountain ranges, and was in very recent times an island. The Nome mining region lies on its southern margin, which does not differ in type from the continental margins that encircle the Arctic Ocean. The coast line is generally even, bordered by low tundra plains, indented deeply several times at the mouths of the larger rivers, and here and there broken by jutting headlands or capes.

Among these Cape Nome is about lat. 64° 30′ N., long. 165° 30′ W., 130 miles north of the mouth of the Yukon and 121 miles northwest of St. Michael, 742 miles from Dutch Harbor in the Aleutian Islands and approximately 2,700 from Seattle by steamer route..

[1] This great land mass has not been named on any maps until recently. The above name was suggested by Governor Brady, in honor of Hon. William H. Seward, to whom the American nation is indebted for its ownership of Alaska.

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Our investigations were chiefly confined to the Nome mining district proper, in which is situated the thriving young city of Nome.[1] The term Nome mining region, which we have used, is not to be confounded with the name of this mining district, which is one of several established by miners and prospectors, all having more or less definite boundaries.

Further investigations will probably trace a connection between the Nome deposits and those of Golofnin Bay, and possibly with those of Cape York. If such connection is established the name Cape Nome mining region will probably include the entire southern margin of the Seward Peninsula. The width of the mineral-bearing belt is yet to be determined.

Nome is situated directly on the seacoast, and on the edge of the tundra, west of the cape which gives it its name and east of another promontory called West Point. (Plates I and II.) The two capes are about 30 miles apart and are jutting extremities of a low mountain range which curves around the tundra plain, defining a former shallow bay. Its outline is that of a low crescent, the inner curve being the even shore line. Its greatest width is from 4 to 5 miles. (Map 2.)

The beach, which is everywhere low and smooth, consists of a fringe or narrow belt of sand and gravel, its submarine portion being a gently sloping coastal shelf, with occasional low bars. During much of the time it is swept by heavy surf.

The beach rises gradually to a sharply cut bench, a hundred to two hundred yards from the surf. (Plate III.) From the edge of this terrace, which is about 20 feet high, the moss-covered tundra extends inland, rising uniformly about 200 feet in 4 or 5 miles, when it merges into the highland belt. In certain localities only do low terraces occur, apparently marking former stages in elevation above the sea level. The most pronounced of these terraces seen is about 3 miles northeast of Nome. (Plate IV.)

Locally the surface of the tundra is roughened or pitted by small mossy hummocks a foot or two in height, and with corresponding depressions. This condition of the surface and the general flatness of the country give a stagnant drainage, which, together with the copious rainfall and the thaw of the underground frost, renders the tundra wet and swampy throughout the summer season. It is in certain areas dotted with ponds, and it is traversed by deep, sluggish rivers and smaller streams, taking tortuous courses from the mountains to the sea. The valleys of the larger streams are broad, with gentle slopes; those of the smaller, narrow and trenchant, their edges being apparently protected from aerial erosion by the cover of moss. Along its northern edge the tundra merges with the alluvial flood plains of the larger valleys, thus extending into the mountains. (Plate V; Map 2.)

[1] First called Anvil City, now officially Nome.

The mountains have rounded slopes, broken here and there by steep escarpments, and rise to elevations of 1,000 to 2,000 feet. (Plate VI.) The axis of the range—about 30 miles from the coast at Nome—seems to trend northwestward from near the head of Golofnin Bay through the unexplored region toward Port Clarence. (Map 3.) Its trend is conspicuously across the strike, as is seen in the Nome district.[1]

At the southern base of these mountains, along the edge of the tundra, the contours are low and rounded, and there are no well-defined foothills. (Map 2, and Plates VII and VIII.) The floors of the main valleys are rather flat and from 1 to 3 miles wide. Snake River Valley (Plate V) is a good type of these. Proceeding northward, the mountains become more rugged, and increase in height toward the axis of the range, and near the head of Snake River (Plates IX and X) there are some peaks which apparently reach the elevation of permanent snow.

Some 8 miles north of Nome, between the heads of Anvil and Dexter creeks, in the region of Mount King, some benching and gravel terraces, seemingly marine, were observed on the lower slopes of the mountains up to the height of about 1,000 feet. They occur at irregular intervals and mark successive stages in an elevation of the land which is probably still in progress.

Beyond the Nome district, northeast of the axis of the range, the descent is said to be somewhat abrupt to the great depression that separates this region from Seward Peninsula.

The drainage of the Nome region is all southward to the coast. The principal streams are Snake, Nome, Penny, Solomon, Bonanza, and Cripple rivers, usually navigable for small boats for 8 to 10 miles from the mouth, as far up as the creek and gulch diggings. (Map 3.) The current is generally rather swift even through the tundra, while in the mountains many of the tributaries become torrential.

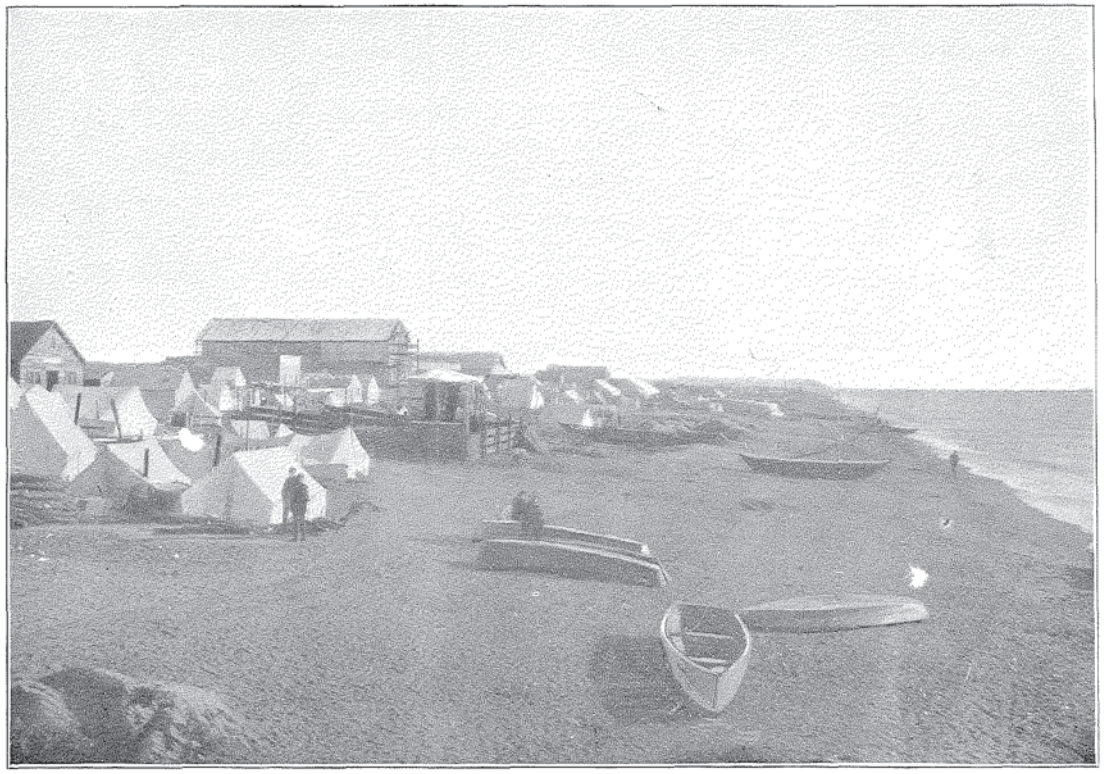
GEOLOGY.

In the limited time we spent in the region nothing like a complete survey of the geology could be made. The following statements in regard to the bed rock are largely based on observations made in a rather limited area in the basins of Anvil and Glacier creeks.

BED ROCK.

In this region the predominating rock types are limestones and phyllites or mica-schists, which occur interbedded in layers of varying thickness. The limestone is of a bluish or bluish-gray color, is fine grained, and has often an almost slaty cleavage. By the processes of

[1] This range seems never to have been named. We have, therefore, called it the Nome Mountains.



EASTERN PART OF NOME AND BEACH, WITH CAPE NOME IN BACKGROUND 15 MILES DISTANT; FROM NEAR MIDDLE OF BEACH IN FRONT OF NOME, LOOKING S. 85° E., OCTOBER 1, 1899.

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metamorphism it has locally been altered to a crystalline limestone or marble.

The mica-schist, which is plainly a clastic rock, is of a light or sometimes dark gray color, and is of medium grain. It is composed essentially of quartz grains and foils of biotite, and is often graphitic. Locally it passes into a metamorphic slate or phyllite. The mica-schist has a well-marked parallel structure, which evinces itself by the arrangement and the elongation of the quartz grains as well as of the biotite plates. It is frequently highly garnetiferous, and often carries considerable magnetite. In a number of localities iron and copper pyrites were observed disseminated through the rock, suggesting that there has been a secondary mineralization since the rocks became indurated.

The limestones and schists have a general northeast-southwest strike, and usually dip southeast at varying angles. They are locally folded and faulted, and usually show jointing. They include many quartz and calcite veins, which, as a rule, follow the foliation, but sometimes cut across it. The major portions of these veins, as far as we observed them, are small and nonpersistent, but some are of considerable size. The veins are frequently mineralized.

It is interesting to note that this series of limestones and schists bear a striking lithologic resemblance to the gold-bearing rocks of the upper Koyukuk River.

On Mount King we observed exposures of a metamorphic schistose rock which, in its lithologic character, differed very essentially from the above-described mica-schist. This rock is comparatively fine grained and is schistose, the cleavage surface showing a metallic sheen. Its internal structure is rather gneissoid than schistose, and gives evidence of having undergone much greater dynamic metamorphism than the limestone and mica-schist. The essential minerals are quartz and muscovite, with considerable light-green amphibole and much epidote. The quartz occurs chiefly in small lenticular grains, about which the mica plates are bent, giving a true *augen* structure. The origin of this gneiss is doubtful. It may be either an altered igneous or a clastic rock. Unfortunately the limits of our time and the presence of considerable snow prevented the determination of the relations between the gneiss and the limestone and mica-schist series.

As fas as our observations go, igneous rocks are almost entirely wanting in the area we examined. On the south slope of Mount King was found a small dike or vein of an aplitic rock, cutting the gneiss. This was the only igneous rock we found in place. Among the beach gravels we observed pebbles of granitic, dioritic, and gabroic rocks, and also some rhyolitic pebbles. Prospectors report large granite areas near the head of Snake River, some 15 or 20 miles from the coast.

No evidence was obtained as to the age of the above-described rocks of the Nome region. Some of the limestones are little altered, and are worthy of examination for fossil remains. The formations are probably not younger than Mesozoic, and they may be Paleozoic, or even older.

GRAVELS.

From the geologic standpoint, the next succeeding formations to the above-described limestones, schists, and gneisses are the unconsolidated gravels found in the gulches and valleys and forming the tundra and terraces. As compared with the bed rock, above described, these gravels are very recent. The bed rocks were deposited, elevated, folded, and metamorphosed many geologic ages before the gravels were laid down. The erosion from the older hard rocks furished the material for the recent unconsolidated beds.

The largest area of these unconsolidoted beds is that of the tundra region along the seacoast. As has already been stated, the tundra is a plain gently sloping from the base of the mountains to the sea. This plain is undoubtedly formed of such gravels, sands, and clays as are observed in the beach diggings near Nome, and the material was derived from the rocks of the adjacent mountains. It was laid down in a shallow sea or bay when the land stood at a slightly lower elevation than at present. The lower reaches of the larger streams, like Snake and Nome rivers, were arms of the sea, and in these also gravels and sands were deposited, brought down by the confluent streams. The coarser gravels were laid down near the shore and the finer material was carried out to sea.

The accompanying section of the tundra gravels (fig. 1) is compiled principally from information furnished by prospectors and miners, and must be considered as of approximate accuracy only. Underneath the dense and spongy growth of moss and grass is a layer of dark-brown or black peat, varying from 2 to 20 inches in thickness. This peat is usually of a coarse, fibrous character, and is formed principally from moss and grass by vegetative decay. Below the peat a layer of blue tenacious clay about a foot in thickness is usually found. This rests upon stratified sands and gravels, and includes considerable white sand similar to that of the beach. There are also a few thin layers of ruby and black sand, occurring at irregular intervals, that carry gold in commercial quantities. These are usually found resting upon a blue or yellowish clay of a tough, impervious character, which is often termed bed rock by the miners.

The hard or true bed rock is reported to be a soft sandstone or mica-schist. These lithologic terms are used rather loosely by the average miner, and we believe that the same bed-rock series that is exposed in the gulches underlies the gravels of the tundra. Where this bed rock

WESTERN PART OF NOME AND BEACH, WITH WEST POINT ABOUT 15 MILES IN BACKGROUND; SEEN FROM NEAR MIDDLE OF BEACH IN FRONT OF NOME, LOOKING N. 65° W.

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has been reached it is usually at a depth of from 20 to 40 feet. It must not be inferred that this is a measure of the average thickness of the tundra gravels, as the test pits from which data were obtained were too few in number to warrant such an estimate. It is not impossible that the tundra gravels may in many localities exceed 100 feet in thickness.

In the sorting and reduction of this material the sea played an important part, for through former ages, as now, the surf has been grinding it up. During the elevation which eventually resulted in the formation of the present coastal plain the shore line gradually receded, so that the waves successively worked over the materials of different portions of the coastal plain.

The beds of clay, often carbonaceous, which played an important part in the concentration of the placer gold, as will be shown hereafter, represent either offshore deposits or periods of stability, during which the growth of vegetation furthered the accumulation of soil on such portions of the plain as were above water. While the dominant orographic movement of this entire coast line has been one of elevation, it does not follow that there were no minor epochs of depression interrupting the upward movement. The clay bed in the beach diggings gives evidence of such a period of depression.

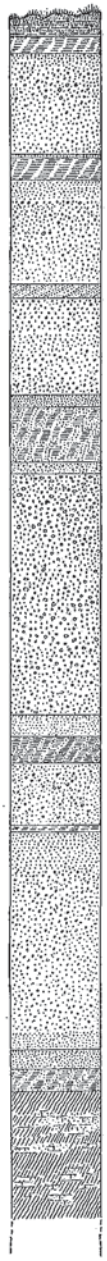

FIG. 1.—Generalized section of tundra gravels. From information furnished by miners. Vertical scale, approximately 8 feet to the inch.

The gravels of the terraces on the mountain slopes, which have been already described, have a similar origin to those of the coastal plain and are probably of a similar character. We can judge of this only by inference, as we unfortunately found no section of these gravels exposed. These terraces are probably in part the remnants of coastal plains that had a far wider extent than they have at present. The elevation and erosion of such plains produced the present topographic forms.

The gravels of the gulches and smaller valleys represent the stream deposits during the period of the deposition of the coastal plain. They lie on the bed rock and are usually of no great thickness. The material is usually coarser than the tundra gravel, and its source is easily traceable to the bed rocks of the vicinity.

Perhaps we have given a more detailed description of the origin and deposition of the unconsolidated formations than the limits of this report would seem to warrant. If so, it has been done because of the close relation of the gold deposits to the gravel, and because of the frequent popular misconception in regard to the origin of these beds. We wish to emphasize the fact that during the deposition of these gravels and sands the conditions were not materially different from those of to-day, except that the land stood at a lower elevation relative to the sea. There is no evidence whatever of glacial action in the region, and the popular idea that the gravels were brought to their present position by ice action is entirely erroneous.

MINERAL RESOURCES AND METHODS OF MINING AND EXTRACTION.

GOLD.

NOME REGION.

The gold of this region has so far all been obtained from placer deposits, which can be conveniently grouped as gulch placers, bar placers, beach placers, tundra placers, and bench placers. During last season only those of the gulches and beach have been important gold producers. No facilities were available for exploiting the tundra deposits, and the benches have not as yet been investigated.

The amount of gold produced during the last season can not be estimated definitely. While there are, as a rule, fairly reliable data as to the production of the gulches and creeks, the amount taken from the beach can only be roughly approximated. From the best information we could gather we believe that the production of gold of the entire belt during the season of 1899 will approach $3,000,000.[1]

[1] Dr. Cabell Whitehead, of the Mint Bureau, informs us that the official records of that Bureau show a receipt of more than $2,600,000 in Nome gold prior to January 1, 1900.

NOME BEACH DIGGINGS, SHOWING ALSO MARINE DRIFTWOOD, EDGE OF TUNDRA, AND WEST POINT IN THE BACKGROUND 10 MILES DISTANT; FROM POINT 4 MILES WEST OF NOME, LOOKING N. 80° W.

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The coarse gold, as far as present developments show, is largely confined to the creek and gulch diggings, ranging from the size of a pin head to nuggets weighing several ounces. Two have been found on Anvil Creek weighing 20 to 25 ounces, worth from $300 to $400. Much of this gulch gold is about the size of No. 3 shot, while nuggets from one-half to 1 ounce are not uncommon. It is probable that much of the fine gold is lost by the more or less primitive method of extraction now in use.

