

Annual Report
OF THE
Mine Inspector
TO THE
Governor of Alaska



1923

BY

B. D. STEWART, Mine Inspector.

ACCOMPANIED BY A SPECIAL ARTICLE BY NORMAN L.
WIMMLER, PLACER MINING ENGINEER, U. S.
BUREAU OF MINES

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LETTER OF TRANSMITTAL.

Juneau, Alaska,
September 1, 1924.

Honorable Scott C. Bone,
Governor of Alaska,
Juneau, Alaska.

Sir:—

I have the honor to submit herewith the annual report of the Mine Inspector for the calendar year 1923, which has been prepared in accordance with the provisions of Section 6, Chapter 51, Session Laws of Alaska for 1917.

Respetfully,

B. D. STEWART,
Mine Inspector.

INTRODUCTION.

Since July 1, 1922, the inspection of metalliferous mines in Alaska has been assigned to the Bureau of Mines, Department of the Interior.

All coal mines at present operated in the Territory are on public lands under leases and permits and their operations are therefore governed by regulations prepared by the Department of the Interior under the Coal Leasing Act of October 20, 1914, the enforcement of which regulations also devolves upon the Bureau of Mines.

The responsibility for the inspection of both metalliferous and coal mines is placed upon the Supervising Mining Engineer for Alaska in his capacity as U. S. Inspector of Mines.

The expense of metal mine inspection is shared by the Territory under the co-operative agreement ratified by the Alaska Legislature in 1923. The duties assumed by the Bureau of Mines in connection with metal mine inspection in Alaska are set forth in Chapter 51, Session Laws of Alaska for 1917, and include, besides the protection of the lives and health of miners, the preparation of an annual published report to the Governor, covering the results of inspection and the collection of data relative to accidents, labor, production and development in the mining industry. Although adequate personnel has been provided for coal mine inspection during the past year, the performance of the work called for by the Territorial Act covering metal mine inspection has been handicapped by lack of personnel. This situation will be corrected during the coming year through a general reorganization of the work of the Bureau of Mines in Alaska that has been authorized.

The essential facts determined with regard to accidents, labor and production in the mines of Alaska, and details as to mining development work accomplished during the calendar year 1923 are set forth in the following report.

GENERAL STATEMENT AS TO MINING CONDITIONS.

During the year 1923 there were in operation in Alaska 30 lode mines, 10 coal mines, 28 gold dredges, 480 (a) placer mines of various types, 2 marble quarries, and numerous prospects and non-productive lode and coal properties under development. There were engaged in the mining industry between 5,000 and 6,000 men. Development work and prospecting done within the year compare favorably in extent with that done in any other year within the past decade.

The outlook for the immediate future is most encouraging. This statement is based upon the proven stability of the copper mining industry of the Territory; the substantial progress made in the successful mining of the low grade gold ores of Southeastern Alaska; the rapid growth of placer dredging in various sections of the Territory; the steadily increasing development of coal lands by private interests; the increasing number of prospectors out in search for minerals of all kinds; and the substantial improvements that are being made in transportation facilities with a consequent reduction in mining costs.

The value of the total mineral production of the Territory for the year was about \$1,300,000 in excess of that for 1922. It was within one and one-half million dollars of the average production for the twenty preceding years, which include all those years within which "flush" production from bonanza operations in the Territory has been recorded.

In spite of the comparatively low market price for the metal that prevailed, the value of the output of copper in 1923 represents 64 percent of that of the total mineral production for the year and is therefore more than twice that of the gold output, which represents but about 28 percent of the total.

Silver and coal rank next to gold in importance, as gauged by the value of the year's output, the value of silver produced representing a little over three percent and that of coal a little under three percent of the total mineral production.

Besides the above minerals, there was produced a small amount of lead and some petroleum, marble and gypsum. The combined value of these minerals, however, represents less than three percent of the total.

The value of Alaska's mineral production to date has now reached the amount of \$518,900,000, of which the value of gold produced was 66 percent and that of copper 31 percent. Other minerals that have been produced, whose combined value represents the remaining 3 percent, includes silver, lead, tin, antimony, platinum, palladium, quicksilver, coal, marble, gypsum and petroleum.

(a)—Advance Statement by U. S. Geological Survey, Jan. 1, 1924.

Mine Production and Development.

REVIEW BY MINERALS.

COPPER.

The tonnage of copper ore mined in Alaska during 1923 was the largest within the history of the industry and amounted to 728,402 tons.

From this ore there was extracted approximately 91,000,000 pounds of copper having a value estimated at \$13,303,000.00. The amount of copper recovered in 1923 has been exceeded in only one previous year (1916) although the value of the output has been greater in four previous years owing to the higher prices for the metal then prevailing.

Production of copper ore was confined almost entirely to the Kennecott group of mines in the Nizina district of the Copper River Basin and the Beatson mine of the same company on Latouche Island, although small lots were shipped from the Green Butte property near Kennecott and from the Rush and Brown mine on Prince of Wales Island. The latter mine was closed down indefinitely in July, 1923.

The amount of underground development work done during 1923 in connection with exposing new ore bodies and increasing the output of copper ores exceeded that done in 1922 by 45 percent.

GOLD.

Lode Gold.

The outstanding feature with regard to lode-gold mining in Alaska during the year was the continued success attending the mining and the treatment of low-grade gold ores of the Juneau district. In these operations a substantial gain was recorded in the tonnage produced, in the value of the output, and in the recovery effected. These facts are of great importance to the industry and knowledge of them has resulted in a revival of interest in the Juneau gold belt, which has received little attention from prospectors and prospective investors for a period of several years.

Production of gold from high-grade ores was adversely affected by the temporary closing down in July of the Chichagoff mine, which in 1921 occupied first place as to value of output among the lode-gold mines of Alaska. Toward the close of the year operations were resumed at this mine, which is now under new ownership, and the crew has been gradually increased until it is again equal in number to the average formerly employed.

The output from all lode-gold mines for 1923, which were 20 in number, amounted in value to about \$2,306,000, which amount is 26½ percent below that produced in 1922.

The amount of underground development work designed to expose new ore bodies and increase the tonnage output of gold ores, was greater by about 15 percent in 1923 than in 1922.

There was a gratifying increase in the amount of prospecting being done for gold lodes. The areas receiving particular attention were the Texas Creek section of the Hyder district and Admiralty and Chichagof Islands, in Southeastern Alaska; the Nuka Bay, Moose Pass and Hope districts on Kenai Peninsula and the Willow Creek, Bonnefield and Fairbanks districts in the Interior.

Placer Gold.

The placer mining season of 1923 was characterized by a severe shortage of water due to the occurrence of the hottest and driest weather yet recorded in the history of the industry. The natural result of this condition was a diminished production for the year.

A detailed review of placer mining development in Alaska in 1923, prepared by N. L. Wimmeler, placer mining engineer for the Bureau of Mines, appears elsewhere in this report.

SILVER-LEAD.

Practically the entire output of silver and lead recorded for the past year was in the form of a by-product from the treatment of ores mined primarily for the gold or copper content.

Development work on silver-lead properties proceeded during the year in the Hyder district and in the Copper Mountain section of the Kantishna district. The work done in the Hyder district was quite extensive and will result in the erection of a small mill at one property that will be in operation during 1924.

Much notice has been attracted to a lode discovered on Portage Creek in the Chulitna River region, adjacent to the Alaska Railroad, that contains ore bearing high values in ruby silver. This lode has not been sufficiently developed to determine its probable extent and importance.

Very little work was done in the Kantishna region, which is badly handicapped by its remoteness and lack of transportation facilities.

OTHER METALS

No production was reported of platinum, tin or antimony during 1923, nor was any development work done on properties bearing these metals.

One of the most interesting and potentially important developments of the past year is the result of prospecting for nickel-bearing ores. Additional bodies of nickeliferous pyrrhotite were located at Surge Bay on Yakobi Island and new discoveries were also reported near Tenakee, on Chichagof Island, and at Snipe Bay, near the southerly end of Baranof Island. Only a meagre amount of underground de-

velopment work has thus far been done on the known nickel deposits of Southeastern Alaska but the extent and nature of surface outcrops exposed undoubtedly warrant further investigation of the underlying deposits.

COAL

A very marked increase in the tonnage of coal produced in Alaska took place in 1923. The output for the year was 119,076 short tons, which is 41 percent in excess of that for the previous year and 56 percent greater than the production for 1921.

Eighty-five percent of the output for 1923 was from privately operated mines, the remainder being from Government reserves. Government coal mining operations ceased entirely September 30, 1923.

Of the coal produced during the year the Matanuska field supplied 69 per cent and the Nenana field supplied 29.6 percent. The remaining small tonnage came from the Broad Pass and Cook Inlet fields.

The most extensive development work on new coal properties took place in the Moose Creek section of the Matanuska field.

This development work followed as a direct result of the completion in October, 1923, of a narrow-gauge railway spur from Moose Creek station on the Matanuska branch of the Alaska Railroad to the Baxter mine, a distance of approximately five miles.

The results of the work accomplished along Moose Creek have conclusively demonstrated that this section contains extensive beds of sub-bituminous coal of superior quality and of favorable widths for cheap mining. There is also quite conclusive evidence that these coal beds are structurally less disturbed than those of other sections of the Matanuska field hitherto explored.

On December 31, 1923, there had been segregated from the public domain in Alaska 64,254 acres of coal lands, of which 84 percent is privately held under leases and permits and 16 percent is retained by the Government as reserves.

PETROLEUM

Drilling for oil proceeded steadily throughout the year on Pearl Creek Dome in the west field of the Cold Bay region. These operations were conducted by the Standard Oil Company and the Associated Oil Company respectively. The latter company, however, suspended operations in June, 1923, and their rigs were idle during the remainder of the year.

Normal production continued to be made from the Katalla field.

Additional surface examinations were made of oil properties in the Yakataga field, which is on the Gulf of Alaska, east of Cape St. Elias, but no drilling was done.

Extensive topographic and geological surveys have been made recently by the U. S. Geological Survey in the petroleum fields of the Alaska Peninsula. The results of these surveys have been published by the Geological Survey in Bulletin 755-D, entitled, "The Cold Bay—Chignik District, Alaska," by W. R. Smith and A. A. Baker.

LABOR.

It is estimated that the mining industry in Alaska employed a total of 5,120 men in 1923 distributed as follows:

	No. Men
Placer Mining (including dredging)	2,500
Lode Mining (including quarries)	1,980
Coal Mining	270
Prospectors	350
Total number men employed	5,100

The amount of wages paid in the various branches of the industry in 1923 is estimated as follows:

Lode Mining	\$3,025,000.00
as under:—	
Copper Mining	\$1,700,000.00
Gold Mining	1,325,000.00
Placer Mining,—(estimated on the basis of 2,500 men employed 150 days at an average wage of \$7.00 per day)	2,625,000.00
Coal Mining	530,000.00
Miscellaneous Mines (including gypsum mines, marble quarries and petroleum operations)	200,000.00
TOTAL	\$6,380,000.00

Wage scales throughout remained on the same basis as in 1922.

The wage scales in effect at the larger lode mines in 1923 ranged as follows:

FOR AN EIGHT HOUR SHIFT	FROM	TO
Machine drillmen	\$4.60	\$5.50
Machine helpers	4.00	5.00
Muckers	4.10	5.00
Timber men	5.00	6.00
Timber men's helpers	4.10	4.75
Trackmen	4.50	5.25
Pipemen	5.00	5.50
Carpenters	5.50	7.00
Carpenter's helpers	4.00	5.00
Blacksmiths	5.75	7.00
Blacksmiths' helpers	4.00	5.50
Holting engineers	4.00	5.75
Cagers	4.35	5.25
Laborers	3.50	5.00

No labor disturbances were reported in 1923.

On the whole conditions affecting labor were well balanced. With the exception of skilled miners all classes of labor were obtainable in sufficient numbers to meet the demands of the mining industry and there was no unemployment. The wages paid were also well adjusted to the cost of living.

NATIONALITY OF EMPLOYEES IN MINING INDUSTRY.

COPPER MINES			GOLD MINES		
Nationality	Number Employed	Per cent of Total	Nationality	Number Employed	Per cent of Total
American	367	37.9	American	255	38.9
Swedish	90	9.2	Native (Indian)	88	13.4
Norwegian	66	6.8	Finn	46	7.6
Greek	49	5.0	Swedish	32	4.8
Finn	36	3.7	Austrian	25	3.8
Russian	34	3.5	Norwegian	23	3.5
Japanese	34	3.5	Serbian	23	3.5
Holland	32	3.3	Filipino	23	3.5
German	31	3.2	Scotch	20	3.0
Austrian	30	3.0	Italian	19	2.9
Italian	24	2.4	Canadian	19	2.9
English	24	2.4	Russian	14	2.1
Serbian	23	2.3	English	11	1.6
Irish	23	2.3	German	11	1.6
Danish	22	2.2	Greek	10	1.5
Scotch	13	1.3	Irish	6	0.9
Montenegrin	13	1.3	Montenegrin	6	0.9
Native (Indian)	10	1.0	Danish	5	0.7
Polish	7	0.7	Belgian	5	0.7
Lithuanian	7	0.7	Bulgarian	4	0.6
Canadian	6	0.6	Mexican	3	0.4
Mexican	6	0.6	French	2	0.3
French	4	0.4	Australian	1	0.1
Swiss	4	0.4	Roumanian	1	0.1
Spanish	4	0.4	Swiss	1	0.1
Belgian	4	0.4	Croatian	1	0.1
Australian	3	0.3	Hawaiian	1	0.1
Bulgarian	2	0.2			
	968			655	

NOTE:—The foregoing table shows the number of each nationality employed as wage earners in the mining industry, and the ratio that this number bears to the total number of employees during 1923. Attention is called to the fact that not all the operators furnished this information, so that the total employed will not correspond with the other tables. However, a sufficient number reported the nationality of their employees that it is felt that the table is representative of the industry as a whole.

PLACER MINING IN ALASKA IN 1923.

BY

NORMAN L. WIMMLER

PLACER MINING ENGINEER, U. S. BUREAU OF MINES.

Introduction:

The field work conducted by the writer during the season of 1923 included visits to the Iditarod and Innoko districts, Candle and Moore Creeks in the Mt. McKinley or upper Kuskokwim district, and the Fairbanks, Yentna, Nizina and Girdwood districts. The districts were visited in the order given. Long delays on the Yukon River caused a loss of much valuable time, especially in returning from Iditarod to Nenana, at which time one of the scheduled trips of the boats was cancelled and 22 days were required to make the trip. Circle district was on the 1923 itinerary and while a start by aeroplane from Fairbanks to that district was made, the trip could not be completed on account of the dense smoke from forest fires. The Hope and Sunrise districts on Cooks Inlet were also to have been visited, but most of the placer properties had suspended operations before these districts could be reached.

A bulletin on placer mining methods and costs in Alaska is now in preparation, but to give early publication to a review of placer mining operations and developments in Alaska during 1923, this report has been written and is the second of a series of such annual reports. As there are more than 50 different placer mining centers in Alaska, widely scattered over a vast territory, it is only possible to visit a small number each season. The information given on districts not visited has been obtained principally from operators and others interested in those districts.

The writer wishes to extend his thanks to the many Alaskans who have so kindly assisted him with information and for the many courtesies shown him in the field, and regrets that individual acknowledgment can not be made here. Special acknowledgment is made to the U. S. Geological Survey for advance statistics on placer gold production; to Dr. A. H. Brooks and S. R. Capps of the U. S. Geological Survey; B. D. Stewart and Jno. A. Davis of the U. S. Bureau of Mines; and to the following for information given on those districts not visited: Chas. Milot, E. J. Matthews, G. Russell, J. J. Cole and R. W. J. Reed of Nome; C. E. Jones and Joe Notti of Ruby; Jno. Kruger of Tolstoi; M. Frank of Hot Springs; Prof. E. N. Patty, Prof. E. R. Pilgrim, and G. N. Kyle; J. R. Parkin of Circle; J. B. Powers and J. E. Scheele of Eagle; A. M. Taylor and E. Briggan of Chisana; N. O. Anderson of Sunrise, and the officers of Alaskan dredging companies with offices in San Francisco, Cal.

Production.

From 1880 to 1923, inclusive, or in 44 years, Alaska has produced from its mines \$341,677,000 worth of gold and over \$9,000,000 worth of alloyed silver. Of this amount, \$234,070,000 in gold, and more than \$1,110,000 in alloyed silver, is credited to the placer mines. More than \$200,000,000 worth of this placer gold has been mined since 1900.

According to the advance statement issued by the U. S. Geological Survey the placer gold production for Alaska for 1923 was about \$3,560,000 or \$800,000 less than for 1922. This decrease was caused mainly by the unusually prolonged dry spell which greatly handicapped operations. The following table (1) gives the number of placer mines operated, number of men engaged, and the placer gold production for the years 1922 and 1923. The statistics for 1922 are complete, while those for 1923 may be somewhat increased when the final reports are received.

GOLD PLACER MINING IN ALASKA, 1922-23.

Region—	MINES			MEN			Value of gold output	
	1922	1923	1922 1923	1922	1923	1922 1923	1922	1923
Copper River	8	7	5	91	80	18	\$ 165,000	\$ 150,000
Cook Inlet-Susitna	36	50	1	174	100	2	293,000	230,000
Yukon Basin	321	250	99	1254	940	321	2,119,000	1,650,000
Kuskokwim Basin	30	23	6	137	120	12	542,000	330,000
Seward Peninsula and misc. districts	112	80	15	542	450	61	1,276,000	1,200,000
Totals	507	410	120	2198	1690	402	\$4,395,000	\$3,560,000

Placer Mining in 1923:

Climatic conditions throughout Alaska were the extreme opposite to those of the previous year. The season of 1923 was one of the hottest and driest in the history of the industry. A serious shortage of water for mining began the latter part of June, and while there were several rains during the summer, they were not sufficient to relieve the situation. This general drought continued until well into September. The season has been an adverse one for most of the operations, except dredging. Many of the mines are operated on a very small margin of profit, and in many cases expenses could not be met. Many of the operators, expecting early relief from the drought retained their crews for a while, but were ultimately obliged to release them and shut down for the season. Others attempted to carry on by impounding water and using it for short intermittent periods. Under such conditions the cost of mining was exceptionally high.

In 1923, 28 gold dredges were operated in Alaska—five more than in 1922. There were 19 dredges operated on the Seward Peninsula; 2 each in the Iditarod, Innoko and Fairbanks districts, and 1 each in the Mt. McKinley, Circle and Yentna districts. In 1922, there were 23 dredges operated, producing gold to the value of \$1,767,750, or about 40% of the total placer gold production for that year.

(1)—Mining in Alaska in 1923. Advance statement, U. S. Geological Survey.

Table 1 contains data on the Alaskan dredges. Those operated in 1923 are so indicated in the table. Of the 28 dredges operated in 1923, four on the Seward Peninsula were operated for only a short period, and made but a small production.

The U. S. Geological Survey reports that 24 of the dredges which were operated produced \$1,870,000 worth of gold, or about 50 per cent of the placer gold output.

In general, the 1923 season was a successful one for dredging, although the hydro-electrically operated dredges were handicapped by inadequate power, and several of the other dredges had to suspend operations for part of the season, due to shortage of water for the sluices and for flotation.

The most important event in dredging during the year was the starting of the two 9-cubic-foot electric dredges of the Hammon Consolidated Goldfields Co. at Nome. This Company is now overhauling the 8-cubic-foot electric dredge formerly operated on Wonder Creek by the Alaska Mines Co., and will place it in operation at the beginning of the 1924 season. Another dredge similar in type and size to the two new dredges is to be constructed in 1924, and the Diesel power plant will be enlarged.

Five dredges on Seward Peninsula which have been idle for a year or more resumed operations during the season, one at a new location. Two others are being moved to new locations on the Peninsula, and should be operating in 1924. The Innoko district will have one new dredge, and possibly two, operating in 1924. However, several of the dredges on Seward Peninsula and one in the Interior, which were operated during 1923, will be idle in 1924. While plans are being considered for new dredging projects in different parts of Alaska, they have not advanced as yet to a stage where they can be definitely announced.

The successful thawing of frozen gravels with water under natural temperature has proven to be one of the greatest factors in enlarging the possible field for dredging in the Territory. More ground was thawed in Alaska in 1923 by this method than during any previous year. At Nome, holes are being drilled during the winter in which the points will be set in the spring, thus making a great saving in time and water over the usual method. While the supply of available water during a portion of the season of 1923 was in practically all cases inadequate for operating the thawing plants to full capacity, the temperature of the water was exceptionally high and thawing was comparatively rapid.

Hydraulic mining suffered most from the prolonged dry spell, although the operations in the Nizina, Chistochina, Girdwood, and similarly located districts receiving their water supply from glacier-fed streams, had an abundance of water and experienced one of their best seasons. Operations in the Interior were hit unusually hard through lack of water, for in many cases there was not sufficient water for even intermittent use. Many of the Seward Peninsula hydraulics

ALASKAN GOLD DREDGES, 19

	Name	Location	Type	Size of Buckets cu. ft.	H.P. and Make of Engines	Fuel Kind
SEWARD PENINSULA						
1(a)	Alaska Kourgarok Co.	Taylor Cr.	Stacker	2½ (b)	1-50; 1-20; Standard	Distillate
2(a)	Alaska Dredging Assn.	Candle Cr.	Flume	1¾ (l)	1-50; Western	Distillate
3(b)	Arctic Cr. Dredge	Arctic Cr.	Flume	2½ (l)	1-60	Distillate
4(a)	Bangor Cr. Dredging Co.	Anvil Cr.	Stacker	3½ (m)	1-60; 1-80; Bolinder S-diesel	Diesel oil
5(a)	Bering Dredging Corp.	Kougarok R.	(g)	2½ (m)	2-50; Western	Distillate
6(a)	Candle Cr. Dredging Co.	Candle Cr.	Flume	3½ (m)	2-50; Western	Distillate
7(b)(d)	Casadelega Mg. Synd.	Canyon Cr.	Flume	2½ (l)	1-60; Western	Distillate
8(a)	Center Cr. Dredging Co.	Snake R.	Stacker	3½ (m)	1-80; 1-24; 1-8; Metz & Weiss	Diesel oil
9(b)	Crooked Cr. Dredge	Crooked Cr.	Flume	2½ (l)	1-25; 1-40; Western	Distillate
10(a)	Dexter Cr. Dredging Co.	Dexter Cr.	Stacker	2¾ (l)	1-35; Western; 1-50; Standard	Distillate
11(a)	Dime Cr. Dredging Co.	Dime Cr.	Flume	1¾ (l)	1-20; Western	Distillate
12(a)	Eldorado Dev. Co.	Osborne Cr.	Stacker	2¾ (l)	1-30; 1-50; Standard	Distillate
13(a)	Eskimo Gold Mg. Co.	Solomon R.	Stacker(h)	5 (m)	1-200 H. P. Dow Willans	Diesel Elec
14(b)	Fries Dredge	Inmachuk R.	Flume	2 (l)	1-50; Standard	Distillate
15(b)(f)	Glacier Cr. Dredge	Glacier Cr.	(g)	2 (l)	1-60; Scandia semi-diesel	Diesel oil
16(a)	Hammon Cons. Goldfids. No. 1	Little Cr.	Stacker	9 (m)	592 H.P. Electric	Diesel Elec
17(a)	Hammon Cons. Goldfids. No. 2	Little Cr.	Stacker	9 (m)	592 H.P. Electric	Diesel Elec
18(b)(c)	Hammon Cons. Goldfids.	Wonder Cr.	Stacker	8		Diesel Elec
19(b)	Inmachuk Dredge	Inmachuk R.	Flume	3 (l)	2-50	
20(a)	Iverson-Johnson Dredge	Big Hurrah Cr.	Flume	1¾ (l)	1-20; Fairbanks-Morse	Distillate
21(a)	Luther Gold Dredging Co.	Budd Cr.	Stacker	2¾ (l)	1-30; 1-50; Standard	Distillate
22(a)	Northern Light Mg. Co.	Ophir Cr.	Flume	2½ (l)	2-35; Western	Distillate
23(a)	Shovel Cr. Dredging Co.	Shovel Cr.	Flume	2½ (m)	2-35; Scandia semi-diesels	Diesel oil
24(a)	Swanson Cr. Mg. Co.	Swanson Cr.	Flume	2 (l)	80 H.P.	Distillate
25(a)	Wild Goose M. & T. Co. No. 1	Ophir Cr.	Stacker	3½ (m)	140 H.P. electric	Hydro Elec
26(a)	Wild Goose M. & T. Co. No. 2	Ophir Cr.	Stacker(h)	3 (m)	2-50; Atlas semi-diesel	Diesel oil
27(b)	Uplift Dredge	Camp Cr.	Flume	2 (l)	1-60; Western	Distillate
YENTNA DISTRICT						
28(a)	Cache Cr. Dredging Co.	Cache Cr.	Flume(i)	6½ (m)	310 H.P. Electric	Hydro Elec
CIRCLE DISTRICT						
29(a)	Berry Dredging Co.	Mammoth Cr.	Flume(i)	3½ (m)	2-75; Wolf locomobiles	Wood
FAIRBANKS DISTRICT						
30(a)	Fairbanks Gold Dredging Co. No. 1	Fairbanks Cr.	Stacker	4 (m)	2-110; Scandia semi-diesel	Diesel oil
31(a)	Fairbanks Gold Dredging Co. No. 2	Fairbanks Cr.	Stacker	3½ (l)	2-75; Werkspoor diesel	Diesel oil
IDITAROD DISTRICT						
32(a)	Riley Inv. Co.	Otter Cr.	(g)	3½ (m)	1-120; Atlas diesel	Diesel oil
33(a)	Northern Alaska Dredging Co.	Otter Cr.	(g)	3 (m)	1-110; Atlas diesel	Diesel oil
INNOKO DISTRICT						
34(a)	Flume Dredge Co.	Yankee Cr.	Flume	2½ (l)	1-60; Western	Gasoline (c)
35(c)	Flume Dredge Co.	Little Cr.	Flume	2½ (l)	1-60; Western	
36(a)	Innoko Dredging Co.	Ganes Cr.	(j)	3½ (m)	2-75; Morris condensing	Wood
MT. MCKINLEY DISTRICT						
37(a)	Kuskokwim Dredging Co.	Candle Cr.	Stacker	3½ (m)	1-60; 1-80; Bolinder S-diesel	Diesel oil

(a) Operated, 1923.

(b) Idle, 1923

(c) Machinery on ground. To be constructed 1924.

(d) Moving to new location as given.

(e) Former Alaska Mines Co. dredge, being reconstructed.

(f) Moving to Ganes Cr. Innoko District.

(g) Combination rev. screen, one flume and conveyor.

(h) Shaking screens.

(i) Revolving screen

(j) Revolving screen

(l) Open link bucket

(m) Close connection

operations were also handicapped, although most of them had fairly successful seasons.

Steam scraper and other similar mechanical operations were conducted mainly in the Fairbanks, Hot Springs, Forty Mile, Iditarod and Koyuk districts, where moderate-priced fuel is obtainable. The number of steam-scraper plants operated was less than the year before. Most of them experienced most favorable conditions for operating. The natural thawing of the ground after stripping the overburden took place satisfactorily, and conditions for excavating the gravels were favorable, although delays in sluicing, because of low water supplies, held back the work. Two dragline excavators were operated during the season, one in the Iditarod district on Willow Creek and the other on Dome Creek in the Fairbanks district. A combination steam shovel and dragline excavator was installed and operated on Caribou Creek, a tributary of the Salchaket River, about 90 miles southeast of Fairbanks.

Drift mining showed a further decline in both the number of operations and in the amount of gold produced. Most of the drift mining now carries on consists of "sniping," or of mining the "side pay," or small isolated areas of ground left by former operators. Drift mining was conducted principally in the Fairbanks, Tolovana, Hot Springs, Ruby and Circle districts, although a small amount was also done elsewhere. Very little drift mining was done on Seward Peninsula. But little known virgin frozen ground, carrying gold in profitable quantities now remains, although a large block of such ground is now being opened up on Little Eldorado Creek in the Fairbanks district, where it is planned to use machine drills to set the steam thawing points, pneumatic picks for breaking down the gravel and scrapers for conveying the thawed gravel to the cars. Considerable wet ground remains in the vicinity of Ester Creek, which, according to reports, will soon be mined. The operations contemplated will require large pumps and heavy timbering, and in this instance should be successful. On Gold Hill, Ester Creek bench, a small-scale experimental operation in hydraulicking underground was successfully conducted.

Ground sluicing, and booming with automatic gates and shoveling-in the remaining gravels is still a popular method of mining with a comparatively large number of individual miners or those working in groups of two or three. The past season was, however, adverse for many of them. Only a small area can be mined by this method each season, and the amount of gold recovered is usually comparatively small, in most instances affording but a meager livelihood.

New Gold Discoveries.

