MINING IN NORTHWESTERN ALASKA.

By S. H. Cathcart.

INTRODUCTION.

The season of 1918 was the most unfavorable for placer mining that the Seward Peninsula has experienced. Several factors combine to account for the great falling off in production, namely, frost, water shortage, labor difficulties, high cost of operating, and the short season. The lateness of snowfall the preceding winter, when the ground was not covered until February, resulted in deep frost that prevented many dredges from digging until late in the season and others from operating at all. In the Solomon River district frost as deep as 10 feet was reported, and in the Council City district frost was encountered at a depth of 18 inches as late as September.

The scant winter snow and light summer rainfall resulted in a water shortage which affected all open-cut and some dredging operations. Hydraulicking was carried on intermittently and was stopped October 3 by the early freeze-up.

The demand of the Nome labor union for an eight-hour day without overtime and a minimum wage of $5 resulted in contention between the union and the operators which was not satisfactorily adjusted. The operators objected to the demand for no overtime, and consequently most mines were short-handed or employed inefficient help.

Increased cost of transportation, repair parts for machinery, labor, fuel, and foodstuffs was felt severely in all mining operations. It is estimated that the cost of production in 1918 was 30 to 40 per cent greater than under normal conditions.

The season was unusually short. Ice did not leave Bering Sea until July and delayed the arrival of the first boat until June 25. Ditch and creek waters froze October 3, and the first 6 inches of snow fell a few days later.

As a result of the adverse conditions outlined above the value of the mineral production of Seward Peninsula in 1918 was only about $1,195,172, compared with $2,747,000 in 1917. Of the output in 1918,

$1,108,000 represents the value of the placer gold and $87,172 the value of the miscellaneous products, including tin, tungsten, silver, and platinum.

GOLD.

TOTAL PRODUCTION.

The production of placer gold was less than half that of 1917 and was the smallest since 1898. The decrease was due to the unavoidable conditions already cited.

The details of the production of placer gold in Seward Peninsula in 1918 are given in the following tables in so far as it is possible to do so without disclosing individual production:

Placer gold produced in Seward Peninsula, 1918, by districts.

District.	Operations.	Mines.	Men employed.	Production.	Per cent of production.
Nome	Dredges	6	42	$107,000	
	Hydraulic	10	93	160,000	
	Underground	21	125	133,000	
	Open-cut	13	20	47,000	
		50	280	447,000	40.3
Solomon	Dredges	5	34		
	Hydraulic	1	5		
		6	39	49,000	4.4
Council	Dredges	7	50	258,000	
	Hydraulic	4	20	41,000	
	Open-cut	6	9	8,000	
		17	79	307,000	27.7
Fairhaven	Dredges	2	18	17,000	
	Hydraulic	5	40	39,500	
	Underground	4	16	31,000	
	Open-cut	11	24	25,500	
		22	98	113,000	10.2
Koyuk [a]	Hydraulic	3	8	10,000	
	Underground	3	36	115,000	
	Open-cut	4	14	10,000	
		10	58	135,000	12.2
Kougarok	Dredge	1	8		
	Hydraulic	1	4		
	Open-cut	15	47		
		17	59	50,000	4.5
Port Clarence	do	6	20	7,000	.6
Grand total		128	633	1,108,000	

[a] Hydraulic and open-cut production in the Koyuk district only approximately proportioned.

Placer gold is recovered on Seward Peninsula by underground mining, dredging, and open-cut work, including hydraulicking. The relative importance of the several methods so far as known is shown as follows:

Placer gold produced in Seward Peninsula, 1918, by methods of mining.

Method.	Number of mines.	Number of men employed.	Production.	Per cent of production.
Dredging	21	152	$466,000	42.1
Underground	28	177	279,000	25.2
Hydraulic	24	170	259,500	23.4
Open-cut other than hydraulic	55	134	103,500	9.3
	128	633	1,108,000	....

DREDGES.

Twenty-one gold dredges operated during the season of 1918, as compared with 28 in 1917, 27 in 1916, and 31 in 1915. Six of these were in the Nome district, seven in the Council district, five in the Solomon district, two in the Fairhaven district, and one in the Kougarok district.

Dredges operating on Seward Peninsula, 1918.

NOME DISTRICT.