The gold is usually rounded and often smoothly polished, i. e., having a waterworn character. In color it is rather dull and somewhat resembles tarnished brass. The nuggets are round and subangular, but seldom flat. Small vitreous quartz masses are not infrequently found attached to the nuggets.

The creek gold usually occurs on or very near bed rock, under a thickness of 5 to 8 feet of gravel. In the diggings the pay streak is of varying thickness, but the gravel usually carries some gold, or at least good colors, from the surface down. The flood plain, or gravel deposits of the stream, in or beneath which the gold occurs (see Plate XI), measured from rim rock to rim rock, varies from 20 to several hundred feet in width on different creeks.

A cross section of the gravels at any given point would show the gold not evenly distributed, but more or less gathered into zones. This pay streak usually trends parallel with the creek valley, and simply marks an earlier channel of the creek, when the gold was laid down in its bed. It is not necessarily continuous, but often occurs in detached pockets, which are sometimes very rich.

The gravels occurring with these placers vary in size from medium to fine, and are usually poorly assorted, with indistinct stratification. In the area examined by us on Anvil and Glacier creeks the pebbles were chiefly limestone and mica-schist, with much calcite and quartz of vein origin. All of these were frequently found to be highly mineralized.

In washing the gravels of the gulches and the creeks much "ruby sand" and "black sand" is obtained. The former is chiefly garnet and the latter magnetite. These minerals, having a high specific gravity, are concentrated with the gold in the pay streaks.

In the lower reaches of Snake River and of the other large streams gold is reported to occur on the bars also, in apparently workable quantity. It is here much finer than in the creeks and gulches, but not so reduced as that in the beach. So far as we learned, it is variously mingled with the gravels and the sand constituting the bars, and, like them, was deposited by the rivers and streams which brought the material down from the creeks and gulches. It was on the bars of Snake River that the Nome gold was first discovered.

Normally, in the beach deposits there is fine gold, gold sand, and some flake gold. The particles are much rolled and flattened, and range in size from that of a small pin head to dust or flour gold. With only the crude appliances for separation at hand during last season, little of the flour gold has, as yet, been saved. Small nuggets, amounting to about $1.50 in value, have been found, but are relatively rare. Some larger ones have also been reported.

The beach gold, when separated, is bright in color, having much the appearance of fresh brass or gold filings, and is usually of uniform grain. It is of irregular shape, usually flattened, with rounded surfaces, and bears evidence of the grinding action of the surf which reduced it to its present fine state.

This beach gold occurs in the beach placers, a strip of comparatively fine gravels and sand, 100 to 150 yards wide, extending parallel to the shore between the frontal edge of the tundra and the water line (Plates III and XII). In the Nome region gold has been found in the beach from a point about a mile east of the town westward for some 10 or 15 miles. Beach deposits are also reported from other localities along the southern margin of Seward Peninsula.

The richest pay streak of the beach deposits usually lies on what is locally called "bed rock." This is a tenacious clay of varying consistency. It is, normally, blue in color, but is often stained yellowish red by iron; frequently it contains some carbonaceous matter and some sandy matter. The clay is noncalcareous, and varies in depth from a few inches at the edge of the tundra to 6 or 8 feet near the water line. It seems to be a bed which dips gently toward the sea. It should be noted, however, that it was not definitely determined that this bed is in all cases the same stratum of clay, for, as has been shown in the account of the geology, such clay beds are likely to occur anywhere in the gravels.

The strata above the clay beds consists of well-stratified "ruby sand," "black sand," fine gravels, and sands, with occasional layers of shingle (Plate XIII). The pebbles are of the rock types which have been described in the account of the geology, as well as of calcite and quartz. As in the case of the pebbles of the gulch gravels, these frequently show some mineralization.

The gold lying on the "bed rock" is not evenly distributed, but occurs in more or less concentrated patches. The thickness of the pay streak is a variant of the methods used in extracting the gold. With the crude method employed by many of the miners, only the richest portion of the pay streak pays for working. This includes, in some instances, only the scrapings of the upper surface of the clay bed; in others, several inches of the overlying gravels. The pay streaks vary in width from a foot to several yards, and can often be traced in more or less disconnected patches from near the tundra to low tide, and

PART OF TUNDRA COASTAL PLAIN, NOME, AND PART OF BERING SEA, WITH SLEDGE ISLAND IN RIGHT BACKGROUND; FROM TERRACE NORTHEAST OF NOME, LOOKING S. 75° W., OCTOBER 1, 1899.

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their longer axes seem to lie at right angles to the shore line. This trend is probably ascribable to the concentrating action of the waves, and possibly of the tide, when the gold was deposited. The gold has been found from the grass roots of the tundra to low tide. There is a probability that this deposit extends seaward, but as yet we have no evidence on this point.[1]

The statement made by some of the miners, that the gold becomes finer toward the tundra and coarser toward the ocean, was not borne out by our observations.

As above described, the richest pay streaks of the beach lie on or close to the clay bed. Another mode of occurrence is in the thin layers of "ruby sand" and "black sand" which occur interstratified along with the beach gravels. The position of such layers, which rarely exceed two in number in any given section, is usually toward the base or near the lower part of the section, as shown in Plate XIII, where near the bottom the layer of ruby sand is seen extending from center to right, about 4 feet below the surface. It is about 1 inch in thickness, is slightly argillaceous, and rests upon a rather dense or compact layer of lighter-colored loam about 4 inches in thickness. Above the 4-inch layer of loam, near "bed rock," which is here simply compact yellowish-brown sand, is another occurrence of the ruby sand. Here it is poorly stratified, but carries good pay, though it is not so rich as the lower layer. The pay dirt from the ruby-sand layers consists chiefly of fine garnets and magnetite, with a few vitreous and rose-quartz grains. Samples of the Nome beach gold and of the black and ruby sand collected by us were carefully examined by Dr. Day, of the United States Geological Survey, for platinum, but none was found to be present. Dr. King, in charge of the Pioneer mines, on Anvil Creek, reports the occurrence of platinum there, in small amount, associated with the placer gold. Other mines have also reported cinnabar, but as yet no samples have been seen by us.

As has already been stated, the coastal plain or tundra is underlain by gravels similar in character to those of the gulches and the beach (fig. 1). There is every reason to believe that these gravels are gold-bearing, though they have as yet received but little attention from the prospectors. As we have already noted, "pay dirt" has been found a few inches below the surface at the edge of the tundra near Nome. This is the only fact in regard to gold in the tundra which we could verify by personal observation.

We wish to acknowledge our indebtedness to the gentlemen who have furnished us with the following information. Dr. F. P. King and Messrs. McArthur and Linden stated that they obtained 10 to 30 cents to the pan at various points between Nome and Anvil creeks.

[1] Since the above was written we have heard that gold has been found by dredging off the Nome beach. Prospecting has also been done this winter through the ice, with favorable results.

Their richest finds were near the ponds and the depressions in the northern part of the tundra. Mr. Kjellman is reported to have sunk holes near the mouth of Center Creek (Wonder Creek) and to have reached hard bed rock at a depth of 15 feet. Near the surface the gravels are said to have yielded from 3 to 5 cents to the pan and to have increased in richness toward bed rock, near which 15 cents to the pan was obtained. At a locality about 5 miles west of Nome and a third of a mile north of the coastal edge of the tundra Mr. J. W. Debus is said to have reached hard bed rock (sandstone?) at a depth of 25 feet, and to have found colors all the way down. It is claimed that he intersected three pay streaks yielding from 15 to 35 cents to the pan. Near the same locality Mr. S. H. Reynolds obtained from one-half cent to 35 cents to the pan in a hole 9 feet deep. His richest find was on a clay "bed rock." Mr. G. N. Wright, postmaster at Nome, obtained 1½ cents to the pan in a hole 5 feet deep at a point 1½ miles northeast of the town. At Nome the well-known well sunk by Charles D. Lane between the beach and the tundra penetrated to a depth of 25 feet, and the ground is reported to have yielded pay all the way down.

On the basis of the above facts and of some further evidence relating to the source of the gold which will be considered below, it is fair to assume that the tundra will yield gold in commercial quantities.

The bench placers of the region have, so far as we know, received little or no attention from the prospectors. Some of the low benches near the creeks have been shown to yield gold, but the higher benches and terraces have been disregarded, chiefly, it seems, because of the difficulties in obtaining water. As has been explained, these benches and terraces have a similar origin to that of the tundra plain, and as their material has a similar source they are likely to contain gold. Whether this gold is sufficiently concentrated to prove of commercial value is a question for the prospectors to settle. A good number of bench claims have been staked, and it is to be hoped that the assessment work of this year will throw more light on this subject.

It is well known that the various forms of gold placers are secondary deposits. The ultimate source of the gold is to be sought for in the bed rock, where it is usually found in veins. In a new region, like that of Nome, the prospector naturally turns first to the deposits which will yield immediate profit, and therefore vein or quartz mining, as it is often called, receives but little attention. In the Arctic region, moreover, prospecting for mineral veins is much impeded by the thick coating of moss which covers most of the surface of the country. We have, therefore, but little definite information in regard to mineral veins of the region.

Under the head of "Geology" we noted that the limestones and mica-schists contain many quartz and calcite veins which are frequently mineralized. We observed both copper and iron pyrites in these veins,

VIEW UP SNAKE VALLEY, SHOWING MERGING OF TUNDRA INTO ALLUVIAL FLOOD PLAIN; FROM SOUTH EDGE OF MOUNTAINS EAST OF RIVER, LOOKING N. 10° W., OCTOBER 5, 1899.

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and we have it on good authority that gold-bearing quartz veins have been found in the region. The placer gold, as we have frequently noted, has small grains of quartz attached to it. In the beach gravels rounded fragments of ore are occasionally found, consisting chiefly of copper and iron pyrites. One of these, assayed for this office by E. E. Burlingame & Co., of Denver, Colo., yielded 0.12 ounce of gold, with a trace of silver, to the ton, or a value of $2.40 in gold per ton.

As far as it goes, this evidence points to a derivation of the gold from the mineralized veins and country rock above described. We wish to emphasize this because of the prevalent idea that the placer gold has been brought from great distances by the action of ice or through some convulsion of nature. This is a complete misconception, for there is no evidence whatever of glacial action, and all the facts point to a local source of the gold. As placer gold can only move downhill from the parent rock, it is evident that the source of the gold in the creeks and gulches must be sought within their drainage basins. We do not wish to imply that mineralized veins of commercial value must necessarily be found in the vicinity of the rich placers. Such has not been proved the case in many other placer regions. The gold of the parent rock may not be in a sufficiently concentrated form, or the cost of mining, because of local conditions, may be too great for profitable exploitation.

A very important consideration, moreover, in regard to the richness of placers is that they have often derived their gold from immense masses of rock. The agents of erosion are constantly attacking the bed rock of any given area, reducing it to gravel, sand, and mud, which streams carry seaward and redeposit in various forms. A heavy substance like gold, which may have been disseminated throughout the rock, is concentrated during this process by the sorting action of water, and thus placers are formed. The richness of a placer, therefore, may quite as likely point to a previous erosion of great masses of bed rock as to rich and large individual veins. We repeat, therefore, that rich placers can not be considered conclusive evidence of the presence of rich gold veins in the region.

In the foregoing the gold has been traced back to its source in the bed rock. The placers of the gulches which lie adjacent to this source have been shown to contain the coarsest gold and to include the richest deposits. The gold in the tundra, having been transported a greater distance than that of the gulches, is of a finer grain, while that of the beach, where it has been subjected to the wearing action of waves, is still finer. The life history of a gold nugget in this region is somewhat as follows:

When the nugget is freed from the parent rock by the disintegrating agencies it has angular form. It is washed down to the gulches and gradually becomes subrounded. By some accident of erosion the gulch

placer may be disturbed, and the nugget, again moved and still further reduced in size, finds its way to the tundra deposits. By the shifting of the shore line it may subsequently be exposed to wave action, ground down still smaller, and eventually be borne to sea as flake or flour gold.

We expand this elementary idea as to the origin of the gold deposits because of a misconception among some of the miners in the Nome region that the sea has washed up the gold and deposited it in the beach. It is even asserted by some that the waves are constantly adding gold to the beach placers by bringing it up from the depths of the ocean.

The beach placers are of such interest and importance to the Nome region that we deem it best to add some more detailed account of their origin. An examination of the following sections, figs. 2 and 3, will show that the beach deposits are largely a concentration of the gold carried by the gravels and sands of the tundra. The waves are constantly cutting away the base of the bluff that nearly everywhere bounds the tundra on the seaward side (figs. 2 and 3). As the material

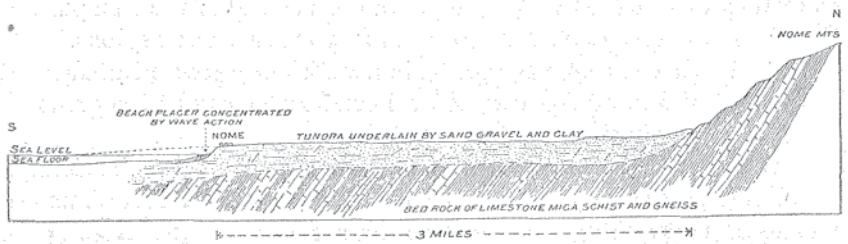


FIG. 2.—Diagrammatic and generalized section of Nome region. Vertical scale much exaggerated.

is thus eaten away the gravels and sands are carried seaward by the undertow, while the gold, because of its greater weight, is left on the beach. It works its way downward, more or less, in the loose sands near the water line, and may subsequently become buried. This action

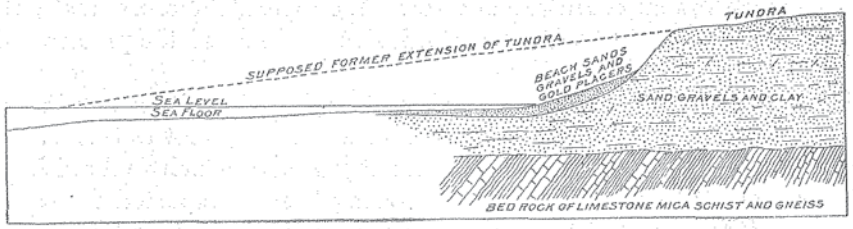
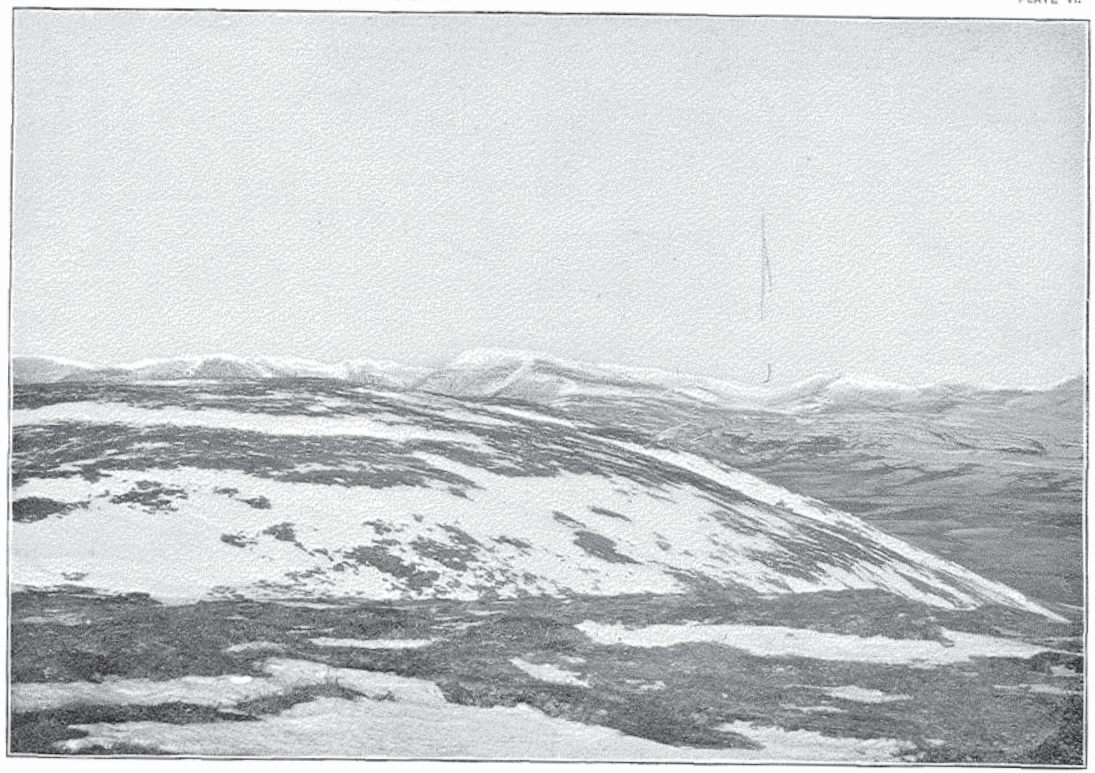


FIG. 3.—Diagrammatic sketch of beach placers.

undoubtedly took place at former stages of elevation of the coastal plain, and we should expect to find lines of beaches in the tundra. This should be borne in mind in considering the possible commercial value of gold deposits in the tundra gravels. Only along these old



MOUNTAINOUS TOPOGRAPHY UP NOME RIVER VALLEY; FROM MOUNT KING (1,200 FEET), LOOKING N. 30° E., OCTOBER 4, 1899.