More attention was given to the search for mining properties in 1923 than for many years past. Not only was there more prospecting in the more isolated fields, but many known properties were investigated by engineers and practical placer miners and some new developments

are under way. The prospector who has for some years been obliged to work in the known fields is again turning his attention to the search for virgin ground.

Gold was discovered at the headwaters of the Dolbatna River on Sissklaka Creek, about 5 miles north of Melozi, which is on the Yukon River. Coarse gold valued at 54 cents was obtained from one prospect shaft sunk to bedrock, and caused a small stampede from Ruby. Many other shafts were sunk during the winter 1922-1923 on this creek, Notti, Nduga and Trail Creeks, but without success. Five outfits with boilers and thawing equipment are continuing the prospecting this winter.

The discovery of coarse gold on a small dry creek, a tributary of the Buckland River in the northeastern part of Seward Peninsula, was reported to have been made by natives in the fall of 1922. Meager reports concerning this find state the ground to be from 2 to 4 feet deep, there being practically no wash gravel, the gold occurring in decomposed bedrock. A high gold content is claimed.

A reported gold find on the Toklat River, a tributary of Nenana River, caused more or less excitement during the late summer, but no indications of any extensive placers have so far been reported.

A new gold find was also made on Crooked Creek, a tributary of the Kuskokwim River; also on Nugget Creek, a tributary of Goldstream Creek in the Fairbanks district, and at numerous other localities, all of these being within known placer fields and restricted to small areas.

Transportation.

Transportation facilities, particularly along the line of the Alaska Railroad, and on the Tanana and Yukon River, as far down as Holy Cross, were considerably improved during 1923. Two river steamers were operated on weekly service by the Alaska Engineering Commission, in conjunction with the railroad from Nenana to Holy Cross, and the through freight rates from the States have been materially reduced. The present arrangement has, however, increased the freight costs to the Iditarod. A Northern Commercial Co. launch, carrying mail and passengers, was operated between Holy Cross and St. Michael. Yukon River points above Tanana were served by irregular trips of the boats operated by the White Pass Co. Freight to Rampart was usually routed via the Alaska Railroad and Nenana, while that destined to points above Rampart was usually brought in via Skagway, the White Pass Railroad and down river boats.

Freight rates to Alaskan coast ports and to Seward Peninsula from Puget Sound ports remain practically the same as those of 1922. A table covering these rates was given in the 1922 annual report. As numerous changes have been made in the joint tariffs to points on the Alaska Railroad and on the Yukon River, table 2, covering the 1923 tariffs is here given. Information concerning transportation and freight rates to and in the different districts will be given in the review by districts.

Road and trail building by the Alaska Road Commission was actively conducted on the many projects under way, the season being especially favorable for such work. The Bureau of Public Roads started construction on roads through the forest reserves for the Forestry Department in several districts in the Kenai Peninsula that will directly benefit the placer mines there.

Road construction will be further discussed in the "Review by Districts," following. The importance of the early completion of the road between Chatanika and Circle is here emphasized, as this road will open a vast area containing extensive deposits of gold-bearing gravel now too inaccessible to be properly mined.

Increased appropriations have been obtained for road building for 1924 and many of the projects now under way should soon be completed.

Successful aeroplane trips from Fairbanks to Livengood, Caribou Creek, Tanana and elsewhere were made during the year, demonstrating such transportation to be practical and most applicable to Alaskan conditions. It is planned to obtain larger planes and extend the service to more distant districts. The use of aeroplanes to facilitate travel and delivery of mails is being given serious consideration by many of the communities, and also by some of the larger isolated mining companies. Travel in Alaska in most instances means a long, hard and expensive trip, often requiring weeks of travel, which could easily be made by plane in a few hours. The awarding of air mail contracts by the Government would make possible an early development of aeroplane service in Alaska, and so help in remedying many of the delays and difficulties now so often encountered.

1923 JOINT FREIGHT TARIFFS BETWEEN SEATTLE OR THE ALASKA

	Talkeetna	Nenana	Fairbanks	Chatanika
Miles from Seattle	2256	2441	2497	2522 (a)
ARTICLE				
Coal in sacks				
C.L. Min. 20 tons, Class D.	\$ 18.00	\$ 24.40	\$ 25.20	\$ 28.60
L.C.L. Class 4	30.40	45.80	48.20	51.80
High explosives, caps, fuse, etc.				
C. L., min. 10 tons, Class 1	48.20	72.60	76.40	80.40
L.C.L. less than 6 tons, (c)	72.40	109.00	114.60	119.20
Groceries, mixed, carload lot				
Min. wt., 12 tons, class 5, (c)	27.80	41.00	41.00	47.00
L.C.L. Class 1	48.20	72.60	76.40	80.40
L.C.L. Class 4	30.40	45.80	48.20	51.80
Grain, flour in sacks				
C.L. mixed or straight Min. wt. 18 tons (c)	19.40	27.00	28.20	35.00
L.C.L. class 4	30.40	45.80	48.80	51.80
Hardware.—iron or steel				
C.L. min. wt. 15 tons Class 3	34.60	52.80	55.60	59.20
L.C.L. Class 2	40.00	60.80	64.00	67.80
Hay—in bales, 22 lbs. to cu. ft.				
C.L. Min. wt. 12 tons (c)	21.40	26.20	27.00	30.20
L.C.L. Class 3	34.60	52.80	55.60	59.20
Lumber, common				
C.L. min. wt. 20 tons (c)	15.80	20.60	21.20	24.60
L.C.L. Class 4	30.40	45.80	48.20	51.80
Mining Machinery, any quantity (c)				
Single pieces not over 4000 pounds (d)	22.00	28.00	30.00	33.00
Oils, explosive, fuel, in drums, cases				
C.L. min. wt. 13 tons Class 5	27.80	41.00	41.00	47.00
L.C.L. Class 3	34.60	52.80	55.60	59.20
RETURN FREIGHT				
Used empty oil drums				
L.C.L. to Anchorage only (f)	6.80	14.40	15.60	19.00
Ore and concentrates in sacks, declared value not over \$50 per ton (g)				
C.L. min. wt. 20 tons (c)	7.20	10.50	12.00	15.70
C.L. min. wt. 10 tons (c)	9.00	13.75	15.00	18.90
L.C.L. under 10 tons (c)	10.80	16.50	18.00	22.00

All rates in dollars and cents per ton of 2000 lbs. Rates via Seward higher on Classes Nos. 1 to 4. Rates on Tanana, Yukon, Innoko and Iditarod rivers effective only during season of navigation until Sept. 1 of each year.

All wharfage and handling charges at Seattle or Tacoma, Anchorage, Nenana and at destination included in rates given.

(a)—Includes \$3.00 per ton transfer charge from standard to narrow gauge track.

(b)—All points on the Tanana and on the Yukon River between Tanana and Holy Cross have same rate as Holy Cross.

(c)—Special commodity rate.

(d)—Additional charge made for all heavy pieces weighing over 4000 lbs.

(e)—Special carload commodity rate, min. wt. 20 tons.

(f)—No thru rate. Rate given is to Anchorage only, to which ocean rate must be added.

(g)—Additional charge of 25 per cent. for each 100 per cent. or fraction thereof of excess valuation declared.

TACOMA AND ALASKAN POINTS, VIA ANCHORAGE AND RAILROAD

Holy Cross	Iditarod	Marshall via N.C.Co. launch	St. Michael launch	Rampart	Beaver via A. Y.	Circle N. Co.	Eagle
3164 (b)	3564	3299	3540	2714	2889	3062	3237
\$ 29.40 50.80	\$ 68.40 89.80	\$ 42.80 63.80	\$ 49.40 70.80	\$ 42.40 63.80	\$ 51.40 72.80	\$ 57.30 78.80	\$ 63.40 78.80
77.60 116.40	116.60 155.40	90.60 129.40	97.60 136.40	106.20 142.60	124.20 160.60	136.20 172.60	148.20 184.60
46.00 77.60 50.80	85.00 116.60 89.80	59.00 90.60 63.80	66.00 97.60 70.80	59.00 90.60 63.80	68.00 99.60 72.80	74.00 105.60 78.80	80.00 111.60 84.80
32.00 50.80	71.00 89.80	45.00 63.80	52.00 70.80	45.00 63.80	54.00 72.80	60.00 78.80	66.00 84.80
57.80 65.80	96.80 104.80	70.80 78.80	77.80 85.80	70.80 78.80	79.80 87.80	85.80 93.80	91.80 99.80
31.20 57.80	70.20 96.80	44.20 70.80	51.20 77.80	44.20 70.80	53.20 79.80	59.20 85.80	65.20 91.80
25.60 50.80	64.60 89.80	38.60 63.80	45.60 70.80	38.60 63.80	47.60 72.80	53.60 78.80	59.60 84.80
30.00	69.00	43.00	50.00	46.00	56.00	61.00	67.00
46.00 57.80	83.00 96.80 (e) 72.00	59.00 70.80	66.00 77.80	59.00 70.80	68.00 79.80	74.00 85.80	80.00 91.80
23.20	35.40						
	54.50						
	57.75						
	60.50						

REVIEW OF PLACER MINING BY DISTRICTS.

SOUTHEASTERN ALASKA

Placer mining in Southeastern Alaska is restricted to a few small operations conducted in the beach deposits at Lituya Bay, Yakataga and Yakutat. One small operation was reported near Juneau. A little placer mining was also done in the Porcupine district, and a hydraulic plant was reported to have been installed there during the season.

COPPER RIVER REGION

The principal placer mining in this region included the hydraulic operations on Dan and Chititu Creeks in the Nizina district, and on Slate Creek and Miller Gulch in the Chistochina district. In the Bremmer district one or two men were shoveling-in, and in the Nelchina district, on Alfred Creek, work of a prospecting nature was carried on. The placer gold output for the Nizina district was about \$110,000, the other districts producing about \$45,000.

Nizina District.

The supply point of the Nizina district is McCarthy (Shushana Junction) on the Copper River Northwestern Railroad. From this point it is 9 miles, by a passable road, to the Nizina River. From there it is 6 miles by trail to the camp of the Dan Creek Mining Company, on Dan Creek, and 8 miles to the lower camp of the Andrus property on Chititu Creek. The Nizina River splits and spreads over a broad valley and as it contains much quicksand it is a treacherous river to cross, even at low-water stages. Anyone not familiar with it should never attempt to cross it alone, for numerous people have lost their lives in so doing. The Alaska Road Commission, after several failures in attempting to bridge this river, is now constructing another bridge at a point down-stream from previous sites.

Average freight rates, in less than carload lots to McCarthy from Seattle range from \$75 to about \$100 per ton. The main freighting from McCarthy to the camps is done with horse and sled before the spring breakup. The summer freight goes in by packtrain. The rate to Dan Creek is \$20 per ton in the winter and \$120 per ton in the summer; to Chititu Creek, \$24 in the winter and \$140 in the summer. While other districts were experiencing extremely low stages of water, Dan and Chititu Creeks, which head in glaciers, were having exceptionally good supplies, resulting in one of the best seasons for hydraulic operations yet enjoyed. On both creeks there was a labor shortage, and in order to compete with the mines at Kennicott, wages paid common labor were raised to \$5 for 10 hours; powder men, donkey men, and stackermen being paid \$5.25 and nozzlemen \$5.50. A bonus of 50 cents per shift was paid each man working the full season. Board is furnished in addition to the wages, the cost to the company being \$1.70 per man per day.

The hydraulic methods employed in mining the creek deposits on Dan and Chititu Creeks are of particular interest and, while especially adapted to the conditions found there, involve principles which could be adopted in some other districts. Under one method the hydraulicking starts at the upper end of the pit and advances down stream while, under the other, the work starts at the lower end and advances upstream. The material is piped over the side of the boxes, which are placed below bedrock and extend up the center of the pit for its entire length. While the face on one side of the sluices is being piped, the face on the opposite side is cleared of boulders, giving almost continuous use of the water. The tailing is stacked by giant. As many inquiries have been received concerning these methods, they will be described in considerable detail.

At the property of the Dan Creek Mining Company the creek-deposit mined varies from 5 to 18 feet in depth, and contains about 75% of material over 8 inches in diameter with many large boulders, some of which are 6 to 10 feet in diameter. The gold is heavy and of the pumpkin seed variety, about 60% remaining on a ¼ mesh screen. Some native silver is present and each season several tons of native copper is recovered in the sluices. The bedrock is slate and shale, cut by occasional porphyry dikes, which form high hard ridges; but in general the contour of the bedrock is quite regular.

The sizes of the pits worked vary from 500 to 700 feet in length and from 175 to 300 feet in width. Generally, in the fall, after a pit is completed, a line of sluice boxes is set in the upper end of the old rock sluice and just at the lower end of the proposed pit. The number of boxes so used depends on tailing room. Usually 16 to 20 are employed, but never less than eight. These are known as gold boxes and are equipped with longitudinal rail riffles for the entire length. In the spring, wings are constructed at the head of these boxes and a cut is piped downstream through the gravel and the bedrock sluice is piped out to grade. The sluicing of this cut is accomplished by the use of a No. 4 giant equipped with a 4-inch nozzle. The setting of the giant is advanced in stages of about 150 feet. The bedrock sluice is made 5 to 6 feet deep and about 6 feet wide, but is kept as narrow as requirements will permit. Pick work is necessary in making the sluice, and some of the harder portions must be blasted. As soon as about 120 feet of rock sluice has been made, the sluice boxes are set, the giant moved ahead and the operation repeated until the upper end of the proposed pit is reached.

The maximum grade obtainable for the sluice boxes varies from 5 to 5½ inches to the box, grades as low as 4 inches having been used. The boxes are 48 inches wide and 46½ inches deep inside, and are set on 6x6 sills at 12 foot centers. Posts are set on these sills and intermediate posts are set at 4 foot centers, all being of 4x6 material. New 1½ inch boards are used for the bottom of the boxes and the lower side boards, above which old lumber is used. To the outside of the posts are fastened heavy slabs or old boards

as a protection to the sides of the boxes. Ties, 6x6, are placed across the bottom of the boxes and held in place by 1½ inch liners. Twenty pound rails, spaced at 4 inch centers are then spiked to these ties. The entire length of the sluice is equipped with these longitudinal rail riffles.

Water is diverted from Dan Creek by a 52-foot timber-crib, gravel-filled, dam into a 3x3-foot flume extending 600 feet to the penstock. From there it is conducted through 7700 feet of pipe, ranging in diameter from 32 inches at the penstock down to 15 inches in the pit. A large amount of groundsluice water is required for the sluice boxes, usually about twice as much being used as is delivered by one pit giant. Starting at the head of the proposed pit, the initial cut is made to bedrock, after which a No. 4 giant with 5-inch nozzle, working under a head of 275 feet, is placed in each corner of the cut. Only one pit giant is used at a time. The material is driven along a diagonal face and over the side into the boxes. While the length of the face worked is governed by the available pressure, it is the aim to hold its direction at an angle of about 45 degrees to that of the sluice. When boulders begin to impede the progress of piping, the giant is shut off and the nozzleman moves to the other side of the sluice where he starts piping with the second giant. Meanwhile a powderman and helper bulldoze the boulders. As a rule it requires from 2 to 3 periods of piping and bulldozing to get to bedrock. All the material is put through the boxes except the largest boulders, which are undercut, rolled over and left. A slice or cut along the face from 35 to 50 feet deep is made before the giant is moved ahead (downstream) and another slice taken. Bedrock is then gone over and cleaned up to within a few feet of the sluice, using two outfits of 2½ inch hose equipped with fire nozzles. The pot holes are siphoned. The method involves the piping in and cleaning up of a series of diagonal cuts until the lower end of the pit is reached and the last of the material piped in. Continuous stacking of the tailing is necessary. This is done with a No. 4 giant with 4-inch nozzle working under a head of 310 feet. Tailing has been stacked to a height of 52 feet.

While customary to clean up the boxes as the work advances as a safeguard against possible loss by theft or flood, all of the pit is sometimes completed before a clean-up is made. The clean-up is made during the day shift only, and is done by a crew of ten. The water is cut down and, starting at the head, about 10 lengths of boxes are cleaned up at one time. The rails are first removed, the heavier gravel and coarse copper nuggets forked out, and the balance of the material worked down and cleaned up. The timber guards and sides of all the boxes except the lower one are then removed and with a canvas hose outfit on each side of the sluice the material alongside is piped in and again cleaned up. The remaining parts of the boxes are then removed and the material hosed down to boxes below. The above described process is repeated at intervals of 10 box-lengths

until the entire string is completed. On an average of about 75 or 80 feet is cleaned up per day. The final clean-up of the entire rock sluice is then made by the foreman and 4 men; crevices are picked, and all the material is siphoned into 2 lengths of 12-inch boxes placed across the sluice and moved along as the work advances. This requires from 5 to 6 days.

The regular pit crew is composed of a nozzleman, a stackerman, a flumeman, a powderman, a powderman's helper, 2 or 3 extra men and a foreman to each shift. The shift is so arranged that the piping is continuous.

According to Mr. G. Howard Burch, the Manager, the average water-duty is .25 cu. yds. to the 24 hours miners inch, the duty being dependent on the volume of water used rather than on the pressure. This low duty is due to the unusually large percentage of heavy material handled and the comparatively low gradient available.

Two pits were completed in 1923; No. 1, being 528 feet long and 165 feet wide, and No. 2, 480 feet long and 170 feet wide. No. 2 pit, which averaged 6 feet in depth, required 9 days for making the set-up; 17½ days to pipe it; and 10 days to clean up. For both pits, 22 days were required to make the bedrock sluice and install the boxes; 42 days for piping; and 26 ten-hour shifts to clean up. For the 27,415 shots fired in blasting boulders, 14,075 lbs. of 60 per cent dynamite, costing \$4,812, was used. The cost for explosives per cu. yd. mined was 4.6 cents. Including a small yardage mined on the bench, 103,192 cu. yds. was mined at a cost, exclusive of capital charges, of 23.1 cents per cubic yard.

The company also conducted hydraulic operations for a short period on the right limit bench, where, with three men, very satisfactory results were obtained.

At the Jno. E. Andrus operations on No. 1 Chititu Creek, the same method is used of piping over the side and working downstream from the upper end of the pit. In 1923 a pit 900 feet long, averaging 150 feet in width and 10 feet in depth was opened up, but about 150 feet at the lower end still remained unworked at the close of the season. As conditions for stacking the tailings are not favorable, 300 feet of gold boxes, all equipped with rail riffles, were set below the pit. At this property piping of the central rock sluice to the upper end of the pit is made in the same way as at Dan Creek, although the sluice boxes placed in it do not have board bottoms.

Across the bottom of the rock sluice are placed 4x6 inch ties, 6 feet long, in which are cut daps for post, so that the outside width of the sluice is 4 feet. These ties are placed at 6 foot centers and 20 pound steel rails, spaced at 4 inch centers and placed lengthwise, are then spiked to them. Posts 4 feet long are set in the daps in the ties and the side boards of the sluices and the timber guards nailed to them. Caps are used to brace the boxes. The grade is 5½ inches to 12 feet.

No. 3 giants, equipped with 5-inch nozzles, are used in the pit. A head of 250 feet is available, although only $\frac{1}{2}$ to $\frac{3}{4}$ of the pressure is used. Otherwise the hydraulicking is conducted as at Dan Creek. Two 10-hour shifts are worked, there being 9 men to each shift—a foreman who is also the nozzleman, a stackerman, a donkeyman and 6 men for handling boulders. While the nozzleman is piping on the opposite side of the sluice, the boulders are loaded into a steel stone-boat and removed by donkey-engine-hoist and stacked on cleaned bed-rock. The larger boulders are bulldozed. About 20% of the material mined is so stacked. Bedrock is cleaned up within a few feet of the sluices by the giant, the potholes being siphoned. Tailings are stacked with a No. 3 giant equipped with 4-inch nozzle. At times the use of an additional stacking giant is necessary.

When the pit is completed, the clean-up crew of 10 men, working only on the day shift, remove the caps, guard rails and upper side boards of the sluice for a distance of 30 to 40 feet at a time, and with a canvas hose and nozzle on each side hose in the bedrock alongside the sluice and cover the cleaned area with canvas. A No. 2 giant without a nozzle and working with only enough water to reach without splashing is set up on a temporary platform directly over the sluice and about 30 feet upstream from the section to be cleaned. With this giant the heavy material is first sluiced along. The rails and ties are then removed, and with the giant and a canvas hose outfit on each side, the rock sluice is piped clean, all material going into the boxes below. Crevices must be picked out and the deeper potholes siphoned. In cleaning up, when the concentrate in any of the boxes become too heavy with copper or when sufficient gold has accumulated, it is removed by sluicing it over "pick-up" boxes. These pick-up boxes are placed in the sluice boxes just below those to be cleaned. They consist of 4 lengths of shallow boxes, each 68 inches long and 35 inches wide. They are equipped with longitudinal wood riffles made of 2x4 timbers spaced 2 inches apart and made up in sets 32 inches long.

Making the cut and rock sluice and installing all of the boxes for this set-up took thirty 24-hour days, with 9 men on each shift, although this work is generally done in less than half that time. The hydraulicking of the pit took sixty-four 20-hour days, during which time 39,326 cubic yards of material was moved. The clean-up required 14 day-shifts.

Practically three times as much ground-sluice water is used as that supplied by the pit giants. The approximate water duty is about .32 cubic yards per 24-hour miners'-inch. The maximum number of men employed during the season at this camp was 21. The cost per cubic yard mined, for labor and mess only, is reported at 22 cents.

At the No. 9 Chititu Creek plant of Jro. E. Andrus the method used is that of piping over the side, but work is started at the lower end of the pit and advanced upstream. The cutting of the rock sluice and the clean-up is conducted as at the No. 1 plant. The same type of boxes is used but the boxes are set on 6-inch grade and are 3x3

feet inside dimension. Bedrock at this property is shale, of regular contour and easy to clean up. The character of the gravel is similar to that at No. 1 plant. Equipment of the same size is also used. The conditions for stacking are more favorable.

A giant is set up in each corner at the lower end of the pit and, after the initial cut has been made, the giants are placed about 25 feet from the outer edge of the pit and about 60 feet back from the face. The alternate piping and boulder-removal are done as at No. 1 plant. The material, however, is piped along a face at right angles to the sluice or pointing upstream a bit. As a protection to the men who are removing the boulders on the opposite side of the sluice, a cut may be piped-through about 25 feet back from the sluice, at an angle of about 45 degrees to it, and the material piped through it, leaving until the last a triangular piece along the side of the sluice. Each face is advanced about 30 feet before the giants are moved ahead (upstream). A 260-foot head is available at the pit giants, although only about half the head is used. The reduced head is used in order not to overload the sluice, as much fine material is present, which tends to pack the riffles. Furthermore this practice has been found more satisfactory than the use of full pressure in working boulders to the surface. As at No. 1 plant, six men load the boulders into a stone-boat operated by donkey hoist, which stacks them on cleaned bedrock. Tailings are stacked by giant.

In 1923, a pit 460 feet long, averaging 140 feet in width and 11 feet in depth, was mined. The making of the entire set-up for this pit, the mining and clean-up took 68 days. The set-up took fourteen 20-hour days; the clean-up ten 10-hour days. The mining took forty-four 20-hour days. A total yardage of 23,323 cubic yards was handled. Practically twice the amount of ground-sluice water is used as that supplied by the pit giant. The approximate water duty was about .35 cubic yard per 24-hour miners inch. The cost per cubic yard for labor and mess only is reported at 21 cents.

The advantage of the above-described methods of hydraulicking is that all the dead work for the entire season can be done at one time, and so permit a maximum amount of time for actual hydraulicking. By alternating from one giant to the other a maximum use of the water is obtained. The method of working downstream from the upper end of the pit has the advantage of working with the grade and the flow of water in the sluices and exposes a long diagonal face which obviously gives a higher efficiency in moving and handling the material. It also permits the boxes to be cleaned up at any time as far as the work has advanced, thereby preventing possible loss by theft or floods. However, should the pit not be completed by this method during the season, the remaining portion of ground is either lost or will be in such condition as to cause delays in the following season. The latter difficulty is overcome by the method of working upstream from the lower end of the pit. A choice of methods also depends on the dip, strike and contour of the bedrock.

C. Cayouette, with one man, and M. Radovan did a small amount of drifting by adit on the Dan Creek benches. On Young Creek, Murray and Jackson were prospecting and Martin Harris with three men, did some ditch construction and prospecting. Mahar and Anderson operated an automatic dam on Calamity Gulch.

CHISANA (SHUSHANA) DISTRICT

Ten placer mining operations, employing about 22 men, were conducted during the season on Bonanza, Little Eldorado, Gold Run and Big Eldorado Creeks, all draining into the Shushana River. The district is reached from McCarthy on the Copper River & Northwestern Railroad. In the summer, 6 days is required in making the 100-mile trip from McCarthy to Chisana by pack train, the packing rates being 25 cents per pound to Chisana and 27½ to 30 cents per pound to the creeks. In the winter, the freighting is done by dog team, the rate being 20 cents per pound. Wages paid are \$12 per 10 hours without board. When board is furnished, \$8. A six months' grubstake for one man costs \$600 to \$700.

The placers being mined are creek deposits ranging from 2 to 12 feet in depth. Boulders are numerous, particularly on Bonanza and Big Eldorado Creeks. Stream gradients range from 2½ to 6 per cent. The gold is coarse. Most of the ground is now being mined for the second time. All the placers are located in high altitudes. Timber and wood must be transported a long distance. Drainage areas are small and the water supply is dependent on the melting snow in the spring and the rains. Consequently most of the mining is done in the spring, the average season being only a month or six weeks. In spite of such conditions the district produced about \$25,000 in gold in 1923. At all the operations, the water is impounded by dams equipped with automatic gates, and by groundsluicing or booming. The gravels are removed as close to bedrock as possible. The remaining gravel and about two feet of the bedrock, which is usually badly creviced, is shovelled into boxes. Several of the operations used hand-operated derricks to remove the boulders. The dams are, as a rule, about 100 feet wide and equipped with 8 to 12-foot automatic gates of the swinging type, costing from \$300 to \$400. The cost of booming ground 4 to 5 feet deep by this method is stated to be 8 to 10 cents per square foot. A hydraulic plant that was taken into the district some years ago was a failure, due to lack of sufficient water and the impossibility of cleaning the bedrock except by hand methods.

James and Thornton on No. 6, Bonanza and No. 1 Little Eldorado, where 6 men were engaged, conducted the largest operation in the district and mined for 32 days. The ground, most of which had been mined before, averaged 4 feet in depth. Atkinson and Eklund, Green and Davis, and A. McGettigan also mined on Bonanza Creek. C. F. Whitham mined on Little Eldorado; W. E. McKinney, and Jno. Carroll on Gold Run; Briggan and O'Hara and A. Nelson on Big Eldorado.

KENAI PENINSULA REGION

During the season of 1923 six hydraulic operations were conducted in the Kenai Peninsula region, with about 35 men employed. Four small open cuts employed 5 men. The largest operation was that on Crow Creek in the Girdwood district. A road is being built from Girdwood in Crow Creek by the Bureau of Public Roads.

The Hope and Sunrise districts are best reached by launch from Rainbow station on the Alaska Railroad. It is 8 miles across Turnagin Arm to Hope, the service being dependent on tides and weather conditions, which often cause long delays. The Bureau of Public Roads proposes to build a road from Mile 29 on the railroad to Hope and Sunrise, a project which will be of great benefit to the districts.

Girdwood District.

Erickson, Totland and Johnson, with a crew of 15 men, conducted hydraulic operations on the old Alaska Crow Creek Hydraulic Mining Co. property on Crow Creek. The unusually long spell of hot weather was most favorable to operations, as Crow Creek is a glacier-fed stream, and steady and abundant water supply was available for practically the entire season of four months.

At this property the water for the giants is diverted by a timber cribbed dam and conducted to the penstocks through a 1¼-mile ditch, 4 feet wide at the bottom; 6 feet wide at the top and 3 feet deep, with a grade of 15.8 feet to the mile. Water for the pit giants is taken from one penstock through 450 feet of 24 to 22-inch pipe to the "Y," thence through 18 to 15-inch pipe to the giant under a head of 145 feet. The second penstock receives the balance of the ditch water, which is conducted to the stacker giant through 1500 feet of 24 to 15-inch pipe under a head of 170 feet. A reservoir along the ditch about ½ acre in area is used at low water periods.

The creek deposit mined varies from 6 to 25 feet in depth, averaging about 12 feet. The wash is unusually heavy, about 50 per cent being over 6 inches in size. Real bedrock is a slate and gray wacke, but a false bedrock of thick clay is most generally mined to. There is no permanent frost.