Dexter Dredging Co	Dexter Creek.
Glacier Creek dredge	Glacier Creek.
Bangor Creek Dredging Co	Bangor Creek.
Center Creek Dredging Co	Center Creek.
Hastings Creek dredge	Hastings Creek.
Julien Dredging Co	Osborn Creek.

SOLOMON DISTRICT.

Esquimo Dredging Co	Solomon River.
Flowers dredge	Do.
Scott-Newburg dredge	Do.
Shovel Creek Gold Dredging Co	Shovel Creek.
Burners-Iverson-Johnson dredge	Big Hurrah Creek.

COUNCIL DISTRICT.

Blue Goose Mining Co	Ophir Creek.
Northern Light Mining Co	Do.
Wild Goose Mining & Trading Co	Do.
Uplift Mining Co	Camp Creek.
G. & O. Dredging Co	Elkhorn Creek.
Moody Mining Co	Canyon Creek.
Goose Creek dredge	Goose Creek.

KOUGAROK DISTRICT.

Behring Dredging Co	Taylor Creek.

FAIRHAVEN DISTRICT.

Candle Creek Dredging Co	Candle Creek.
Fries Dredging Co	Inmachuk River.

It is estimated that the 21 gold dredges operating on Seward Peninsula in 1918 employed 152 men and produced gold to the value of $466,000, or 42.1 per cent of the total production of the peninsula. It is difficult to estimate the quantity of gravel handled, and, consequently, the average value of the gravel worked in 1918, as, except at very few places, the frozen condition of the ground interfered with operations and made much unproductive digging necessary; but the information at hand indicates that about 1,164,000 cubic yards of gravel was handled and that the recovery per cubic yard was about 40 cents.

UNDERGROUND MINING.

Twenty-eight deep placer mines, employing about 177 men, were worked on Seward Peninsula in 1918. The production is estimated at $279,000, or 25.2 per cent of the total production of the peninsula. The distribution of the mines so far as known is as follows:

Deep placers worked on Seward Peninsula in 1918.

NOME DISTRICT.		KOYUK DISTRICT.	
Submarine	5	Dime Creek	3
Second beach	2	FAIRHAVEN DISTRICT.	
Third beach	5		
Center Creek	1	Inmachuk River	1
Dexter Hill	8	Candle Creek	3
	21		4

OPEN-CUT MINING.

Twenty-four hydraulic operations, employing about 170 men, and 55 open-cut mines other than hydraulic, employing about 134 men, were worked on Seward Peninsula in 1918. It is estimated that the hydraulic operations produced $259,500, or 23.4 per cent, and other open-cut works $103,500, or 9.3 per cent, of the total production of the peninsula. The distribution of these mines is, so far as known, as follows:

Hydraulic operations on Seward Peninsula in 1918.

NOME DISTRICT.		NOME DISTRICT—continued.	
Little Creek	1	Dry Creek	1
Monument Creek	1	Dexter Creek	1
Boulder Creek	1	Bangor Creek	1
Osborn Creek	1		
Rock Creek	1		10
Gold Bottom Creek	1		

KOYUK DISTRICT.

Dime Creek	2
Sweepstake Creek	1
	3

SOLOMON DISTRICT.

Big Hurrah Creek	1

FAIRHAVEN DISTRICT.

Bear Creek	1
Patterson Creek	2
Jump Creek	1
Johnny Bull Hill	1
	5

COUNCIL DISTRICT.

Ophir Creek	1
Casadepaga River	3
	4

KOUGAROK DISTRICT.

Macklin Creek	1

Open-cut operations other than hydraulic on Seward Peninsula in 1918.

NOME DISTRICT.

Specimen Gulch	1
Dry Creek	2
Bear Creek	1
Nome River	1
Buster Creek	2
Oregon Creek	2
Penny River	1
Jess Creek	1
Anvil Creek	1
Second Beach	1
	13

KOYUK DISTRICT.

Dime Creek	4

PORT CLARENCE DISTRICT.

Gold Run	1
Bluestone	4
Coyote Creek	1
	6

FAIRHAVEN DISTRICT.

Candle Creek	8
Inmachuk River	3
	11

COUNCIL DISTRICT.

Dutch Gulch	1
Warm Creek	2
Albion Creek	1
Sunshine Creek	1
Tubutulik River	1
	6

KOUGAROK DISTRICT.