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shore lines or in the bars of abandoned stream channels should we expect to find it as concentrated as it is on the present beach.

The practical criteria suggested for locating these old buried shore-line and old stream-channel pay streaks without actual prospecting are those of topography. In case of the shore lines the method would be by determining the old terrace, or the general alignment and trend of any remnants of the same terrace, however slight, as indicative of the former beach line. We should expect this old beach-line pay streak to bear much the same relation to its old terrace that the present deposits of the Nome beach diggings bear to the frontal edge of the tundra along the present coast line, as shown in figs. 2 and 3. The normal position of the old beach pay streak is along the foot or base of its respective terrace, and always on its coastal side. We should expect these old beach pay streaks in the tundra to trend, for the most part, parallel with the present Nome coast. Toward the base of the mountains, however, owing to irregularity of the bed-rock topography (see Map 2), the old shore lines were not so straight. Accordingly, we should here expect the old beach pay streaks not to adhere to the trend of the present coast line, but to follow more or less roughly the swing of any given contour traversing the tundra in this locality, forming reentrants or incurves up the lower reaches of the larger valleys, and opposing outcurves around projecting or bulging hills or slopes.

In the location of the old stream-channel pay streaks we should look for portions of old, dry, or shallow valleys, or draws, the general alignment or trend of depressions or ponds in the surface of the tundra representing the course of former waterways or stream channels. This, naturally, will be found to trend more or less across the tundra, and, in general, at right angles to the old beach lines in any particular locality, and to the present coast line. The gold of the beach being derived from the former extension of the tundra by the cutting and concentrating action of the surface, the amount of gold in any given stretch of the beach may be regarded as a rough measure of the amount of gold in a section of the tundra having the same dimensions.

We have heard it often asserted that the Nome beach placers are unique occurrences of gold, but as a matter of fact similar deposits, though usually not so rich, have long been known in other parts of the world. They have been found at various points along the west coast of North America, notably in California and Oregon. According to the State mineralogist,[1] beach gold was first discovered at Big Lagoon, Cal., in the early fifties, and is also found along the coasts of Del Norte, Humboldt, Maria, and San Francisco counties. The gold is, however, in many cases so fine that the deposits have not paid for working.

[1] Reports of State mineralogist, California Mining Bureau.

In Oregon beach placers have been found in Coos County, near the mouth of Coquille River. Mr. Diller has been able to trace this gold to its source in the crystalline rocks of the Klamath Mountains, thus refuting the old theory that it had been cast up by the waves.[1]

Gold was discovered on the shores of Yakutat Bay,[2] in southeastern Alaska, in 1880, and the deposits are reported to be locally rich enough for exploitation. This gold, as well as the associated black sand, is said to have been concentrated by surf action from morainic material. At Anchor Point, on Kenai Peninsula, workable beach placers have been found, which are said to have yielded $7 a day to the man.[3] On the southern shores of Kadiak Island the beach gravels carry light gold. The gold is very fine, and as yet the exploitation of these deposits has not proved a commercial success.[4]

The gold of these Pacific coast placers, like that of the Nome beach, has, as a rule, been more or less concentrated by wave action. The predominating mineral associated with the gold is magnetite, occurring as the so-called "black sand," with which are also found other heavy minerals. Small quantities of platinum are not uncommon. These auriferous gravels also often carry garnet (ruby sand), ilmenite, chromite, iridosmine, with quartz, feldspar, mica, etc.

Also on the coast of New Zealand[5] occur auriferous beach deposits which seem to be more remunerative than in most other parts of the world. Here the beach sands are reported to be worked by a large number of gold miners.

Where, through submergence, burial, and age, such auriferous beach gravels as at Nome become consolidated, they form gold-bearing pudding stone, or fossil-beach placers. These, like the recent beach deposits, are also known to occur in various parts of the world. In the Fortymile district, Alaska, the gold-bearing conglomerate at the mouth of Napoleon Creek has been referred to by Mr. J. E. Spurr as a fossil placer and probably a beach deposit.[6] Also in the Transvaal, South Africa, in the Johannesburg region, the Witwatersrand "banket," a conglomerate extremely rich in gold, is regarded by Dr. Becker as of marine beach origin.[7] Dr. Becker also calls attention to the fact that Europe, America, Australia, and New Zealand all possess auriferous marine gravels of pre-Tertiary age, and on pages 177 to 184 discusses "Other pre-Tertiary gold-bearing pudding stones."

[1] A Geological Reconnaissance in Northwestern Oregon, by J. S. Diller, Seventeenth Annual Report Director U. S. Geol. Survey, pp. 515-520.

[2] Maps and Descriptions of Routes of Exploration in Alaska in 1898, with General Information concerning the Territory, United States Geological Survey, 1899, p. 103.

[3] Op. cit., p. 110.

[4] Op. cit., p. 114.

[5] Gold, its Occurrence and Extraction, Alfred G. Lock, pp. 890 and 893.

[6] Geology of the Yukon gold district, Alaska, by J. E. Spurr, Eighteenth Annual Report U. S. Geo., Survey, 1896-97, Part III, Economic Geology, 365.

[7] The Witwatersrand Banket, by George F. Becker, in the Eighteenth Annual Report of the U. S. Geol. Survey, Part V, Mineral Resources, pp. 160, 173, and 175.

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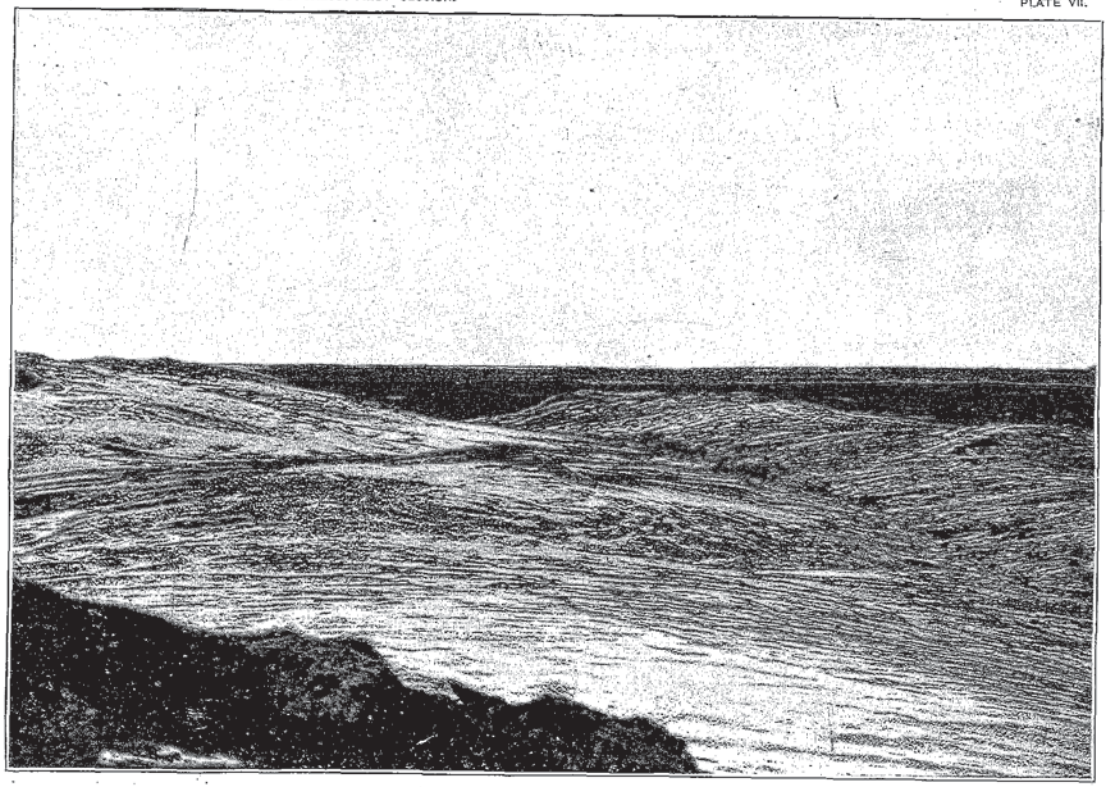


ANVIL CREEK VALLEY AND LOW ROUNDED TOPOGRAPHY AT EDGE OF MOUNTAINS, WITH ANVIL MOUNTAIN IN LEFT, TUNDRA AND BERING SEA IN BACKGROUND, AND SLEDGE ISLAND IN EXTREME RIGHT; FROM MOUNT KING (1,200 FEET), 7 MILES NORTH OF NOME, LOOKING S. 50° W., OCTOBER 4, 1899.

OTHER GOLD DISTRICTS OF NORTHWESTERN ALASKA.

During last season (1899) nearly the entire gold product of Seward Peninsula came from the Nome district. There was, however, considerable prospecting done along the whole southern coast of the peninsula, and a number of mining districts were formed which gave promise of becoming gold producers, though as far as we know the Golofnin Bay district is the only one which was exploited on a commercial scale. We unfortunately could not examine these other regions in person, but are able to append the following notes in regard to them, which we have gleaned from various sources.

Cape York region.[1]—This region includes an area between Cape York and Cape Prince of Wales (Map 3), the latter being the westernmost promontory of Seward Peninsula, and hence forms the American side of Bering Strait. The region is about 100 miles northwest of Nome and 25 miles from Port Clarence, which is its nearest harbor.

The mountains of this part of the peninsula are said to be rugged, with sharply cut valleys and gulches. At Cape York they lie close to the sea, and here the cliffs rise abruptly from the water, forming a rock-bound and forbidding coast. (Plate XIV.) To the westward the mountains recede, and the crescent-shaped area between the two capes is a low, rolling country. Cape Prince of Wales is said to be a sand spit, jutting out from a low, hilly country. There is no coastal plain, such as is found at Nome.

At Cape York Captain Jarvis observed a narrow rock bench about 300 feet above the sea (see Plate XIV), which he was able to trace more or less continuously to Cape Prince of Wales. The drainage of the region is into Bering Sea.[2] (See Map 3.) The principal streams are Onokovuk River and Kivyearzruk and Bituk creeks.

Captain Jarvis informs us that the rocks of the region are sharply folded and uptilted and stand on edge. What their character is and whether they are the extension of those in the Nome region will remain for future investigation to determine.

The placer gold is, we are told, found in the creeks and gulches near bed rock, under shallow gravel deposits, and is similar in occurrence to that of Nome.

Gold has been found in the gulches only, there being, so far as we know, no beach or tundra diggings.

The discovery was made in June, 1899, by Kivyearzruk, a Prince of Wales native, then employed as reindeer herder by W. T. Lopp, a missionary in charge of a Government reindeer station. This native found coarse gold on Buhner Creek, a western tributary of the Ono-

[1] We are indebted to Captain Jarvis, of the United States Revenue Service, for most of our facts about this little-known region.

[2] We wish to acknowledge our indebtedness for information furnished us by Mr. J. J. Brown and other Cape York prospectors, through the intermediary of Captain Jarvis.

kovuk River. He is said to have taken out $8 in four hours of work, using a short and very crude sluice box. A sample of this gold, shown us by Captain Jarvis, was similar in character to that of the Nome gulches. It averages considerably coarser than that of Nome, but this may be due to the crude methods of extraction, by which only the coarsest material was retained. The value of the largest nugget was about $1.30. Besides this find, workable deposits have been reported from other creeks of the region.

The Kanowock mining district, named after a native village, was organized last summer in this region. Its chief camp, called York, is at the mouth of Onokovuk River. Port Clarence, about 25 miles away, has an excellent harbor, and a mission, trading post, and a large native village are also located there. There are a number of other native villages and several reindeer stations along this part of the coast. Last fall (1899) many prospectors left Nome, prepared to spend the winter in the Cape York region.

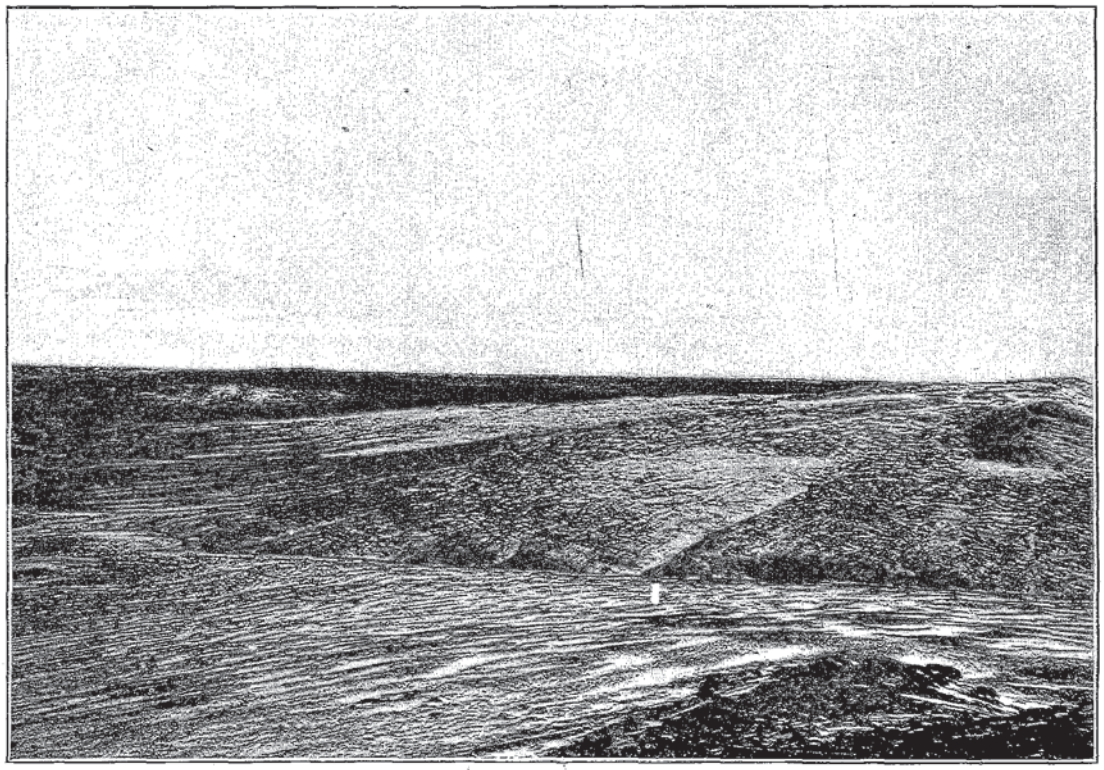
Siberia.—The American prospector, in his search for gold, has now reached the extreme western limit of the continent, and it is but natural that he should regard Siberia, from which he is separated by only a narrow strait, as a possible new field for investigation. There were many rumors current at Nome about discoveries of valuable gold placers in the Russian domain adjacent to Bering Strait, but these we have been unable to verify. It is certain that there has been little or no prospecting done on this part of the Asiatic coast. It is reported that an American company is negotiating with the Russian Government for the lease of a hundred miles of the Siberian coast for mining purposes. Such leases have been granted to several foreign companies along the northwest coast of the Sea of Okhotsk.

In the event of the occurrence of gold in commercial quantities in eastern Siberia, it is probable that American capital and energy will be welcomed by the Russians, and that American prospectors will be allowed to take part in its development, if they conform to the Russian mining laws.

Solomon and Bonanza River region.[1]—This region is east of Nome River and includes the territory about the headwaters of Solomon, Bonanza, Eldorado, and Flambeau rivers, which flow southward to Bering Sea. (See Map 3.) The topographic and geologic conditions, as reported by prospectors, seem to be very similar to those of Nome, which lies about 40 miles to the southwest. A tundra plain, sloping gently seaward, extends inland from the coast, beyond which rise the rounded slopes of the mountains. (Plate XV.) The mountains are probably not so high as those of the Nome region.

This region began to receive attention from the prospectors late last

[1] We are indebted to Mr. H. W. Ball for information about this region, as well as for a sketch map, which has been embodied in Map 3.



DEXTER CREEK AND LOW COUNTRY DOWN NOME RIVER VALLEY, WITH CAPE NOME LEFT OF CENTER, TUNDRA AND SEA IN BACKGROUND; FROM MOUNT KING (1,200 FEET), LOOKING S. 30° E., OCTOBER 4, 1899.