The usual practice is to work an area from 200 to 250 feet in width and 400 to 450 feet long, dividing it lengthwise into two cuts. In each cut is set a No. 7 giant with 6-inch nozzle and each cut has its own line of sluice boxes. While piping is going on in one cut, the boulders are being drilled and blasted in the other; at the same time this cut acts as a by-pass for the excess water. In the long cuts above described, an additional giant is set up about half way down the cut and to one side. After the head giant has piped the material as far down as it can, the lower giant boosts it along into the head of the boxes. All the material goes through the boxes, no boulders being stacked. The ground between the two cuts is removed when most practical. At the head of each line of sluices there are heavy timber

wings. The sluice boxes are 5 feet wide and 3 feet deep, and are set on a 6-inch grade. From 8 to 10 boxes are generally used. In the first two boxes 40 lb. rail-riffles are set crosswise on 6x6 timbers; in the rest of the boxes 25 lb. rails, set lengthwise, are spiked to 6x6 ties. Tailing from both sluices is stacked by one No. 7 giant with 5-inch nozzle. In former operations the tailing was not stacked, as a result of which a string of from 60 to 75 boxes was often necessary; two boxes being set each day. Giant-stacking has proven to be the most economical and practical method of caring for tailing at this property.

When running to capacity, about 2100 miner's inches of water runs through the sluices, usually about twice as much ground-sluiced water being used as that supplied by the pit giant.

An interesting feature of the Crow Creek operations is the arrangement for disposal of boulders. About 15 per cent of the deposit consists of hard rounded granite and graywacke boulders, most of which must be drilled before they can be blasted. Some can be broken by bulldozing. With a crew of four men, generally working day shift only, the boulders are drilled. For this purpose three "Clipper" air drills equipped with 7/8-inch hollow steel and Carr bits are used. Sixty per cent dynamite is used for blasting. An average of 300 blasts are made per day. In 1923 1½ tons of dynamite, 25,000 detonators and 72,000 feet of fuse were used for this work. The average cost of dynamite was \$11.00 per box. Air is produced by a 12x10 Chicago Pneumatic Tool Co. single stage compressor, belt driven by a 20-inch Pelton water wheel operating under 150 ft. head.

The only other placer mining in this district was the groundsluice operation of Axel Lindbloom on the benches of lower Crow Creek.

Sunrise District.

The Canyon Creek Development Co. on Canyon Creek did not do any mining, but a small amount of work was done on the large dam, which is about half completed.

Tom Allison, with three men, hydraulicked on the bench on the Wibble property on Canyon Creek. Wilson was mining at the junction of Canyon and Mills Creeks. Harper Bros. and Bryant hydraulicked on Lynx Creek, completing two pits. Bob Michaelson was mining on Mills and M. Connelly on Six Mile.

Hope District.

Only two operations were conducted in the Hope district. Matheson and Ketchum, with 8 men, hydraulicked creek ground on Resurrection Creek and Ed Belmont with 2 men conducted a similar operation about 3½ miles up Bear Creek.

YENTNA DISTRICT

The Yentna District produced approximately \$210,000 in placer gold in 1923. Twenty plants were operated. These consisted of one dredge,

12 hydraulic outfits and 7 small groundsluicing or shoveling-in operations. The maximum of men employed was 32. Water shortage greatly curtailed all the mining operations. Practically all the placer mining of the district is done on Cache Creek and Peters Creeks and their tributaries. These creeks are reached from Talkcetna on the Alaska Railroad, from which point it is 45 miles to Cache Creek. The Alaska Road Commission had two crews on the construction of the road from Talkcetna to the placer district, the season being most favorable for this kind of work. The latter part of August the swampy area between mile 18 and mile 22 still remained to be completed to make the road continuous to the Peters Creek bridge or Mile 23. During the summer freight is taken across the Susitna River in poling boats, thence to Mile 14½ by light wagon and from there on by pack train. Summer freight rates to the placer camps are 20 cents per pound. Winter sledging rates are \$65 to \$75 per ton, depending on location. About 250 tons of freight was taken in during the 1922-23 winter. Prevailing wages for placer miners are \$6.25 for 10 hours with board furnished. The cost of boarding is \$2 to \$2.50 per man per day.

Cache Creek.

The principal operation in the district was that of the Cache Creek Dredging Co., which operated its 6½ cu. ft. electrically driven dredge and handled 307,044 cu. yds. of material. The average depth of the ground dredged was 9.4 feet. Dredging started on May 13, and the seasons operations closed on Nov. 3. Of the 174 days available for dredging the operating time was 76 per cent. The exceptionally low water conditions necessitated intermittent operation of the dredge. Water impounded in the ditch was released to the hydro-electric plant for periods of from 10 to 15 minutes. For a time the water supply was so low that the dredge was operating less than half of the time. When the rains finally came, a flood resulted, which shut down the operations from Sept. 11 to Sept. 20. The operating cost for the season was about 20 cents per cubic yard. Twenty-four men were employed, eight-hour shifts being worked on the dredge.

This dredge prior to 1921 was operated by steam, but since then has been driven by hydro-electric power, water for which is obtained from Cache Creek and its immediate tributaries. In connection with the hydro-electric plant there is one mile of ditch, 6 feet wide at the bottom; 12 feet wide at the top and having a grade of 1.8 inches to 100 feet; together with several short flumes, 3x6 feet in dimension and on the same grade, with a total carrying capacity of 55 to 60 second-feet of water. From the penstock two pipe lines, each 1800 feet in length and 34 inches in diameter, conduct the water to the power house at the mouth of Falls Creek, where a 23-inch double discharge Leffel turbine water wheel under a head of 85 feet operates a belt-driven, 300-K. V. A., General Electric generator. Power is

transmitted from the plant at 11,000 volts to transformers near the dredge where it is stepped down to 2300 volts.

The gravels dredged average from 4 to 6 feet in depth and contain numerous boulders. Often 4 to 5 feet of the bedrock, which is a coal-bearing formation, must be dug to provide the 7-foot depth of water necessary for floating the dredge. At low water periods even greater depths of bedrock must be dug. The flotation has been improved by adding pontoons to the bow and to both sides of the dredge.

The dredge is of the revolving-screen, flume type. The specially constructed bucket line is close connected, and contains sixty-six $6\frac{1}{2}$ -cubic foot manganese steel buckets, operated by a variable speed motor. An average of 18 buckets dump per minute. The material goes to a revolving screen, 6 feet in diameter and 12 feet long, with 8 inch holes. Three $1\frac{3}{4}$ -inch nozzles, under high pressure and set at the lower end of the screen, wash the material. The oversize passes to a "Y," where it is split and passes through two rock-chutes and is dumped about 10 feet behind the dredge. This arrangement helps to prevent the sands from filling the pond under the boat. The under-size goes to a flume 4 feet wide and 108 feet long. At a point 88 feet down the flume are two 20-foot branches, one on each side of the main flume. Gates divert the material to these branches so that the tailing is stacked level across the series of cuts, permitting a higher water level to be carried in the pond. The main flume and branches are set on an average grade of $7\frac{1}{2}$ per cent, and are equipped with 2x4's capped with $\frac{5}{8}$ -inch manganese steel plates for riffles, giving $1\frac{3}{4}$ -inch spacing. Some rail riffles are also used. A 5-inch high pressure and a 15-inch low pressure Morris centrifugal pump supply the water required, about 6000 miners inches going through the sluices.

On Upper Cache Creek, O'Rork and Perkins were hydraulicking shallow creek gravels.

Falls Creek.

Joe Anderson conducted hydraulic operations on the Falls Creek group with a crew of six men. The creek deposit mined averages 9 feet in depth. The gravels lie on clay. Two giants with 3-inch nozzles are used in the pit, one at a time. They are under a 100-foot head and serve to pipe the gravels into the head of the boxes. Boulders are cleared by hand. Tailing is stacked by giant. The average pit mined is 80 feet wide and 125 feet long. With a full water supply 1000 square feet of bedrock can be piped-in in two ten-hour shifts. Under these conditions, the average operating cost is about $7\frac{1}{2}$ cents per square foot or 23 cents per cubic yard.

Frank Irvin with 5 men was hydraulic mining and Geo. Tomac and 5 men did a little shovelling-in on this creek.

Dollar Creek.

O. E. Hillman, with 4 men, conducted hydraulic operations in the shallow creek gravels on the right limit of upper Dollar Creek.

He has abandoned hydraulic operations in his "big pit," where a deposit of auriferous residuel quartz was mined for many years. The face at this pit is now about 100 feet high, requiring the handling of a great amount of barren overburden, which, under present conditions, does not permit profitable mining.

Thunder Creek.

During 1923 Al Wolf, with 3 men, was hydraulicking on the Battle Axe Group. A face about 300 feet long on the right limit of the creek was worked by nozzling-down the face and piping the material into the head of sluice boxes. The face is now from 20 to 35 feet high, the height increasing as work advances into the bench. The deposit is unique in that the gold occurs in beds of quartz which are interbedded with soft sandstones, shales and thin bands of lignite coal. The lower bed of quartz rests, unconformably, on a slate-graywacke formation, containing numerous irregular quartz bodies, and is clearly a residual product derived from the erosion of this formation. This lower bed contains angular quartz up to six inches in size, a small amount of clay with occasional small pieces of slate and the main bulk of the gold. In the upper beds the material is of smaller size. In all of the beds, some of the quartz has shown a little movement, the edges being slightly worn. Many quartz crystals are present. The gold is coarse and very sharp, some with quartz attached and some crystalline in form. The largest piece found contained \$94.10 in gold. The average gold content of the deposit so far mined is stated to have been about 30 cents per cubic yard. The lower bed of quartz which averages 10 feet in thickness is estimated to contain about 55 cents per cubic yard. Operations at this point will soon cease as the deposit is dipping westward into the hill at an average angle of 20 degrees, and is also becoming too deep. The deposit, however, continues across the creek, and has been prospected for a distance of over $\frac{1}{2}$ mile. Similar quartz occurrences are found on Dollar, Peters and Poorman Creeks.

Nugget Creek.

James Murray, with 4 men, conducted hydraulic operations on shallow creek gravels and prospected, with results reported as satisfactory, the low bench on the right limit.

Bird Creek.

Chris Hammerschmidt continued mining the preglacial bench deposit on the St. Louis bench. For a while one man was hired. The deposit being worked contains much clay, and under ordinary conditions would be most difficult to mine. As situated, however, each winter the face of the pit freezes back to a depth of about 6 feet. When thawing commences groundsluice water is run over the face, which is then readily washed down into the pit, where by means of water, conducted through a canvas hose, it is sluiced into the boxes. Water for groundsluicing is available for only a month or six weeks. A pit about 400 feet

long has been opened, of which the inner bank is about 80 feet high. Tailing is dumped into the creek about 75 feet below the pit. While the cost of mining this deposit cannot be stated, it is probably the lowest in cost per cubic yard of any placer mining in Alaska. Peters Creek.

The Yentna Placer Mining Association, hydraulicked during the entire season on property formerly owned and operated by Harper Bros. The number of men employed varied from 7 to 14. The sluice boxes were set above bedrock on a grade of 7 inches, in a cut made down the center of the pit. The pits average 200 feet in width and 220 feet long in ground averaging 9 feet in depth. A No. 1 giant with 3-inch nozzle was set each side of the sluices and the material piped over the side. While nozzling was being done from one side of the sluices, the boulders on the other side were being loaded on a stone boat and dragged away by a horse, and stacked on cleaned bedrock. Tailing was stacked with a No. 2 giant equipped with a 4 inch nozzle. This operation was continuous. With the sluices set parallel with the channel, as was the case in this plant, no particular advantage can be claimed for the method. With the sluices set at right angles to the channel a considerable saving in time can be effected by utilizing time otherwise lost in making the set up for a new pit. Such a method has been used in the Kantishna district. It was briefly described in the 1922 report of the Mine Inspector.

This plant has the best water supply for hydraulicking in the district. There is a $2\frac{1}{2}$ mile ditch with a capacity of from 600 to 700 miners inches that takes water from upper Peters Creek. Peters Creek, being partly glacier-fed, assures a quite steady supply, although there was a shortage during the past season. An average of about 600 miners inches is also available for groundsluice water. There is a double pipe line one 16-inch to 8-inch, the other 13-inch to 9-inch. The head at the present site is 180 feet.

Three pits were mined during the season, the last one being in the canyon from where the best results are said to have been obtained.

Elmer Carlson also did some mining several miles below the above described plant.

Other Creeks.

Hugh Price hydraulicked on Short Creek. N. Balabanoff was sniping on Thunder Creek. Frank Jenkins and John Rice were mining on Willow Creek. Cast and Mack were mining with a canvas hose outfit on Poorman. Gray, Bedar and Vest were open-cut mining on Clear Creek. Matt Hugar and Pat Collins were on Mills Creek, and F. Zorn on Lake Creek.

VALDEZ CREEK DISTRICT

The Valdez Creek district is reached via trail from Cantwell Station on the Alaska Railroad, from which point it is distant about 65 miles. The principal operation is that of the McKinley Placer

Mining Co., which conducted hydraulic operations for a part of the season. About 35 men were employed. It is reported that the company has completed its hydraulic work and that the deposit will from now on be drift-mined. Drift mining is to be continued through the winter. L. S. Wickersham on Valdez Creek and Pete Monoham on White Creek conducted small groundsluicing operations.

KANTISHNA DISTRICT

The placer gold production from this district was about \$9,000. The principal operation was conducted on Moose Creek, where Fink and Hamilton, with five men, operated the hydraulic plant which was installed and operated for a short period last year by the Kantishna Hydraulic Mining Co. An area of about 20,000 square feet was mined, the ground averaging 8 feet in depth. One pit is reported to have averaged 21 cents to the square foot.

The Mt. McKinley Gold Placers, Inc., did not operate their hydraulic plant on Caribou Creek this year, but the entire season was devoted to an examination of the property. Drilling with a Keystone drill was done on benches, where encouraging results are said to have been obtained.

A number of shovelling-in and automatic-dam operations were also conducted in the district.

FAIRBANKS DISTRICT

Early returns indicate that the placer gold production of the Fairbanks district for 1923 was about \$600,000, a decrease from that of the previous year. Incomplete data show that during the 1922-23 winter 15 drift mines, employing 86 men, were operated. Six of these mines continued as summer operations. There were over 50 summer mines in operation that employed about 310 men. These properties included 21 drift mines, 6 hydraulic mines, 5 steam scraper plants, 1 cableway excavator, 1 dragline excavator and 2 dredges. The balance were small open-cut mines, employing principally ground-sluing and shovelling-in methods. The 2 dredges, 1 cableway excavator, and 4 of the steam scraper plants employed 106 men. Este Creek.

The principal operation on Ester Creek was that of Sholseth and Hadden on Gold Hill, where drift mining, with a crew of 10 men, was conducted during the summer. A. Benson, with 3 men, conducted an experiment in hydraulicking underground on the Pioneer Association bench. The gravel here is comparatively light and, while frozen, it contains a dry porous frost which thaws quite readily upon the application of water. A 35-foot shaft was sunk to bedrock and a 95-foot drift was run to the south. This drift comes to the surface on Ester Creek and is provided with a flume which handles the excess water and fine material from the hydraulicking. From a 160-foot drift, run to the north from the shaft, diagonal drifts 40 feet apart were piped out for a distance of from 50 to 75 feet each side of the

main drift. A maximum of 60 miners inches of water is conducted down the shaft and to the working faces. Starting at the far end of the diagonal drifts and working toward the main drift, the water is piped against the gravel face through a 4-inch sheet iron nozzle. The loosened material is conveyed through temporary boxes to the main sluice. It goes through 12-inch riffled sluice boxes set in the main drift and is impounded in a hopper at the shaft. Upon the release of a gate, the tailing runs into a self-dumping bucket. The excess water is removed and the bucket is hoisted and dumped. The excess water and fines run into Ester Creek through the south drift or tunnel. Frozen pillars and timber cribs are used for holding the roof. At the time of visit early in August about 4000 square feet of bedrock had been mined, the face being about 5 feet high. While the operation has by no means been perfected, the method of hydraulicking underground under such conditions as found at Ester Creek appears practical.

Drift-mining was done during the winter on Ester Creek by A. Martin, Kolkman & Co., Gasloff & Co., Guis & Co., and during part of the summer by Driscoll & Co., Crook & Co., Avsaragoff & Co., the results in general being unsatisfactory.

On Happy Creek, Cosgrove and Gillis, and James Morgan drifted during the winter.

It is reported that Gus Peterson has obtained a lease on the Berry ground on No. 9 and No. 10 Ester, and will start development work during the winter. This is thawed ground containing much live water and is said to average about \$3 per square foot. Large pumps and heavy timbering will be required.

Engineer Creek.

Sansome, Gove and Hughes, with a crew of eight men, drifted during the winter, these operations being conducted with half the crew during the summer by Gove and Robertson. Al. Everman did some drilling.

Goldstream Creek.

H. Atwood, with 11 men, and F. Bleecker, with 7 men, operated Bagley scrapers, completing the pits started the previous season. H. Wagoner with 21 men conducted the largest Bagley scraper operation in Alaska. A pit containing about 120,000 square feet was opened up and completed during the season. Stripping of muck by hydraulic methods was done in preparation for future operations, and another area was stripped of moss with a scraper. A. Hanot on Discovery claim, with 12 men, operated his cableway excavator.

On No. 12 below, the Goldstream Mining Co. was stripping an area of muck by groundsluicing. The company states that it hopes to have a dredge on the property in the near future.

Peterson and Tronstad, with 9 men, and Casalegno Bros., with 8 men, drift-mined during the winter. Casalegno Bros. continued work through the summer on No. 16 below.

Gilmore Creek.

James McPike, on No. 3 below, with a crew of 14 men, conducted Bagley scraper operations, completing the 100,000 square feet of pit held over from 1922. He later stripped and installed equipment for a new pit of the same size.

Chas. Olin, with two men, did some hydraulicking, and Steve Liedy, Chas. Peterson, Tom Carr, and J. Welden, each working alone, did some mining.

Pedro Creek.

Guis & Krize, with 9 men, conducted hydraulic operations on Pedro Creek. Owing to a shortage of water the operations were conducted only intermittently. A change from the practice of stacking tailing by giant to that of stacking by steam-operated scraper, was made. A. Nelson, on No. 2 above, with 7 men, hydraulicked, cleaning bedrock by hand. On Twin Creek, A. Zimmerman, with 6 men, was hydraulicking; stacking tailing with a Hanot cableway excavator.

Vault Creek.

J. Stolcis drift-mined with a crew of 12 on the "A" fraction. Heaving of the ground around the shaft necessitated the retimbering of a portion of it. Honkanen, Niemi & Co., with 7 men, drifted on the Alabama Association. Kinney and Gillis did some drilling.

Dome Creek.

Kinney and Gillis, with 6 men, drifted during the winter on the Diamond C. fraction. They encountered old workings and had much difficulty with water. Lahti and Orn also drifted during the winter on No. 3 above. Kirk and Lind drifted for awhile on No. 12 below. J. Cameron, with 8 men, drifted in well paying ground on No. 4 above. Morgan and Rothenburg, with a crew of 7, drifted during the summer on the Shakespeare Association, and Magnussen and Anderson were on the Niggerhead Association.

Little Eldorado Creek.

H. Andresen & Co., with 6 men, on No. 3 below, and Rehn and Freeman, with 8 men, on the Goldstake Association, drifted during the winter and continued until early in the summer. Nelson and Killis on No. 2 above, and Larson, Berg & Co., on Goldstake, were drift mining.

The Idaho Mining Co., on the Oregon Association, sank a new shaft and is opening up a large block of virgin ground. This block, according to drill holes, is estimated to average 85 cents to the square foot, and to be 180,000 square feet in area. The deposit here is 165 feet deep, solidly frozen, and, with the exception of 15 feet of muck covering, is practically all gravel. The height of the face mined is usually 5 feet, which includes from 1½ to 2 feet of bedrock. The gravel is unusually compact and as it contains much heavy ma-

terial, difficulty is had in setting steam thawing points by the usual methods. A jackhammer air-drill of the wet type is therefore used to drill the holes in which the steam thawing sweaters are placed. If the results of underground development work bear out the drilling results, the entire block will be opened with a main drift 600 feet long and 150-foot cross cuts will be driven from each side of this drift. The power plant will also be enlarged and additional air drills will be obtained. Pneumatic air picks may be used for picking down the thawed gravel, which will then be conveyed to underground cars by means of a scraper. Cars will dump into a self-dumping bucket and the material will be hoisted to sluices on the surface. These improvements will make this the most modern and also the largest drift mine operating in Alaska.

Chatanika Flats.

Fred Schaup, on the Hope and Totem Claim, with 7 men; Sam Weiss on the Hazzard Fraction, with 9 men; and Ward, Dalton and Lindsay, on Discovery, conducted summer drift-mining operations.

Cleary Creek and Tributaries.

Small scale operations were conducted at ten localities in the Cleary Creek drainage during the summer. At the largest plant 6 men were employed, while at four of them only one man was at work. No prospecting with drills was done in this locality during the season.

On Cleary Creek, Hansen, Knutsen & Co., and Pearson and Johnson did some drift-mining; R. Cunningham and Jno. Ragner were open-cut mining and E. Englebritzen was conducting experiments in handling tailing with a mechanical loader. Geo. Wombold, with 5 men, operated a slip scraper at the mouth of Bedrock Creek. T. Johnson and Chas. Danielson, were open-cut mining on Wolf Creek. On Chatham Creek Colbert and Dahl, after stripping, were shoveling and wheeling to a self-dumping carrier, and Giske and Hovlid were shoveling-in.

Fairbanks Creek.

The Fairbanks Gold Dredging Co. operated its 4 cu. ft. dredge on No. 2 below, and the 3½ cu. ft. dredge on No. 3 above. The old 3½ cu. ft. Risdon dredge, formerly a wood-burning steam dredge, was reconstructed and equipped with two 75 h. p. Werkspoor diesel engines, and started the season's operations on August 4. Lack of water handicapped the water thawing operations. Thirty-two men were employed.

Other Creeks.

Eagan, Wild & Co., on Fourth of July Hill on Fish Creek, prospected and did some groundsluicing during the early part of the season. On Last Chance Creek, Jackson and Wickander were hydraulicking. On Kokomo Creek, James, Steeves, and Harbell put in a bedrock drain preparatory to drift mining. On Homestake Creek, a

tributary of Faith Creek, Miller & Co. hydraulicked. It is reported that they are to enlarge their plant. On Nome Creek, McClellan and Opdike, with 5 men, operated a small dragline excavator.

CHENA DISTRICT

Walter McQuire and 7 men were hydraulicking on Shamrock Creek, and A. Van Curler mined on Bedrock Bar. The Chena Mining Co. did some prospecting and shipped in a hydraulic plant, which has as yet not been installed. A. McIntosh, with 3 men, installed a hydraulic plant on Palmer Creek, after several years of prospecting.

SALCHAKET DISTRICT

The Stewart Mining Co. installed and operated a combination steam-shovel and dragline excavator plant on Caribou Creek. The creek gravels at this property average about 30 feet in depth, the gold content being found in the lower gravels. The upper 15 or 20 feet of gravel is removed by dragline excavator. The lower gravels are then dug by steam shovel which dumps into large cars set on tracks on either side of the machine. The material in the cars is then hoisted up an incline to the sluices.

CIRCLE, EAGLE AND FORTY MILE DISTRICTS

Early returns indicate that the placer gold production from the above districts for 1923 was about \$150,000. Operations were greatly curtailed as a result of the unusually prolonged dry spell, which caused most of the plants to cease operations for several months during the summer. The production from the hydraulic mines especially was below normal. A type of drift mining peculiar to these districts was employed in the 15 or more operations that were conducted during the winter. Mining is usually done by a lone miner or a crew of two. The gravel is hoisted by hand windlass and some of the thawing is done by means of woodfires.

In the Circle district the largest producer was the steam dredge of the C. J. Berry Dredging Company, operating on Mammoth Creek at Miller House. During 1923, this dredge operated for 125 days, handling 251,692 cubic yards of gravel. The dredge was in active operation 84.7% of the possible time available. About 76,000 cu. yds. of overburden was stripped by groundsluicing, and a small area was thawed with steam. About 20 men were employed.

The Berry Company operated its hydraulic plant on Eagle Creek for only a very short period, most of the season being spent in preparation for next year.

J. A. Anderson operated two hydraulic plants on Mastadon; and another hydraulic plant was operated on Miller Creek. Some small open cuts were worked on Deadwood, Independence, and several other creeks. J. R. Parkin will install a hydraulic plant on the Cheeko group on the north fork of Birch Creek.

In the Eagle, Seventy Mile, and Forty Mile districts, the principal operations consisted in hydraulic mining by Froelich, Kemmer, Ott and Scheele, with 10 men, on Crooked Creek; Bryant and Parson, with 6 men, on Alder Creek; the Dome Gold Corporation, with 20 men, on Dome Creek; the July Creek Placer Company, with 20 men, on Fourth of July Creek; and the McCandless Company, with 15 men, on Jack Wade Creek.

L. Steele employed 15 men on ditch construction and other preparatory work on Forty Mile River, where he will conduct hydraulic operations.

TOLOVANA DISTRICT

The gold output of the Tolovana district for 1923 was about \$150,000. The prolonged dry spell seriously affected the operations and the forest fires during the summer destroyed several of the drift mining plants. During the early summer, 17 operations, including seven hydraulic plants and ten drift mines, were active. Five of the drift mines were in the prospecting stage. About 100 men were employed. Prospecting on the Tolovana benches, near the Tolovana Crossing roadhouse, uncovered some good showings and three or four outfits will probably be at work there during this winter. No operations were reported from Wilbur or Gertrude Creeks.

Livengood Creek.

McIntosh Bros., Drakula and Simon, O'Conner, Kelley & Co. and Sam Godfrey were opening up drifting ground. J. McClellan, with 3 men, on No. 4 above, hydraulicked ground 35 feet deep, using two No. 1 giants under 85 foot head and a hydraulic elevator.

Amy Creek.

Enstrom Bros., with a canvas hose outfit, hydraulicked the early part of the season at the mouth of Amy creek. Later, drifting operations were started in a small block of good ground nearby. Bostrom and Wickstrom, with 6 men, working one shift, were drift-mining from a 120-foot shaft. The gravel here is small, very easy to mine, and no timber is required, except at the top crib in the shaft. Ground is stated to average about 60 cents per square foot, and can be worked for 50 cents. Bachner & Company and F. Sharp also conducted small drift operations. Jack Nielson, with one man, was hydraulicking.

Ruth Creek.

Bentley Falls, with 2 men, conducted hydraulic operations.

Lillian Creek.

Olof Iverson, with 10 men, hydraulicked on the benches. The ground averages 25 feet deep with 15 feet of gravel. Water was available only for 10 weeks, but the clean-up is reported to have been large. The ground averages about \$1.56 per square foot. M. Beegler also hydraulicked on the benches with a canvas hose outfit.

Olive Creek.

N. R. Hudson, with 5 men, mined on Discovery. The deposit worked averages 20 feet in depth, there being about 17 feet of gravel. Bedrock is soft schist. A canvas hose outfit is used to pipe the gravel into the sluice boxes, boulders are removed by stone boat operated by steam hoist, and a steam scraper is used for the final cleaning of bedrock.

HOT SPRINGS DISTRICT

Sixteen operations, with 68 men employed, were conducted in this district during the year. The total gold output was about \$45,000.

In the Eureka area, Frank & Co. on Pioneer Creek conducted hydraulic operations on the benches and operated an automatic dam on Yorrick Creek. Seven men were employed. Farmer and Jones on Eureka; Lane and Lund on Rhode Island; and Johnson, Ainsley and Sundstedt near Glenn Gulch, conducted hydraulic operations in shallow bench deposits. Olsen and Evenson groundsluiced and shovelled-in on Omega, and Victor Erickson operated an automatic dam on Chicago Creek.

In the Tofty area, Cleveland and Howell, employing 8 men, conducted the largest hydraulic operations in the district on Sullivan Creek, but were greatly handicapped through lack of water. On Deep Creek, Hanson and Lindberg continued their drift mining operations, and Mellon, Strand and Hartwick, with 2 men, drift-mined during the winter. Radovich & Co., on Miller Gulch, Miller and Hosler on the Mohawk claim, and Otto Hovely on Cache Creek, conducted drifting operations. Gallon and Serafino operated a Bagley scraper on American Creek for awhile, and on the same creek M. Murray, with 5 men, and Ed Ness, with 4 men, after stripping the muck and groundsluicing off some of the gravel, shoveled into self-dumping carriers, which conveyed the material to the sluices. Friedlund and Nurstes groundsluiced and shovelled-in on Boulder Creek.

RUBY DISTRICT

Early reports show the gold production from this district for 1923 to be about \$60,000, or only about half as much as that for the previous year. There were 23 outfits at work in the district, 78 men being engaged. The properties worked included a number of small drift prospects, at which the operators were unsuccessful in finding pay, and many of the plants were operated for only a short period. About one mile of road was built from Long toward Greenstone.