Dahl Creek	3
Quartz Creek	1
Wonder Gulch	1
Harris Creek	2
Arizona Creek	1
Homestake Creek	1
Humboldt Creek	1
Dick Creek	1
Coffee Creek	1
Garfield Creek	1
Boulder Creek	1
Kougarok River	1
	15

Hydraulic elevators were used on Little, Osborn, and Ophir creeks, Rubel elevators on Candle and Bear creeks, and a steam scraper on Dime Creek.

DISCOVERIES.

The only new strike of the season was made by Connelly & Listen on Poorman bench, off No. 6, Monument Creek, in the Nome district. Gravels carrying about $32 to the cubic yard were opened. The adjoining claims were being prospected late in the summer but with little success. Considerable winter work is planned which will no doubt show the extent of the deposit. The locality was visited by the writer, but not until after the ground was covered by 7 inches of snow. The claim was opened by a pit 40 by 60 by 6 feet. The ground was hydraulicked, and work suffered from water shortage. Where the rich gravels were found the bedrock surface reverses its slope from east to west and slopes into the hill at an angle of about

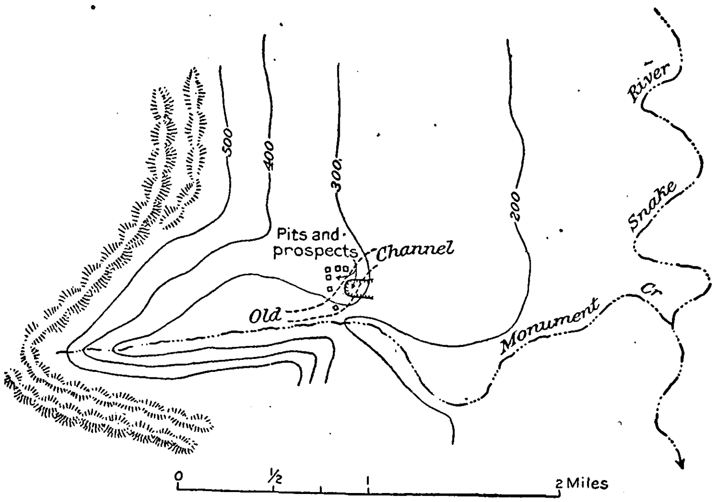

FIGURE 6.—Sketch showing placer deposits on Poorman bench, Monument Creek.

20°, probably indicating an old stream channel. The gravels are mostly schist, with some quartzite and limestone, 25 per cent coarse (8 to 24 inches), 50 per cent fine (2 to 8 inches), and 25 per cent clay. The pay streak occurs in the lower 4 feet of gravel, overlain by 4 feet of gravel and 2 feet of muck. The size of the gravel would seem to indicate its relation to Monument Creek rather than to Snake River deposits. This conclusion is further borne out by the absence, in these concentrates, of scheelite, which occurs in the Snake River gravels but not in the gravels of Monument Creek. A sketch of the occurrence so far as known is shown in figure 6.

THAWING.

The use of cold water—that is, water at the normal summer temperature of ponds, ditches, and creeks—in thawing perpetually frozen muck and gravel is a recent development that promises to be of value to the placer miners of Alaska. The idea is perhaps not entirely new, but its application to mining was not successfully demonstrated until the season of 1918. The method is far from being established, and much experimental work remains to be done before its real value and limitations are known. It promises to be an economical means of thawing ground for dredging and open-cut mining. The available data on the subject are given below.

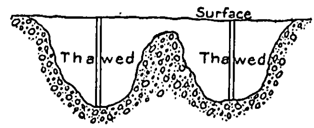

FIGURE 7.—Sketch showing results of thawing by hot water and steam at boiler temperature.

Experiments were made during the season of 1917 under the direction of John Miles for the Alaska Mines Corporation, on its ground near Nome, for the purpose of determining the most efficient and economical means of thawing the deep Nome gravels for dredging. Superheated steam at a temperature of 1,000° F., steam at boiler temperature, hot water at 150° to 180° F., and water at stream temperature of 52° F. were used in the experiments.

In the experiments in which steam and hot water were used three holes were drilled to bedrock at the points of an equilateral triangle 12 feet apart, and at a point intermediate between them a test hole was drilled, which was cased and kept open to determine when the ground had thawed to the center. Shafts were sunk in the thawed ground, and drifts were run to the limits of the thawed area. In the tests in which hot water and steam at boiler temperature were used the thawed area tended to cone downward, leaving horsts of unthawed ground on bedrock. (See fig. 7.) Superheated steam at 1,000° F. gave results as shown in figure 8. The thawed area was greatest on bedrock, and where a clay stratum was encountered the hole did not pinch.