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fall (1899), and little or no systematic development has been begun. Good diggings are reported to have been found on most of the rivers, several of which are said to have yielded 5 and 10 cents to the pan.

Golofnin Bay and Fish River region.—Golofnin Bay is an almost landlocked arm of Bering Sea on the southeast coast of Seward Peninsula. Fish River, a stream of considerable size, flows into the head of this bay. The country adjacent to the bay and the drainage basin of Fish River are usually known as the Golofnin Bay region. The shores of the bay are said to be high and rocky. Fish River occupies a broad valley, and some of its tributaries are said to be connected with the waters of Port Clarence by a short portage.

For many years it has been known that metalliferous deposits occur in this district, rich silver ores having been reported as early as 1881.[1]

Of this region Mr. J. E. Spurr says:[2] "Gold was long ago reported on the Fish River, which flows into Golofnin Bay, but no mining was attempted. On the same river 30 miles above the mouth the Oonilak mine of silver-bearing galena was discovered long ago and the Golofnin Bay Mining Company, of San Francisco, formed to work it. There was difficulty, however, in getting the ore down the shallow river to the vessel which took it to San Francisco; and, in addition to this, two vessels with all on board were lost by the company previous to 1885. In 1890 operations were suspended, owing to the report of experts that there was no continuous vein; but in 1891 work was renewed. The overflow of the Klondike rush turned prospectors into Golofnin Bay, and in the summer of 1898 many claims were located on the Fish River and other streams in the district. The gold is said to be fine, but of high grade, and to be easy of access; and it is reported that there is plenty of water for sluicing. There were three hundred or four hundred people on Golofnin Bay last summer, and last winter probably two hundred prospectors spent the winter on the peninsula between Kotzebue and Norton sounds."

During the season of 1898 valuable gold discoveries were reported from this region. So far as we know, these were all stream and gulch placers, and the best are chiefly on water courses tributary to the Neukluk, which is an important fork of Fish River. What evidence we have seems to point toward the conclusion that the geology is somewhat different from that of the Nome region. The gravels are said to be of a more granitic character, and to contain numerous dark-colored pebbles, which are believed to be derived from rocks of volcanic origin.

The best diggings are said to be on Ophir Creek, a tributary of the Neukluk. Here one claim is said to have yielded $75,000 last season

[1] Bancroft's History of Alaska, p. 690.

[2] Op. cit.,—Maps and Descriptions of Routes of Exploration in Alaska in 1898, United States Geological Survey, 1899, p. 125.

(1899). The total output of the district could not be ascertained. Several miners who are personally familiar with both regions think that Golofnin Bay may eventually rival Nome as a gold producer.

Last summer the Eldorado mining district was formed and its chief camp located, which was named Council City. This camp is said to be on Neukluk Creek, at the mouth of Melsing Creek, one of its tributaries, some 40 miles from tide water, and may be reached from the bay by flat-bottomed river steamers. At the head of Golofnin Bay there is a good harbor, with 4 fathoms of water.

Norton Bay region.—Norton Bay is a deep indentation of the coast line, which separates Seward Peninsula from the mainland. We have little definite information in regard to this region, but it is reported that several of the rivers entering the bay from the north were prospected last season and that some gold was found.

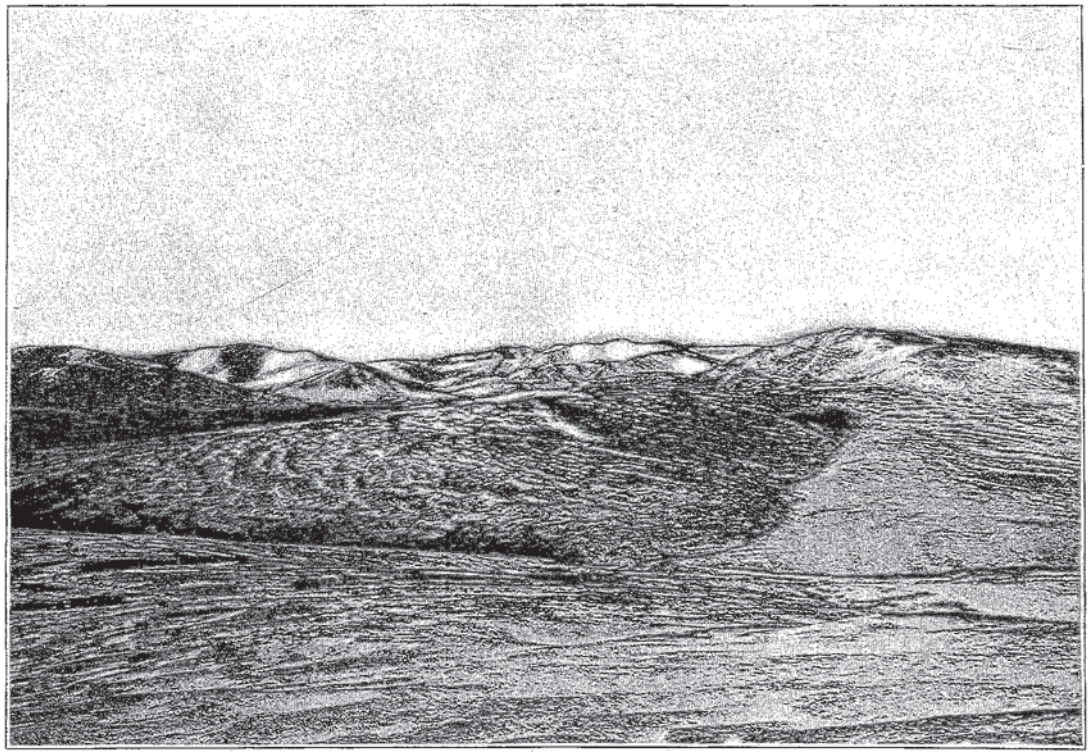
Unalaklik River.—This is a small river which flows into Norton Sound, about 50 miles northeast of St. Michael Island. Late in the fall of 1898, gold discoveries were reported from this river. The headquarters of the Government reindeer stations are located on the Unalaklik, 8 miles from the coast. Dr. F. H. Gambell is superintendent of the station and also postmaster. The post-office is officially known as Eaton.

Anvik River.—Anvik River rises about 30 miles south of the Upper Unalaklik, and about the same distance from the coast. It flows southward and joins the Yukon some 250 miles above the mouth of the latter. Several prospecting parties have visited the region about the headwaters of the Anvik, and have reported the finding of coarse gold. The rocks are said to be of a crystalline character. This region can be reached both from the coast and from the Yukon, but the latter is the advisable route during the summer months. At the mouth of the Anvik there is a native village, a mission, and a sawmill.

Nulato River.—This is a small stream which flows into the Yukon from the north, about 400 miles from the sea. According to native reports, which are not always trustworthy, gold occurs on the headwaters of the Nulato, which lie about 90 miles east of Norton Bay. A small party of prospectors left the mouth of the Nulato for its headwaters late last fall, but besides this we know of no prospecting that has been done on this stream. An Indian village is situated on the Yukon, near the mouth of the Nulato, and bears the same name. A post-office, a trading post, and a mission are located at Nulato. Here the Nulato Valley is flat and wide, bordered by low, plateau-like hills. (Plate XVI.)

METHODS OF MINING AND EXTRACTION IN THE NOME REGION.

On the creeks and in the gulches the process of mining consists of stripping, damming, ground sluicing, and box sluicing. In some cases



VIEW ACROSS GLACIER CREEK, NEAR HEAD, WITH VALLEY OF UPPER SNAKE RIVER AND MOUNTAINS BEYOND TO WEST; FROM MOUNT KING (1,200 FEET), LOOKING N. 50° W., OCTOBER 4, 1899.

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rockers also are used. The gold here is largely coarse, so that its separation from the associated black and ruby sand found with it in the sluice box is not a difficult task. Further separation is accomplished by first panning, then blowing, and finally the employment of hand magnet, in case of the magnetic black sand. On some of the gulches where water is scarce it is proposed to raise water from neighboring streams for sluicing purposes. The Charles D. Lane Company are planning to work their rich prospects on Dexter and adjacent creeks in this way, by means of a pumping plant to be placed on Nome River in that locality.

On the beach the principal method of mining during last season was by hand rocking, though at a few points sluice boxes were laid and the surf water was pumped to them by stationary steam engines. There was also a dredge or two in the field, but these were not extensively operated, so far as known to us. It is thought that much of the beach extending eastward from Nome to near Cape Nome (Plate XVII), the most of which is reported to be auriferous, but hardly rich enough to pay for extraction by the ordinary method of rocking, can be worked with profit by the proper sort of dredging machinery. In a few cases, also, Chinese pumps and water wheels were employed near the mouth of Snake River in raising the river water to high sluice boxes, whence it was conducted across the point to the beach gravels.

As already stated, the principal method of working the beach gravels during last season was with the hand rocker. Each man selected his own small block of ground, 10 or 15 feet in area, and proceeded to sink a prospect hole to the clay "bed rock," usually reached at a depth of 2 to 5 feet. The several layers of gravel and sand passed through were carefully prospected by panning, to ascertain the presence and approximate amount of gold. Upon finding a good pay streak, the overlying gravels were stripped off and thrown aside, and the pay streak worked with the rocker. If water is found in the prospect hole, which is usually the case if it extends to tide level, and often when it does not, this water is utilized in rocking the pay dirt, the same water being used repeatedly. If no water is present in the pit, the pay dirt is packed or carted in boxes, hods, canvas bags, or wheelbarrows to the water's edge, where the surf water is used for rocking. Where small streams or rivulets issue from the tundra across the beach they are of great service and much prized for both rocking and sluicing.

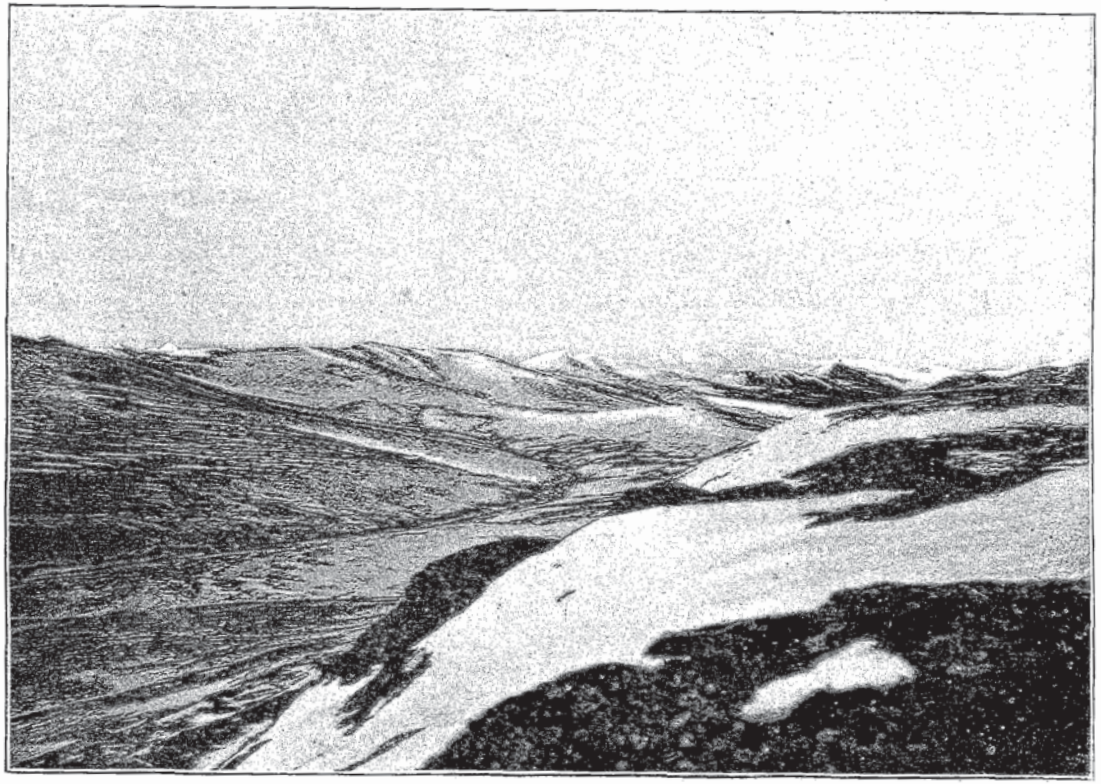
In rocking, most of the beach gold for some time was caught on blankets. Some, however, is so fine, being mere dust or flour gold, that quicksilver or mercury, commonly called "quick" by the miners, is used to good advantage in catching the gold, with which it forms an amalgam. The appliances at first were very crude and the men inexperienced, and much of the gold, doubtless, was washed over

with the tailings and lost, but with the introduction of the copper plate and quicksilver better results were obtained. The mercury, or "quick," is painted or coated over the copper plate in the bottom of the rocker, where it seizes upon and amalgamates with the particles of gold as the pay dirt is washed over its surface. The extreme brightness and purity of the Nome beach gold renders it admirable for collection by the mercurial process, far more so than the normally "rusty" or oxide-coated gold of the gulches. Last season the supply of copper plate at Nome was wholly inadequate to the demand. Where it could not be obtained many miners, equal to the emergency, covered the bottom of their rockers with American silver coin as a substitute for the copper plate and applied the "quick" to the coin, where it worked perfectly. One miner is reported to have covered the bottom of his rocker with 64 United States silver dollars. Much of this substitute silver coin, still wearing a gold plate of the amalgam collected in the rockers, has found its way back into circulation at Nome.

The gold caught on the blanket is collected by removal of the blanket from the rocker and rinsing in a tub or bucket of water. The remaining fine gravel and coarse sand is then panned out, and much of the ruby and black sand eliminated with the bellows by blowing, and some of the still remaining black sand by means of the horseshoe magnet, when the gold is ready for market, or the miner's sack, as a circulating medium. It is probable that where the magnetic black sand is abundant a magnet excited or agitated by electricity can be used with great advantage in its separation from the gold.

The method of collecting the gold caught on the copper plates, however, is quite different. Here the gold forms an amalgam with the quicksilver, from which it is separated by heating in almost any metallic vessel. The one most frequently employed is the ordinary fry pan of the miner. The mercury, or "quick," being volatile, is driven off by volatilization, while the refined gold remains collected in the pan, usually in the form of a beautiful porous or honeycomb-like cake, or a rounded, beady mass, composed of the grains, flakes, and coalesced particles of pure gold. In this form it enters the commercial world, of Alaska at least, as a medium of exchange. In fineness the Nome gold is reported to average between $18 and $19 per ounce, being somewhat purer than the average gold of the Yukon district. The trading companies, however, so far as observed, allow but $16 per ounce.

The tundra placers, as elsewhere stated, have not yet been worked, and have been but little prospected at only a few points. They are not like the beach placers, which are preeminently "poor-man diggings." The tundra seems in many cases to offer excellent opportunities for hydraulic operations, but capital is necessary for development. For realization of the best results cooperation, or the working of the



SNOW-COVERED MOUNTAINS ABOUT HEAD OF GLACIER CREEK; FROM MOUNT KING (1,200 FEET), LOOKING N. 10° W., OCTOBER 4, 1899.

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ground in large tracts, is essential, so that ground sluicing, stripping by horsepower, and other "dead" work may be performed on a large scale, and extensive areas of the frozen ground be bared to the thawing influence of the atmosphere and the sun. This method, in connection with ground sluicing and box sluicing, seems to be the most promising and the least expensive. In most cases it will be found advantageous to lead the water from near the edge of the mountains to insure sufficient fall, or to raise it from neighboring streams. Also steam drills and high-pressure streams and jets of hot water may prove to be advantageous, but, presumably, not so profitable when the cost of fuel and machinery and the limited area such plants may be able to cover in a given time are considered.

HISTORY AND DEVELOPMENT OF THE NOME GOLD REGION.

DISCOVERY OF GOLD.

CREEK GOLD.

Up to the time of the "Klondike rush" of 1897 and 1898 but little attention was paid to prospecting in Seward Peninsula, in spite of the fact that both gold and silver had been found in the Golofnin Bay region. According to Father F. Barnum, for many years missionary on the Lower Yukon, and one of the best-informed men of the country, the presence of gold in the Nome region was reported by natives to Yukon prospectors some six or eight years ago. These seem to have placed but little confidence in the report, and did not consider it worthy of further investigation. In the fall of 1898 a considerable influx of disappointed "Klondikers" into the Golofnin Bay district took place, and the prospecting of Seward Peninsula may be said to have been then inaugurated.