On Solomon Creek, Jensen, Johnson and Vicklund sank a new shaft and were developing new ground. R. Fulkerson, with 6 men, completed drifting on one good block of ground and developed another block farther up the creek. On Flat Creek, Wm. Midgley, McGettigan, Morton and Sohn; Chas. Johnson and McKelvey and McConn and Matson were drifting. Willike, Cannon and Ferry on Poorman Creek

at the mouth of Duncan were drifting in ground reported to be the best in the district. True Manuel was stripping pillars. Bittel and Pahlke, and Ward & Co. drifted for a short period on Tamarack. McCarty and Campbell, on Spruce Creek, were prospecting and intended later to start drifting. Farrell and Warren, with 4 men, completed one block of ground and sank a new shaft on Meketchum Creek. On Greenstone Creek, B. J. Bowers, with 4 men, did some drifting on the right limit and also conducted open-cut operations. Phillips and Gibson drift-mined on the left-limit bench. On Long Creek, Burke, Vucich and McDonald were drifting on the Emil bench and Chan Walker drifted on the Mascot. Deacon and Johnson, with 5 men, were open cutting on Discovery claim. At this property the ground was stripped of muck, the gravel shovelled into a self-dumping bucket and conveyed by overhead cable to the sluices. L. E. Sturtevant was open cutting on Bear Pup. On Trail Creek, Tom Deane and 5 men, Max Rigler with 2 men, and Hanson and Woodruff conducted drift-mining operations. One drift-mining operation was conducted on Birch Creek.

OTHER INTERIOR DISTRICTS.

Other districts of the interior where placer mining was carried on and the approximate placer gold output of each for 1923 are as follows: Bonfield, \$20,000; Richardson, \$10,000; Koyukuk and Indian River, \$80,000; Chandalar, \$50,000; Rampart and Gold Hill, \$15,000; Marshall, \$12,000.

The main production from the Chandalar district came from the winter drift mine of Fred Smith on Little Squaw Creek.

IDITAROD DISTRICT

The gold output from this district for 1923, including the operations on Moore Creek and those of the Georgetown area, in the Kuskokwim Region, was about \$310,000, which is a decrease compared with that for 1922. Thirty plants were in operation with 160 men employed. Two dredges were operated with 39 men employed; 18 plants using some form of hydraulicking were active with 95 men engaged; and one dragline excavator was operated with 5 men employed. The balance consisted of small groundsluicing operations. Many of the operations were not profitable. Low-water conditions prevailed for a period of more than two months and the average gold content of the ground mined was comparatively low. Characteristic of the district are the small water supplies under low head that for the greater part of the season can only be used in "splashes" or short intermittent periods.

The Iditarod district now receives all its freight via Holy Cross on the Yukon River. All freight from the States is routed via the Alaska Railway to Nenana; thence by government steamers to Holy Cross, where it is transferred to a privately operated steamer or to shallow-draught stern-wheel gas boats. These boats run to Iditarod, a distance of 400 miles, during high water periods. During low water

only the smaller boats with light loads can continue above Dikeman, which is 80 miles below Iditarod. Through freight rates to Iditarod are given in Table 2, page 21 of this report. The up-stream rate from Holy Cross to Iditarod is \$39 per ton. Freight rates under present conditions are now considerably higher than when routing was via St. Michael. Freight from Iditarod to Flat is taken over an 8-mile surface tram with gas-car, or by truck or team over the wagon road at a cost of \$20 per ton. From Flat to the camps of the district, all of which are within a distance of 7 miles, the freighting rates are from \$20 to \$40 per ton, according to location. Winter rates are approximately half the summer rates. Moore Creek is 42 miles east of Flat by trail. Summer rates by pack train to this camp are 25 cents per pound; winter rates by dogteam are 8 cents per pound. The Georgetown district is reached from Flat by trail, although some supplies go in via Georgetown on the Kuskokwim River.

Wages in the Iditarod district are \$6 to \$7 per 10-hour day and board. The cost of boardings is \$3 to \$3.50 per man per day.

Otter Creek.

The largest placer operation in the Iditarod district is that of the Riley Investment Co., which during the past season operated its dredge on the left-limit portion of the K. P. M. Association claim. The ground that was worked averages 15 feet in depth and from 40 to 50 per cent of it is permanently frozen to bedrock. Most of the gravel is of medium size with very few boulders, and is covered with from 1 to 2 feet of sod or moss, there being practically no muck. Formerly steam-thawing was employed in connection with the operation of this dredge at a cost of from 35 to 40 cents per cu. yd. After several years of experimentation with a small water-thawing outfit an equipment consisting of 700 water points was installed in 1923 and most satisfactory results were obtained.

Water for thawing is obtained from a 4-mile ditch from Slate Creek. From the ditch it is conducted through a pipe line to two thawing units or 9-inch manifolds, from which it passes through the various headers to the points. The pressure at the extreme end of the headers varies from 19 to 23 pounds to the square inch. The equipment contains one hundred 16-foot solid-head steam-points of $\frac{3}{4}$ -inch diameter with $\frac{1}{4}$ -inch openings at the point and seven hundred 16-foot sweaters of $\frac{1}{2}$ -inch extra strong pipe, which is used with a full opening, but with about four inches of the end case hardened. The solid-head points, under full water pressure, are used to thaw a hole to bedrock. They are then withdrawn and sweaters are inserted. Points are set at intervals of 10 feet in rows which are separated from one another by 10 foot spaces. Alternate rows are offset 5 feet with reference to adjacent rows, giving a triangular arrangement to the points. The average time required for thawing is from 10 to 12 days, although with warmer water than usual available during part of the 1923 season, one thaw was complete in 5 days. Temperature readings taken

in 1922 up to July 7 ranged from 36 to 68 degrees Fahr., and were no doubt even higher during some days later in the season. The temperature during the 1922 season averaged between 42 and 44 degrees, the highest being 50 degrees.

With the system now employed, 8 men will put down 40 points in two 10-hour shifts and get them under way. A thawing crew consists of 8 pointmen, one day foreman and one night foreman, one ditch man, one blacksmith and one blacksmith's helper. Only half the time of the blacksmith and helper is required. Labor and mess cost for this crew amounts to \$113.50 per day from June 22 to July 2, with the above crew, 391 points were set and 39,100 square feet of ground that was 15 feet deep (21,722 cu. yds.) was thawed, at a cost for labor, mess and repair, amounting to 5½ cents per cu. yd.

The company employed 27 men during the season.

The Northern Alaska Dredging Co. operated the Beaton-Donnelly dredge on the right limit of the K. P. M. Association Claim. Only the unfrozen areas were dredged. The company employed an average of 12 men.

Richardson Bros. were hydraulicking on the low bench on Discovery, Otter Creek.

Rivers and Galneck groundsluiced on the Malamute Pup and Frank Salen on No. 1 above on Granite Creek was groundsluicing and hydraulicking with 7 men.

Flat Creek.

Pete Muscovich, with 4 men, operated a hydraulic elevator plant on the Mohawk Association claim; Finnegan, Agoff and Scott were groundsluicing on Omega Fraction, and Capt. Becker operated an automatic dam on the Bonanza Association claim. The C. C. K. Co., with 6 men, hydraulicked on the Wild Cat Association bench claim, piping the gravel into the head of the boxes and stacking tailings with a steam scraper. Frank Anderson was working just above the Wildcat claim. The Alpha Mining Co., with 8 men, hydraulicked on the Alpha Association bench, where they found pay gravel coming in from the right limit. Deane and Lee did some mining on the Gold Hill Association. The Strandberg ground on the Upgrade Association claims was worked by three different outfits as follows: Olaf O'son with 8 men; Marone, Dassatti and Pearson, and Cardinoff Bros., with 7 men. This deposit is situated on the side of a mountain at the head of Flat Creek and is composed principally of residual gravels, which contain many large granite boulders. It varies from 6 to 18 feet in depth. The bedrock is decomposed granite which contains numerous veinlets of gold bearing quartz. Most of the material is removed by groundsluicing and with the aid of a small giant is piped into the boxes. Boulders are removed with hand-operated stiff-leg derricks; the large boulders being blasted. Bedrock is cleaned with brushes and scrapers which penetrates deep into the bedrock crevices and the

quartz veinlets. The one water supply is divided between the three plants. The average cost of mining at the plants above described, exclusive of royalty, was about \$1.00 per cu. yd. Walter Sakoff and Justin Johnson were sniping on the same claim. Paul Wobnig groundsluiced on the Idaho Association claim.

Happy Creek.

Ground sluicing and hydraulicking operations were conducted by Olson and Hanley on No. 1 Ray Fraction where the deposit consists of creek gravels. Peter Steger groundsluiced shallow gravels on the Summit Association claims, which are unique in that they lie on the very summit of the mountain at the head of Flat and Happy Creeks.

Willow Creek.

Boulanger & Co., with 4 men, and Loranger & Co., with 3 men, mined on the Wild Cat Association claims. The muck and top gravel at these properties is first stripped, leaving from 2 to 4 feet of gravel. The gravel and from 1 to 2 feet of slate bedrock is then piped to a locally constructed hydraulic elevator made of 8-inch pipe, and is elevated from 6 to 8 feet to the sluices with water under 50-foot head. The tailings are stacked at intervals with a steam operated Bagley scraper. The water supply is divided so that only alternate shifts can be worked. It is stated that the operating costs are from 40 to 50 cents per cu. yd.

Johnson & Co., with 5 men, operated a Bucyrus dragline excavator, owned by Frank Manley, on the Free Gold Association bench claims. This dragline, which is of the class-14 type, is equipped with a 60-foot boom, 1½ cu. yd. Page bucket, and is moved on skids and rollers. A 60-h. p. Pennsylvania boiler, which burns from 1¼ to 1½ cords of wood per 10 hour shift, produces the steam for operating. The crew for one shift consists of one engineer at \$10; one fireman at \$7.50; one dumpbox man at \$8; and two roustabouts at \$7. In addition to wages board is furnished, which costs \$3.50 per man day. Wood landed at the machine costs \$20 per cord.

On an average the deposit is 18 feet deep, and consists of 12 feet of muck and 6 feet of light gravel. Bedrock is soft slate, the decomposition of which has formed a blue sticky clay, on which the gravel lies. The ground is practically all frozen before the muck and part of the gravel is removed by groundsluicing and hydraulicking. As this is done generally a season in advance, the gravels are all thawed by the time they are dug.

As a rule, the area is stripped so as to leave from 4 to 5 feet of gravel, which together with one foot of bedrock, is dug, conveyed, and dumped into the sluice hopper by the excavator. The average pit is 110 feet wide and 150 feet long and requires five step-ups of the machine to complete its excavation. The center of the machine is always kept 65 feet, or the dumping reach, from the center of the sluice hopper. From the position of each setup an arc-cut from 30

ic 50 feet wide is made. The bucket can be thrown 18 feet beyond the digging reach, which is 62 feet and can then be made to take out the corners and outlying areas. Each time the bucket is filled the machine is swung and the contents of the bucket is dumped into the sluice hopper. The system employed in making the various cuts is complicated by the fact that the areas that can be reached from the several setups overlap. When a cut has been completed the machine is moved ahead for the next cut, etc., until the full pit is completed.

The sluice hopper is 14 feet long, 8 feet wide at the bottom, and 6 feet deep. To it is attached a 16-foot length of sluice, which diverges to 2 feet in width at the lower end. This equipment rests on a timber frame 12 feet high, provided with flanged wheels so that upon completion of a pit it can be moved on a wooden track to the position for the next one. The center of the track is 8 feet from the edge of the pit and parallel to it. The remainder of the boxes composing the complete sluice are generally about 10 in number; are 2 feet wide; and are erected on timber bents. The entire sluice is paved with manganese cast Hungarian riffles. The grade of the hopper is 20 inches in 14 feet and the boxes are set with a grade of 13 inches to the length.

Water is supplies by two ditches. During the greater portion of an average season the supply is inadequate to furnish water for continuous use. It is therefore impounded in a reservoir and released for periods of from 1½ to 2 hours. At low water periods, water is available for only about half the time. Water from the lower ditch supplies the hopper. That from the other ditch is used in operating a giant provided with a 3-inch nozzle. The size of the nozzle is reduced to 2 inches when low water prevails. The giant is set just above the 2-foot boxes, where the dumpbox man "boils up" the material as much as possible before it passes through the sluices. Even with this precaution clay goes through the sluices in large chunks.

In 1922, during which season there was a good water supply, 130,000 square feet of ground averaging 19 feet in depth, was mined at an operating cost stated to be 11 cents per sq. ft., or about 16 cents per cu. yd. This cost is exclusive of a royalty of 25 per cent of the gross gold production that is paid for the ground rental and for the use of the excavator. Approximately 67,400 cu. yds. of overburden was stripped at a cost of 9 cents per cu. yd. The excavator working one 10-hour shift per day, with 7 men employed, dug in 52 days 24,100 cu. yds. of gravel and bedrock averaging 5 feet in depth. The cost of excavating and sluicing was 28 cents per cu. yd. The cost of a new excavator of this type and size is \$25,250, F. A. S. Seattle, and its weight when prepared for export shipment is 52 tons.

Chicken Creek.

The Chicken Mining Co. conducted hydraulic operations on the Chicken Association claims for part of the season and with 13 men

employed. As the property is located nearly at the top of a mountain, water is available in average seasons for a period of only about 6 or 8 weeks. A giant equipped with a 2-inch nozzle, and under a 60-foot head, pipes against the face and washes the material into the sluices. A steam-operated "sky line" carrier, equipped with a net, is used for handling boulders. No stacking of tailing is necessary. In about 2 weeks time during June, 6,000 sq. ft. of ground averaging 25 feet in depth, was mined, and yielded \$12,000 in gold.

Moore Creek.

Dawson and Keller, with 6 men employed, hydraulicked on the B & C claim on No. 6 Pup. The deposit on this claim averages 10 to 12 feet in depth and contains no boulders. Material is piped into the head of boxes and tailing is stacked at odd intervals with a giant. In 1922, when the average depth of ground was 11 feet, 120,000 sq. ft. was mined in a season of 122 days and at a cost of 15 cents per sq. ft. or 37 cents per cu. yd. The wages paid at this property are \$8 and board for 10 hours. Board costs \$3.50 per day. In 1923 the cost of mining was about 50 cents per cu. yd. Prospecting conducted during the summer demonstrated that the pay streak continues a full claim above present operations. A new 3-mile ditch was constructed during the season.

F. Boushau and Paul Reimer were groundsluicing in the vicinity.

The gold output from Moore Creek in 1923 was about \$20,000.

Georgetown District.

On Donlin Creek, a tributary of Crooked Creek, Barney Walsh, with 5 men, and Harry Stevens, with 6 men, hydraulicked on the benches. On George River, Riley and Duffy, with 4 men, were hydraulicking. Tom Anderson and one man mined on Julian Creek. The gold output resulting from the above-named operations was about \$45,000. Some good pay dirt was discovered on Crooked Creek during the summer.

INNOKO DISTRICT

Early reports indicate that the placer gold output of the Innoko district for 1923 was about the same as for 1922, or about \$200,000. There were 18 plants in operation, with 86 men employed. Of these two were dredges that employed 38 men. The others included 3 slip scraper plants, 1 drift mine and 11 small open cut operations.

The Innoko district may be reached either from the Kuskokwim River via McGrath and Tacotna, or from Holy Cross, on the Yukon River via the Innoko River and Ophir. Still another route, and the quickest way for the traveller, is from Flat by trail to Ganes Creek, a distance of 82 miles. Freight rates from Holy Cross to Ophir are \$140 per ton. Freight is taken up the Innoko River to Cripple in small stern wheel boats; thence by horse-drawn scows or poling boats to Ophir. From McGrath to Tacotna, which is 60 miles by launch,

the freight rate is \$25 per ton. The winter sled rate between these points is $4\frac{1}{2}$ cents per lb. The winter rate from Tacotna to Ophir, a distance of 24 miles, is $2\frac{1}{2}$ cents per lb. The summer rate is 10 cents per lb. A splendid road, built by the Alaska Road Commission, has been completed from Tacotna about half way to Ophir. Connecting with this road at 8-Mile is a privately-built road, 8 miles in length, to Yankee Creek. This has recently been extended 5 miles to Ganes Creek.

Wages in the district are \$6 to \$7 per 10 hours and board. The average cost of board is \$3.50 per man per day.

Ganes Creek.

The Innoko Dredging Co. constructed a $3\frac{1}{2}$ cu. ft. steam dredge and started operations on No. 7 above June 7th, 1923. The dredge operated until about the middle of August. This dredge was formerly operated by the Yukon Gold Co. on Greenstone Creek in the Ruby district. With a crew of 50 men, the dredge was constructed on Ganes Creek in 43 days at a construction cost of \$15,000. The average number of men employed in connection with the dredge operation during the season was 28. Eight-hour shifts were worked on the dredge. The ground to be worked ranges from 8 to 20 feet in depth, and averages about 10 feet. It consists of light gravel wash with from 1 to 3 feet of soil in places. The gold is coarse and worn, and its distribution is very erratic and principally on bedrock. Bedrock is slate and sandstone cut by hard dikes. Most of the ground is free of permanent frost. Seasonal frost is from 2 to 5 feet deep.

The Glacier Creek dredge, formerly operated by Guinan and Ames on Glacier Creek, Seward Peninsula, has been moved to Upper Ganes Creek, where it will be operated on the Glass holdings.

Hans Erickson groundsluiced during the season on the Meyer bench.

Yankee Creek.

The Flume Dredge Co. operated its dredge for a period of 135 days, with ten men employed. The company is constructing on the right limit of the Innoko River a 29,600-foot ditch and 1000 feet of 27-inch pipe-line that will deliver water to a hydro-electric plant at the mouth of Yankee Creek under a head of about 100 feet. The power plant will contain a 21-inch Pelton-Francis turbine which will operate a 200-k. w. Westinghouse generator. The plant is to be completed in 1924, and will be used to operate the Yankee Creek and Little Creek dredges.

Little Creek

Vibe and Cameron operated a slip scraper on Discovery with 7 men employed. F. Speljack mined on the Bonanza Association bench and Dan Nicholson put in a bedrock drain on the Bonanza creek claim.

The Flume Dredge Co. had two men stripping muck on ground to be dredged. The Little Creek flume-dredge machinery and hull-material

is on the property and is to be erected in 1924. The dredge will be operated by electricity from the Yankee Creek plant, described above. Spruce Creek

Reich, Daniels and Vinal on Discovery bench, and Edwards and Nicholson on No. 2 above bench, conducted stripping and groundsluicing operations.

Ophir Creek.

Collins and Hard, with 6 men, operated a slip scraper on No. 9 above lower Discovery. An average of about 30,000 sq. ft. of bedrock is mined at this property per season. The ground averages 16 feet in depth and consists of 10 feet of muck and clay overburden and 6 feet of gravel. The overburden is stripped by groundsluicing and hydraulicking and the gravel and the bedrock, which is scraped, are dragged up a high incline to the sluices. The operating cost for the entire operation is about 30 cents per sq. ft., or 51 cents per cu. yd.

Johnson and Johnson, working alone, conducted a small slip-scraper operation on No. 4 above upper Discovery.

John Staton, and Berg and Meier, on No. 4 below lower Discovery, groundsluiced and hydraulicked the overburden from a deposit 30 to 40 feet in depth. There was left 3 to 4 feet of gravel, which was shovelled into a self-dumping bucket, and by means of a small steam-hoist was trammed over an inclined cable to the sluices. The operating cost for the entire operation is about 50 cents per cu. yd.

Victor Gulch.

Victor Hill completed a $1\frac{1}{2}$ mile ditch line that takes water from Spruce Creek, and at the time of visit was prepared to resume mining the narrow, rich channel he discovered in the Gulch several years ago. The ground is about 25 feet deep. In drifting over 500 sq. ft. of bedrock at one place on this property there was produced \$6500 in gold. The gold is usually coarse and rounded.

Dahl and Wilson groundsluiced on Gold bench.

The Anvil Creek Mining Co., with 4 men employed conducted drift mining on No. 5 Sunshine Claim on Anvil Creek. Gus Lamka and H. Hansen were prospecting on Ester Creek, a tributary of the Beaver, where the former is reported as having made a gold discovery.

TOLSTOI DISTRICT.

The Tolstoi district produced about \$25,000 in placer gold in 1923. In the Mt. Hurst area, 8 operations were reported, with a total of 11 men employed.

On Esperanto Creek, H. Madison, and Kruger and Brisler were drift mining. On Madison Creek, Ed Enholm, Paul Keaton, Wm. Ames, and P. Murdock were groundsluicing and Alexon and Brule were drift mining. In the Cripple area there were 8 operations with ten men. On Cripple Creek, Mitchell and Wilson were groundsluicing. A. Greenberg and Sid Paulson drift mining and prospecting, Coffin and Graegan

drift mining and groundsluicing. On Colorado Creek, Alex Schedel and Wm. Critchley were drifting and on Eldorado Creek Chas. Collins and Wm. Scenatkos were prospecting. Prospecting will also be done on Boob Creek this winter.

KUSKOKWIM REGION.

The Kuskokwim Region embraces the Mt. McKinley (McGrath), Georgetown, Tuluksak-Aniak and Goodnews Bay districts. While Moore Creek in the Mt. McKinley district, and Donlin, Crooked, George and Julian Creeks in the Georgetown district are in the Kuskokwim Region, the headquarters for operations conducted upon them is at Flat and work done on these streams is reported under the Iditarod district, above. The Mt. McKinley district, of which McGrath is the main settlement, produced about 90 per cent of the placer gold output of the region for 1923. This district produced over \$300,000 during the season. This output came from 15 summer operations, employing 74 men and 3 winter drift mines employing 6 men. The Kuskokwim Dredging Co., on Candle Creek, was the principal producer and employed 30 men. In the Tuluksak-Aniak district eight operations, with 33 men employed, produced about \$20,000 and the Goodnews Bay district produced about \$10,000, with 4 operations, employing 11 men, reported.

Three different steamers were operated between Seattle and Bethel in 1923. There was also added competition on the Kuskokwim River between Bethel and McGrath as a result of which freight rates were reduced. The average rate on all commodities from Seattle to Bethel was \$22.50 per ton, and from Seattle to McGrath \$45 per ton, ships option, which was generally on the measurement basis. The first boats reached Bethel on June 4, the earliest in many years, but through needless delays at Bethel, the river boats did not arrive at McGrath until June 28. Practically all freight for the Innoko district is also routed by way of Bethel and McGrath. There was a general shortage of provisions and supplies until the first shipments arrived.

Mt. McKinley (McGrath) District.

The Kuskokwim Dredging Co. operated its dredge on Candle Creek from May 2 to Oct. 23, or 174 days. The dredge was operated 84.3 per cent of the total time. The ground dredged averaged 18 feet in depth and 239,369 sq. ft. of bedrock, or 173,452 cu. yds. was dug. About 300,000 cu. yds. of overburden was stripped in spite of the shortage of water. A small amount of gravel was thawed with steam.

Gold was discovered on Candle Creek by Fred Tuttle in 1914, and for several years the upper end of the creek was worked by hydraulic methods.

The dredge was constructed in 1917 and started operations in 1918 just below the area theretofore mined by the hydraulic method. The grade at that point was about 7 per cent. The deposit was from 12 to 15 feet in depth, was comparatively free of muck overburden and confined to the creek bed. Numerous boulders were present and about

50 per cent of the ground was permanently frozen. Many other difficulties were encountered. Working down stream, the dredge is now on No. 9 above Discovery, where the grade is less than 2 per cent. the gravel is of medium size, but tightly packed and difficult to dig. On the last two claims worked this ancient creek deposit has swung to the left limit of the valley, where the deposit averages 35 to 50 feet in depth; from 15 to 25 feet of gravels being overlain by a deep frozen overburden of muck and clay. In the lower ground this overburden is 60 feet thick. The bedrock is decomposed porphyry. The pay channel has averaged about 250 feet in width, but has recently widened to about 360 feet. At one place dredged this season, it was 600 feet wide.

The frozen overburden is removed by groundsluicing and hydraulicking, and while the water supply in average seasons is limited to several months use, the stripping has been kept at least two seasons in advance of the dredge. About 225,000 cu. yds. of overburden has been stripped each season at an average cost of 10 cents per cu. yd. The gravel is now free from permanent frost, as the irregular frozen areas which were encountered up to this year have been steam thawed. The average cost of this thawing operation was about 25 cents per cu. yd.

The dredge is of the revolving-screen table and stacker type, and is equipped with two bucket elevators, which convey the sand from the tables to the stacker. The bucket line is of the close connected type and carries seventy-two $3\frac{1}{2}$ cu. ft. buckets. The average rate of dumping is 17 buckets per minute. The revolving screen is 6 feet in diameter, 22 feet long and has $\frac{1}{2}$ -inch perforations, except in the lower half plate, where they are $\frac{3}{4}$ inch. The stacker is 80 feet long. the gold saving area is 560 sq. ft. with an additional 30 sq. ft. of save-all area. Approximately 3600 gallons of water per minute is used. Power is supplied by one 60-h. p. and one 80-h. p. Bolinder semi-diesel engine, the average daily consumption of diesel oil being 150 gallons. The average cost of diesel oil is 40 cents per gallon. The average operating time is 80 per cent and the dredge handles about 1200 cu. yds. per day. The company employs 30 men, 18 men being used on the dredge where 12 hour shifts are worked. The average operating costs for dredging only are about 30 cents per cu. yd. About \$162,000 is invested in the dredge and its equipment, and about \$50,000 in thawing, hydraulic and other equipment.

Other Operations.

North of McGrath on Hidden Creek, a tributary of Nixon River, Goebel and Blackburn, with 9 men, were hydraulicking with a canvas hose outfit. They were stacking the tailing with a scraper. The creek deposit that they were working is from 12 to 14 feet deep.

On Ruby Creek O'Mally Bros. did some winter drifting and Strand and Pearson mined a shallow residual deposit. Ed Whelan, on Holmes Gulch, H. Goshan on Birch Gulch, and C. Winan on Riddle Gulch were groundsluicing and shovelling-in.

Tuluksak-Aniak District.

The hydraulic plant formerly operated by the Tuluksak Mining Co. and Spruce Creek was operated on a restricted scale this season.

Some work was done on the property of the New York Tuluksak Co., at the junction of the Tuluksak River and Bear Creek. According to general reports this company has for some time been planning to install a dredge. A small amount of mining was done on Bear Canyon, Mabel, and some other creeks of the district.

SEWARD PENINSULA

Seward Peninsula produced, according to early returns, about \$1,200,000 in placer gold during 1923, which is a small decrease from the output of the previous year. About 100 operations were conducted, employing about 500 men. Transportation from the States was improved during the season. A new company placed a boat on the Seattle-to-Nome run. The first boat of the 1923 season reached Nome June 14. The last one left Nome October 28. Freight and lighterage rates, with the exception of a slight reduction in handling charges at Seattle, remained the same as formerly. There was an appreciable reduction in the price of case gasoline and distillate, and fuel oil of 16 gravity sold for \$4.25 per barrel, at Nome.

With 1500 tons of Utah and 2500 tons of British Columbia coal being brought to Nome during the season by three different parties, coal sold for from \$27 to \$33.50 per ton. This winter's price is \$36 per ton.

The old Seward Peninsula Railroad, which was purchased by the Territory, has been repaired for about 40 miles and will be completed through to Shelton next season. It has been turned over to the use of the public. Bridges are being constructed for 5-ton loads and a gasoline driven car, with trailer, is now being used over the tracks by one of the operators. The completion of this road will be of great benefit to the Kougatok district and creeks along the line. As elsewhere in Alaska, the Peninsula experienced a prolonged dry spell and water shortage, in 1923, which handicapped most of the placer operations, although the season was in general a successful one.

Dredging.

In 1923 19 dredges were operated on Seward Peninsula, producing approximately 73 per cent of its placer gold output. The dredges that were operated are indicated in Table 1, page— of this report.

The most important event in dredging was the operation of two 9-cu.-ft. electric-driven dredges by the Hammon Consolidated Goldfields Co., near Nome. No. 1 dredge started operations on July 14 and continued until November 29. No. 2 dredge operated from July 6 to December 2. During this period the temperature dropped to 36 degrees below zero at one time. The company is overhauling the 8-cu.-ft. dredge formerly operated by the Alaska Mines Co. on Wonder Creek, and will place it in operation in 1924. Another new 9-cu.-ft. dredge

will also be constructed next season and the diesel power plant will be enlarged.

The Center Creek dredge operated on Snake River from June 17 to Oct. 15, digging about 70,000 cu. yds. Operations were greatly delayed by engine trouble. A 50-point water-thawing plant, using pumped water successfully, thawed ground 35 to 40 feet deep.

The Bangor dredge on Anvil Creek operated from July 5 to Oct. 23, digging 210,000 cu. yds, and producing \$80,646 in gold. The operating cost was 20 cents per cu. yd.