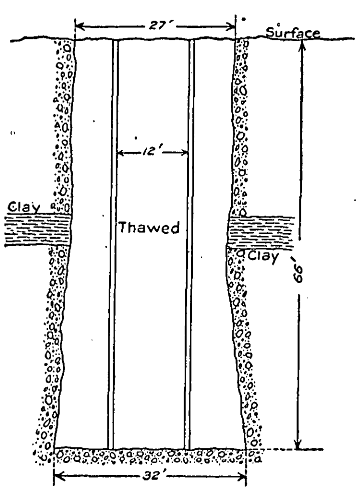

FIGURE 8.—Sketch showing results of thawing by superheated steam.

Two holes were thawed by the cold-water method, both single holes without the test holes used in the foregoing experiments. One hole was 43½ feet and the other 50 feet deep. Both were 6-inch holes drilled to bedrock with an Empire drill. A 2-inch pipe was inserted to bedrock, and a small gas engine developing not more than 30 pounds pressure was used to force water down the pipe. The water was allowed to run from the bottom of the pipe and flow over the surface, the circulating water thawing the ice out of the muck and gravel. As no test holes were used, it was not possible to tell how rapidly the thawing progressed until the ground began to slough in at the surface. This required from five to six days. The shrinkage in the thawed ground was about one-third, which represents the volume of ice present in the muck and gravel. The temperature of the water issuing from the hole was not taken. A shaft sunk in the thawed ground showed the holes to have passed through a stratum of clay. The area thawed was in cross section like an hour glass, having a width of 22 feet on bedrock, pinching to 6 feet at the clay stratum and widening to 18 feet at the surface. (See fig. 9.) It is to be noted that the thawing was most effective where it was most desired—on bedrock.

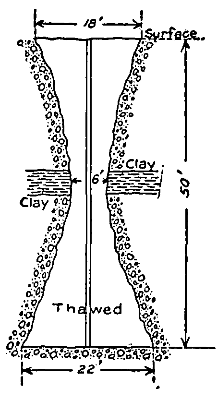

FIGURE 9.—Sketch showing results of thawing by water at stream temperature.

Sufficient work was not done nor were sufficient quantitative data collected to warrant any extensive conclusions, but the experiments are interesting in that they demonstrate the ability of cold water to thaw frozen ground and to thaw effectively on bedrock. Otherwise stated, they demonstrate the efficiency of a heat unit which is near the freezing point and available by natural processes. The moderate efficiency of hot water and boiler steam and the high efficiency of superheated steam are equally shown. Any preference for thawing by cold water rather than by superheated steam must of course rest on grounds of economy.

During the season of 1918 the cold-water method just outlined was used with some important modifications and under different conditions in several operations.

Pierce & Johnson, in the Candle district, drilled a 6-inch hole in 24 feet of muck (no gravel) and introduced water by a $\frac{3}{4}$-inch pipe under a head of 15 feet (6 pounds pressure). The water entered the ground at 42° F. and left at 32° to 34° F. The time of thaw was seven days, and the diameter of the thawed area 8 feet. Steam had been tried under the conditions prevailing here and was not satisfactory. Water did the work well.

The same company used cold water in thawing creek gravels preparatory to dredging. The ground thawed was 12 or 13 feet deep and consisted of 4 to 5 feet of clay and muck, 4 to 5 feet of gravel, and 3 feet of soft blue-clay bedrock. A battery of forty $\frac{3}{4}$-inch points was used, the points spaced in squares 5 feet apart. It was found by trial that 5-foot spacing required 48 hours to thaw, and that the thaw was perfect, whereas 10-foot spacing required 96 hours to thaw, and horsts of unthawed material were left on bedrock. The water entered the ground at 42° F. and came from the thaw at 38° to 39° F. Water under a head of 24 feet (10.4 pounds pressure) was used. The thawing took place first and was widest on bedrock. Shrinkage of as much as 3 feet was observed and was confined almost entirely to the muck. It is estimated that 60 miner's inches of water was used to run the 40 points continuously. Three men were employed, two on the day and one on the night shift. A 50-horsepower engine was used to pump water to a reservoir 24 feet above creek level and was run three hours in each eight. In this operation holes were not drilled. The points were set with water and required only an occasional twist with a Stilson to force them to bedrock as thawing progressed.