In July, 1898, a rumor is said to have reached the Swedish Mission at Golofnin Bay that gold had been found by a reindeer herder on the coast at Sinrock, about 30 miles northwest of Cape Nome. Soon after a party, consisting of the missionary, N. C. Hultberg, J. J. Brinterson, and others, set out for Sinrock in a small boat along the coast. Becoming storm bound on the way, they landed near the mouth of Snake River, at the present site of Nome. Here they are reported to have prospected some, and found fine gold on the bars in the lower reaches of the river, which led them next day to cross over the tundra to the now famous Anvil Creek, a tributary of the Snake. Here, on July 26 or 27, they found some colors of coarse gold, but the majority of the party insisted on proceeding to Sinrock, their original destination. At Sinrock, however, they were not successful, and returned to Golofnin Bay. The colors of coarse gold which had been found on

Anvil Creek during their storm-bound period were not forgotten, for they were considered a favorable prospect by Hultberg. Accordingly, a small party of Swedes or Norwegians, consisting of Eric O. Lindblom, John Brinterson, and Jafet Linderberg, one of whom was in the employ of the Government reindeer service as herder, and another a whaler from the bark *Alaska*, returned to Anvil Creek[1] about the middle of September (1898). Here they spent a couple of weeks, and on the 20th are reported to have discovered coarse gold of unquestionable economic value. They made extensive locations on Anvil Creek, and also crossed over the low divide and staked claims on Glacier Creek and one of its tributaries, Snow Gulch, which during last season proved the richest gulch in the Nome region. Ground was also located on Rock and Dry creeks. After collecting some samples, the party returned to Golofnin Bay, with ground enough staked to make all of them millionaires, as the development of the property last season demonstrated.

Upon their return to Golofnin Bay another and larger party was soon formed, which hurried back to the Nome region, and as the news spread, notwithstanding the lateness of the season, a general stampede for the new El Dorado, to secure locations, set in from Golofnin Bay, the Fish River country, and St. Michael. A meeting was held on October 18 (1898), when the Cape Nome mining district was organized, which was to comprise an area 25 miles square, with Cape Nome at its southeastern corner. Dr. Kittleson is reported to have been elected recorder. The meeting also determined that the size of all locations should be 320 by 560 feet. Nearly every individual located not only for himself, but also for his many friends, by power of attorney. These locations comprised not only mining claims on the different gulches, but also town lots near the present site of Nome. The lowest number of locations said to have been made by any one person was four and the highest thirty. To such an extent was the power of attorney here abused that more than 7,000 acres of ground were located by fewer than forty persons, for themselves and their friends, so that the several thousand Americans who arrived later, finding no unstaked ground anywhere in the vicinity, justly raised a somewhat bitter complaint.

At present the majority of the Nome miners are said to be in favor of abolishing the right to stake ground by power of attorney, of reducing each mining district to 5 miles square and making a reduction in the size of claims, and of restricting ownership to one claim per individual in each district. Such a reform would seem to be a commendable step toward the prevention of fraud and the practice of parasitism on the

[1] This creek and its adjacent mountain are reported to have been named Anvil by Linderberg from the huge anvil-like shape of the boss or knob of rock at the top of the mountain, as shown in the left of Plate VII.

ANVIL CREEK, CLAIM 1, BELOW DISCOVERY, SHOWING RICH DIGGINGS, WITH TUNDRA AND BERING SEA IN BACKGROUND; FROM LOWER END OF DISCOVERY CLAIM, LOOKING S. 30° W. DOWN ANVIL CREEK, OCTOBER 4, 1899.

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miners' vocation by the great number of so-called "pencil and hatchet men," whose design is not to mine, but merely to make extensive locations for purely speculative purposes. Ground thus held has not only retarded the development of many of the mining districts of Alaska, but has been the source of unlimited trouble in many placer camps.

As it was already late in the fall of 1898 when gold was discovered, but little attempt could be made at development that season. About $2,000, however, were taken out of Anvil Creek and Snow Gulch before the creeks became tied up by frost.

BEACH GOLD.

Up to the middle of the summer of 1899 the attention of the prospectors was entirely confined to the creeks and gulches, but late in July the first discoveries of gold beach were reported almost simultaneously by a soldier from the United States army barracks, who is said to have found gold while digging a well, and by some prospectors of Nome.

One of the first reported to engage in beach diggings was an old prospector from Idaho, by the name of John Hummel, who, it is said, was afflicted with scurvy and, therefore, could not reach the gulches. Hummel prospected the beach, and, finding that it yielded a fair return, went to work with a rocker and took out $1,200 in twenty days of work.

As soon as the news of these rich finds became disseminated, a perfect frenzy for digging in the beach seized the people of Nome. The commandant of the United States army post enforced a regulation[1] that no claims could be staked within a strip of ground running along the beach, 60 feet in width, measured from high-tide limit. Within this reserved area all had an equal right to dig and wash the gravels. The good feeling and good fellowship which generally prevailed in this isolated community is attested by the fact that, in spite of the crowded condition of this public strip, few, if any, serious disputes occurred between the miners. This is rather remarkable, considering the fact that men are often working within a few feet of one another on the same pay streak. This may have been in part because of the popular fallacy that the beach furnished an inexhaustible supply of gold, and that the deposits were being constantly renewed by the action of the surf.

During the height of the excitement upward of 1,000 men were at work on the beach; by some the estimate is even put as high as 2,000. Every man at Nome, be he physician or carpenter, lawyer or barkeeper, dropped his usual vocation and went to work with a shovel and rocker. Men who had been employed in the gulches at good

[1] See circular from the General Land Office, issued June 8, 1898, page 18, section 41, on "A roadway 60 feet in width parallel to shore line."

wages flocked to the beach and went to work for themselves. This undoubtedly retarded the development of the gulch diggings very much, for it was difficult to get miners, even when the wages went up to $11 a day. The beach placers proved a veritable "poor man's proposition." No capital for development was required, any one owning a shovel and a rocker having an equal chance with the rest.

The larger part of this crowd of men were at work near the town, but the beach diggings extend for 12 or 15 miles to the west of Nome. In the fall, when this army of miners had stopped work because of the frost, an almost continuous rampart extended along the beach near Nome, which had been formed by the newly dug gravel, and gave the shore the appearance of having been fortified to repel an invasion. (Plate XII.)

The output of gold from the beach can only be roughly estimated, for no records were kept. It is fair to assume that the beach miners averaged at least good wages. Such being the case, the product of the beach must have been upward of half a million dollars, and may have been much more. There are some intelligent men, who were at Nome during the excitement, who estimate the beach output of gold at from $900,000 to $1,000,000.

ROUTES AND TRANSPORTATION.

SUMMER ROUTES.

All-ocean route.—The shortest and quickest route from the States to the Nome region is by ocean steamer, from Seattle across the North Pacific Ocean and Bering Sea direct to Nome. The distance is about 2,700 miles, and under favorable circumstances about ten days are required to make the trip. Some of the largest and most commodious steamers of the Pacific coast ply on this route. A stop for coal and water is usually made at Unalaska, between the Pacific Ocean and Bering Sea. Freight rates from Seattle to Nome are usually quoted at $40 per ton, first cabin passenger rates $100, and second cabin $60; but as circumstances often govern rates, and some companies readily deviate from the established schedule at chance of gain, the above may be no criterion for the season of 1900, when a large traffic is expected. It would seem, however, that the release of American transports from the Philippine service and the competition of Atlantic coast and other vessels which are to be placed on the line may operate toward the prevention of exorbitant rates. Certain vessels are reported to have engaged all their space last November for their first trip to Nome next June, at prices amounting to several times the usual rates, but we do not know this to be authentic. The leading companies operating on the line and at Nome last season were the Alaska Commercial Company, the North American Transportation and Trading Company,

NOME BEACH DIGGINGS, WITH WEST POINT IN BACKGROUND, 12 MILES DISTANT; FROM BEACH 2 MILES WEST OF NOME, LOOKING N. 70° W., OCTOBER 17, 1899.

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and the Alaska Exploration Company. Other companies intending to place boats on the line are the Pacific Steam Whaling Company, the Empire Line, and the Pacific Clipper Line. Most of the companies expect to have their first boats direct for Nome leave Seattle early in June. Those leaving much earlier will, presumably, discharge their cargoes at Unalaska, or engage in other traffic this side of Bering Sea. On account of the ice in Bering Sea the season of ocean transportation to Nome is, as a rule. restricted to a period of five months, from about early June to early November. During the remainder of the year the northwest coast of Alaska is usually icebound, and not accessible by vessel.

Distances by ocean route from Seattle to Cape Nome and St. Michael.[1]

Nautical miles.		Station.	Statute miles.	
Local.	Through.		Through.	Local.
	0	Seattle	0	
130				150
	130	Off Strait of Fuca	150	
1,552				1,785
	1,682	Unalga Pass	1,935	
20				23
	1,702	Dutch Harbor, Unalaska	1,958	
645				742
	2,347	Cape Nome	2,700	
105				121
	2,425	St. Michael[2]	2,821	

[1] For these distances we are indebted to the United States Coast and Geodetic Survey.
[2] St. Michael from Dutch Harbor direct is 760 statute miles, and from Seattle direct 2,718 miles.

Yukon route.—Another route, also a summer route, and nearly all by water, is the inland or Yukon route. This is by ocean steamer from Seattle to Skagway, thence by the White Pass and Yukon Railway over the Coast Range to Lake Bennett, the head waters of the Yukon, and from here by river steamer down the Yukon to St. Michael, and from St. Michael by ocean steamer to Nome. This route is not nearly so direct or expeditious as the all-ocean route, as frequent changes and delays are usually involved. There is a change of river steamers on the upper waters of the Yukon, covering Miles Canyon and White Horse Rapids, around which the portage of about 3 miles is by horse tramway. Skagway is open to ocean vessels the year round, but as the ice does not leave the lakes and the Upper Yukon waters until early June, the route offers little or no gain to the Nome-bound passenger, so far as reaching his destination early in the season is concerned. As a return route the Yukon is not practicable for boats leaving St. Michael later than early in September, on account of the ice which forms on its upper waters later in the month. Prob-

ably the chief advantage of the Yukon route consists in its enabling the passenger to escape an open sea voyage. The principal companies operating from Seattle to Skagway are the Pacific Coast Steamship Company, the Pacific Steam Whaling Company, and the Alaska Steamship Company. Others also frequently visit Skagway. The principal company of the Upper Yukon is the Canadian Development Company, operating as far down as Dawson, where connections for St. Michael are made with the commodious Lower Yukon steamers of the A. C. Co., N. A. T. and T. Co., and other companies.

It should be mentioned that when navigation closed on the Upper Yukon waters last October hundreds of tons of freight are reported to have been accumulated at Lake Bennett, where it is said it will have to lie until the opening of navigation next spring, a point worthy of consideration by any who may contemplate the shipment of much freight over this route during the season of 1900.

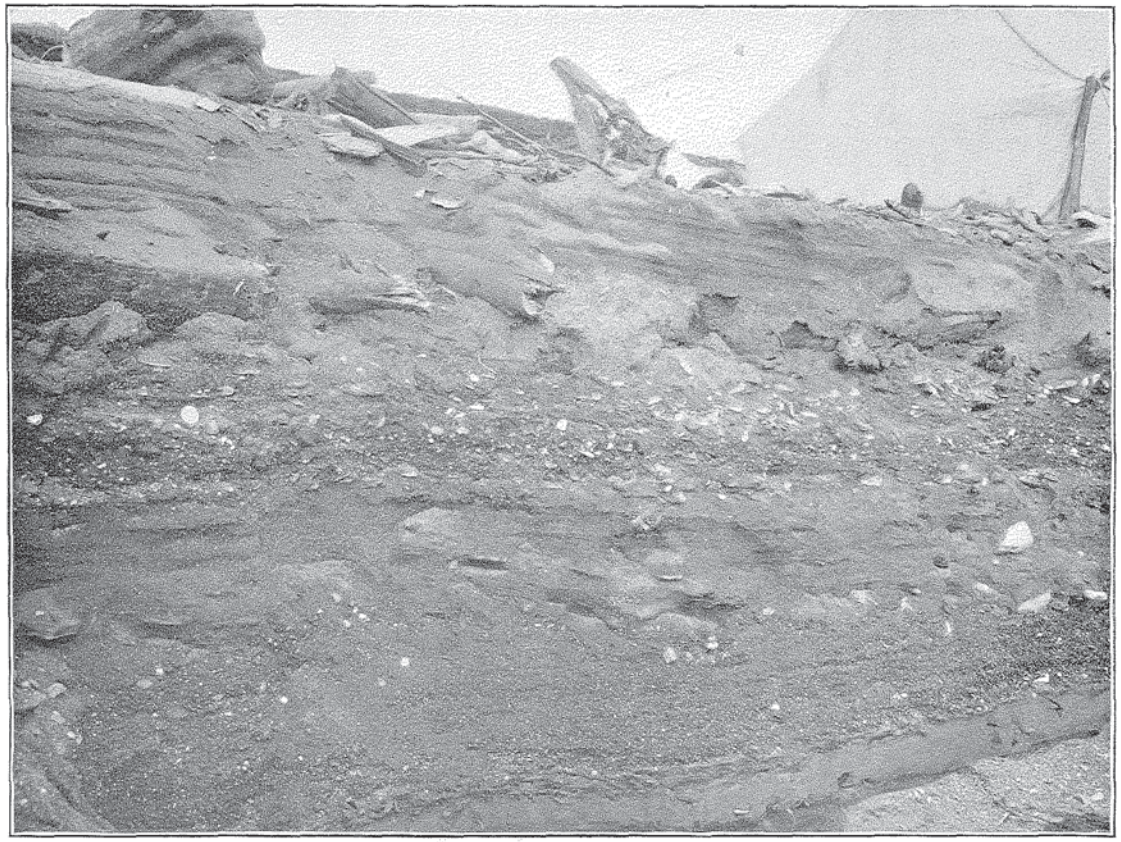
Owing to the lack of harbor facilities and the precarious method of landing freight at Nome, persons making shipments to that point may do well to contract with the company of the vessel to deliver their goods ashore above high-tide mark.

OVERLAND OR WINTER ROUTES.

These routes are overland or winter routes only so far as pertains to Alaska and a portion of the Northwest Territory.

Yukon route.—One of them, the Yukon route, leaves the coast at Skagway, or the head of Lynn Canal, crosses Chilkoot Pass or White Pass, and follows the Yukon the same as the Yukon steamer route, with the exception that the transportation is by dog sled or reindeer down the river on the ice instead of on the water by boat. But at the mouth of Autokatat River it would leave the Yukon and proceed westward over the portage to Unalaklik River and the head of Norton Sound; thence across or around the head of Norton Bay to Nome. It is by this route that both the Canadian and the American mails are sent to the Yukon region at the present time, largely through the agency of the Canadian Development Company. Much of the danger formerly attending this route has been eliminated by the establishment of Northwest mounted police posts at regular intervals on the Upper Yukon, and of American posts, stations, and natives' villages on the lower part of the river. It is the only overland route in practical use at the present time. Dawson and the Klondike have largely made it what it is. The route, however, is a long one, the trail rugged, on account of the roughness of the ice on the river, and the journey arduous.

Valdes route.—For several years past some effort has been made to explore and open up a so-called "All-American route" from the coast to the Yukon country, by way of Valdes and Copper and Tanana



NOME BEACH GRAVELS, VERTICAL SECTION 5 FEET, SHOWING LAYER OF AURIFEROUS RUBY SAND NEAR BASE, WHICH YIELDS ABOUT $1 PER PAN; AT LOCALITY 2 MILES WEST OF NOME, LOOKING NORTHEAST.

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rivers, but as yet it has not come into practical use. As a route to Nome it is rather indirect. By it the Nome-bound passenger would proceed by ocean steamer to the head of Prince William Sound, leave the coast at Valdes, travel northward through Copper River Basin, over the divide, by way of Mentasta Pass, to the Tanana, and westward down the Tanana to the Yukon; thence down the Yukon to Nome by way of the route described above. But as relay or supply stations have not yet been established along this route, and native villages are remote between the coast and the Yukon, and the country is subject to fierce blizzards, this route should not be undertaken during the present winter except in large and well-organized parties, and then with caution.

Cook Inlet–Kuskokwim route.—This is, as yet, only a proposed route, but, according to Captain Jarvis, J. E. Spurr, F. Barnum, and other pioneers, who are most familiar with the country, it seems without doubt destined to become immediately the favorite overland route for the Nome, St. Michael, and Lower Yukon regions. This route leaves the western shore of Cook Inlet just north of Kamishak Bay and a little northwest of Augustine Island, in approximately 59° 30′ north latitude. It leads westward from Iliamna Lake, past Kakwok, and northwestward across Tikchik Lake to Kalmakof on the Kuskokwim and northwestward to Holy Cross Mission and Anvik on the Yukon, up Anvik River, and over Anvik portage to the head of Norton Sound; thence to Nome as before. By this route the distance from the coast at Cook Inlet to St. Michael and the head of Norton Sound is approximately 400 miles, with the country for the most part of easy, gentle slope and no barriers. Katmai, about 100 miles south of where the route would leave the coast, is open to vessels all winter. The same, so far as known, is true of the Kamishak Bay region. If this is correct, for smoothness of country, shortness, directness, and dispatch, as an overland route the Cook Inlet and Kuskokwim route can not be equaled. At present writing we are informed that Captain Jarvis, of the revenue service, is planning to send a party to examine the route. It seems highly commendable that the Government should without delay give the route a most thorough investigation, that the northwest Alaskan public may reap its benefits. By some it is thought that the route may be practicable in summer as well as in winter. Its early development is expected.