The Northern Light dredge on Ophir Creek operated from June 14 to Oct. 14, handling 141,358 cu. yds., and producing gold to the value of \$60,346.

Both dredges of the Wild Goose Company were operated on Ophir Creek. The upper tumbler-shaft of the No. 2 dredge was broken on Sept. 26 and this dredge will no longer be operated. All dredging operations on Ophir Creek will be finished in 1924.

Five of the Seward Peninsula dredges were operated only during a period of from 30 to 50 days.

The dredges that have been idle for a season or more, and that resumed operations in 1923 on the same creeks where they were formerly operated were the following:

That of the Alaska Kougatok Company, on Taylor Creek; that of the Luther Gold Dredging Company, on Budd Creek (formerly the Dobson Dredge); the Swanson Creek Dredge, and that of the Alaska Dredge Association (formerly the Candle Dredge).

The dredge formerly known as the Kugruk Dredge was moved to Candle Creek and was operated in 1923 by the Candle Creek Dredging Company.

The G. and O. Dredge, formerly located on Warm Creek, was moved to and operated on Dime Creek.

The moving of the Casadepaga Dredge was not completed in time for operation in 1923 but the dredge will be operated in 1924 on Kenyon Creek.

The Glacier Creek Dredge was removed to Ganes Creek in the Innoko District.

The Inmachuk Dredge is to be moved to Candle Creek.

While plans are being considered for other dredging propositions, they have not as yet reached the point where they can be definitely reported.

Hydraulic Mining.

Hydraulic mining in some form was conducted in most of the districts on Seward Peninsula. At the Pioneer hydraulic-elevator operations at Little Creek but two of the elevators were operated, and for the greater part of the season only one was in use.

Lee and Swanberg on Osborne Creek, the Wild Goose Company on Ophir Creek, and 3 or 4 companies in the Fairhaven district also operated hydraulic elevators.

A. V. Cordovada, who has acquired the holdings of the Fairhaven Ditch Co. in the Inmachuk district, conducted hydraulic-elevator operations with 22 men for 140 shifts, handling about 90,000 cu. yds. The Quigley Hydraulic Mining Co. on Big Hurrah, the Golden Ore Mining Co. on Boulder Creek, and S. M. Gaylord on the Casadepaga operated their hydraulic plants. Six hydraulic plants were operated in the Candle district. The Keewalik Mining Co., near Candle, operated its rubble-elevator plant, with 18 men employed.

Drift Mining.

Very little drift mining was done around Nome. During the winter some sniping was done on Dexter Hill and Anvil Creek, and one small operation was conducted on Center Creek. At Dime Creek, drifting was done by W. Porter, Olson Bros., Rylander and Johnson, and Jno. Hoen. Further prospecting by drifting under the lava capping in the Inmachuk district was done and H. Stull is reported to have found some very encouraging prospects there.

Quite a number of small open cut operations employing ground-sluicing and shovelling-in methods were conducted in various districts and a few men still make wages mining by such methods on the Nome and Bluff beaches.

KOBUK REGION

Placer mining was conducted on Dahl, California and Lynx Creeks in the Shungnak district. There are two hydraulic plants in the district, that of Fred Johnson on Dahl Creek, and Rose and Gougher. About 20 white people are in the district.

Review of Lode Mining by Districts.

SOUTHEASTERN ALASKA.

HYDER DISTRICT.

Development work on new properties and prospecting were probably more active in the Hyder district in 1923 than in any other lode mining district of Alaska.

Prospecting was particularly active in the Texas Creek section of the district where at least fifty prospectors were engaged in the search for and preliminary development of new properties.

Riverside Mine:

Development work was prosecuted throughout the year on the Riverside Mine at Seven Mile on Salmon River. This property is now controlled by Ketchikan business men.

A crew of nine men was engaged in driving tunnels that developed two veins of silver lode ore. About four thousand feet of tunnel work has been completed within the past two years. The property was equipped in 1922 with a small compressor and power driven drills. Within the past year a new compressor with a capacity of 478 cubic feet was placed upon the property.

Sufficient ore has been exposed as a result of the development work accomplished within the past two years to cause those in control of the property to feel justified in erecting a mill which is now under construction. The capacity of this mill is about sixty tons a day and it is expected that concentrates will be shipped by November 1, 1924.

PRINCE OF WALES ISLAND.

Productive mining on Prince of Wales Island in 1923 was confined to two small lode mines, and the marble quarries at Token.

Most of the mining development that has been done on Prince of Wales Island in the past has been on lodes valuable primarily for their copper content. The unfavorable copper market that has existed during the past year has operated to discourage development of the copper bearing mineral deposits of the Island which are known to be quite extensive.

Rush and Brown Mine:

The Rush and Brown Copper Mine, which is situated at the head of Kasaan Bay on the East Coast of Prince of Wales Island was operated but six months during 1923.

The mine was closed on July 10th after continuous operation extending over a period of many years. A total of 85 feet of development work was done during the period that the mine was in operation, and one small shipment of ore was made to the smelter at Tacoma.

Salt Chuck Mine:

The Salt Chuck Mine, located at the head of Kasaan Bay, about a mile and a half from the Rush and Brown Copper Mine was idle during 1923 but toward the close of the year preparations were made for resumption of operations. This property produces copper ore, principally in the form of bornite, accompanied by platinum and palladium.

Kasaan Gold Mine:

This property has hitherto been variously referred to as the Duntun, Julia and Harris Creek mine, and is situated at the head of Twelve Mile Arm.

The property is now known as the Kasaan Gold Mine and is controlled by the Kasaan Gold Company of Minneapolis, Minn.

An output of 1170 tons of ore is reported for the year 1923 from this mine, and development work totalling 400 feet was done during the year. The crew engaged consisted of from five to seven men working underground and from six to ten men on the surface. Four men were employed in and about the mill and plant.

Moonshine Property:

The Moonshine Property, located on the South Arm of Chalmers Sound, on the East Coast of Prince of Wales Island, upon which considerable development work was done during 1921 and 1922, was idle during 1923, and it is understood that development work upon the property has been indefinitely suspended.

Jumbo Mine:

The Jumbo Mine, commonly known as the Sulzer property, situated on the West Coast of Prince of Wales Island, remained idle during 1923. The last active mining at this property was done in 1918. Further development will be necessary before further production can be made from this property, and this will probably not be undertaken until a more favorable copper market exists.

Shakan Molybdenite Lode:

This property is situated at Shakan and is controlled by the Alaska Treadwell Gold Mining Company. As for several years past, assessment work only was done during 1923.

Vermont Marble Quarries:

During the year two quarries were operated by the Vermont Marble Company at Tokcen and Calder respectively with an average crew of 56 men engaged.

The output of marble was somewhat less than in 1922, the gross tonnage shipped being reported as 4,127 tons.

WRANGELL DISTRICT.

No productive mining was carried on in the Wrangell district during the past year, although some prospecting work was done at various localities within the region.

A wide variety of both metallic and non-metallic minerals is known to occur within the Wrangell district, but mining on a commercial scale has never been successfully undertaken on any property within the district.

Geological and mineral resources of this district have been described by A. F. Buddington, in U. S. Geological Bulletin No. 739-B, issued in 1922.

CHICHAGOF ISLAND

The West coast of Chichagof Island was again the scene of considerable active development work in 1923, and one new gold quartz mill was erected during the season.

This region has been particularly attractive to prospectors on account of the numerous high grade gold lodes that have been discovered within it. Copper and nickel deposits are also known to occur, and the latter particularly have been sought out during the year.

For a full description of the geology of the region, accompanied by a geological map, reference is made to "Geology and Mineral Resources of the West Coast of Chichagof Island," by R. M. Overbeck, U. S. Geological Survey Bulletin No. 692, Mineral Resources of Alaska, 1917, pp. 91-141.

Chichagoff Mine:

The Chichagoff Mine was operated in 1923 only until July, when the property was closed down and the announcement was made that the ore bodies were exhausted and that the mine would be abandoned.

Subsequently the property was acquired by a new company, incorporated under the name of the Chichagof Development Company. The new owners began the work of reconditioning the mine workings in November with a crew of about forty men. By the end of the year the crew had been increased to fifty-five and production was resumed shortly afterward.

For many years the Chichagoff Mine has ranked first in Alaska among the producers of gold from high grade ores and in the year 1921 the value of its output was greater than that of any other gold mine in the Territory.

Hirst Chichagoff Mine.

The Hirst-Chichagoff Mine was operated continuously throughout the year with an average crew of fifteen men of whom twelve men worked underground and three men on the surface.

The ten-stamp mill, which was erected in 1922, was operated for a period of nine months.

The amount of development work done during the year totalled about 770 feet.

The Hirst-Chichagoff vein lies parallel with and east of that of the Chichagoff Mine. The camp and mine workings are North of and on the opposite side of Doolth Mountain from Chichagoff.

Jumbo Prospect.

The Jumbo property, otherwise known as the Louis Smith ground lies west of the Chichagoff Mine and at a distance of about one-half mile from it. Owing to lack of available capital very little work has been done on this group for a number of years.

During 1923 the claims were held under option by parties who conducted surface explorations on the mineralized zone traversing the claims that can be traced from Klag Bay to Ogden Passage. This zone lies parallel with the vein at the Chichagoff Mine, and is characterized by numerous outcrops of auriferous quartz from which very fine specimens of free gold have been obtained.

The property has been described by Overbeck in "Mineral Resources of Alaska, 1917," issued by the U. S. Geological Survey as Bulletin 692.

Pinta Bay Mining Company.

About 2,000 feet of development work was reported as having been done during 1923 on three groups of claims known respectively as the Golden, Copper, Mineral Hill and Brown Bear, all of which are controlled by the Pinta Bay Mining Company and are situated in the vicinity of Pinta Bay and Deep Bay on the West Coast of Chichagof Island.

The company reports that ten men were employed underground during the year and twenty-five men on the surface.

Falcon Mining Company.

Development work done in 1923 at the property of the Falcon Mining Company at Ford Arm was confined to surface work that extended over a period of but three months. During this time eight men were employed.

Apex-El Nido Mining Company.

A crew of 25 men was employed at the Apex-El Nido property on Lisianski Inlet during 1923, six men being engaged in underground work and 19 men on the surface.

Underground development consisted of 440 feet of tunnels and raises.

On the surface a ten-stamp mill building was erected and partially equipped. Milling operations are expected to commence early in 1924.

Pacific Coast Gypsum Company.

The mining operations of the Pacific Coast Gypsum Company at Iyoukeen Cove were curtailed during the past season and toward the close of the year were entirely discontinued. A normal crew was maintained during the first half of the year, after which the number was reduced by one-half.

Operations were continued with this reduced force until December when all work ceased. It was announced that the gypsum deposit, upon which mining has been carried on for many years, has been exhausted and that the closing of this mine is therefore permanent. Other deposits of gypsum are known to exist in the vicinity of Iyoukeen Cove and it is probable that the closing of the mine at Gypsum will result in their development.

Nickel Prospects.

The existence of nickel ores on the west coast of Chichagof Island has been known for many years and a limited amount of development work has been done on one property north of Portlock Harbor. During the past three weeks prospecting has revealed outcrops of nickel-bearing ores at other localities. During the past year the discovery is reported of a deposit of nickeliferous pyrrhotite near Tenakee. Sufficient work has not been done to determine its importance.

YAKOBI ISLAND.

Nickel Prospect.

No further development work has been done on the Bohemia and Tasmania groups which were located in 1921 and cover extensive outcrops of nickeliferous ore. These outcrops were visited by representatives of the U. S. Geological Survey during the year, but a report upon the results of the investigation has not yet been published.

BARANOF ISLAND.**Nickel Prospect.**

A deposit of nickel-bearing ore was discovered at Snipe Bay near the southerly end of Baranof Island during the past year and some claims were located upon it. Details as to the nature and extent of this deposit are not known, except that it is of a similar type to those found on Chichagof and Yakobi Islands.

ADMIRALTY ISLAND.**Peckovich Mine.**

Development work done at the Peckovich Mine at Funter Bay during 1923 was of a minor nature. Plans were being worked out for more extensive operations in 1924, however.

Alaska-Dano Mines Company.

Two men were engaged during eight months of the year in prosecuting development work on the property of the Alaska-Dano Mines Company at Funter Bay. The work accomplished consisted in sinking a winze a distance of 45 feet and in driving 100 feet of tunnel. Open cuts totalling about 400 feet in length are also reported to have been dug.

Williams Property.

The large group of claims located by Charles Williams and situated north of Hawk Inlet on the south slope of Mt. Robert Barron was held under option during the past year by Mr. R. K. Neill, who carried on active development of the property during the entire season. A substantial camp was constructed and underground work was in progress throughout the winter. The veins being developed on this property are probably within an extension of the mineralized zone traversing the Peckovich property on the opposite or Funter Bay side of Mt. Robert Barron.

JUNEAU DISTRICT.**LYNN CANAL.****Alaska Endicott Mining and Milling Company.**

Development work has proceeded for a number of years on this property, which is situated at William Henry Bay on the west side of Lynn Canal opposite Berners Bay. A 15-stamp mill has been erected but no production has been recorded.

During 1923 the work done was confined to prospecting. An average of 11 men were employed throughout the year.

Jualin Berners Mining Company.

A crew of 30 men was employed by the Jualin Berners Mining Company from January first until June 30, 1923, in extending the drainage and development adit at the Jualin mine. Progress effected amounted to a total of 1300 feet. The property has been idle since the completion of this work.

Yankee Basin and Eagle River.

No work, other than that necessary to meet annual assessment requirements, was done on properties at Yankee Basin and Eagle River during 1923.

Peterson Mine.

The Peterson mine at Pearl Harbor continued operations on a small scale and the three-stamp mill made a small production.

GASTINEAU CHANNEL.**Alaska Juneau Mine.**

The tonnage of ore mined at the Alaska Juneau mine in 1923 amounted to 2,476,240 tons, which is an increase over that of the preceding year of approximately 170,000 tons.

The crew employed in 1923 averaged 385 men, which is an increase of 64 men over the number employed in 1922. In December the crew had been increased to 421 men. The crew was distributed as follows: Underground, 155 men; in yards and shops on the surface, 90 men; at the milling plant 149 men. Three shifts were employed in both mine and mill throughout the year.

The amount of development work done in driving levels, drifts, crosscuts and raises was nearly double that for the previous year and amounted to a total of 10,442 feet.

The total value of the output of the mine for 1923 was \$1,514,744. The value of the total output of the mine from 1893 to 1923 inclusive is \$7,282,354.

The following statements regarding production, development and construction are taken from the published annual report of the company for 1923:

"The crew available for development and preparatory mining work averaged but 23 men. The progress in preparing the South half of the mine is not up to schedule and the output from that part of the mine was but 20.5% of the total, whereas a larger production had been expected.

"In the No. 1 cone area an additional 1,000,000 tons will be made available upon the completion in the early spring of 1924 of a small amount of further preparatory work. This new ore will be mined continuously at the rate of 1,000 tons per day, whereas the cone originally laid out was productive in the summer months only.

"The area of No. 2 cone was increased by 16,428 square feet, making a total of 48,000 square feet of cut out area. By means of this ore-way and its branches, it is possible to transfer ore directly from the stope to the main haulage level, thus eliminating all upper level tramming. All the foregoing work is additional to the program originally laid out for this cone, consequently the normal rate of production from this part of the mine was not reached. During 1924, however, the average daily production from No. 2 cone should be about 2,000 tons.

"On No. 3 cone, 1,696 feet of work was done. Scarcity of men, and the additional work done on both No. 1 and 2 cones retarded progress on No. 3 cone. As a part of the development work on this cone, a branch of Gold Creek tunnel was driven 1,514 feet. Of this distance 887 feet was in ore, 112 muck samples averaging \$0.96 per ton.

"In the year, 2,476,240 tons were trammed from the mine to the mill. * * *

"It was necessary to blast 51 powder drifts, 205,100 pounds of powder being used. For bulldozing, the powder consumption was 614,700 pounds, making a total powder consumption of .331 pounds per ton trammed.

"Material for making 50 ore cars was purchased and delivered. Additional machine shop equipment for the building of cars was purchased and installed. Five cars were completed and henceforth new cars will be completed at the rate of five per month. All this is in accordance with the program of securing additional cars so the tonnage from the mine to the mill can gradually be brought up to 10,000 tons per day.

"In order to secure access during the winter months to the tops of the stope raises from No. 2 cone, snow sheds were built in the upper basin. These will make it possible to handle powder for powder-drift blasting quickly and economically.

"Of the 2,476,240 tons trammed to the mill, 1,341,481 tons or 54.17% was rejected as coarse waste, and the balance or 45.83% was fine milled. The daily average fine milled for the year is 3,675 tons, an increase of 638 tons per day over the average for 1922.

"The average recovery of the gold content of the ore fine milled was 81.43% and the overall recovery of the gold content of the rock trammed was 71%; the corresponding recovery figures for the preceding year were 79.09% and 68.60% respectively.

"In order to further increase the efficiency of the mill, all the concentrating tables on the finishing floor of the mill are gradually being replaced with a better and more efficient type of table; this replacement will continue until all departments are supplied with the most efficient table for its particular work. A full investigation will be made to determine whether or not flotation equipment will serve to increase the extraction of all metals.

"In order to further increase the capacity of the mill a start was made on the conversion of the tube mills into ball mills. To do this it is necessary to reverse the direction of the flow through the mill, by making changes on both heads of the mills. The feed for the tube mills will be oversize from the ball mills, supplemented by enough original feed to keep the mills up to capacity. Owing to the fact that the trunnions of the tube mills are of less diameter than the ball mill trunnions the supplemental original feed will be passed through a 6 D gyratory crusher before going to the tube mills.

"In order to insure continuous and economical operation of the coarse crushing plant when handling over and above a duty of 8,000 tons per day, a new 36x48-inch Jaw Crusher will be installed. This third crusher will be a duplicate of the two now installed, and with three crushers

available two can always be in service, thus giving the coarse crushing plant a capacity of 10,000 tons a day.

"The floor of the mill originally occupied by the 'roughing' tables has been stripped of these tables and in this space a complete machine shop has been installed. The equipment was moved from the Treadwell shop and this, together with some new tools, makes a complete shop. With the shop in this location repair and other work is done cheaper, more expeditiously, and with closer supervision than before.

"A new flume was built for tailing disposal. This flume has more grade than the original flume and therefore requires less water to carry tailings; this will effect a saving in the winter months, because power will not have to be purchased to pump the flush water required by the old flume.

"The service flume that carries water from Gold Creek to the mill has been rebuilt for considerable distance in order to carry more water.

"Construction work planned for the ensuing year contemplates the beginning of work on a more economical layout for waste disposal; moving the foundry from Douglas Island to a suitable site on the beach below the mill, and work to provide additional protection from snow and rock slides.

"All foundry and machine shop work formerly done by the Alaska Treadwell Gold Mining Company has been absorbed in the departmental work of this company. This change partly accounts for the increased number of men employed, and the increased average wage. Increased output and the increase of 10% in the ore production contract also account in part for the increased crew and wage.

"An average of 398 men was employed at an average wage of \$5.15 per day.

"The total cost per man per day was \$9.47 against \$9.62 for the year before."

Ebner Mine.

The property of the Ebner Gold Mining Company, which adjoins that of the Alaska Juneau Company on the northwest remained idle throughout the year 1923.

Alaska Treadwell and Ready Bullion Mines.

While these mines are permanently closed down, a crew of men averaging 39 in number was maintained throughout the year in various types of surface work about the plants, principally in the work of dismantling and in connection with the operation of the foundry.

The tailing dumps of both these mines have been leased and the work of erecting plants for the recovery and retreatment of the tailings was carried on throughout the open season of 1923.

Jumbo Prospect.

Prospecting and development work were carried on a group of claims held by the Douglas Mining Company and situated about one and one-half miles west of the town of Douglas.

From 2 to 4 men were employed for 3 months during the summer of 1923, during which time 30 feet of open cut work and 96 feet of tunnel were driven.

WINDHAM BAY.

Mining development in the Windham Bay district during the past year was confined to the performance of annual assessment work on various groups of claims and to surface prospecting.

SNETTISHAM**Daisey Bell Mine.**

Only assessment work was done at the Daisey Bell mine at Snettisham. This work consisted in driving 17 feet of open cut and in advancing the south drift a distance of 23 feet.

COPPER RIVER BASIN.**Kennecott Mines.**

The Kennecott group of mines, consisting of the Bonanza, Jumbo and Glacier mines of the Kennecott Copper Corporation and the Mother Lode mine of the Mother Lode Coalition Mines Company, were operated throughout 1923 with a slightly smaller total crew than in 1922.

The production made and development work accomplished, however, both showed a substantial increase over those of the previous year.

Development work was also carried on at the Erie mine of the Kennecott Company, where nearly 4,000 feet of tunnel was driven, designed to connect this mine with the others of the group.

The average crew employed at the Kennecott mines in 1923 amounted to 522 men. They were distributed as follows: underground, 243; on the surface, at shops and yards, 52; at the milling plant, 227.

Green Butte Copper Company.

The Green Butte Copper Company continued development work on its property, which is situated on McCarthy Creek and east of the Kennecott groups. A crew of about 45 men was engaged and some small shipments of ore were made.

The ore being developed at this property is similar in character to that of the Kennecott mines.

North Midas Mine.

The North Midas mine, situated about 12 miles from Strelna and on the Kuskalana River, was operated during the season with a crew of about 20 men employed.

Some production was made and at least 2 carloads of concentrates were shipped to the smelter. It is stated that as a result of the erection of a steam power plant this property will operate throughout the year.

Hubbard-Elliott Property.

The Hubbard-Elliott property, which is also situated in the Strelna district, was idle throughout the year.

PRINCE WILLIAM SOUND.**Beatson Mine.**

The Beatson mine of the Kennecott Copper Corporation, which is situated on Latouche Island, was operated continuously during 1923 with an average crew of 281 men employed. This number is an increase of 110 over that employed in 1922. Production and development work were correspondingly increased.

The amount of underground development work accomplished during the year was nearly double that done in the previous year and amounted to a total of 13,515 feet of drifts, cross-cuts and raises.

Rua Property.

Development work was continued during the year on the Rua property, situated on Knights Island. A crew of about 6 men was employed.

Granite Mine.

After being idle for a number of years, operations on a small scale were again started at the Granite gold mine in the Valdez district. Much of the work done was of the nature of development and rehabilitation.

Culcross Island Mining and Milling Company.

Development work at the property of the Culcross Island Mining and Milling Company on Culcross Island continued only during about one-half of the year in 1923. Approximately 360 feet of underground work was done with a crew of 4 men. Three men were engaged in surface work.

Big Four Property.

A small amount of development work was done on the Big Four property in the Valdez district although no production was made.

KENAI PENINSULA.

Lucky Strike Mine.

During 1923 the Lucky Strike mine, better known as the Hirchey mine, was bonded to the Alaska Minerals Company, of Anchorage, and development work and mining was carried on by that company until weather conditions compelled the suspension of operations in the fall.

This property has been successfully operated for a number of years by its owner, Mr. John Hirshey, although the work done was on a small scale. The total tonnage milled up to and including 1922 is stated to have been 800 tons. The output for 1923 was about 250 tons.

The development work accomplished by the Alaska Minerals Company included the driving of 75 feet of levels, 250 feet of cross-cuts and 150 feet of raises. The crew consisted of from 5 to 8 men underground; 6 to 17 men on the surface, and 3 to 4 men at the mill. The mine was worked 124 days during the year, and the mill 89 days.

Additional camp facilities were provided during the season by the erection of a frame bunk house and the conversion of a log building into a change house, supplied with shower baths and laundry facilities.

The mill that has been in operation at the property heretofore is of the Gibson type and of doubtful efficiency. During the fall a five-stamp mill was secured from a neighboring property and erected at the Lucky Strike Mine. While not entirely completed when the season closed, this mill was given a test run and will be in readiness for regular operation early in 1924.

Other Prospects on Kenai Peninsula.

Much prospecting was done at several localities on Kenai Peninsula, including besides the Hope District, the Moose Pass District and the Nuka Bay region. Details as to the results accomplished were not secured.

WILLOW CREEK DISTRICT.

Willow Creek Mines Company.

The Gold Bullion mine of the Willow Creek Mines Company on upper Craigie Creek was idle throughout the year. The work of the company was confined to development work and stoping in the Lucky Shot mine and the adjoining War Baby mine. A disastrous fire occurred at the Lucky Shot property in December, 1923, that resulted in the almost total loss of the mill, which served both Lucky Shot and War Baby mines. Owing to the remoteness of this property from the

railroad and the difficulties of transportation, the reconstruction of the mill will be difficult and slow of accomplishment.

Mabel Mine.

The Mabel mine was operated 204 days in 1923 with a crew of 10 men and the mill was in operation 112 days with 2 men employed.

About 600 feet of development work was accomplished and between 300 and 400 tons of ore was milled.

Fern Mine.

The Fern mine on Archangel Creek was operated continuously throughout the year with a crew of 6 men underground and 4 men on the surface. The mill was operated 45 days with 2 men employed.

Development work consisted of driving 400 feet of tunnel, 30 feet of cross-cut, and 10 feet of raise.

Opal Prospect.

The Opal Prospect, owned by Skarstad and Laubner of Anchorage, is situated on the west side of Reed Creek, about one-half mile above its confluence with Archangel Creek. Development of the property has been in progress for several seasons and was continued in 1923.

Gold Cord Property.

The Gold Cord property on upper Fish-Hook Creek which was once productive, has been idle for several years. During the summer of 1923, work was resumed on a small scale, though no production was made.

Other Properties in the Willow Creek District.

Besides the mining and development work above described, assessment work and prospecting were in progress on numerous groups of claims in the district.

CHULITNA REGION.

Ohio Creek.

Further development work sufficient to cover annual assessment work was done on several claims in the Ohio Creek section of the Chulitna drainage basin. These claims have been under development for a number of years. The ore developed consists of a silver-lead and auriferous arsenopyrite.

Portage Creek.

A lode bearing ruby silver was under development during the year on Portage Creek, about 12 miles from Chulitna station on the Alaska

Railroad. A group of claims called the Mint Silver group was located on this lode by Johnson and Wertz of Anchorage. The development work accomplished consisted of 16 feet of tunnel and 10 feet of open cut driven on the lode at the outcrop. Assays made of ore from the outcrop showed it to have a value of from \$200 to \$271 per ton in silver and from \$2 to \$8 in gold. A mill test of 50 pounds of the ore made in the Fairbanks station of the Bureau of Mines indicates that the ore is readily amenable to treatment by flotation. Further development work on the lode is planned during the coming season.

BONNIEFIELD REGION.

Liberty Bell Property.

The Liberty Bell group of claims is situated on Eva Creek, a branch of California Creek, which is one of the main tributaries of Tetatlanika Creek in the Bonniefield region.

The property lies about 50 miles southeast of Nenana and 10 miles east of Ferry Siding (Mile 371) Alaska Railroad. The group was located by several Fairbanks people but is at present controlled by the Corey-Wilson Syndicate.

The ore deposit is chiefly valuable for the gold content although some silver and a little bismuth accompany the gold, which is also associated with arsenopyrite.

Development work by the Corey-Wilson Syndicate was commenced during the latter part of September, 1923, with 5 men employed. By the end of the year 210 feet of underground development work had been completed. If the results of the work done continue to be encouraging, it is planned to increase the crew to 15 or 20 men during 1924.

FAIRBANKS DISTRICT.

The following notes on lode mining development in the Fairbanks district were furnished by Mr. John A. Davis, U. S. Bureau of Mines:

FAIRBANKS CREEK.

Hiyu Group.

The upper tunnel on the Helen S. claim (See 1922 report, page 92, line 17, "third tunnel") which was started late in 1922 was extended towards the workings on the Hiyu claim for a distance of nearly 600 feet. It is approximately 125 feet below the main Hiyu tunnel and will be used to mine the ore between these two levels.

A tunnel about 50 feet below the main tunnel on the Helen S. (1922 report, page 92, line 11) was extended for some distance and the ore above it was stoped out and milled in the 5-stamp mill on the property.

Five men were employed and the work was practically continuous throughout the year.

Ohio Group.

The only activity at this property was the performance of the annual assessment work and comprised cleaning out and repairing the main cross-cut tunnel.

Mizpah Mine.

The annual assessment work on this property consisted of repairs to the timbering in the extension of the Ohio tunnel.

CLEARY CREEK.

Pioneer Mine.

Prospecting was conducted by Robinson & Licman in the adit on this property. A small body of ore was discovered and a 3-ton sample was milled at the Alaska station of the Bureau of Mines.

Free Gold Mine—Wyoming Group.

Late in the fall of 1923 the Free Gold mine and the Wyoming group were consolidated and extensive preparations were made for developing these properties during the coming summer.

Tolovana Mine.

Approximately 150 feet of development tunnels were driven and 8 or 10 tons were milled in the 2-stamp Nissen mill on the property, from which a recovery of \$16 per ton is reported.