Some of the questions still to be answered that will probably influence the successful working of the process are, What quantity of water and what water pressure will give best results—that is, thorough thaw in the least time, in deep or shallow gravels, in the presence of sand, clay, muck, etc.? Is a heat unit just above freezing as efficient as one 5° above freezing? If so, the least possible pressure to insure circulation should be used; if not, the pressure should be increased to insure removal of the water before it is lowered to an inefficient temperature. What is the relation of rate of thawing to character of ground and depth of gravel? From the case illustrated in figure 9 clay would seem to require special consideration. Will increase in pressure or increase in time be more efficient in thawing such impervious strata? What is the most efficient spacing for various depths of gravel? In deep gravels the dead work necessary in handling and connecting pipe will probably justify fewer holes and longer operating time to each thaw than will be found efficient in shallow gravels. Will a staggered arrangement of holes give more satisfactory results than uniform spacing?

It is possible that the method may not be applicable under all conditions. Depth of ground, character of ground, availability of water, and slowness of thaw may be factors that will limit its use. It has been suggested that in the Nome region the depth of the gravel will so retard the thawing that this method will be impracticable for dredging operations. Also that where water must be pumped the cost will prohibit the use of the method. No quantitative data is available that will prove or disprove these assertions, and opposite views are held by equally competent men. Even though there are limitations to its application, the method will undoubtedly be useful in thawing shallow ground where water is easily available, and that is putting the maximum restriction upon its use. Should it prove applicable to the deep gravels of the Nome coastal plain, it will be the means of opening a large area of dredgeable ground, much of which would not afford the expense of thawing by other methods.

Concerning this point the season of 1919 should furnish additional data, as preparations are now under way to use the process on Dry Creek in conjunction with dredging operations.

Sufficient data are not available to make any general prediction concerning the time required in thawing under various conditions, but the information at hand is summarized below.

In the experimental work on the deep Nome gravels the volume actually thawed amounted to about 50 cubic yards a day for one point using a pressure of about 30 pounds and water at 52° F. The test on muck in the Candle district shows a volume of about 6 cubic yards thawed per point per day, where the water pressure was about 6 pounds, the water temperature 42° F., and the depth of ground 24 feet. The creek gravels thawed at the same locality were 13 feet deep. Water at a pressure of about 10 pounds and a temperature of 42° F. was used, and the rate of thaw is calculated at 6 cubic yards per point per day.

From these figures the rate of thaw in deep gravel would seem to be favorable rather than unfavorable, 20 points being required to supply 1,000 cubic yards of thawed ground a day, as compared with 160 points required to supply a like amount of shallow creek gravel or muck.

The cost of thawing gravels by steam is as follows: The Northern Light Dredge Co. in 1911 thawed 9-foot gravels at a cost of 35 cents a cubic yard, using ten 10-foot points spaced 7 feet apart for 6 to 7 hours. The Esquimo Dredge Co. thawed 12-foot gravels, using 90 points 4 feet apart for 24 hours, at a cost of 7½ cents a cubic yard. If much sand was present in the gravel the cost was 9 cents a cubic yard. Scott & Newburg thawed in the spring of 1918 for 8 days at a cost of 12 cents a cubic yard.

LODE MINING.

Little work was done on the lodes of Seward Peninsula in 1918. The usual prospecting was almost entirely discontinued, owing in part to the fact that assessment work was not required and in part to the increased cost of such work.

About 20 men under the direction of F. Fearing were engaged in making an examination of the Lost River tin lodes for J. Halpin. The Cassiterite Creek placers were also tested. A force of seven men will be employed in retimbering the workings during the winter. No production was attempted.