Bering Sea coast route.—Another route is the more or less well-known winter route along the coast, or in use to some extent by the Russians. Starting from Katmai or vicinity and crossing the base of Alaska Peninsula, it follows the coast more or less continuously around to the head of Norton Sound. At the mouth of the Kuskokwim, however, is offered an alternative of proceeding about 100 miles up this river, thence about 20 miles across to the Yukon, then up the

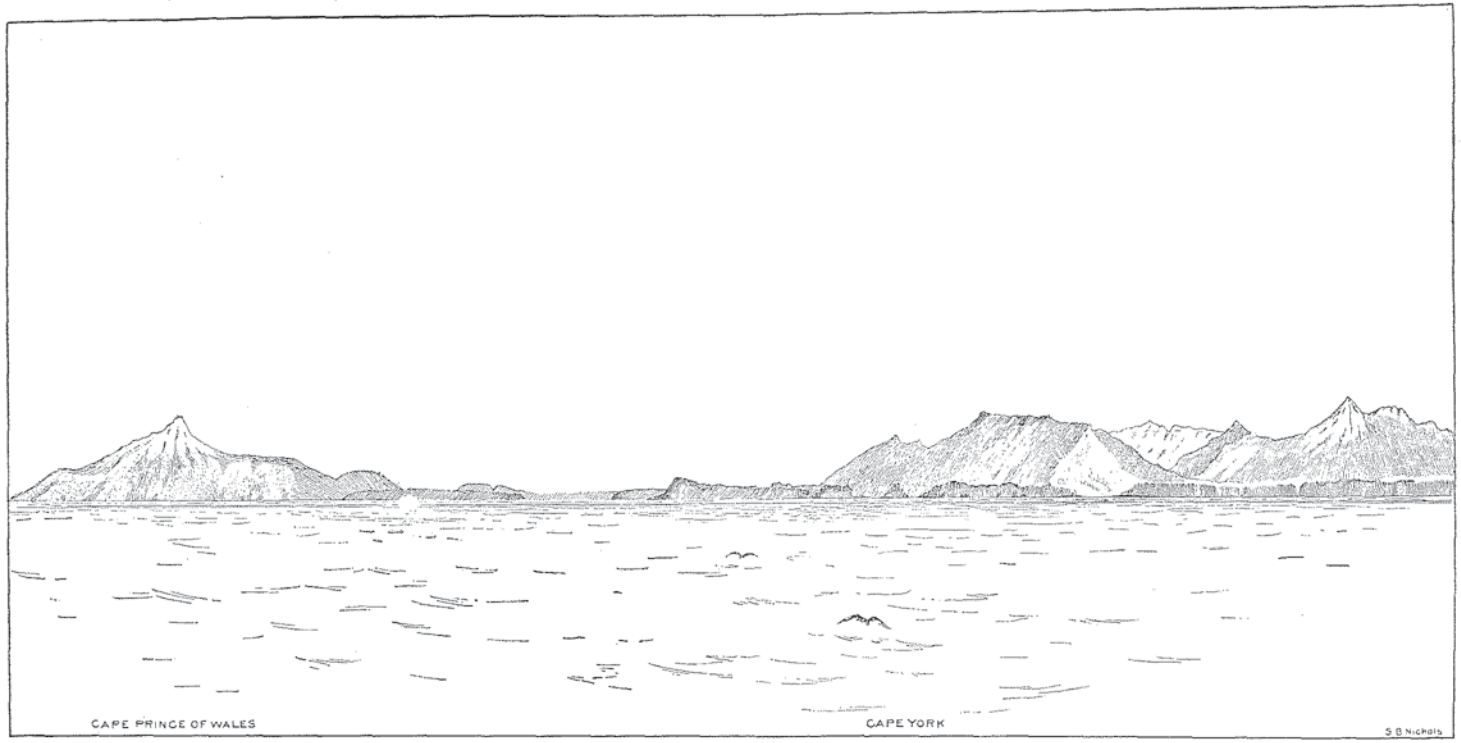
Yukon, and, by way of Holy Cross Mission and Anvik River and portage, to Norton Sound and Nome, as before. This route is rather circuitous and long, but has the advantage of safety, as the posts and native villages upon it, from which food and dog feed may usually be obtained, are nearly always within reach.

TRAVEL AND TRANSPORTATION IN NOME REGION.

In the Nome region, along the coast, waterways, and streams of sufficient size, travel and transportation are principally by small boats and canoes. Across the country there are as yet but few definite or well-marked trails. The country is not, however, of so rugged a character but that one can without much difficulty proceed in almost any direction. During last summer several pack trains of horses were employed in conveying freight and supplies from Nome to the gulch diggings. Some teaming by wagon was also done to these points. About Nome, during the summer season, freighting is accomplished on wheeled vehicles drawn principally by dogs and horses, notwithstanding the fact that the tundra is usually soft for horse footing. Since the larger part of Seward Peninsula seems not ill adapted for teaming and pack trains, it appears certain that horses will be very extensively employed throughout the region during the coming season. So far as experience goes, travel in winter is best accomplished by dog teams or, preferably, reindeer. The use of dogs for sledding in this region has long been too well known to require further mention. The dog, however, is reported to be much surpassed by the reindeer, recently introduced into Alaska, especially in districts where the reindeer moss abounds, as on Seward Peninsula. The chief advantage of the reindeer consists in the fact that it is not necessary to carry forage, since the deer subsists upon the moss wherever camp may be made. There are at present some 1,000 or 1,200 Government reindeer on Seward Peninsula, scattered principally in stations along the southern part and on the coast, with centers at Golofnin Bay and Port Clarence. Dogs are usually scarce in most Alaskan mining regions during the winter season. At Nome last fall an average dog was worth from $50 to $100. A fair team generally consists of about 9 dogs. In reindeer freighting the poulka, or Lapland freight sled, shaped like a boat, is employed. A collection of these was seen on Anvil Creek. They are usually drawn by one or two reindeer. Where real sleds are used the sleds are very low and the runners wide. A trained or draft reindeer at Nome is said to be worth about $150.

HARBOR FACILITIES.

Unfortunately there are no harbor facilities for ocean vessels in the Nome region. The only representative or semblance in this line is the lagoon-like inlet known as Port Safety, about 25 miles east of



SKETCH OF THE COAST FROM CAPE YORK TO CAPE PRINCE OF WALES, INCLUDING CAPE YORK GOLD REGION; SEEN FROM THE OCEAN, LOOKING NORTHWARD (AFTER CAPT. F. W. BEACHY'S ADMIRALTY CHART, 593).

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Nome. It, however, is suitable only for small boats and craft not drawing over 8 feet of water. It was investigated last season by the United States Coast and Geodetic Survey, whose statement concerning it, as published in the "Notice to Mariners, No. 250" (p. 9, sec. 23), is here quoted for the information of those interested:

ALASKA.

Norton Sound—Cape Nome—Port Safety—Range beacons established.—The commanding officer of the United States Coast and Geodetic Survey steamer *Patterson* reports that on September 10, 1899, he erected two whitewashed beacons, which form a range for crossing the outer bar at Port Safety.

The outer beacon, pyramidal in shape, is located on the end of the low spit marking the western side of the entrance.

The inner beacon, also pyramidal in shape, is located on the inshore side of Port Safety Bay, and is about 2½ miles WNW. from the outer beacon.

To cross the bar.—With the two beacons in range, bearing WNW., stand in until the breakers on both sides of the channelway are abeam; then change course for the middle of the entrance.

Port Safety is situated about 12 miles eastward of Cape Nome, Norton Sound, and affords excellent shelter for vessels drawing not over 8 feet.

As it is the only harbor in the vicinity, a preliminary examination of it has been made, and a sketch will be published as soon as practicable.

(October 27, 1899. Chart affected: T.)

Port Safety, however, as stated, can in nowise accommodate seagoing vessels such as touch at Nome with freight and passengers. The nearest harbor for such vessels is Port Clarence, about 70 miles northwest of Nome, or Golofnin Bay, more than 80 miles east of Nome. Though it seems highly probable that with continued development of the Seward Peninsula regions these harbors will eventually have railroad connections with the Nome region, nevertheless the lack of harbor facilities at present at Nome is embarrassing. Last season more than 5,000 passengers and many thousand tons of freight were landed at Nome from ocean vessels through the surf by the rudimentary means of river steamboats, barges, scows, rowboats, and canoes. (See Plates XVIII and XIX.) The inconvenience and risk of such methods will be realized when it is learned that the beach at Nome is so shallow that seagoing vessels can not approach much within a mile of shore, and that the beach during much of the time is swept by a heavy surf, with high combers, breakers, and squalls, which are frequently fatal to the various kinds of craft used in landing freight and passengers, and often result in the loss of both craft and cargo, amounting to many thousand dollars in value. Two such instances occurred while we were there in October. Last season, so far as known, no life was lost, though in a number of cases passengers received injuries or suffered broken limbs. The expense of landing freight in this way is usually $15 or $20 per ton. Moreover, the delay occasioned to large seagoing vessels in discharging their cargoes in

this manner is not only embarrassing but very expensive. It frequently happens that, on account of storm and the surf, vessels are isolated from the beach or have to put out to deeper sea for safety, and can not unload for a period of several days. Realizing the great need of harbor facilities here, it is reported that a number of enterprising men have organized a company and are negotiating to construct at Nome an extensive deep-water pier or wharf, to extend nearly a mile from shore, to a point where ocean vessels can discharge their cargoes onto it, whence they will be brought ashore by tramways to warehouses along the beach.

Until harbor facilities are provided, persons shipping freight to Nome should contract with the company of the vessel for the deliverance of freight on shore above high-water line, as the present precarious method of landing may result in loss of freight or entail risk or damage which few can afford to bear.

CLIMATE.

The climate on Seward Peninsula, though it is arctic, is milder and much more even than that in the same latitudes in the interior of Alaska, or the Yukon country. The precipitation, also, is considerably greater. The summer is not so warm, nor the winter so cold. The sea, here traversed by a branch of the Japanese Current, is the great moderator. About the only weather records we have of the region, which are of a primitive character, are those kept by the missionary and reindeer people at Port Clarence, Golofnin Bay, Prince of Wales, and those of Captain Jarvis, of the United States Revenue Service.[1] Some incomplete records were also made at Port Clarence in 1850–1852, and meteorologic observations were maintained at St. Michael (100 miles to the southeast) for many years.

According to the records of the Weather Bureau, the mean annual temperature at St. Michael is 26.1° F., and the annual precipitation (rain and snow) 14.44 inches. The extremes of temperature noted on the island are 75° F. in July and —55° F. in February. The records show freezing temperatures every month except July. The most reliable data indicate that the temperature at Nome is usually somewhat lower than at St. Michael, and that the precipitation is about the same. The winters, as noted, are not so cold at Nome as in the Yukon Basin, but are more trying, because of the dampness and of the cold winds, from which there is no shelter.[2]

The summer, which is short and generally cool, resembles spring in the northern United States. During the warmer months many

[1] The former are found in the reports on the Introduction of Domestic Reindeer in Alaska, by Dr. Sheldon Jackson, and those of Captain Jarvis in the Report of the Cruise of the U. S. Revenue Cutter *Bear* and Overland Relief Expedition in 1897 and 1898.

[2] See Reports of the U. S. Weather Bureau, Department of Agriculture, summarized in Maps and Descriptions of Routes of Exploration in Alaska in 1898, United States Geological Survey, 1899, pp. 133–135.

A PART OF NOME RIVER VALLEY AND COUNTRY TO THE EASTWARD, NEAR HEAD OF BONANZA AND SOLOMON RIVERS; FROM MOUNT KING (1,200 FEET), LOOKING N. 70° E., OCTOBER 4, 1899.

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bright, clear days occur, but the mountains are usually overhung or obscured by vapory clouds, which presage rain. Rain is of frequent occurrence, often continuing steadily for several days, but it is not usually accompanied by wind. Dense fogs, however, are not common. The prevailing summer winds are from the south. Vegetation attains its maximum growth in late July and early August, when verdure and wild flowers abound, and give a great variety of colors; but they do not flourish long, for scarcely has the season emerged from spring and the snow disappeared, when it passes into fall, with its nipping frosts, indicative of the approaching winter. In summer the days are long. From late May to early July it is daylight nearly all the time, with night scarcely perceptible at the time of summer solstice, about the 21st of June. In August the length of the day begins rapidly to decrease.

The winters will probably average 10 or more degrees milder than at the Fortymile and Klondike region, in the same latitude in the interior. They are not much colder than in some parts of the northern United States. The minimum temperature, or greatest cold, seems to occur at about the middle of January, at which time the thermometer rarely descends to more than 30° below zero. From late October to early April, however, for a period of nearly six months, there are said to be but few days on which the thermometer rises above the freezing point. Snow begins to fall on the mountains early in September and on the low country along the coast about the middle of that month. Blizzards are frequent. They begin early in November and are usually of several days' duration, but some have been known to last for as many weeks in the month of February. They generally come from the north or northeast. The snowfall is not heavy, but the snow drifts greatly. It comes with the prevailing winter winds, which are usually from the north or northeast, especially the latter. A west wind denotes clear weather, during which the display of northern lights is said often to be sublime. The fallen snow is peculiarly dry-frozen, so that pieces of it when struck together give a clinking, metallic sound. The ice attains a thickness of from 4 to 5 feet, but Bering Strait, the channel between Seward Peninsula and Siberia, is rarely, if ever, frozen over by a continuous sheet of ice. Only rarely can the Diomede Islands, in the middle of the channel, be reached on the ice. According to Captain Jarvis,[1] along the shore solid ice usually extends out from 5 to 6 miles, beyond which is open water with fields of ice drifted about by the wind. Even in the coldest weather the natives go out to this open water to hunt seal, and nearly every year some of them are carried away and almost perish from starvation before the ice field drifts, so as to enable them to leave it and reach the shore. In the spring, water begins to flow in the creeks and rivers

[1] Report of the Cruise of the U. S. Revenue Cutter *Bear*, by Captain Jarvis, p. 52.

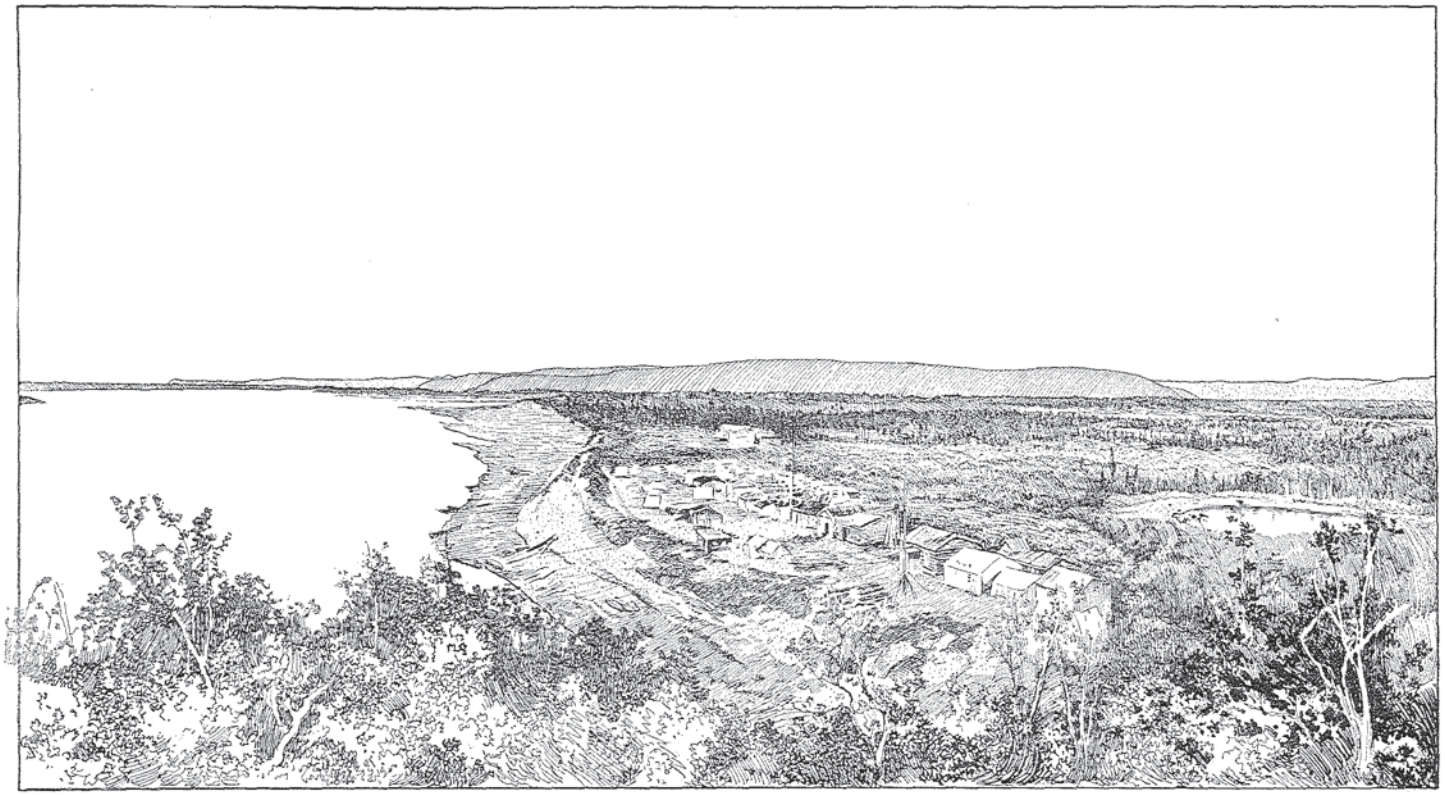
toward the latter part of May, about the same time that the ice breaks up in the Yukon country. The Nome coast is free from ice earlier in the spring and later in the fall than the coast about St. Michael Harbor, but usually the fields of drift and shore ice do not sufficiently disappear to permit the approach of vessels before the 10th of June. It begins to form again about five months later, so that vessels should not count on leaving the region later than early November. Where played upon by the wind and tide, the drift ice is said often to pile up to a height of several hundred feet along the shore.