LITTLE ELDORADO CREEK.

Newsboy Mine.

The annual assessment work at this property consisted of a series of open cuts tracing the extension of the leage.

PEDRO CREEK.

Rainbow Mine—David Mine.

Two men were employed at this property intermittently throughout the year in stoping ore between the main tunnel and the surface.

Approximately 300 tons was mined and milled in the 2-stamp mill belonging on the David claim.

ST. PATRICK CREEK.

Billy Sunday Mine.

Three men were employed at this property for about five months. A 30-horse power boiler and a 2-inch Worthington pump were installed. After dewatering the mine two winzes each 15 feet deep were sunk on the 200-foot level. One winze uncovered two feet of partly oxidized ore, the other three feet of sulphide ore in which visible particles of free gold could be seen. The 120-ft. level was extended 50 feet to the south and a raise of 30 feet was driven at this point. Two hundred and twenty tons of ore were mined and treated at the neighboring St. Paul mill.

Ryan Lode Group.

A shaft was sunk 35 feet deep on the Eva claim and extensive repairs were made to other shafts during the course of annual assessment work on this property.

Mohawk Claim.

Approximately 700 feet of drifts and 200 feet of raises were driven by the owners of the Mohawk claim during 1923. One thousand tons of ore was mined and milled at the new mill which was erected on the property. This mill consists of an 8x12-inch Dodge crusher feeding a 7-ft. Lane mill which discharges over a 5x10-ft. amalgamating plate. Power is furnished by a 40-horse power Erie boiler. Mill construction was started on July 5th. The recovery from the amalgamating plate is reported at from \$20 to \$25 per ton. In addition to the 1,000 tons already milled, from 1,200 to 1,500 tons has been broken and stored in the stopes and on the dump at the mouth of the tunnel.

A tunnel has been driven on the Mohawk No. 2 for a distance of 150 feet at which point it encountered the Mohawk vein which at that point had a thickness of approximately two feet.

The southern end of the Mohawk claim was leased to O'Connor and Johnson who sank a shaft 60 feet deep, from the bottom of which they drove two short drifts along the vein each about 20 feet long. One hundred tons of ore was mined from above these drifts and milled at the Mohawk mill.

Last Chance Prospect.

Approximately 150 tons was mined from the bottom of the 60-ft. shaft on this property and treated at the neighboring St. Paul mill.

KUSKOKWIM REGION.

Nixon Fork Mine.

The only lode mining work done in the Kuskokwim region in 1923 consisted of the milling of about 2,500 tons of ore previously mined at the Nixon Fork, of the Treadwell-Yukon Company, Ltd., located near McGrath.

Five men were employed at this property and 11 men at the mill which was operated 100 days during the year.

Operations ceased in October, 1923

REVIEW OF COAL MINING BY FIELDS.

During the year 1923 coal was produced in Alaska from four separate fields. The production made from each field is indicated in the following table:

Field	Short Tons	Percent of total
Matanuska	82,145	69.0%
Nenana	35,190	29.6%
Cooks Inlet	1,441	01.2%
Bering River	300	00.2%
TOTAL	119,076	100.0%

The total coal production of the Territory in 1923 was 41% in excess of that for the previous year. Comparison with the production for prior years may be made by consulting the general tables of mineral production to be found as appendices to this report.

Of the total tonnage of coal produced in 1923, 84.7% was mined by private operators. The remaining 15.3% was mined by the Government at the Eska mine in the Matanuska field. These Government mining operations were rendered necessary in order to meet a threatened shortage of coal for use on the Alaska Railroad resulting from the serious mine fire that occurred at the Evan Jones mine in November, 1922. The Eska mine was indefinitely closed down September 30, 1923, since which date all coal produced in the Territory has been mined by private parties.

MATANUSKA FIELD.

Production was made in 1923 from three leasing units, two areas covered by four-year prospecting permits and one reserved unit in the Matanuska field, as follows:

From leases:	Short Tons
Unit No. 1—Bruno Agostino	4,963
Units 2 and 3—Baxter Bedell	9,517
Unit No. 6—Evan Jones Coal Co.	49,114
From 4-year permits:	
Unit No. 4—Rawson Coal Co.	91
A. P. Lindquist	258
From Reserved Unit No. 7:	
Eska Mine (Government)	18,202
Total production from Matanuska field.....	82,145

Aside from the actual mining of coal, prospecting and development work was conducted on several areas in the Matanuska field. Most of this work was done in the Valley of Moose Creek where several seams of coal were discovered and partially developed that give promise of being of considerable importance. This fact was recognized by the Alaska Railroad in the construction of a narrow gauge railway spur from Moose Creek station on the Matanuska branch to Leasing Unit No. 3, a distance of approximately five miles. This spur was completed in October, 1923. Owing to unforeseen difficulties, principally of a financial nature, the tonnage of coal shipped by operators on Moose Creek since the completion of the railway spur has been disappointing. Results from recent development work give basis for the belief, however, that properties supplying the Moose Creek spur will eventually provide much of the tonnage of coal to be derived from the Matanuska field.

EVAN JONES MINE, LEASING UNIT NO. 6.

The mine of the Evan Jones Coal Company situated at Jonesville, which is about one mile west of the Government mine at Eska, is the largest producer of coal in the Territory. Much of the coal needed in the operation of the Alaska Railroad has been supplied by this mine since the cessation of Government mining operations at Chickaloon and Eska in the fall of 1921. The total production made by the mine to date has been approximately 100,000 tons.

The event of principal importance occurring in connection with the operation of this mine in 1923, was the erection of a small coal washing plant. This washery is equipped as follows: 1 set of tandem shaker screens driven by a small upright engine of the "Star" type; 1 coal washer, similar in type to the "Elmore" jig; 1 settling tank, with conveyor, complete; 1 horizontal engine, operating elevators, washer and conveyor; and a coal-drying bin with a capacity of about 100 tons.

The operation of this washery during the last quarter of 1923 resulted in reducing the average ash content of the run of mine coal from 22.21% to 14.30%—a reduction of 35%—with an attendant increase of the calorific value of the coal from 10,716 B.T.U's to 11,429 B.T.U's—an increase of 7%.

Extensive development work was carried on underground on the second or lower level of the mine. On this level the main haulage gangways on beds Nos. 3 and 4, east and west, were advanced approximately 3,000 feet. A total of 53 new chutes were driven, from which 41 rooms were turned.

Safety conditions in the mine have been materially improved during the past year by the driving of several additional escapeways.

The plan of connecting the bottom level of the mine with the surface by means of a 1250-foot rock crosscut tunnel, designed to re-

place the slope and present entry tunnel as a haulage way and provide improved air courses, is still in contemplation and some progress has been made on the work.

Only Edison electric safety lamps are employed underground at the Evan Jones mine and none but permissible explosives are used.

The average number of men employed during 1923 was 84, of whom 53 were engaged in underground labor and 31 on the surface.

ESKA MINE, RESERVED UNIT NO. 7.

Operation of the Government coal mine at Eska was resumed in November, 1922 in order to forestall a threatened shortage of coal for railway use, resulting from the serious mine fire that closed the Evan Jones mine upon which the railroad was depending for its principal supply.

The systematic mining of coal at Eska was stopped on June 12, 1923. The slight production made after that date was incidental to the work of putting the mine in condition for an indefinite shutdown. The repair work undertaken was completed on September 30, 1923. This work was conducted under the supervision of the U. S. Bureau of Mines. The entire main haulage gangway was re-timbered, as the old timbers were badly decayed and unfit to support the tunnel during a long period of idleness. The repair work involved the replacement of about 250 sets of gangway timbers and embraced a section of the tunnel approximately 1500 feet in length. In order to provide a sufficient supply of air to prevent the rapid decay of timbers and also for use as an escapeway in any future mining operations, the two innermost rooms on the Eska west bed were driven to the surface, a distance of approximately 900 feet as measured on the plane of the bed.

Active mining operations were conducted a total of 143 days between January 1 and June 14, 1923. Further operations in connection with closing the mine continued for eighty additional working days. The average number of men employed during the period of active mining was 94, of whom 55 men were engaged in underground work and 39 men on the surface. The average crew during the repair period consisted of 38 men, of whom one half worked underground and the other half on the surface.

BAXTER-BEDELL MINE, LEASING UNITS NOS. 2 AND 3.

The situation of the Baxter-Bedell mine on Moose Creek, approximately five miles from the railroad, has made it possible to conduct mining operations only during those months when the presence of snow on the ground enabled coal to be transported to the railroad

by means of sleds. During 1923 "soft" weather caused a shutdown of the mine that continued from April until September.

During the summer arrangements were perfected whereby control of these units passed from E. L. Bedell, lessee, to the Alaska Bituminous Coal Company, and the mining operations conducted between September and the end of the year were carried on by this company.

The quality of the coal that has been secured from the Baxter mine for the most part has been excellent, but serious faulting encountered in the workings has limited the proven available reserve coal to a very small tonnage. Development work is in progress and further work is planned, designed to expose other seams of coal on the property and to locate faulted sections of those heretofore mined.

At the close of the year there were employed at this mine 27 men of whom 14 worked underground and 13 on the surface.

Future development and operation of this mine will be greatly facilitated by the Moose Creek spur of the Alaska Railroad that reached the property in October, 1923.

AGOSTINO MINE, LEASING UNIT NO. 1.

The Agostino mine, which is located immediately adjacent to the tracks of the Moose Creek spur of the Alaska Railroad, continued production in 1923 until June 9th, when operations were suspended pending the completion of the spur. Within the six months of this year during which the mine was operated, 4,918 tons of coal was produced and transported by means of sleds to the main Matanuska branch of the Alaska Railroad, a distance of four miles. This coal was produced from the largest two of a series of four beds recently discovered on the north side of Moose Creek. The quality and grade of the coal is similar to that found on the neighboring Baxter-Bedell property and is the best coal yet discovered in the Matanuska field outside the semi-bituminous coal of the Chickaloon and Coal Creek mines. The tonnage of coal available above water level in these newly discovered beds is small, and in fact a large percentage of it was removed in the mining operations at the Agostino mine conducted during the first half of the year.

This condition, coupled with the fact that the Agostino workings were on disputed ground, necessitated the sinking of a slope in order that further development of the seams could be continued within Unit No. 1.

The work of sinking the slope was commenced in November, 1923 and has been actively prosecuted since that time by the Premier Coal Mining Company, which was organized in October for the purpose of conducting operations under the Agostino lease. The average crew employed during November and December consisted of 12 men.

RAWSON MINE, UNIT NO. 4.

Operations on Unit No. 4 during 1923 were confined largely to development work, although a small tonnage of coal was produced and sold. Underground development work on a small scale proceeded throughout the year with brief interruptions. Substantial additions were made to the mine camp in the form of increased bunkhouse facilities and loading bunkers. The 2½-mile wagon road between the mine and the terminus of the Moose Creek railroad spur was put in good repair and at the latter point a coal bunker was erected. The mine crew consisted of two to three men.

LEROY PROPERTY

The area held by Wm. T. LeRoy under a 4-year prospecting permit embraces a belt four miles in length along the valley of Moose Creek that lies adjacent to, and to the northwest of leasing units Nos. 1 and 6 inclusive. Surface prospecting has been carried on in various sections of this area for several years, as a result of which an extensive series of coal beds was revealed. In July, 1923, a crosscut tunnel was started that was designed to intersect the coal seams exposed on the surface by the open cut work that had been done.

The portal of this tunnel is situated approximately one-half mile east of the workings of the Rawson Coal Company on Unit No. 4. By November 1, 1923 the tunnel had been advanced a distance of 135 feet. One seam of coal 5½ feet in thickness and of good quality was penetrated within 25 feet of the portal. The balance of the tunnel is in rock, but surface prospecting indicates that other seams will be reached within 200 or 300 feet of the face. Early in December an option on the LeRoy holdings was granted to Messrs. Jesson and Howard who are proceeding steadily with the development work started by Mr. LeRoy. The section of the permit area now being explored, lies about three miles above the present terminus of the Moose Creek railroad spur. The lower section of the permit area adjacent to Units 1, 2 and 3 is also known to contain a series of several beds of coal, from which coal of excellent quality has been mined.

CHICKALOON MINE.

The Chickaloon mine, which was under development by the Navy Department until May, 1922, was prepared for abandonment in September, 1923. All salvable material underground was removed and pumping and ventilation operations, which had been carried on continuously theretofore at considerable expense, were discontinued. While tests of the Chickaloon coal conducted by the Navy proved that the coal after being washed was of standard "Navy" grade, it has also been proven that the disturbed condition of the coal seams at

Chickaloon, resulting from the widespread occurrence of igneous intrusives and of a complex system of faulting, and the consequent erratic occurrence of the coal in discontinuous spindle-shaped masses, renders the cost of mining and preparing the coal for market excessive and precludes the possibility of successful commercial operations under existing conditions.

LINDQUIST PROSPECT.

The Lindquist prospect is situated on Kings River, approximately eight miles northwest of Chickaloon. The work done on this prospect in 1923 included surface prospecting, the sinking of two shafts a combined distance of 87 feet, and the driving of a tunnel a distance of 44 feet, the erection of camp buildings and a considerable amount of road work.

The coal that has been developed at this prospect is a semi-bituminous coking coal similar in grade to the Chickaloon coal. The beds are quite badly disturbed near the surface and the coal produced has a high content of iron oxide.

COAL CREEK MINE, RESERVED UNIT NO. 14.

The Coal Creek mine, upon which extensive development work has been done by the Navy Department, was idle in 1923. Two seams of excellent coking coal of semi-bituminous grade were quite extensively explored at this property, both by means of gangways and diamond drilling. Commercial mining of the coal from these seams would necessitate provision of transportation facilities that would involve heavy expense. In order to reach the property with a railway spur it would be necessary to erect bridges across the Chickaloon and Matanuska Rivers.

ROSS HECKEY PROSPECT.

The Ross Heckey prospect embraces a portion of leasing unit No. 14 that lies adjacent to, and west of the Coal Creek reserved units. The seams developed at the Coal Creek mine extend westerly across Coal Creek and into the area included in the Heckey prospect. Active prospecting work was started on the ground in September, 1923 and was continued throughout the year. The two coal seams sought were located and short gangways driven upon them. The coal secured from these openings is suitable for use as blacksmith coal.

NENANA FIELD.

Suntrana Mine.

The Suntrana mine of the Healy River Coal Corporation was in operation from the first of the year until June 9th, when washouts

on the railroad spur serving the mine caused a shutdown. Suspension of operations continued until about the middle of October. From that time until the end of the year, mining continued steadily on a normal scale. Extensive development work was accomplished during the year. The main crosscut entry tunnel was advanced a distance of 270 feet. The tunnel now has a total length of 924 feet and six coal seams have been penetrated by it. Gangways were driven during the year on the Bowen, Lathrop and Donaldson seams, the combined length of which amounted to 1815 feet. Thirty-three new rooms were turned during the year.

The average crew employed at the Suntrana mine during the period of operation consisted of 43 men, of whom 31 were engaged in underground work and 12 on the surface. The total production of coal for the year was 35,190 tons.

R. F. Roth Prospect.

A camp has been erected and preparations have been made to drive two prospecting tunnels on the area held by R. F. Roth of Fairbanks under a 4-year prospecting permit. This area lies adjacent to Healy River, four or five miles upstream from the Suntrana mine. It is planned to secure from the two proposed tunnels sufficient coal for use in making tests to determine its commercial usefulness. It will be necessary to transport the coal to the railroad by means of sleds, which can be used only during the period that Healy River is frozen.

BROAD PASS FIELD.

Mile 341.

Development work was carried on throughout the year on the property of the Mt. McKinley Bituminous Coal Corporation, situated at Mile 341 on the main line of the Alaska Railroad.

A substantial camp was erected and coal bunkers were built adjacent to the railroad siding provided by the Alaska Railroad. Underground work was concentrated in driving the main entry gangway and accompanying counter level. The results obtained in this work were for a time very encouraging. The coal was encountered about 150 feet from the portal of the gangway. Beyond this point for a distance of about 400 feet the seam averaged six feet in width and was very regular. At about 600 feet from the portal, however, a serious fault was encountered. Exploration work carried on by means of rock tunnels has failed to recover the coal seam beyond this fault.

The tunnels driven during 1923, including prospect drifts, main haulage tunnels, and the counter level, amounted to 1743 feet in combined length.

The underground crew employed ranged from 2 to 12 men, and that on the surface from 2 to 17 men.

COOK INLET FIELD.

Coal mining was carried on in the Cook Inlet field only during June and July, 1923. The total tonnage mined amounted to only 1141 tons.

The principal market for the coal of this field is provided by salmon canneries on Cook Inlet and Kodiak Island.

BERING RIVER FIELD.

No production of coal was made from the Bering River field during 1923, and very little, if any, development work was carried on. The development of this field is seriously handicapped by difficult transportation conditions.

LOCAL FREIGHT RATES, ALASKA (GOVERNMENT) RAILWAY

(In effect June, 1924.)

In less-than-carload lots—per 100 lbs.

FAIRBANKS TO—	Ester Siding	Fox	Gilmore	Ridgetop	Olnes	Eldorado	Chatanika
Coal in sacks	\$0.10	\$0.21	\$0.24	\$0.28	\$0.32	\$0.33	\$0.35
Dynamite, powder, etc.	0.32	0.68	0.76	0.90	1.00	1.06	1.10
Groceries, NOIBN. — (Highest rate — 1st Class)	0.16	0.34	0.38	0.45	0.50	0.55	0.55
(Groceries) Fourth Class	0.10	0.21	0.24	0.28	0.32	0.33	0.35
Hay	0.12	0.25	0.28	0.33	0.37	0.39	0.41
Grain	0.10	0.21	0.24	0.28	0.32	0.33	0.35
Lumber, common	0.10	0.21	0.24	0.28	0.32	0.33	0.35
Machinery, mining; 4th Class — Single pieces or pkgs. not over 2,000 lbs.	0.10	0.21	0.24	0.28	0.32	0.33	0.35
Over 2,000 lbs. wt.	With heavy shipments, shipper must arrange for loading and unloading						
General hardware NOIBN. 2nd Class.	0.14	0.29	0.32	0.38	0.43	0.45	0.47
Oils — distillate, gasoline, fuel, engine, etc. in drums	0.12	0.25	0.28	0.33	0.37	0.39	0.41

FREIGHT RATES, ALASKA (GOVERNMENT) RAILWAY

(In effect June, 1924.)

COAL in carload lots—40,000 lbs. minimum—per short ton.

	Nenana	Fairbanks	Chatanika
Broad Pass, Summit, or Colorado to	\$1.50	\$2.00	\$2.75
Healy, Lignite or Suntrana to	1.00	1.50	2.50

WOOD—CARLOAD LOTS

	Fox	Gilmore	Ridgetop	Eldorado	Chatanika
Bartlett, Martin or Cache to	\$2.00	\$2.00	\$2.15	\$2.30	\$2.30

Minimum 18 cords—128 cu. ft. per cord—to the carload.

Return freight rate on oil drums (Gauge 16 or thicker) to Seattle—4th Class.

	From Fairbanks	From Gilmore
Less than carload lots	\$2.41 per 100 lbs.	\$2.46 per 100 lbs.
Carload lots 18,000 lb. min.	1.46 per 100 lbs.	1.52 per 100 lbs.

FREIGHT RATES VIA ALASKA (GOVERNMENT) RAILWAY

(In effect June, 1924.)

In less-than-carload lots—per 100 lbs.

	SEWARD TO Anchorage	Fairbanks	ANCHORAGE Talkeetna	Healy	Nenana	TO Fairbanks	Chatanika	Seattle to Fairbanks via Seward Carload lot
Coal in sacks	\$0.68	\$1.73	\$0.67	\$1.22	\$1.44	\$1.56	\$1.64	\$2.48 1.26
Dynamite, powder, etc.	2.16	5.48	2.12	3.86	4.56	4.94	5.09	5.91 3.94
Groceries, NOIBN. — 1st class	1.08	2.74	1.06	1.93	2.28	2.47	2.57	3.94 2.05
4th class						1.56		2.48
Hay, baled	0.48	1.22	0.47	0.86	1.01	1.10	1.17	*\$7.00 *\$27.00
Grain	0.68	1.73	0.67	1.22	1.44	1.56	1.59	*\$49.60 *\$28.00
Emigrants movables, household goods, etc., Rel. c.l. 20,000 lbs.	0.48	1.52	0.59	1.08	1.27	1.37	1.45	2.05
Lumber, common	0.68	1.73	0.67	1.22	1.44	1.56	1.64	2.48 1.08
Machinery, mining and dredge — 4th class—single pieces or pkgs., not over 4,000 lbs.	0.68	1.50	0.67	1.22	1.44	1.50	1.50	1.50 1.50
From 4,000 to 6,000 lbs.								†2.00
From 6,000 to 8,000 lbs.	On heavy pieces over 4,000 lbs. shipper must							†2.00
From 8,000 to 10,000 lbs.	arrange for loading and unloading							†2.00
From 10,000 to 20,000 lbs.								†4.50
Oils—fuel, distillate, gasoline engine, etc.—in drums	0.50	2.00	0.95	1.60	1.86	2.00	2.13	2.85 2.05
Trucks, tractors, general hardware, when billed with mining machinery	Same rate applies as for mining machinery							

*—Per ton.

†—Per ton in addition to above rate.

MINERAL PRODUCTION.

The following tables of mineral production are taken from the publications of the U. S. Geological Survey, except as indicated by footnotes.

VALUE OF TOTAL MINERAL PRODUCTION OF ALASKA 1880-1923

By Years—		By Substances—	
1880-1890.....	\$ 4,686,714	1907.....	20,850,235
1891.....	916,920	1908.....	20,146,632
1892.....	1,098,400	1909.....	21,146,953
1893.....	1,051,610	1910.....	16,887,244
1894.....	1,312,567	1911.....	20,691,241
1895.....	2,388,042	1912.....	22,536,849
1896.....	2,981,877	1913.....	19,476,356
1897.....	2,540,401	1914.....	19,065,666
1898.....	2,587,815	1915.....	32,854,229
1899.....	6,706,226	1916.....	48,632,212
1900.....	8,241,734	1917.....	40,710,205
1901.....	7,010,838	1918.....	28,253,961
1902.....	8,403,153	1919.....	19,620,913
1903.....	8,944,134	1920.....	23,303,757
1904.....	9,569,715	1921.....	17,004,124
1905.....	16,480,762	1922.....	19,562,726
1906.....	23,378,428	1923..... (c)	20,903,000
Total.....		\$518,945,139	

NOTE: (c)—Figures for production in 1923, included in above totals, approximate only.

GOLD AND SILVER PRODUCED IN ALASKA, 1880-1923

GOLD		SILVER	
Year—	Quantity (fine ounces)	Quantity (fine ounces)	Value
1880.....	967		\$ 20,000
1881.....	1,935		40,000
1882.....	7,256		150,000
1883.....	14,561		301,000
1884.....	9,724		201,000
1885.....	14,512		300,000
1886.....	21,575		446,000
1887.....	32,653		675,000
1888.....	41,119		850,000
1889.....	43,538		900,000
1890.....	36,862		762,000
1891.....	43,538		900,000
1892.....	52,245		1,080,000
1893.....	50,213		1,038,000
1894.....	62,017		1,282,000
1895.....	112,642		2,328,500
1896.....	138,401		2,861,000
1897.....	118,011		2,439,500
1898.....	121,760		2,517,000
1899.....	270,997		5,602,000
1900.....	395,030		8,166,000
1901.....	335,369		6,932,700
1902.....	400,709		8,283,400
1903.....	420,069		8,683,600
1904.....	443,115		9,160,000
1905.....	756,101		15,630,000
1906.....	1,066,030		22,036,794
1907.....	936,043		19,349,743
1908.....	933,290		19,292,818
1909.....	987,417		20,411,716
1910.....	780,131		16,126,749
1911.....	815,276		16,853,256
1912.....	829,436		17,145,951
1913.....	755,947		15,626,813
1914.....	762,596		15,764,259
1915.....	807,966		16,702,144
1916.....	834,068		17,241,713
1917.....	709,049		14,657,353
1918.....	455,641		9,480,952
1919.....	455,984		9,426,032
1920.....	404,683		8,365,560
1921.....	390,588		8,073,540
1922.....	359,057		7,422,367
1923.....	(c) 5,914,000		(c) 5,914,000
Totals.....		\$341,440,460	
(c)—Approximate.		\$9,489,922	

COPPER PRODUCED IN ALASKA, 1880-1923

Year—	Mines Operated	Ore Mined (Tons)	COPPER PRODUCED Pounds	Value
1880.....	1	20	3,933	\$ 826
1900.....	1	500	100,000	16,000
1901.....	2	1,350	270,000	44,000
1902.....	3	2,750	510,000	59,000
1903.....	4	9,000	1,730,000	224,510
1904.....	4	15,000	2,843,586	376,076
1905.....	8	52,199	3,481,771	542,155
1906.....	15	105,729	6,459,803	1,246,682
1907.....	13	98,927	6,308,786	1,261,757
1908.....	9	51,509	4,585,362	605,267
1909.....	7	34,669	4,124,705	536,211
1910.....	7	39,365	4,241,689	538,695
1911.....	8	68,975	27,267,878	3,408,485
1912.....	7	93,452	29,230,491	4,823,031
1913.....	6	135,756	21,659,958	3,357,293
1914.....	6	153,605	21,450,628	2,852,934
1915.....	14	369,600	86,509,312	15,139,129
1916.....	18	717,264	119,854,839	29,484,291
1917.....	17	659,957	88,793,400	24,240,598
1918.....	17	722,047	69,224,951	17,098,563
1919.....	8	492,644	47,220,771	8,783,063
1920.....	8	766,095	70,435,363	12,960,106
1921.....	6	477,121	57,011,579	7,354,497
1922.....	5	581,384	77,967,819	10,525,655
1923.....	(a) 7	728,402	91,000,000	13,303,000
Total.....		6,277,330	842,086,642	\$158,781,823
(a)—Estimated by Mine Inspector.				

PLATINUM METALS PRODUCED IN ALASKA, 1916-1923

Year—	Crude Ounces	Fine Ounces	Value
1916.....	12.0	8.33	\$ 700
1917.....	81.2	53.40	5,500
1918.....	301.0	284.00	36,600
1919.....	579.3	569.52	73,663
1920.....	1,493.4	1,478.97	160,117
1921.....	57.0	40.00	2,673
1922.....	39.0	28.30	2,830
1923.....	(a)		
Totals.....		2,562.9	2,462.52
(a)—No production reported for 1923.			\$282,080

TIN PRODUCED IN ALASKA, 1902-1923

QUANTITY		Value	QUANTITY		Value
Year—	Ore (Tons)		Year—	Ore (Tons)	
1902.....	25	\$ 8,000	1913.....	98	44,103
1903.....	41	14,000	1914.....	167.5	66,560
1904.....	23	8,000	1915.....	167	78,846
1905.....	10	4,000	1916.....	232	121,000
1906.....	57	38,640	1917.....	171	123,300
1907.....	37.5	16,752	1918.....	104.5	118,000
1908.....	42.5	15,180	1919.....	86	73,400
1909.....	19	7,638	1920.....	26	16,112
1910.....	16.5	8,335	1921.....	7	2,400
1911.....	92.5	52,798	1922.....	2.3	312
1912.....	194	119,600	1923..... (a)		
Totals.....		1,609.3	933.4	\$937,576	
(a)—No production reported for 1923.					

LEAD PRODUCED IN ALASKA, 1892-1923

Year—	Quantity (Tons)	Value	Year—	Quantity (Tons)	Value
1892	30	\$ 2,400	1909	69	5,934
1893	40	3,040	1910	75	6,600
1894	35	2,310	1911	51	4,590
1895	20	1,320	1912	45	4,050
1896	30	1,800	1913	6	528
1897	30	2,160	1914	28	1,344
1898	30	2,240	1915	437	41,118
1899	35	3,150	1916	820	113,160
1900	40	3,440	1917	852	146,584
1901	40	3,440	1918	564	80,088
1902	30	2,460	1919	687	72,822
1903	30	2,520	1920	875	140,000
1904	30	2,580	1921	759	68,279
1905	30	2,620	1922	377	41,477
1906	30	3,420	1923	(a)378	55,500
1907	30	3,180			
1908	40	3,360			
Total					\$827,514

(a)—Estimated by Mine Inspector.

ANTIMONY PRODUCED IN ALASKA, 1915-1923

Year—	Quantity Crude Ore (tons)	Value
1915	833	\$ 74,000
1916	1,458	134,000
1917	165	28,000
1918	36	1,500
1919	none	none
1920	none	none
1921	none	none
1922	none	none
1923	none	none
Totals		2,492 \$237,500

COAL PRODUCED AND CONSUMED IN ALASKA,
1888-1923, IN SHORT TONS.