Perkypile & Ford propose to do considerable work on a silver-lead lode on Kugruk River, a quarter of a mile east of the mouth of Independence Creek. Six men were employed during the summer under the direction of Edwin Elge. The force was increased to 10 men in the fall, and it is the intention to work 20 men during the winter. A 30-foot shaft has been sunk on the ore body, and a 40-foot tunnel driven. The operators propose to continue the shaft to a depth of 200 feet and to crosscut the ore body. Mr. Ford states that assay returns from an average sample show 150 ounces of silver and $2.45 in gold to the ton, 30 per cent of lead and a trace of zinc. The locality was not visited by the writer, but the deposit is said to occur in marmarized limestone along a limestone-granite contact, to be from 7 to more than 12 feet wide where opened, and to be traceable for 2,000 feet on the surface. (See fig. 10.) About 50 tons of ore is

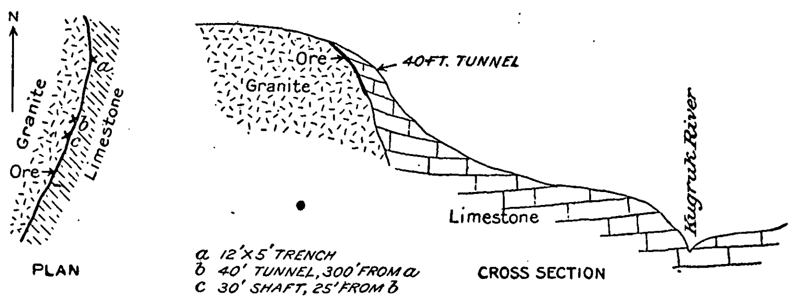

FIGURE 10.—Sketch showing prospect on Kugruk River a quarter of a mile east of the mouth of Independence Creek.

ready for shipment. The ore must be hauled about 50 miles to Willow Bay and lightered to ships.

Hed & Strand report further development on their antimony-gold property on Dahl Gulch, described by Mertie.[1] Another ore shoot has been encountered since Mertie's visit. The ore is reported to carry $15.50 in gold and 2 ounces of silver to the ton. Further work will be done on the lode during the winter of 1918.

TIN.

The total production of tin in this region was much less than in 1917. Only one tin dredge on Buck Creek, in the York district, operated in 1918. A small amount of tin concentrates was also produced by sluicing. Placer tin has been discovered on Potato Creek, which flows northwest from Potato Mountain, and also on Humboldt Creek, tributary to Goodhope River in the Fairhaven district.

The ground on Potato Creek was prospected in 1918, and it is planned to dredge the creek in the near future. The placers of the Potato Mountain region have supplied practically all the tin produced in the district, but operations have thus far been confined to the streams southeast of the mountain.

[1] Mertie, J. B., jr., Lode mining and prospecting on Seward Peninsula: U. S. Geol. Survey Bull. 662, pp. 437–438, 1918.

Concentrates from Humboldt Creek, a tributary of Good Hope River, in the Fairhaven district, contain cassiterite, the oxide of tin. According to information given by J. Sullivan the placers are of considerable extent but not of high grade. Gold, however, is said to occur with the tin and may make it profitable to mine. Whether of great value of not, the development of placer tin in this region is new.

TUNGSTEN.

The production of tungsten on Seward Peninsula in 1918 was less than in 1917. It was wholly incident to the mining of placer gold, no operations being conducted for the recovery of scheelite alone.

PLATINUM.

About 56 ounces of platinum was recovered from the gold placers of Seward Peninsula. Most of this came from Dime Creek, in the Koyuk district, but a small amount was obtained from Bear Creek, in the Fairhaven district.

COAL.

Coal was mined in a small way in several localities in northwestern Alaska during the summer of 1918.

In the Kobuk region about 150 tons was produced from a mine on Kobuk River about 25 miles above Squirrel River. It is reported to be a bituminous coal of good quality and to have sold in Kotzebue for $17 a ton.

It is estimated that during the summer about 100 tons of coal was shipped to Nome from Unalaklik and probably twice that amount to St. Michael. It sold in Nome for $20 a ton. The deposit is on Coal Mine Creek where it empties into Norton Sound. The bed is reported to cover an area of about 10 miles and to be as much as 6 feet thick. No real development work has been done, and only the weathered outcropping coal has reached the market. The coal is a free-burning lignite, and is valued by local consumers as equivalent to one-half its weight of outside coal. It is easily accessible by coast boat and can readily be marketed along the coast.

It was reported that coal would be mined in the winter of 1918–19 on Kugruk River to supply fuel for the underground placers on the Inmachuk.

OIL PROSPECTING.