The climate, though for the most part moist and rainy, may be said to be generally healthful in summer, but rather harsh and severe when cold weather sets in, so that severe colds and pulmonary troubles, especially pneumonia, are common. Drainage and water supply last season was poor, so that typhoid fever, often complicated by pneumonia, was common and not rarely fatal. About the middle of last October there were reported to be about three hundred cases of typhoid and pneumonia in the Nome region.

VEGETATION.

Absence of timber.—The striking feature of the Nome region with respect to vegetation is the absence of timber. The tundra has been referred to as a flat, treeless, moss-covered waste. In this it differs little from the barren plains of the arctic coast. Not a tree is to be seen, and in most places not a bush or shrub of any sort. The nearest approach to anything like timber in the region is a very dwarfed or stunted growth of alder and willow (Plates V and XI). This shrubbery or brushwood rarely attains more than 3 or 4 feet in height, and seldom 3 inches in diameter. It occurs principally along the edges of some of the valleys and on the creeks and gulches in the lower reaches of the mountains, and is sometimes found crouched in fringes closely hugging the stream beds in the tundra. It is unsuitable for camping, and wholly inadequate for cabin-building and mining purposes. This absence of timber is assigned by Prof. F. V. Coville, United States botanist, who has visited the region, to the rigors of the arctic climate.

From the reports of Dr. Sheldon Jackson and Lieutenant Jarvis, the Port Clarence region is similarly destitute, while the absence of timber in the St. Michael region is well known. Some timber, however, occurs in the Golofnin Bay region, as may be seen from the following account of Lieutenant Jarvis in his Overland Relief Expedition to Point Barrow in 1897 and 1898. The timber here, which is presumably spruce, with some poplar, cottonwood, alder, and willow, probably owes its existence and preservation to the more sheltered condition of the region on the southern edge of Seward Peninsula. "On the east side of this mountain," to the east of Golofnin Bay, "is a good heavy growth of timber, but the west side is bare. In a few



LOWER PART OF NULATO RIVER VALLEY AND ADJACENT TOPOGRAPHY, WITH NULATO VILLAGE IN FOREGROUND AND YUKON RIVER IN LEFT; FROM GRAVEYARD POINT, ON BANK OF YUKON ABOVE NULATO, LOOKING S. 65° W.

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valleys of Golofnin Sound was a sparse growth of trees, but, except for a few visible in the distance in the Kotzebue Sound region, we saw no more trees in all the country we traveled through from here to Point Barrow.[1]"

Drift timber.—Though the Nome region grows no timber, there is another source of fuel supply on this bleak coast. It consists of driftwood or timber cast ashore by the sea. Here it has been left in a great windrow, extending almost continuously along the beach near the base of the tundra (Plate III), while in the estuaries, embayments, and tidal lagoons the accumulation is often very great, covering many acres in area. This driftwood consists principally of trunks and stumps of trees, forming logs often 20 to 40 feet in length and 2 or more feet in diameter, many of which are still in a fair state of preservation. The timber is principally Alaskan spruce, though other varieties are reported. It has come from the Yukon River and distant shores. Some logs bearing the brand of Puget Sound sawmills are reported to have been found. The value of this driftwood to Nome and the prospector during last season, both as fuel and in the construction of winter cabins, can hardly be overestimated. At points away from Nome its use to the prospector will probably continue for some time to come. For so great a population as that at Nome, however, the supply is necessarily limited, so that little or no reliance should be placed upon it for future use.

Grass.—In the Nome region, both on the tundra and in the larger valleys, occurs a patchy but fair growth of grass, suitable for the support of horses, cattle, and sheep during the summer months. In certain localities the reindeer also are reported to feed upon it in the green state. It does not, however, so far as observed, seem to be suitable for hay. Wild flowers abound in great profusion, and some herbs, presumably of the arctic flora type, are reported to occur.

The principal wild fruits occurring in the region are the blueberry and the salmon berry. The former is rather common. In some localities on the peninsula it is reported to be preserved by the missionaries and natives for winter use.

Moss.—The principal and almost universal vegetation in the Nome region is moss. It is of the true Siberian or Arctic tundra type of the eastern continent. It covers with a dense growth the entire Nome tundra, and in many localities extends well up into the mountains. According to Dr. Sheldon Jackson, of the Bureau of Education, that covering the tundra flats about Nome is of two kinds. The larger portion of it is the *Sphagnum*. Mixed with this moss is the "reindeer moss" proper, the scientific name of which is *Cladonia rangiferina*. On this latter moss the reindeer thrive at all seasons of the year.

[1] Lieut. D. H. Jarvis's Report of the Cruise of the United States Revenue Cutter *Bear* and the Overland Expedition, 1897–98, pp. 46, 48.

AGRICULTURE.

From the shortness of the summer season, the absence of timber, and the presence of but few species of vegetation of any kind in the Nome region, it would seem that only very moderate possibilities in the line of agriculture could be expected, though the soil, consisting of a foot or two of peaty and vegetable decayed matter, is probably fertile enough to support a good growth of almost any kind of crop. On the coast line of Golofnin Bay efforts at gardening by Captain Dexter, who has been settled there for several years, have been fairly successful, especially in growing the more hardy vegetables. Rev. A. E. Carlson, missionary at Unalaklik (latitude 63° 50′), on Norton Sound, where the climatic conditions are probably not unlike those of Nome, reports that he has raised potatoes, turnips, carrots, cabbage, radishes, and green peas in the garden at his station.[1]

FISH AND GAME.

In the Nome region and on the greater part of Seward Peninsula game of almost every kind is scarce, especially large game. The principal indigenous land quadruped is probably the Arctic hare. Some lynx are also said to occur. Only occasionally is a caribou or bear to be seen. Of the feathered tribe, the ptarmagin, grouse, and Arctic owl are all indigenous and common, while during the short summer season many species of temperate-climate birds visit the region as guests.

Fishing is carried on in a small way by the natives along the greater part of the coast, but more especially on the larger streams. The principal fish is the salmon. Here, as elsewhere in Alaska, this and the cod are the fish on which the native largely relies for his supply of winter food. Salmon-trout are also common, and fine rock-cod occur as far north as Cape Prince of Wales. At Port Clarence a species of herring or smelt, very plentiful and of a delicious flavor, is known to occur. A species of large crab, much like the Pacific coast crab, very delicious and much used as food, is found at Golofnin Bay and as far north as Cape Prince of Wales. The hair seal is common all along the coast, and becomes abundant toward Cape Prince of Wales. Economically it is a very important animal to the native, on account of its store of meat and oil, and especially the skin for clothing, footwear, and sundry uses. The seal are taken in both winter and summer. In winter the natives go out on the sea ice some 6 or 8 miles from shore, where a few seal are procured at the edge of the open sea. The natives are also reported to take a whale or two along the coast almost every year. They sell the bones, while the carcass is appropriated for food.

[1] Agricultural Experiments in Alaska, by C. C. Georgeson. Yearbook, Department of Agriculture, 1892, p. 520.

BEACH AND EDGE OF TUNDRA BETWEEN NOME AND CAPE NOME, WITH CAPE NOME IN RIGHT BACKGROUND, 14 MILES DISTANT; FROM EAST OF NOME, LOOKING S. 75° E., OCTOBER 1, 1899. SLUICE BOXES IN FOREGROUND.

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POPULATION.

Native inhabitants: Eskimo.—The natives of Seward Peninsula, numbering about 800, are Mahlemuts, or Eskimo. They are, in general, scattered along the coast, with several more or less centralized settlements about the missions and reindeer stations, at Port Clarence, Cape Prince of Wales, Golofnin Bay, and in the Cape Nome region. They usually live in small villages of 8 or 10 families, crowded in crude underground huts, or dugouts. Their principal support is by hunting and fishing. They are a good-natured people, and generally industrious. The youth are reported to be apt in the mission schools.

Whites.—Prior to the recent discoveries of gold, about the only whites on Seward Peninsula were the few Americans in charge of the several missions and reindeer stations, and a score or so of Swedes and Laps employed as herders. Accordingly the population of Nome, as a mining camp, is essentially unique, and as yet, for the most part, scarcely six months old. A year ago a few Eskimo huts and one or two sod houses of white men were the only human habitations along 60 miles of the present Nome coast. Last June a dozen or score of tents contained the whole population. By October a town of 5,000 inhabitants fronting the ocean was crowded for a mile or more along the beach. Hundreds of galvanized-iron and wooden buildings were irregularly scattered along two or three thoroughfares, running parallel with the coast line. There is every description of building, from the dens of the poor prospectors, built of driftwood, canvas, and sod, to the large companies' warehouses, stores, and the army barracks—a city, as it were, sprung up in the night, built under the most adverse circumstances on the barren seacoast, a coast without harbor, all the supplies being landed through the surf, as already described and shown on Plates XVIII and XIX. The country contributes nothing toward the support of the population except a few fish and a limited supply of driftwood.

The city is of the most cosmopolitan type and contains representatives of almost every nationality on the globe: Germans, Canadians, Frenchmen, Englishmen, Russians, Swedes, Norwegians, Poles, Chinese, negroes, Italians, Spaniards, Greeks, Jews, and Americans. The dominant type is the American, through whose efforts, with that inherent talent of the Anglo-Saxon race for self-government, this isolated community at once organized a city government. Before the close of the summer Nome had a mayor, councilmen, a police force, a deputy United States marshal, a United States post-office, a fire department with town well, a board of health, a hospital corps, and charitable organizations. A majority of the people consists of the shifting population of the Yukon country, which, upon hearing the news of the discovery of gold, poured itself into Nome. Hundreds also came from the Koyukuk,

Kotzebue Sound, and Kowak River regions, whence, unsuccessful in their search for gold, they reached Nome in a financially stranded condition, but soon became prosperous by mining on the beach. Many also, designing to engage in sundry lines of business and trade, came from the southeastern coast of Alaska and the United States. The influx continued until late in the fall.

By calling, the majority of the people were miners and prospectors, or hoped to become such. The professions of law, medicine, and divinity are well represented, also the vocations of surveying, real estate, insurance, and sundry mercantile branches of business. The saloon, hotel, and restaurant business is prominent and profitable. Along with the shifting population of the Yukon from Dawson and other camps came also many would-be explorers, adventurers, and especially gamblers, but good order prevails throughout. Drunkenness, disorderly conduct, and theft are promptly tried before the police justice and punished by fine and imprisonment. Copies of the official rules and regulations are kept posted before the city hall and in other conspicuous places, as a warning to all: "Ignorance of the law is no excuse." Some of the well-known "toughs" and most undesirable characters are reported to have been rounded up by the authorities late in the fall and exported to the States. There is also quartered here, in comfortable barracks, a detachment of United States soldiers, under Lieutenant Craigie, who in the early part of the season are reported to have done much toward the maintenance of order and the protection of individual rights and property.

A thoroughly energetic and enterprising American spirit pervades the business world. There are several printing presses and three newspapers—the Nome News, Nome Herald, and Nome Gold Digger. The Nugget, with printing press and equipments from Dawson, bound for Nome, went down in a gale on Norton Sound in September, and a similar Nome-bound outfit was wrecked on the *Laurado*, at St. Lawrence Island in Bering Sea, a few weeks later. The leading large companies operating at Nome are the Alaska Commercial Company, the North American Transportation and Trading Company, and the Alaska Exploration Company. There are also innumerable smaller companies and firms engaged in various mercantile lines and sundry vocations. Early in the winter, on recommendation of Mr. G. N. Wright, postmaster at Nome, effort was made by the United States Post-Office Department at Washington, D. C., to secure for the Nome people semimonthly mails during this winter, and a contract was let for the transportation of such mails by way of the Yukon country. With what success this has met has not yet been learned.

There are at least 2,500 people now wintering at Nome, and, by estimate, at least several thousand are on their way there by winter routes. Last season, as soon as the richness of the discoveries

DISEMBARKMENT OF PASSENGERS IN SURF ON NOME BEACH.

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became realized, the larger trading companies built large warehouses and shipped all the supplies possible from St. Michael to Nome, in addition to those brought from the States. Also, a considerable supply of fresh reindeer meat was imported from the Siberian coast by enterprising owners of schooners and other seagoing vessels. It is estimated that, with no accident, there will be sufficient to carry the population through the winter, but none to spare. During the fall, and especially at the close of the season, commodities and living were high. Coal was $125 per ton; wood, gathered from the driftwood on the beach, was $50 and upward per cord; lumber, $125 to $300 per M., when it could be bought at all; board and lodging, from $6 to $10 per day. The price of an ordinary meal was from $1.50 to $3; fresh meat was $1 to $1.50 per pound, and other things almost proportional. Unskilled labor received $12 per day.

IMPROVEMENTS SUGGESTED.

Government.—Since, according to the conservative estimate of those who are best situated to judge, it is believed that the Nome region will have a population of at least 30,000 or 40,000 people this year (1900), some public improvements there seem not only commendable but urgently necessary. Among these the most important are: Some municipal form of government, water supply, land-office service, and harbor facilities. As the General Government had never made provision for any form of municipal government in Alaska, the people of Nome, in response to the urgency of the hour, called a mass meeting, and organized the present government of Nome, with a complete corps of city officers, as aforesaid, though they were conscious at the time that it was without authority from the United States Government. The town was divided into three wards, with two councilmen from each. The expenses of the government were defrayed by taxing business houses and general property owners. There was also a poll tax of $5. The government, for the most part, worked admirably and was fruitful of beneficent results. However, with the large influx of people expected during the coming season, it is most earnestly hoped that, acting on the recommendation of the governor of Alaska and representatives of Nome, the present Congress will make provision for some form of municipal government, so much needed at Nome.

Drainage and water supply.—The climate, though somewhat harsh in cold weather, is generally healthful. Nevertheless, last fall Nome was visited, to a rather alarming extent, with typhoid fever. The hospitals, which were soon crowded to their utmost capacity, rendered most efficient service. However, many cases complicated with pneumonia proved fatal. The fever is ascribed by the health officers and physicians to the poor drainage and unwholesome water supply. This can be remedied at small cost, for, though the tundra about Nome is

nearly level, its elevation and relations to the beach, to Dry Creek on the north, and to Snake River toward the west, as shown on Map 2, are such that the drainage can be rendered comparatively perfect without great expenditure of money and labor. With reference to the water supply, the topography is also most favorable, as shown on Map 2. An abundance of most wholesome water could at moderate cost be drawn from the upper reaches of Snake River, or its tributaries, issuing from the mountains at some distance back from the coast, and distributed through the town. From early spring until winter these streams discharge a considerable volume of water derived from rain and the melting snow and ice in the mountains and hills. The water accordingly is of the most desirable quality. It could probably be best conducted to Nome by means of surface conduits, or flumes, especially as the streams could not be depended upon for winter use. For permanent or perennial supply a large well, to be sunk in the tundra at a safe distance back from Nome, is suggested.