Year—	Produced in Alaska, chiefly subbituminous and lignite	Value	Imported from States, chiefly bituminous from Washington (a)	Total foreign coal, chiefly by bituminous from British Columbia (a)	Total coal Con- sumed
1880-1896	6,000	\$ 84,000			
1897	2,000	28,000			
1898	1,000	14,000			
1899	1,200	16,800	10,000	b50,100	61,320
1900	1,200	16,800	15,048	b56,623	72,871
1901	1,300	15,600	24,000	b77,774	102,974
1902	2,212	19,048	40,000	b68,363	110,575
1903	1,447	9,782	64,626	b60,605	126,678
1904	1,694	7,225	36,589	b76,815	115,198
1905	3,774	13,250	67,713	b72,612	144,099
1906	5,541	17,974	69,493	b47,590	122,624
1907	10,139	53,600	46,246	b93,262	149,647
1908	3,107	14,810	23,893	b36,404	113,404
1909	2,800	12,300	33,112	69,046	104,958
1910	1,000	15,000	32,098	58,420	91,518
1911	900	9,300	32,255	61,845	95,000
1912	355	2,840	27,767	68,316	96,438
1913	2,300	13,800	69,066	56,430	127,796
1914			41,509	46,153	87,662
1915	1,400	3,300	46,329	29,457	77,186
1916	13,073	62,317	44,934	53,672	111,679
1917	53,955	265,317	58,116	56,589	168,660
1918	75,606	411,850	51,520	37,986	165,112
1919	60,674	343,547	57,166	48,708	166,548
1920	61,111	355,668	38,128	45,264	144,503
1921	76,817	496,394	24,278	33,776	134,871
1922	84,403	480,000	28,457	27,021	139,881
1923	119,076	(c)581,000	(c)25,000	(c)30,000	(c)174,076
Totals		594,084 \$3,353,522	1,007,443	1,412,751	3,005,278

(a)—No figures on imports before 1899 are available.

(b)—By fiscal year ending June 30.

(c)—Estimated by Mine Inspector.

ACCIDENTS

FATALITIES.

During the year 1923 a total of eleven fatalities occurred in and about the mines and metallurgical plants of Alaska.

Nine fatalities occurred in connection with lode mining, six of which were at gold mines, one at copper mines; one at gold mills and one at copper mills. The remaining two fatalities occurred in connection with placer mining, one in an underground shaft and the other in an open pit mine where a dragline scraper was in use.

No fatalities have occurred in connection with coal mining operations in Alaska within the past five years.

The causes that led to the fatalities reported for the year 1923 were as follows:

1.	Run of ore in bulldozing chamber	3
2.	Falls of rock or ore from roof or wall	2
3.	Falling down shaft	1
4.	Falling down raise	1
5.	Direct contact with electric trolley	1
6.	Caught by surface cable	1
7.	Suffocation in ore bin	1
8.	Snowslide	1
Total		11

There were reported as occurring during the year 93 serious accidents and 186 slight accidents involving a total loss of time amounting to 5,058½ days. The total number of men employed during the year is estimated to have been 5,100 and the number of shifts worked to have been 1,100,000.

A description of the manner in which each fatality occurred and tables showing in detail the nature of all accidents in the various branches of the mining industry during 1923, together with the results of the accidents, classified as to causes and accompanied by statements of the men employed and shifts worked will be found appended to this report.

SUMMARY OF MINING ACCIDENTS OCCURRING IN ALASKA DURING 1923.

NUMBER OF MINES	GROUP	Number of men Employed	Number Shifts Worked	RESULTS OF ACCIDENTS			TOTAL TIME LOST (Days)
				Fatal	Serious	Slight	
PLACER MINES:							
5	Dredges	204	64,020	0	4	2	362
14	Hydraulic	88	15,788	0	0	0	000
11	Others	35	5,140	2	1	0	32
30	Sub-Total	327	84,948	2	5	2	394
COAL MINES:							
	Underground	141	37,780	0	10	26	539½
	Surface	124	29,147	0	4	2	134
9	Sub-Total	265	66,927	0	14	28	673½
LODE MINES:							
29	Gold	756	191,216	6	30	40	1,735
12	Copper	663	235,745	1	34	95	1,642
2	Non-Metal	82	28,740	0	00	00	0,000
43	Sub-total	1,501	455,703	7	64	135	3,377
MILLS:							
13	Gold	207	63,328	1	3	16	158
3	Copper	269	99,328	1	7	5	456
16	Sub-Total	476	162,656	2	10	21	614
98	GRAND TOTAL	2,569	770,234	11	93	186	5,058½

NOTE:—The number of men employed and the shifts worked in connection with placer mining that are indicated in the above table represents only those reported by the 30 mines that submitted detailed data. The total number of men actually employed is estimated to have been 2,500 and the total shifts worked to have been 415,000.

LIST OF ALL ACCIDENTS REPORTED FROM PLACER MINES OF ALASKA FOR THE YEAR 1923, CLASSIFIED AS TO CAUSES AND RESULTS.

CAUSES	Killed	Permanent to- tal Disability-(A)	Permanent par- tial Disability-(B)	Temporary Disability-(C)		Total Injured
				Time lost more than 14 days	Time lost less than 14 days	
Underground						
Number Killed or Injured by—						
1. Fall of rock or ore from roof or wall
2. Rock or ore while loading at work- ing face or chute
3. Timber or hand tools
4. Explosives
5. Haulage (mine cars, mine locomotives, breakage of rope, etc.)
6. Persons falling down chute, winze, raise, or stope
7. Run of ore from chute or pocket
8. Drilling (by machine or hand drills)
9. Electricity
10. Machinery (other than locomotive or drills)
11. Mine fires
12. Suffocation from natural gases
13. Inrush of water
14. Nails and splinters
15. Other causes
Total number killed or injured underground
Shaft Accidents						
Number Killed or Injured by—						
16. Falling down shaft	1	....	....	....	....	1
17. Objects falling down shaft
18. Breaking of cables
19. Overwinding
20. Cage, skip or bucket
21. Other causes
Total number killed or injured by shaft accidents	1	....	....	....	....	1
Surface Accidents						
(At surface yards and shops)						
Number Killed or Injured by—						
22. Mine cars or mine locomotives, grav- ity or aerial trams	1	....	....	....	....	1
23. Railway cars and locomotives
24. Run or fall of ore in or from ore bins
25. Falls of persons
26. Nails and splinters
27. Hand tools, axes, bars, etc.
28. Electricity
29. Machinery
30. Other causes
Total number killed or injured by surface accidents	1	....	....	....	....	1
Dredging						
Number Killed or Injured by—						
1. Machinery	4	....	4
2. By electricity (voltage)
3. By boiler explosions or bursting steam pipes
4. By falls of persons
5. By tools	1	1

6. By other causes	....	....	....	1	1
Total number killed or injured	....	....	4	2	6
Hydraulicking					
Number Killed or Injured by—					
7. By cave of bank	....	....	....	....	....
8. By explosives	....	....	....	....	....
9. By hydraulic giants	....	....	....	....	....
10. By falls of persons	....	....	....	....	....
11. By rock while handling	....	....	....	....	....
12. By tools	....	....	....	....	....
13. By machinery, derricks, etc.	....	....	....	....	....
14. By other causes	....	....	1	....	1
Total number killed or injured	....	....	1	....	1
GRAND TOTAL	2	....	5	2	9

Average number of men employed on dredges	204
Average number of men employed hydraulicking	88
Average number employed other placer methods	35
Total number of shifts, dredging	64,020
Total number of shifts, hydraulicking	15,788
Total number of shifts other methods	5,140
Total time lost on account of all accidents	394 days

(A)—Permanent total disability.—Loss of both legs, or arms, one leg and one arm, total loss of eyesight, paralysis or other condition permanently incapacitating workman from doing any work of a gainful occupation.

(B)—Permanent partial disability.—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed or any other injury known in surgery to be permanent partial disability.

(C)—Under this head are included only those accidents which cause a loss of time more than the balance of the day or shift upon which the accident occurred.

NOTE:—The number of men employed and the shifts worked in connection with placer mining that are indicated in the above table represents only those reported by the 60 mines that submitted detailed data. The total number of men actually employed is estimated to have been 2,500 and the total shifts worked to have been 415,000.

LIST OF ALL ACCIDENTS REPORTED FROM COAL MINES OF ALASKA FOR THE YEAR, 1923, CLASSIFIED AS TO CAUSES AND RESULTS.

CAUSES	Killed	Permanent to- tal Disability-(A)	Permanent par- tial Disability-(B)	Temporary Disability-(C)		Total Injured
				Time lost more than 14 days	Time lost less than 14 days	
Underground						
1. Falls of roof (coal, rock, etc.)	3	7	10
2. Falls of face or pillar coal	1	....	1
3. Mine cars and locomotives	2	2
4. Gas explosions and burning gas	1	3	4
5. Coal-dust explosions (including gas and dust combined)
6. Explosives	1	....	1
7. Suffocation from mine gases
8. Electricity
9. Animals
10. Mining machines	1	1
11. Mine fires (burned, suffocated, etc.)
12. Other causes	4	13	17
TOTAL	10	26	36
Shaft						
13. Falling down shafts or slopes
14. Objects falling down shafts or slopes
15. Cage, skip, or bucket
16. Other causes
TOTAL	0	0	0	0	0	0
Surface Shops and Plants						
17. Mine cars and locomotives	1	....	1	2
18. Electricity
19. Machinery
20. Boiler explosions or bursting steam pipes
21. Railway cars and locomotives	1	....	1
22. Other causes	1	1	3
TOTAL	0	0	2	2	2	6
GRAND TOTAL	0	0	2	12	28	42

Average number of men employed underground 141
 Average number of men employed on the surface 124
 Total number of shifts underground 37,780
 Total number of shifts on the surface 29,147
 Total time lost on account of all accidents 673.5 days

(A)—Permanent total disability.—Loss of both legs, or arms, one leg and one arm, total loss of eyesight, paralysis or other condition permanently incapacitating workman from doing any work of a gainful occupation.

(B)—Permanent partial disability.—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed or any other injury known in surgery to be permanent partial disability.

(C)—Under this head are included only those accidents which cause a loss of time more than the balance of the day or shift upon which the accident occurred.

LIST OF ALL ACCIDENTS REPORTED FROM GOLD MINES OF ALASKA FOR THE YEAR, 1923, CLASSIFIED AS TO CAUSES AND RESULTS.

CAUSES	Killed	Permanent to- tal Disability-(A)	Permanent par- tial Disability-(B)	Temporary Disability-(C)		Total Injured
				Time lost more than 14 days	Time lost less than 14 days	
Underground						
Number Killed or Injured by—						
1. Fall of rock or ore from roof or wall	1	....	....	....	....	1
2. Handling rock or ore:						
(a) Loading at face .....	....	....	....	....	2	2
(b) Loading at chute .....	....	....	....	....	....	....
(c) Sledging .....	....	....	....	....	....	....
3. Timber or hand tools .....	....	....	....	....	4	4
4. Explosives:						
(a) Transportation .....	....	....	....	....	....	....
(b) Charging .....	....	....	....	....	....	....
(c) Suffocation .....	....	....	....	....	....	....
(d) Drilling into old holes .....	....	....	....	....	....	....
(e) Striking into loose rock .....	....	....	....	....	....	....
(f) Thawing .....	....	....	....	....	....	....
(g) Caps, detonators, etc. ....	....	....	....	....	....	....
(h) Unguarded shots .....	....	....	....	....	....	....
(i) Returned too soon .....	....	....	....	....	....	....
(j) Premature shot .....	....	....	....	....	1	1
(k) Miscellaneous .....	....	....	....	2	....	2
5. Haulage:						
(a) Hand and animal .....	....	....	....	....	....	....
(b) Mechanical .....	....	....	2	2	....	4
6. Persons falling down chutes, winze, raise or slope	1	....	....	....	....	1
7. Run of ore from chute or pocket.....	3	....	....	11	10	24
8. Drilling (by machine or hand drills)...	....	....	....	1	1	2
9. Electricity:						
(a) Direct contact with trolley wire	1	....	....	....	....	1
(b) Tool or bar striking trolley wire .....	....	....	....	....	....	....
(c) Contact with motor .....	....	....	....	....	....	....
(d) Others .....	....	....	....	....	....	....
10. Machinery other than 5 and 8.....	....	....	....	....	....	....
11. Mine fires .....	....	....	....	....	....	....
12. Suffocation from natural gases.....	....	....	....	....	....	....
13. Inrush of water .....	....	....	....	....	....	....
14. Nails and Splinters .....	....	....	....	....	....	....
15. Other causes						
(a) Falling objects, other than 1 and 2 .....	....	....	....	....	....	....
(b) Flying objects, other than 2c. ....	....	....	....	....	2	2
(c) Burns .....	....	....	....	....	2	2
(d) Miscellaneous .....	....	....	....	1	1	2
Total number killed or injured underground	6	....	2	17	23	48

Shaft Accidents

Number killed or injured by:						
16. Falling down shaft	...	...	...	...	...	...
17. Objects falling down shaft	...	...	...	...	...	...
18. Breaking of cables	...	...	...	...	...	...
19. Overwinding	...	...	...	...	...	...
20. Cage, Skip, or Bucket:	...	...	...	...	...	...
(a) Runaway	...	...	...	...	...	...
(b) Riding with rock or ore	...	...	...	...	...	...
(c) Riding with timber or tools	...	...	...	...	...	...
(d) Struck by	...	...	...	...	...	...

21. Other causes	---	---	---	---	---
Total number killed or injured by shaft accidents	---	---	---	---	---
Surface Accidents (At surface plants and shops) Number Killed or Injured by—					
22. Haulage:					
(a) Hand and animal	---	---	1	1	1
(b) Mechanical	---	---	1	---	1
23. Railway Cars and Locomotives	---	---	---	---	---
24. Run or Fall of Ore in or from Ore Bins	---	---	---	---	---
25. Falls of Persons	---	---	3	---	3
26. Nails and Splinters	---	---	---	1	1
27. Hand Tools, Axes, Bars, Etc.	---	---	---	3	3
28. Electricity:					
(a) Direct contact with trolley wire	---	---	---	---	---
(b) Tool or bar striking trolley wire	---	---	---	---	---
(c) Contact with motor	---	---	---	---	---
(d) Others	---	---	1	2	3
29. Machinery	---	---	1	2	3
30. Other Causes:					
(a) Falling objects	---	---	1	2	3
(b) Flying objects	---	---	1	---	1
(c) Burns	---	---	---	---	---
(d) Miscellaneous	---	---	4	8	12
Total number killed or injured by surface accidents	---	---	11	17	28
Open-Pit Accidents Number Killed or Injured in Pit by—					
31. Falls or Slides of Rock or ore	---	---	---	---	---
32. Explosives:					
(a) Transportation	---	---	---	---	---
(b) Charging	---	---	---	---	---
(c) Suffocation	---	---	---	---	---
(d) Drilling into old holes	---	---	---	---	---
(e) Striking in loose rock or ore ..	---	---	---	---	---
(f) Thawing	---	---	---	---	---
(g) Caps, detonators, etc.	---	---	---	---	---
(h) Unguarded shots	---	---	---	---	---
(i) Returned too soon	---	---	---	---	---
(j) Premature shot	---	---	---	---	---
(k) Miscellaneous	---	---	---	---	---
33. Haulage:					
(a) Hand and animal	---	---	---	---	---
(b) Mechanical	---	---	---	---	---
(c) Railway cars and locomotives ..	---	---	---	---	---
34. Steam Shovel	---	---	---	---	---
35. Falls of Persons	---	---	---	---	---
36. Falls of Derricks, Booms, Etc.	---	---	---	---	---
37. Run or Fall of Ore in or from Ore Bins	---	---	---	---	---
38. Machinery (other than 33 and 34)	---	---	---	---	---
39. Electricity:					
(a) Direct contact with trolley wire	---	---	---	---	---
(b) Tool or bar striking trolley wire	---	---	---	---	---
(c) Contact with motor	---	---	---	---	---
(d) Others	---	---	---	---	---
40. Hand Tools	---	---	---	---	---
41. Other Causes:					
(a) Falling objects other than 31 ..	---	---	---	---	---
(b) Flying objects	---	---	---	---	---
(c) Burns	---	---	---	---	---
(d) Miscellaneous	---	---	---	---	---
Total number killed or injured by open-pit accidents	---	---	---	---	---
GRAND TOTAL	6	2	28	40	76

- (A)—Permanent total disability.—Loss of both legs, or arms, one leg and one arm, total loss of eyesight, paralysis or other condition permanently incapacitating workman from doing any work of a gainful occupation.
- (B)—Permanent partial disability.—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed or any other injury known in surgery to be permanent partial disability.
- (C)—Under this head are included only those accidents which cause a loss of time more than the balance of the day or shift upon which the accident occurred.

Average number of men employed at Gold Mines during 1923 756
 Total number of shifts underground 109,104
 Total number of shifts on surface 82,112
 Total time lost on account of all accidents at Gold Mines..... 1,735 days

CAUSES	Killed	Permanent to- tal Disability-(A)	Permanent par- tial Disability-(B)	Temporary Disability-(C)		Total Injured
				Time lost more than 14 days	Time lost less than 14 days	

LIST OF ALL ACCIDENTS REPORTED FROM COPPER MINES OF ALASKA
FOR THE YEAR, 1923, CLASSIFIED AS TO CAUSES AND RESULTS.

Underground

Number Killed or Injured by—						
1. Falls of Rock or Ore from Roof or Wall	1	---	---	4	15	20
2. Handling Rock or Ore:	---	---	---	---	---	---
(a) Loading at face	---	---	---	1	2	3
(b) Loading at chute	---	---	---	---	2	2
(c) Sledging	---	---	---	---	2	2
3. Timber on Hand Tools	---	---	---	1	5	6
4. Explosives:	---	---	---	---	---	---
(a) Transportation	---	---	---	---	---	---
(b) Charging	---	---	---	---	---	---
(c) Suffocation	---	---	---	---	---	---
(d) Drilling into old holes	---	---	---	---	---	---
(e) Striking in loose rock or ore	---	---	---	---	---	---
(f) Thawing	---	---	---	---	---	---
(g) Caps, detonators, etc.	---	---	---	---	---	---
(h) Unguarded shots	---	---	---	---	---	---
(i) Returned too soon	---	---	---	---	1	1
(j) Premature shot	---	---	---	---	---	---
(k) Miscellaneous	---	---	---	---	---	---
5. Haulage:	---	---	---	---	---	---
(a) Hand and animal	---	---	---	2	10	12
(b) Mechanical	---	---	---	2	3	5
6. Persons Falling down Chutes, Winze, Raise or Stope	---	---	---	---	---	---
7. Run of Ore from Chute or Pocket	---	---	---	2	7	9
8. Drilling (By Machine or Hand Drills)	---	---	---	---	2	2
9. Electricity:	---	---	---	---	---	---
(a) Direct contact with trolley wire	---	---	---	---	---	---
(b) Tool or bar striking trolley wire	---	---	---	---	---	---
(c) Contact with motor	---	---	---	---	---	---
(d) Others	---	---	---	---	---	---
10. Machinery other than 5 and 8	---	---	---	1	---	1
11. Mine Fires	---	---	---	---	---	---
12. Suffocation from Natural gases	---	---	---	---	---	---
13. Inrush of water	---	---	---	---	---	---
14. Nails and Splinters	---	---	---	---	1	1
15. Other Causes:	---	---	---	---	---	---
(a) Falling objects, other than 1 and 2	---	---	---	1	1	2
(b) Flying objects, other than 2c	---	---	---	2	5	7
(c) Burns	---	---	---	---	---	---
(d) Miscellaneous	---	---	2	5	11	18
Total number killed or injured underground	1	---	2	21	71	95

Shaft Accidents.

Number Killed or Injured by—						
16. Falling Down Shaft	---	---	---	---	---	---
17. Objects Falling Down Shaft	---	---	---	---	---	---
18. Breaking of Cables	---	---	---	---	---	---
19. Overwinding	---	---	---	---	---	---
20. Cage, Skip or Bucket:	---	---	---	---	---	---
(a) Runaway	---	---	---	---	---	---
(b) Riding with rock or ore	---	---	---	1	1	2
(c) Riding with timber or tools	---	---	---	---	---	---
(d) Struck by	---	---	---	---	---	---

21. Other causes	---	---	---	---	---	---
Total killed or injured by shaft accidents	---	---	1	1	2	---
Surface Accidents.						
(At surface plants and shops)						
Number Killed or Injured by—						
22. Haulage:	---	---	---	---	---	---
(a) Hand and animal	---	---	---	1	---	1
(b) Mechanical	---	---	2	1	---	3
23. Railway Cars and Locomotives	---	---	---	---	---	---
24. Run or Fall of Ore in or from Ore Bins	---	---	---	---	---	---
25. Falls of Persons	---	---	1	2	---	3
26. Nails and Splinters	---	---	---	3	---	3
27. Hand Tools, Axes, Bars, etc.	---	---	---	1	---	1
28. Electricity:	---	---	---	---	---	---
(a) Direct contact with trolley wire	---	---	---	---	---	---
(b) Tool or bar striking trolley wire	---	---	---	---	---	---
(c) Contact with motor	---	---	---	---	---	---
(d) Others	---	---	---	---	---	---
29. Machinery	---	---	---	3	---	3
30. Other Causes:	---	---	---	---	---	---
(a) Falling objects	---	---	1	3	---	4
(b) Flying objects	---	---	1	3	---	4
(c) Burns	---	---	1	---	---	1
(d) Miscellaneous	---	---	4	3	---	7
Total killed or injured by surface accidents	---	---	10	20	---	30
Open-Pit Accidents.						
Number Killed or Injured by—						
31. Falls or Slides of Rock or Ore	---	---	---	---	---	---
32. Explosives:	---	---	---	---	---	---
(a) Transportation	---	---	---	---	---	---
(b) Charging	---	---	---	---	---	---
(c) Suffocation	---	---	---	---	---	---
(d) Drilling into old holes	---	---	---	---	---	---
(e) Striking in loose rock or ore	---	---	---	---	---	---
(f) Thawing	---	---	---	---	---	---
(g) Caps, detonators, etc.	---	---	---	---	---	---
(h) Unguarded shots	---	---	---	---	---	---
(i) Returned too soon	---	---	---	---	---	---
(j) Premature shot	---	---	---	---	---	---
(k) Miscellaneous	---	---	---	---	---	---
33. Haulage:	---	---	---	---	---	---
(a) Hand and animal	---	---	---	---	---	---
(b) Mechanical	---	---	---	---	---	---
(c) Railway cars and locomotives	---	---	---	---	---	---
34. Steam Shovel	---	---	---	---	---	---
35. Falls of Persons	---	---	---	---	---	---
36. Falls of Derricks, Booms, etc.	---	---	---	1	---	1
37. Run or Fall of Ore in or from Ore Bins	---	---	---	---	---	---
38. Machinery (other than 33 and 34)	---	---	---	---	---	---
39. Electricity:	---	---	---	---	---	---
(a) Direct contact with trolley wire	---	---	---	---	---	---
(b) Tool or bar striking trolley wire	---	---	---	---	---	---
(c) Contact with motor	---	---	---	---	---	---
(d) Others	---	---	---	---	---	---
40. Hand Tools	---	---	---	---	---	---
41. Other Causes:	---	---	---	---	---	---
(a) Falling objects other than 31	---	---	---	---	---	---
(b) Flying objects	---	---	---	---	---	---
(c) Burns	---	---	---	---	---	---
(d) Miscellaneous	---	---	---	1	---	1
Total number killed or injured by open-pit accidents	---	---	---	2	---	2
GRAND TOTAL	1	---	2	32	95	130

- (A)—Permanent total disability.—Loss of both legs, or arms, one leg and one arm, total loss of eyesight, paralysis or other condition permanently incapacitating workman from doing any work of a gainful occupation.
- (B)—Permanent partial disability.—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed or any other injury known in surgery to be permanent partial disability.
- (C)—Under this head are included only those accidents which cause a loss of time more than the balance of the day or shift upon which the accident occurred.

Average number of men employed at Copper Mines during 1923 663
 Total number of shifts underground 153,794
 Total number of shifts on surface 81,953
 Total time lost on account of all accidents at Copper Mines during 1923 1,642 days

LIST OF ALL ACCIDENTS REPORTED FROM GOLD MILLING PLANTS
 OF ALASKA FOR THE YEAR 1923 CLASSIFIED AS
 TO CAUSES AND RESULTS.

CAUSES	Killed	Permanent to- tal Disability- (A)	Permanent par- tial Disability- (B)	Temporary Disability- (C)		Total Injured
				Time lost more than 14 days	Time lost less than 14 days	
Ore-Dressing and Milling Accidents.						
Number Killed or Injured by—						
1. Haulage System:						
(a) Cars and motors				1	1	1
(b) Mechanical conveyors				1	1	2
2. Railway Cars and Locomotives					1	1
3. Crushers, Rolls, or Stamps						
4. Tables, Jigs, Etc.						
5. Other Machinery					1	1
6. Falls of Persons					2	2
7. Suffocation in Ore Bins					5	5
8. Falling Objects (Rocks, Timbers, Etc.)						
9. Cyanide or other Poisoning						
10. Scalding (Steam or Water)						
11. Electricity						
12. Hand Tools, Axes, Bars, etc.				1	2	3
13. Nails, Splinters, Etc.					1	1
14. Flying Pieces of Rock from Sledging or Crushing						
15. Other Causes					2	2
Total number killed or injured at mills				2	16	18
Auxiliary Works' Accidents.						
(Yards, shops, construction, etc.)						
Number Killed or Injured by—						
31. Haulage Systems, Cars, Motors, etc.						
32. Railway Cars and Locomotives						
33. Falls of Persons						
34. Falling Objects (Rocks, Timber, Etc.)				1		1
35. Nails, Splinters, etc.						
36. Hand Tools, Axes, Bars, etc.						
37. Electricity						
38. Machinery						
39. Failure of Ladder, Scaffold, or Other Support						
40. Handling Hot Materials						
41. Other Causes	1					1
Total number killed or injured by shop and yard accidents	1			1		2
GRAND TOTAL	1			3	16	20

- (A)—Permanent total disability.—Loss of both legs, or arms, one leg and one arm, total loss of eyesight, paralysis or other condition permanently incapacitating workman from doing any work of a gainful occupation.
- (B)—Permanent partial disability.—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed or any other injury known in surgery to be permanent partial disability.
- (C)—Under this head are included only those accidents which cause a loss of time more than the balance of the day or shift upon which the accident occurred.

Average number of men employed at Gold Mills during 1923 207
 Total number of shifts worked 63,328
 Total time lost on account of all accidents at Gold Mills 158 days

REPORT OF MINE INSPECTOR

LIST OF ALL ACCIDENTS REPORTED FROM ALL COPPER MILLING PLANTS OF ALASKA FOR THE YEAR 1923 CLASSIFIED AS TO CAUSES AND RESULTS.

CAUSES	Killed	Permanent to- tal Disability- (A)	Permanent par- tial Disability- (B)	Temporary Disability- (C)		Total Injured
				Time lost more than 14 days	Time lost less than 14 days	
Ore-Dressing and Milling Accidents.						
Number Killed or Injured by—						
1. Haulage System:						
(a) Cars and motors				3	2	5
(b) Mechanical conveyors						1
2. Railway Cars and Locomotives				1		1
3. Crushers, Rolls or Stamps						1
4. Tables, Jigs, Etc.				1		1
5. Other Machinery				1	1	2
6. Falls of Persons	1				1	1
7. Suffocation in Ore Bins						
8. Falling Objects (Rocks, Timbers, etc.)						
9. Cyanide or other Poisoning						
10. Scalding (Steam or Water)				1	1	2
11. Electricity						
12. Hand Tools, Axes, Bars, Etc.						
13. Nails, Splinters, Etc.						
14. Flying Pieces of Rock from Sledging or Crushing						
15. Other Causes						
Total number killed or injured at mills	1			7	5	13
Auxiliary Works' Accidents.						
(Yards, shops, construction, etc.)						
Number Killed or Injured by—						
31. Haulage Systems, Cars, Motors, etc.						
32. Railway Cars and Locomotives						
33. Falls of Persons						
34. Falling Objects (Rocks, Timbers, Etc.)						
35. Nails, Splinters, etc.						
36. Hand Tools, Axes, Bars, etc.						
37. Electricity						
38. Machinery						
39. Failure of Ladder, Scaffold, or Other Support						
40. Handling Hot Materials						
41. Other Causes						
Total number killed or injured by shop and yard accidents						
GRAND TOTAL	1			7	5	13

- (A)—Permanent total disability.—Loss of both legs, or arms, one leg and one arm, total loss of eyesight, paralysis, or other condition permanently incapacitating workmen from doing any work of a gainful occupation.
- (B)—Permanent partial disability.—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed, or any other injury known to surgery to be permanent partial disability.
- (C)—Under this head are included only those accidents which cause a loss of time more than the balance of the day or shift upon which the accident occurred.