Samuel Kean employed four men in drilling for oil at Cape Nome. An attempt to locate oil at this place was made in 1906, but no work had been done since that time. In 1906 it was reported that at a depth of 122 feet gas was encountered which blew a 1,200-pound stem 75 feet up the hole. A second hole, 176 feet deep, drilled in 1906, is said to have shown a trace of oil. During the summer of 1918 two wells were drilled. The first well was abandoned at 210 feet owing to the loss of a bailer in the hole; the second had reached a depth of about 150 feet at the end of the season. The company is equipped with a star drill, which is not capable of drilling to any great depth. It is believed that any gas which may have been encountered was derived from the alluvial deposits.

The hopes of the operators are based upon the gas and oil indications encountered in 1906; upon oil-like films of unknown composition which occur on the lagoons in the neighborhood; and upon a beach foam which is brought in by the on-shore winds and which is suspected of being paraffin.

The hard rocks of the locality are granite and schist. Rocks of this kind do not contain oil or gas.

FREIGHT RATES IN SEWARD PENINSULA.

The high cost of transportation to and from points on Seward Peninsula is a large factor in the cost of production. Freight charges on supplies delivered to camps in the several districts are shown in the attached table. Most operators maintain that any extensive work will be impracticable until steamship rates are reduced.

Freight cost to certain localities on Seward Peninsula, season of 1918.

District.	Locality.	Rate per ton.	
		By stages.	Total.
Budd Creek	Port Clarence	Seattle to Teller $22.50, Teller via lighter to mouth of Agiapuk $12.50, up Agiapuk 50 miles via flatboat $10.	$45.00
Macklin Creek	Kougarok	Seattle to Nome $27, Nome to Teller $17, Teller to Davidson Landing $12.50, overland haul $16.	72.50
Taylor Creek	do	Seattle to Teller $22.50, Teller to Davidson Landing $12.50, overland haul to Taylor $40.	75.00
Ophir Creek	Council	San Francisco to Golovin $21, lighterage to Council $35, overland haul $10.	66.00
Do	do	Seattle to Golovin $20, lighterage to Council $35, overland haul $8.	63.00
Big Hurrah Creek	Solomon	San Francisco to camp	52.00
Shovel Creek	do	Seattle to Bonanza $29, overland haul $10	39.00
Glacier Creek	Nome	Seattle to Nome $27, overland haul $15	42.00
Bangor Creek	do	Seattle to Nome $27, overland haul $25	52.00

KOBUK REGION.

The production of placer gold in the Kobuk region in 1918 is estimated at $15,000. About 35 men were engaged in mining operations. The gravels are of low grade and to the small operator offer a grubstake only.

Favorable prospects were found on California Creek, a tributary of the Kogoluktuk, by Fergeson & Melson during the summer. This is a new strike on both creek and bench pay. The creek gravels seem to be permanently frozen, an unusual condition on the Kobuk, and are about 18 feet thick to bedrock. Extensive preparations were being made for winter work.

In the Squirrel River country about 30 men took out grubstakes only. Several localities in the region are now being prospected by the drill with a view to dredging.

INDEX.

RECENT SURVEY PUBLICATIONS ON ALASKA.

[Arranged geographically. A complete list can be had on application.]

All these publications can be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they can be obtained free of charge (except certain maps) on application.
2. A certain number are delivered to Senators and Representatives in Congress for distribution.
3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they can be had at prices slightly above cost. The publications marked with an asterisk (*) in this list are out of stock at the Survey, but can be purchased from the Superintendent of Documents at the prices stated.
4. Copies of all Government publications are furnished to the principal public libraries throughout the United States, where they can be consulted by those interested.

The maps whose price is stated are sold by the Geological Survey and not by the Superintendent of Documents. On an order amounting to $5 or more at the retail price a discount of 40 per cent is allowed.

GENERAL.

REPORTS.

*The geography and geology of Alaska, a summary of existing knowledge, by A. H. Brooks, with a section on climate, by Cleveland Abbe, jr., and a topographic map and description thereof, by R. U. Goode. Professional Paper 45, 1906, 327 pp. No copies available. May be consulted at many public libraries.

*Placer mining in Alaska in 1904, by A. H. Brooks. In Bulletin 259, 1905, pp. 18–31. 15 cents.

The mining industry in 1905, by A. H. Brooks. In Bulletin 284, 1906, pp. 4–9.

*The mining industry in 1906, by A. H. Brooks. In Bulletin 314, 1907, pp. 19–39. 30 cents.

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