Harbor facilities.—One of the most urgent needs is that of harbor facilities. Improvements in this direction will justify the expenditure of a considerable amount, and will, presumably, yield good returns. As has already been stated, it is reported that capital has been enlisted by a company of enterprising men, who are now petitioning and negotiating with the Government for right of way and certain longshore privileges, to construct at Nome a deep-water pier, and it is hoped that their efforts may meet with success. The pier is to be built in sections at Unalaska, and when erected at Nome is to extend with its tramway nearly a mile to sea, where deep-sea-going vessels can discharge their cargoes. Only with more extended discoveries of gold can Nome hope for railroad connections with the harbor at Port Clarence, which is about 70 miles distant, or Golofnin Bay, still farther away.

Life-saving station.—Unless harbor improvements are provided in the near future, the establishment of a life-saving station at Nome during the summer months seems to be of importance. It should be brought before the authorities and not overlooked.

Land office.—There has been no branch of the General Land Office at Nome during the past season. It seems beyond question that a branch of this service would be of more benefit to the public at this point during the coming season than at any other place in Alaska. It is presumed that the authorities will not overlook this important matter.

Railway and telegraphic connections.—Governor Brady, in his recent report of 1899, p. 22, has emphasized the necessity of railway connections between the Cape Nome region and Port Clarence and Golofnin Bay, in case the region produces half what is expected of it during the coming season. The importance of cable and telegraphic connections

UNLOADING OF FREIGHT IN SURF ON NOME BEACH.

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has also been set forth by the governor, and with further development it is to be hoped that such service will be realized in the not distant future.

SUMMARY.

In the foregoing preliminary report we have attempted to sum up the existing knowledge of the Nome region and the adjacent portions of Seward Peninsula. Our notes on the Nome district proper are chiefly the result of our own observations, while those on the other mining districts are based on the most reliable information available.

We have shown that the bed rock of the Nome district consists of more or less altered limestones, mica-schists, and gneisses. The rocks are closely folded and have an east-west strike. Mineralized quartz and calcite are common. The gravels we have classified as gulch, terrace, and tundra gravels, those of the beach being closely related to the latter. The presence of these terraces indicates that the entire region has been slowly elevated.

We have noted that the important gold deposits thus far exploited are the gulch and beach placers. Gold is also known to occur in the bars of the larger rivers and in the tundra. Our theories would lead us to believe that the higher benches and terraces are worthy of investigation by the prospectors. The gulch and beach placers are extraordinarily rich. As would be expected in a new region, no bed-rock mining has been done; but as the gravels and gold are largely of local origin, there is at least a possibility that workable mineral veins will eventually be found. The methods of mining and separating in use last season are crude and imperfect, so that much of the fine gold was lost.

Of other parts of Seward Peninsula we know nothing from personal observation. The Solomon River and Bonanza River region is said to afford good prospects for gold. The Golofnin Bay region, still farther east, has produced gold in commercial quantities. Gold is said to occur on the rivers of Norton Bay and on Unaklik and Anvik rivers. To the northwest of Nome gold has been reported from near Cape York.

The geographic positions of some of these different localities suggest that they may belong to the same gold belt. The facts known to us are not sufficient to prove this, and it must simply be regarded as a working hypothesis. Should subsequent development and investigation show that the gold of all of these districts of Seward Peninsula is derived from the same series of rocks, this gold-mining region will embrace an area of at least 5,000 or 6,000 square miles. If this proves to be the case, it does not by any means follow that the entire belt will contain workable gold deposits. We should rather expect to find the gold confined to certain zones within the belt.

In the coming spring (1900) it is expected that there will be a very large influx of population into the Nome and adjacent regions. A conservative estimate places the number at at least 20,000 men. Several thousand miners and prospectors wintered at the various camps along the coast, and during the winter many will probably go down the Yukon on the ice. It is evident, therefore, that this region, compared with other parts of Alaska, will be densely populated, and it is not likely that the high rate of wages paid last year will be maintained.

The newcomers in the spring will find that nearly all of the known gold-bearing region has been staked. If the beach strip continues to be withheld from private ownership it will undoubtedly offer good opportunities for many men. It must be remembered, however, that the beach placers, like all others, are not inexhaustible, and that they do not, by any means, extend along the whole coast.

While the staking of new claims in the Nome region is probably nearly a thing of the past, yet those having capital to invest will undoubtedly find plenty of claims for sale. Those who lack knowledge of mining matters should invest their money very cautiously, for there is a vast army of speculators at Nome ready to "unload" when the first steamerful of "tenderfeet" arrives. It would be very wise for all inexperiened newcomers to save money for the return passage.

There will be good opportunities at Nome for experienced miners in working on shares or for wages. Good mechanics will also be in demand. We would warn the public of the danger of typhoid fever and other epidemics in the crowded mining camps, a danger which was amply proved by the conditions at Nome last season.

We believe that the Nome region has a great future, but would strongly advise men inexperienced in mining and prospecting to consider the matter carefully before joining in the mad rush which will undoubtedly take place in 1900.

APPENDIX A.

PROVISIONS AND OUTFIT.

In the matter of food and equipment, each man will, of course, follow his personal taste. Those uninitiated to prospecting in this northern region may find the following hints in regard to equipment of value:

The subject of kind, quality, and quantity of food demands the earnest attention of the prospector bound for Alaska. His health, and therefore the success of his expedition—even his life—may depend on a proper choice of food.

We can not undertake to advise where the purchase of supplies ought to be made. It will undoubtedly be safer to take provisions from the point of embarkation, but at the same time there is always danger of total loss in landing at Nome in the surf. Large quantities of supplies will be shipped to Nome during the coming summer, and provisions will probably not be very high until toward the close of the season. In the matter of mining tools and clothing, it will probably be best for the prospector to equip himself before leaving the States. It is a safe rule to follow that everything taken to Alaska should be of the very best quality, for the original cost is small compared with cost and labor of transportation. This is especially true in regard to provisions. In purchasing supplies, it should be the aim to have as much variety as is consistent with economy of weight and bulk. In determining the amount of food to carry, one can assume that a man will not eat more than 3 pounds of dry food a day. If many canned goods are taken, the amount consumed per man a day may be considerably more than this. The following estimates are based on the experience of the United States Geological Survey parties during three seasons of field work in Alaska:

Kinds of provisions useful to Alaskan parties.

Flour.
Germea.
Corn meal.
Oatmeal.
Wheat grits.
Rice.
Maccaroni.
Hard-tack.
Dried soup vegetables.
Evaporated potatoes.
Evaporated onions.
Bacon.
Butter.
Dried beef.
Bologna sausage.
Beef extract.

Crystallized eggs.
Cheese.
Evaporated milk or cream.
Beans.
Pea soup.
Sugar.
Sweet chocolate.
Tea.
Coffee.
Evaporated peaches.
Evaporated apricots.
Evaporated nectarines.
Evaporated raisins.
Evaporated currants.
Evaporated pears.
Baking powder.
Yeast cakes.
Salt.
Pepper.
Mustard.
Nutmeg.
Ginger.
Cinnamon.
Curry powder.
Vinegar.
Lime juice.
Soda.

On short packing trips only a very small variety of food is taken, while, on the other hand, at permanent winter camps, to which transportation is easy, the above list can be much extended. In such case the following articles might be added: Canned meats, such as corned beef, mutton, etc.; canned tomatoes, corn, and asparagus; canned fruits, marmalade, and jelly; salt mackerel, codfish, etc.

In making a choice of provisions for consumption in the Nome region, it should be borne in mind that fuel is very scarce, and therefore foods which take much cooking should be avoided. It will be advisable to take an abundant supply of hard-tack, as it may often be impossible to bake bread. When fuel is scarce it is not advisable to depend on such foods as beans and rice, which require long cooking. The pea soup, which has been much used in Alaska, is quickly cooked and is a substitute for beans, while germea or oatmeal may be taken instead of rice.

It has been the universal experience of men working in northern latitudes that there is a great craving for sweets, especially during the cold winter months, and therefore an abundant supply of sugar and, if possible, marmalades, jellies, etc., should be provided. The anti-scorbutics, such as vinegar, fruits, and lime juice, are of special value in preserving the health of the prospector. The much-dreaded disease of scurvy can usually be avoided by free use of these foods, conjoined with cleanliness, proper cooking, and regular exercise. Tea is preferable to coffee, because it is lighter and retains its flavor better than coffee. The most preferable form of tea is that compressed into bricks, such as are extensively used in Russia and Siberia.

The following ration is given with a view of aiding inexperienced men in determining the amount of supplies to provide for any given length of time. It must not be supposed, however, that supplies bought according to this ration will necessarily meet the requirements exactly, because the amount of any particular kind of food consumed by a party is a variant depending on different factors. For instance, if a large quantity of fresh meat is eaten, this estimate for salt will probably prove insufficient.

Ration for one man one month.

	Pounds.
Flour and hard-tack	30
Baking powder (1 pound to 35 pounds flour)	1
Other farinaceous foods—rice, oatmeal, etc.	8
Dried vegetables	$2\frac{2}{3}$
Bacon and dried beef	22
Butter	$3\frac{1}{3}$
Beans	6
Pea soup	1
Dried fruit	7
Sugar	7
Tea ($2\frac{1}{2}$ pounds coffee may be substituted for 1 pound tea)	1
Salt	$1\frac{2}{3}$
Miscellaneous	2
	$92\frac{2}{3}$

EQUIPMENT.

For summer prospecting a light mosquito-proof tent, if the party be moving much, is advisable, while in permanent camp and in cold weather the 9 by 9 army tent is most serviceable. In the treeless region of Nome tent poles, which should be made with joints, must be carried, and also light iron tent pins. In winter it is essential to have a fur robe for sleeping, while in summer woolen blankets or sleeping bags furnish ample warmth. We have found that sleeping bags furnished a maximum amount of warmth for a minimum weight.

A small sheet-iron stove is essential to an equipment, so as to economize the small amount of wood available. The prospector should also be provided with a kerosene stove and a supply of kerosene. The cooking utensils should be made as light as is consistent with durability.

The average prospector going to the Nome region is not likely to see any game, except a few ptarmigan and grouse. If any gun is carried, it should be a light shotgun. Those planning long trips into the interior should provide themselves with 30–30 smokeless-powder carbines.

A light ax, a hatchet, a saw, an auger, and a supply of nails are essential to every outfit. If a prospector is going into extensive building and mining operations, he will best know with what tools to provide himself. For ordinary prospecting, a pick, shovel, and gold pan are necessary, while for working the beach sands and gulch gravels the miner should also have a rocker, copper plates, a supply of mercury, and an iron crucible for reducing amalgam. For more extensive mining, lumber for sluice boxes, wheelbarrows, or two-wheeled carts are essential. For larger operations this list could be indefinitely extended, but these are usually managed by experienced mining engineers, who are fully competent to choose their outfits. It seems probable that steam drillers will have extensive use at Nome in testing the tundra and beach sands.

In the matter of clothing, every man will probably follow his individual tastes to a very large extent, but a few hints based on our own experience will perhaps be useful. It is desirable to wear woolen underclothing the entire year, in summer light weight and in fall and winter heavy weight. The outer garments for summer should be of durable material, such as canvas, corduroy, whipcord, etc. We have found that the 10-inch chrome-tanned leather hunting shoes are the most serviceable for long tramps. Every prospector always provides himself with hip rubber boots, and often with rubber gloves for panning in cold water. Some sort of mosquito-proof headdress (best made of bobinet) is essential, as also are mosquito-proof gauntlet gloves. The prospector will find the Nome region rather wet in summer, and a waterproof coat is desirable. In winter heavy woolen mackinaw clothing or furs are usually worn. The Eskimo fur parki is an excellent garment for this northern region. For winter traveling the Eskimo boot called "muchlucks" is probably the best foot gear. In traveling in winter there is as much danger in being dressed too warm as in being dressed too lightly. In the former case perspiration may be induced, and there is grave danger of freezing. For this reason woolen gloves or mitts are preferable to those made of fur.

For use along the coast, the Eskimo skin boats with native crews are said to be serviceable, especially for landing in the surf. A whaleboat fitted with a sail is also well adapted to this purpose. In ascending the rivers light canoes, which can be easily portaged by one man, are the best boats. Canoes might well be provided with oars, as well as paddles. It is well to provide duplicate paddles, as it is impossible to replace them if lost. For going upstream tracking lines 40 to 50 feet long, made of one-fourth-inch hemp rope, are essential, as well as poling poles about 10 feet long and shod with iron.

For winter traveling with dog teams the broad Yukon sled, provided with iron runners, is generally used. The reindeer are usually driven to "poulkas" (canoe-shaped Lapland sleds), which resemble a toboggan in that they are not provided with runners. When used for packing, the reindeer are provided with pads and hampers, which can easily be made of 10-ounce canvas.

APPENDIX B.

KOYUKUK REGION.

By F. C. SCHRADER.

A report on the Koyukuk region is in nowise to be considered as coming within the province of that on the Nome region. The following brief statement is here appended solely in response to the numerous inquiries and letters received by the Survey, calling for authentic information of recent date on the Koyukuk region.

Koyukuk River flows into the Yukon about 450 miles from Bering Sea and about 20 miles above Nulato (Map 1, frontispiece), and has a large drainage basin, which heads in the northeastern part of Alaska, on the southern slope of the rugged divide which separates the drainage of the Arctic Ocean on the north from that of the Yukon on the south.

The Koyukuk gold region lies in the upper part of the basin, within the Arctic Circle, between (approximately) 67° and 68° north latitude and 147° and 148° west longitude. The occurrence of placer gold at Tramway Bar, about 570 miles above the mouth of the river, on its middle fork, has been known for some time. These placers can probably be worked with a small amount of capital and means for hydraulicking.

During the Klondike rush, in the summer of 1898, the Koyukuk region was visited by twelve hundred or more prospectors and explorers, many of whom ascended the river by steamboat, while others came by trail. After passing the winter there and finding but little or no gold, most of them followed the ice down the river by boat in the spring of 1899. In the meantime, however, in the month of March, coarse placer gold in paying quantities had been discovered on Slate Creek, an east-side tributary of the Middle Fork of the Koyukuk, which it enters 16 miles (approximately) above Tramway Bar. The discovery was made by members of the Dorothy party, commonly known as the "Dorothy boys," from Boston, Mass.

The country rock is principally mica-schist and slate. It is uplifted and stands on edge, while the gold occurs as shallow creek and gulch diggings. It is found principally on or near bed rock, in the jointings, fissures, and cleavage crevices. The gravels rarely exceed 3½ feet in thickness. The diggings begin about 9 miles above the mouth of the

creek, at the confluence of the two main forks, of which the north one is known as Myrtle Creek and the south one as Slate Creek proper. From this point they extend up to the head of Myrtle Creek, a distance of 5 or 6 miles, and up Slate Creek considerably farther. At the time the region was visited by me, in August, 1899, but little mining, beyond development work, had yet been attempted. Two mining districts had been organized, known as Slate Creek and Myrtle Creek districts. Most of the season was being devoted to bringing in supplies and building cabins preparatory for winter. Sluicing had been begun on but two claims, one of which, on Myrtle Creek, reported the gravel as yielding from $60 to $80 per day per shovel. The gold is clean looking and coarse. It is considerably rolled, or flattened, and shows travel. The largest nugget taken out had a value of nearly $20. The benches along these creeks are also found to be auriferous and are reported to prospect from 3 to 5 cents per pan.

In August there were reported to be 75 men at the diggings. A score or so others were on their way, many from along the South Fork, where they had been working with only moderate success during most of the summer. By estimate, there are probably 100 men now wintering (1899–1900) in the region. The principal supply post for the region is Bergman, near what was formerly known as Arctic City, 440 miles by river above the mouth of the Koyukuk and 146 miles from the diggings. This post is supplied principally by the Alaska Commercial Company, but is owned by and in charge of Pickarts, Bettles & Pickarts. It is practically at the head of steamboat navigation on the Koyokuk. A nearer post is Peavy, 104 miles below Slate Creek. Here are located a United States post-office, a United States land office, and a store, but at present the place is not stocked with the staple articles of provisions needed by the miners. The establishment of a post at the mouth of Slate Creek during the coming winter is proposed by Pickarts, Bettles & Pickarts, who had much freight en route for the purpose. The principal summer route into the region is up Koyukuk River by flat-bottom steamboat. In winter the region may be best reached by the trails leading overland from the Yukon near Fort Hamlin by way of Dall River, or from Fort Yukon by way of Chandlar River. Placer gold is known to occur over a somewhat wide range of country in the Koyukuk region, but, like that at Tramway Bar, the most of it may require capital to work the gravels. The placers on Slate and Myrtle creeks are the only known rich diggings seen by members of the Survey. Late in August, 1899, word was received at Bergman that rich prospects had recently been found in a region known to the miners as Rocky Bottom, on the upper waters of Allatna or Allenkakat River, a large tributary to the Koyukuk, which it enters from the northwest about 10 miles above Bergman.

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