Average number of men employed at copper milling plants during 1923 269
 Total number of shifts worked 99,328
 Total time lost on account of all accidents at copper mills during 1923 456 days

REPORT OF MINE INSPECTOR

FATAL ACCIDENTS OCCURRING AT THE MINES AND ORE DRESSING PLANTS OF ALASKA DURING THE YEAR 1923, WITH STATEMENTS BY EMPLOYERS AND FELLOW EMPLOYEES REGARDING THE ACCIDENTS

(Gold Lode)

January 9—WILLIAM DRASICH (Blagoje Drashovich), Montenegrin, miner, aged 37 years, employed by the Hirst-Chicagof Mining Co., at their Hirst-Chicagof mine at Chicagof, was instantly killed by a slab of rock which fell on him, while he was attempting to pick it down from the wall, preparatory to blasting a round of holes.

The following statement describing the accident is made by Mr. D. J. Williams, superintendent of the mine:

"Deceased was in the act of picking down a slab of ground which looked dangerous to him and while picking, the slab fell down upon him resulting in immediate death. Deceased had been drilling near this slab all day and was about to load the holes for blasting. He attempted to pick down this slab of waste before spitting holes so that the waste slab would not be mixed with the ore drilled. The slab fell from the side of the stope and he was on his knees at the time because the back of the stope was not sufficiently high to permit his standing erect."

Marco Dapceovich who was working in a raise leading from the same stope at the time and Mike Savich who was working in an adjoining stope and who helped carry the deceased from the mine, were questioned by the Mine Inspector and from their answers, facts were deduced confirming the statement of Superintendent Williams.

(Gold Lode)

February 27—ANDREW MERICKLE, ditch tender, American, aged 67 years, employed by the Alaska Juneau Gold Mining Co., to look after the Treadwell ditch situated on Douglas Island and used in the operations of the Alaska Juneau Gold Mining Co., was killed by being carried down the mountain side in an earth and snow slide.

The following description of the accident which caused Merickle's death is set forth in the affidavit of J. W. Adkins, who lived with Merickle and was employed in the same capacity as deceased:

Mr. Adkins says: "That he is an employee of the Alaska-Juneau Gold Mining Company at the Treadwell ditch.

"Affiant states that on the 27th day of February, 1923, he and a man by the name of Andrew Merickle were taking care of the Treadwell ditch, which is situated on Douglas Island, Alaska. At or about 7:00 a. m. on said day, Andrew Merickle, who was in charge of the ditch, told affiant, 'you go up the ditch and see how it is and I will go down the ditch and raise some of the water gates and let some of the water out.' Affiant went towards the upper end of the ditch and everything was in good running order; he returned to the cabin and shovelled some snow off the roof of the cabin; then he had lunch and left the cabin at or about 12:30 noon to break a trail to the beach or to the boat-landing as

they expected to get some provisions in a few days to the cabin; after he broke the trail he returned to the cabin, expecting to find Andrew Merickle at the cabin, but he was not, and affiant became somewhat suspicious that something might have happened to him and he went down the ditch or flume on his trail and when he came to Falls Creek he seen where a slide of what appeared to be snow, water, gravel and some boulders, passed over the ditch or flume and one boulder was on the flume. Affiant seen the track of the ski which Andrew Merickle had on up to the place where the slide occurred and on the opposite side there was no track to be seen and affiant came to the conclusion that he must have been taken down the creek with the slide and affiant went down the creek bed where the slide went and when he was about 500 feet below the ditch or flume he found Andrew Merickle, caught on a snag and was held there by his rain coat or slicker which he wore, dead. Affiant then moved his body to a higher ground on the side of the creek in a more protected place. Affiant then went to the cabin and tried to telephone to Treadwell office, but the phone was out of commission. Then he came to Juneau and reported the accident to L. H. Metzgar, Superintendent of the Alaska-Juneau Gold Mining Company, which was about 8:30 p. m. on said day and on the following day affiant and other men removed the remains of Andrew Merickle from where it lay to the undertaker rooms of C. W. Young Co., at Juneau, Alaska."

(Gold Placer)

April 6—ARTHUR ROBINSON, miner, Belgian, aged 37, employed by J. P. Schoeser, operator, on 1st-Tier Bench Claim, Right Limit, No. 9 Below Discovery, Dome Creek, Fairbanks District, was killed by falling from the bucket, while being hoisted from the bottom of shaft.

The statement by Mr. Schoeser in charge of operations says:

"Fell from bucket and fractured skull. He was immediately hoisted from bottom of shaft and taken to cabin on a stretcher; then telephoned to Fairbanks for Dr. de la Vergne who came on the railroad speeder. After the doctor arrived ordered a special train to bring in. He died on the way into Fairbanks. John O'Shea was in bucket with Robinson at time he fell."

Mr. O'Shea in his affidavit says: "That he was employed by J. P. Schoeser at the time of the accident of Arthur Robinson, on Bench claim in the First Tier, Right Limit of Creek Claim No. 9 below Discovery on Dome Creek. That at the time said Arthur Robinson fell from the bucket he was in the bucket ascending with him. That he has read the report of J. P. Schoeser made this day on Mine Inspector's Accident Report, and that the statements made therein are true and correct."

Affidavit of Mr. O'Shea executed May 22, 1923.

(Gold Lode)

April 10—WILLIAM MOSES, laborer, Native (Indian), aged 27 years, employed by the Alaska-Juneau Gold Mining Company in their Alaska-Juneau mine, at Juneau, Alaska, was instantly killed by falling down a raise.

It was deceased's first shift in that part of the mine and he was taken to the dry room and told to remain there until the return

of the stope boss who was to show him where he was to work. Instead of remaining as instructed, Moses left the dry room and wandered out through the workings alone, taking the south side of the drift which led directly into the opening of the oreway instead of the north side where a regular passage was prepared leading to the stope.

Affidavits by Jim Giboloff, stope boss, James F. Hoag, shift boss and Peter Petievich, loader, who were on shift in the mine at the time of the accident, are descriptive of the same and follow in order as named:

Mr. Giboloff says: "That he is an employee of the Alaska-Juneau Gold Mining Company, in the Alaska-Juneau mine as stope boss.

"Affiant states that at or about 3:15 o'clock p. m. on the 10th day of April, 1923, James F. Hoag, shift boss in the mine, told him to take William Moses to No. 2 South Level to muck. Affiant, William Moses and other men went to the dry room which is situated at No. 2 South and when they got to the dry room, affiant gave William Moses a jumper to put on and told him to stay in the dry room until he would return. Affiant went with another man to the hoist and then returned to the dry room and William Moses was gone and he looked all around and in the various drifts and he could not locate him. Affiant then telephoned to No. 2 raise to the shift boss, James Hoag, and he told him that the new man (William Moses) was missing, then the shift boss looked all around but could not find him. Then the shift boss ordered to draw the No. 450 raise or chute and after a few car loads were drawn William Moses' body came out of the chute, dead."

Mr. Hoag says: "That he is shift boss in the Alaska-Juneau mine at or near Juneau, Alaska. Affiant states that at or about 3:15 o'clock p. m. on the 10th day of April, 1923, he gave William Moses who was going to work in the mine, at the mine office, a mine check. Affiant told Jim Giboloff, a stope boss, to take William Moses to the South ore body at No. 2 level to muck.

"At or about 3:45 o'clock p. m. on said day affiant was notified that William Moses was missing. Affiant immediately went to No. 450 raise and he asked Jim Giboloff, the stope boss, did he search around in all the drifts and Giboloff answered 'yes, I search all around and I can't find him.' Affiant then came to the conclusion that he must have fallen into the No. 450 raise and he telephoned to the mine office and Ralph Perrick, the stope boss, answered and affiant told him to tell Dan Pavlovich to send the train to No. 450 raise to draw the chute and in about thirty minutes the train came and they begin to draw the ore from the chute and when they draw five car loads from the chute the body of William Moses came out with the ore, dead. His body was sent to C. W. Young Company, undertaking parlors at Juneau, Alaska."

Mr. Petievich says: "That he is an employee of the Alaska-Juneau Gold Mining Company, in the Alaska-Juneau mine, as a loader. Affiant states that at or about 3:20 o'clock p. m. on the 10th day of April, 1923, he met William Moses in the dry room, which is situated at No. 2 South and asked him what he was going to do and he answered that he was going to 'muck.' Affiant then left and shortly afterward he met the stope boss (Jim Giboloff and he asked him where is the new man (William Moses) affiant answered 'he is in the dry room,' and he went to chute No. 298 to load.

Shortly afterward the stope boss (Jim Giboloff) came and asked him 'did you see the new man, I can't find him anywhere,' and then we went all around the drifts and various other places and we could not locate him anywhere. The stope boss then notified the shift boss (James F. Hoag) and he looked all around and could not find William Moses, then the shift boss came to the conclusion that William Moses must have fallen into the No. 450 raise and he ordered to draw the chute."

(Gold Lode)

May 11—WILLIAM RILEY, car loader in mine, American, aged 23 years, employed by the Alaska-Juneau Gold Mining Company, in their Alaska-Juneau mine at Juneau, Alaska, was electrocuted by coming in contact with the trolley wire of the haulage system in the mine while attempting to adjust a piece of rock in the loaded car that was resting too high to pass under the mine timbers.

Descriptions of the accident which caused Mr. Riley's death are contained in affidavits made by William S. Johnson and Herbert Martin, also car loaders in the mine, who were working with deceased at the time of the accident. The description follows:

Mr. Johnson says: "That he is an employee of the Alaska-Juneau Gold Mining Company in the Alaska-Juneau mine. Affiant states that at or about 11:00 o'clock a. m. on the 11th day of May, 1923, William, Riley, Herbert Martin and he were loading cars at No. 30 drift, No. 59 chute, in the Alaska-Juneau mine. After loading a car a rock was extending above the car and William Riley went on the car to lower the rock so as it would pass under the timbers which is overhead in the main tunnel and in some manner he dropped down a little on the car and his head came over the trolley wire and the trolley caught him below the chin on the neck. Herbert Martin immediately threw a steel bar on the trolley wire and then he grasped him by the shoulders and pulled him off the trolley wire. In the meantime affiant called for help and some men came.

"Affiant further states that William Riley was breathing a little but said nothing."

Mr. Martin says: "That he is an employee of the Alaska-Juneau Gold Mining Company, in the Alaska-Juneau mine for a period of about eleven months. Affiant states that at or about 11:00 o'clock a. m. on the 11th day of May, 1923, William Riley, William S. Johnson and he were loading cars at No. 30 drift, No. 59 chute, in the Alaska-Juneau mine. After loading a car, a rock was extending higher than would pass under timbers in the main tunnel and William Riley went between the cars and partly on the car which the rock was on to lower the rock and in some manner his foot slipped which caused his body to drop down a little on the car and in the meantime his head came down over the trolley wire and the trolley wire caught him under the chin on the rock. Affiant immediately threw a steel bar on the trolley wire to kick the juice off, but he failed, then he grasped Riley by the shoulders and he pulled him off quick and during this time William S. Johnson called for help and some men came.

"Affiant further states that after Riley was removed off the trolley wire he did not say a word."

(Gold Lode)

July 9—JOHNNY W. JOHNSON, bulldozer, Native (Indian), aged 23, employed by the Alaska-Juneau Gold Mining Company, in their Alaska-Juneau mine, at Juneau, Alaska, was killed by falling down the chute of the bulldozing chamber in which he was employed. There was no other person present at the time and how he happened to fall down the chute is unknown.

The following descriptions and details of the accident are contained in affidavits by E. C. Kilburn, assistant mine foreman in the mine, Harry Swinzyon, bulldozer, employed in the mine and John Rudy, bulldozer, also employed in the mine:

Mr. Kilburn says: "That he is assistant mine foreman in the Alaska-Juneau mine. Affiant states that at or about 8:45 o'clock a. m. on the 9th day of July, 1923, he came to No. 53 bulldozing chamber and John W. Johnson, a bulldozer, had just blasted a rock, he and affiant went to the grizzly and said a few words to each other and affiant went toward No. 63 bulldozing chamber and in about ten minutes after he was talking to John W. Johnson, John Tielens told him that a man fell in No. 53 chute. Affiant immediately went to No. 53 chute and covered the grizzlies and let a rope down the chute. By this time other men came and affiant thought that he might get the man out of the chute through the gateway and went to the gate, but he discovered that there was too much rock in the chute and returned. By this time John Rudy and Harry Swinzyon were down in the chute removing rocks off the man as he was covered up with rocks and fine muck, and in about an hour they got the man out of the chute, apparently dead.

"Affiant further states that the man who fell in the chute was John W. Johnson, the bulldozer at No. 53 bulldozing chamber and at the time of the accident there was no other person with him. Affiant further states that when he came to the grizzly he could hear the man in the chute hollering and calling for help and continued hollering and groaning for about fifteen minutes and then it ceased.

"Affiant further states that John W. Johnson's head and face was badly cut and had the appearance of being crushed to some degree by the rocks that apparently fell down after he fell in the chute."

Mr. Swinzyon says: "That he is an employee of the Alaska-Juneau Gold Mining Company in the Alaska-Juneau mine as a bulldozer. Affiant states that at or about 8:45 o'clock a. m. on the 9th day of July, 1923, a man came where he was working at No. 42-A bulldozing chamber and asked for a rope and said, 'a man fell down in No. 53 chute.' There was no rope there and affiant immediately went to No. 53 bulldozing chamber and other men were there and he helped them cover up the grizzlies with planks and other material that was to be had. Then affiant went down in the chute on a rope a distance of about forty feet where the man was (John W. Johnson). He was covered up with muck and he could hear him groaning and calling for help. By this time John Rudy came down in the chute and they removed the muck off John W. Johnson and pulled him up from underneath it and he appeared to be dead. Then they tied a rope around his body and was raised up to the top of the grizzlies.

"Affiant also states that there was probably about a foot of muck over John W. Johnson and it took them about forty minutes to remove enough muck to get hold of him and be pulled out."

Mr. Rudy says: "That he is an employee of the Alaska-Juneau Gold Mining Company in the Alask-Juneau mine, as a bulldozer."

"Affiant states that at or about 8:45 o'clock a. m. on the 9th day of July, 1923, one John Teilens, who is employed in the mine, came where affiant was working at No. 59 bulldozing chamber and said, 'did you see the man who works at No. 53 bulldozing chamber, I think that he must have fallen in the chute.' This affiant went immediately to No. 53 bulldozing chamber and he heard the man (John W. Johnson) hollering and groaning down in the chute and in about thirty seconds other men came and they covered up the grizzlies with planks and other material that was available. Then Harry Swinzyon went down in the chute on a rope and this affiant followed him shortly afterward."

"Affiant states that John W. Johnson was covered up with about a foot of muck and that he could hear him groaning and asking for help three or four times and in about forty minutes they pulled him out from underneath the muck and he appeared to be dead. Then they tied a rope around his body and he was raised to the top of the grizzlies."

(Gold Lode)

July 13—JOHN PAWLUK, bulldozer, Austrian, aged 31. employed by the Alaska-Juneau Gold Mining Company in their Alaska-Juneau mine, at Juneau, Alaska, was killed by a run of ore from the stope, while barring rocks at the collar or throat of the stope near the grizzly.

Description and details of the accident contained in affidavits by C. W. Bland and Jim Nicolo, are as follows:

Mr. Bland says: "That he is an employee of the Alaska-Juneau Gold Mining Company, in the Alaska-Juneau mine. Affiant states that at or about 9:00 o'clock p. m. on the 13th day of July, 1923, affiant was working at No. 490 chute as chute puncher, as the loader was drawing the muck out of the chute affiant seen the body of a man coming out of the chute on top of the muck, which went in the ore car on top of the muck. Affiant immediately went to No. 1 hoist house to telephone to the shift boss and as he was at the door he met Jim Nicolo and they went to the car where the remains of John Pawluk was, Jim Nicolo being working with John Pawluk at No. 299 bulldozing chamber and he fell in the chute. Affiant and Jim Nicolo removed the remains off the car on a stretcher and was taken to C. W. Young's undertaking parlors at Juneau, Alaska."

Mr. Nicolo says: "That he is an employee of the Alaska-Juneau Gold Mining Company, in the Alaska-Juneau mine. Affiant states that on or about 8:15 o'clock p. m. on the 13th day of July, 1923, John Pawluk and affiant were working at No. 299 bulldozing chamber (South Ore Body), John Pawluk was barring down rocks at collar or throat of stope near the grizzly bars and affiant was standing about six feet behind him watching for rocks that might come from the stope. Affiant seen a rock coming from the stope striking the bar that John Pawluk had in his hands, knocking him down head first between the grizzly bars and down into the chute."

"Affiant immediately went to No. 1 hoist to call for the shift boss (James F. Hoag) and as affiant was coming out of the hoist

room the loaders met him and told him that they drew out of the chute the remains of John Pawluk in the ore car, dead. Affiant assisted the loaders removing his remains from the ore car on a stretcher and was taken to C. W. Young's undertaking parlors, Juneau, Alaska.

(Gold Lode)

August 9—NICK ZUKOFF, bulldozer, Russian, aged 29, employed by the Alaska-Juneau Gold Mining Company in their Alaska-Juneau mine at Juneau, Alaska, was killed by suffocation, caused by a run of ore which imprisoned him in the bulldozing chamber.

Descriptions and details of the accident contained in affidavits by E. C. Kilburn and Seward Kunz, are as follows:

Mr. Kilburn says: "That he is mine foreman in the Alaska-Juneau mine at or near Juneau, Alaska. Affiant states that at or about 2:40 o'clock p. m. on the 9th day of August, 1923, Nick Zukoff and Seward Kunz were trying to blast down a hang-up in No. 49 bulldozing chamber and while they were up in the bulldozing chamber the rock started down. Seward Kunz got out of the way and Nick Zukoff went behind a large rock for protection and the hang-up came down. At the time the hang-up came down affiant was at or near No. 52 bulldozing chamber and Alphonse Buccamazza met him and said, 'Nick Zukoff is covered up with muck in No. 49 bulldozing chamber.' Affiant immediately went to No. 49 bulldozing chamber and Seward Kunz was there and said, 'Nick Zukoff is buried in the muck pile.' Affiant crawled up into the draw hole as far as possible and spoke to Nick Zukoff, and he said 'that he was behind a large rock and to draw the chute.'

"Under the conditions this was not advisable. so with the aid of men and timber affiant tried to work a hole through the muck pile until it was about eight o'clock that evening. Seeing that it was useless to try and get him out by timbering and believing that the man was dead, affiant started to blast the boulders and draw the chute and at 5:45 a. m. on 10th day of August 1923, his remains was found about twenty feet from the grizzly. Affiant further states that in his opinion Nick Zukoff was alive until about 4:00 o'clock p. m. on the afternoon of the accident and that he must have died by suffocation in the muck."

Mr. Kunz says: "That he is an employee of the Alaska-Juneau Mining Company, in the Alaska-Juneau mine as bulldozer. Affiant states that at or about 2:40 o'clock p. m. on the 9th day of August, 1923, he and Nick Zukoff started to break down a hang-up in No. 49 bulldozing chamber (which was hanging up for a number of hours). They dug a hole under a big rock which was in the bulldozing chamber, then they went and got a quantity of blasting powder and placed it in the hole which they dug under the big rock. At this time the rocks began to move down and affiant said to Nick Zukoff to get down quick and affiant ran into the cross-cut and in a moment later he returned about thirty feet and flashed the light to show and guide Nick Zukoff out of the bulldozing chamber, but by this time the chute was about full of rocks and almost up to the collar, then affiant called to Nick Zukoff a number of times and no reply. He then went to the mine office and reported the matter there and on his way back he met some men and he told them what happened and in a few minutes many other men were at the scene and they started to get Nick Zukoff out from under the muck."

(Gold Placer)

October 7—JOHN COUSE (Ernest J. Couse), blacksmith, American, aged 63, employed by H. W. Atwood, operator on No. 11 below Discovery, Goldstream, Fairbanks District, received a cut on his leg from a cable, while descending from the top of the pole where he had climbed to adjust a block, and died two days later as a result of said injuries.

Mr. Atwood in describing the accident makes the following statement:

"The blacksmith was through for the season but as it was not yet 6 o'clock he took advantage of the chance of a temporary shut-down to change a block, without letting the engineer know and when the engineer started the engine Couse started to climb down and his leg got foul of the cable. He was taken to the hospital and two days after his leg was amputated for gangreen and he failed to recover."

(Copper Lode)

October 3—TONY CARINO, laborer, Italian, aged 22 years, employed by the Kennecott Copper Corporation, as surface laborer, at their Beatson Mine, Latouche, Alaska, was buried in a cave-in or slide of concentrates, through neglecting to replace his safety rope after taking it off, while shovelling concentrates in the dock ore bin, resulting in his suffocation.

Death did not ensue immediately, however, but about fifteen hours after artificial respiration had been induced and the injured man had been taken to the hospital. Insufflation pneumonia developed and death occurred at 8:10 a. m. on October 4.

Descriptions and details of the accident are contained in the affidavits of Dan Benson, Jim Pitt, Gunder Ramstad, Paul Cvorovich and George Ivankovich, which are as follows:

Mr. Benson says: "That he has been in the employ of the Kennecott Copper Corporation at Latouche, Alaska, as foreman of their surface department, in charge of all surface yard work, including the loading of concentrates from the dock bunkers into ships, since January, 1923.

"We started to load the steamer 'Nebasna' early Sunday morning, September 30, 1923, and worked more or less continuously with two shifts up to the time that Tony Carino was caught in a slide about 4:15 p. m. October 3, 1923. There were working with him in the same bunker at that time the following men: Jim Pitt, George Ivankovich, Gunder Ramstad and Paul Cvorovich. About four o'clock in the afternoon I was on top of the bunker looking at the men and the work, and all the men then had ropes tied around their waists. These ropes are provided for the men to wear and they are instructed to wear them around their waists to prevent them being carried down and covered up should any slides of concentrates occur. At that time Carino was working nearer the chute than the other men. The concentrates are dumped into bins from above out of cars and drawn out from the bottom through a chute onto a conveyor belt which delivers them to the steamer. When the

bins are first drawn the concentrates above and around the chute run freely through but after that it is necessary to put men into the bins to shovel them down. This was what the men were doing when Carino was caught.

"I was sitting in the dock office when Paul Cvorovich told me of the accident. I went up on top of the bunkers to see if anything could be done from the top, and seeing that this was impossible went down below to the chute. They were just getting Carino out through the chute when I arrived. He was taken to the walk and given artificial respiration until he began breathing, when he was taken to the hospital. Would estimate that he was covered about five minutes before he was gotten out.

"Carino had been working in the bunkers about four shifts altogether when he was injured."

Mr. Pitt says: "That he has been in the employ of the Kennecott Copper Corporation at Latouche, Alaska, working in their surface department, since July 9, 1923.

"On October 3rd, 1923, I went on shift at one p. m. working in the concentrate bunkers on the wharf with Tony Carino, Paul Cvorovich, George Ivankovich and Gunder Ramstad. We were shoveling the concentrates in the bunker down to the chute and had ropes tied around our waists to keep us from being carried down and covered up should the concentrates slide down in a large mass. We worked several hours in the afternoon when the conveyor belt stopped for a short time. Carino took his rope off and did not put it back on when the conveyor belt started up and we all began shoveling again. He did not say why he did not put it back on.

We had been working a few minutes after the belt started up when a slide came from above and carried Carino down and covered him entirely up with concentrates. The slide also struck me but the rope around my waist kept me from being carried down. When the slide hit Carino he called to us but he was covered up before we could help him. We all went out of the bunker and down to the chute to draw the concentrates and took him out through the chute."

Mr. Ramstad says: "That he has been in the employ of the Kennecott Copper Corporation at Latouche, Alaska, working in their surface department since July 9th, 1923.

"On October 3rd, 1923, I went on shift at 1 p. m., working in the concentrate bunkers on the wharf with Tony Carino, Paul George Ivankovich and Gunder Ramstad. We were shoveling the concentrates in the bunker down to the chute. We all had ropes tied around our waists and these ropes are fastened to the top of the bunker. Sometime after four o'clock in the afternoon the conveyor belt shut down for a few minutes and Tony Carino took his rope off from his waist. When the conveyor belt started up again after a few minutes he did not put it back around his waist. Carino was standing about three feet below the rest of us. The belt had been running probably three minutes when a slide from above came and carried Carino down to the chute and buried him under three or four feet of concentrates. The slide carried me off my feet but the rope around my waist kept me from going further down. We all went out of the bunker to draw the concentrates through the chute from the outside and we took him out in this way, as it was impossible to uncover him from the inside of the bin. I would estimate it was about ten minutes before we got him out of the bin. He was unconscious when we got him out. After artificial respiration was started he was taken at one to the hospital."

Mr. Cvorovich says: "That he has been in the employ of the Kennecott Copper Corporation at Latouche, Alaska, working in their surface department since April 1, 1923.

"On October 3rd, 1923, I went on shift at one p. m. working in the concentrate bunkers at the wharf with Tony Carino, Jim Pitt, George Ivankovich and Gunder Ramstad. We were shoveling the concentrates in the bunker down to the chute and had ropes tied around our waists to keep us from being carried down by a slide of concentrates. We worked several hours in the afternoon when the conveyor belt stopped for a short time. Carino took his rope off and did not put it back on when the conveyor belt started up and we all began shoveling. We had been working a few minutes after the belt started up when a slide came from above and carried Carino down and covered him up entirely with concentrates. We all went out of the bunker and I went and told Dan Benson the foreman of the accident. The rest of them went down to the chute to take Carino out that way as we could not get at him from above."

Mr. Ivankovich says: "That he has been in the employ of the Kennecott Copper Corporation at Latouche, Alaska, working in their surface department since July 28th, 1923.

"On October 3rd, 1923, I went on shift at one p. m. working in the concentrate bunkers at the wharf with Tony Carino, Paul Cvorovich, Jim Pitt and Gunder Ramstad. We were shoveling concentrates in the bunker down to the chute and had ropes tied around our waists to keep us from being carried down in case of a slide of concentrates. We worked several hours in the afternoon when the conveyor belt stopped for a short time. Carino took off his rope and did not put it back on when the conveyor belt started up and we all began shoveling. We had been working a few minutes after the belt started up when a slide came from above and carried Carino down and covered him entirely up with concentrates. I

was standing on the right side next to the wall and the slide did not hit me at all. We all went out of the bunker and down on the outside to draw the concentrates out and take Carino out that way. He was unconscious when we got him out. After giving him artificial respiration and he started breathing he was taken at once to the hospital."

(Copper Lode)

October 19—MILO PAROVICH, miner, Montenegrin, aged 39 years, employed by the Kennecott Copper Corporation in the Mother Lode mine at Kennecott, while drilling a hole in loose ground, was struck by a slab which was loosened by the jarring of his machine, suffering injuries from which he died an hour later.

The following statement was made by W. C. Douglas, superintendent of the mine:

"There were no witnesses to the accident as the rock breaker was working at a distance of 200 feet from Parovich.

"Parovich was working in the 1400 Level Stope of the Mother Lode and had been in this stope for several months. The ground there is more blocky than usual at Kennecott and this man had always been very careful in taking down all loose slabs. From all indications he had barred on this slab which caused his death and had not been able to get it down. He was drilling a plug in it to blast it down and was standing well back of his machine.

The jarring of the machine loosened the slab enough to make it fall, and from what we can gather, the concussion of the falling piece must have knocked him over backwards. There was not enough rock on Parovich to have caused his death, as you will note from the affidavits, so we have concluded that the fall or the thrust of the machine must have been the main cause of his injury.

"Parovich was immediately taken to the hospital and died about an hour after arriving there. Examination by the doctor proved that he had a broken hip and was injured internally."

Descriptions and details contained in affidavits by E. Todd, shift boss, and Gunder Algren, powderman, are as follows:

Mr. Todd says: "I was making my first round through the mine and happened to stop at the top of 1251 winze to make a few notes. The powderman was a little ahead of me, and had started down the winze, but returned at once saying he heard a man groaning. We both hurried down and found a miner lying on his back, with rocks covering his left arm and leg. The man had a bad cut over his left eye, so I put my arm under his head, and raised it from the sharp rock which I believed had cut him. The powderman loosened his arm and leg, and we carried him to a safe place. The miner complained of his back hurting, so I placed my coat under his head and leaving the powderman to watch I went for help and stretcher. When I returned we carried him to 1250 station and turned him over to the foreman."

Mr. Algren says: "I was going down the Twelve Fifty-one (1251) winze for steel when I heard someone calling for help. I returned to station and told shifter that someone was hurt. We both hurried down and found miner lying on his back, with his left arm and leg covered with rock. We got him free and carried him to a safe place, and I stayed with miner while shifter went for help and a stretcher. We then brought him to 1250 station."