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Annual Report

OF THE

Territorial Mine Inspector



TO THE

Governor of Alaska

1920

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Letter of Transmittal

Juneau, Alaska,
February 26, 1921.

Hon. Thomas Riggs,
Governor of Alaska,

Sir:

Herewith, in accordance with the provisions of Section 6, Chapter 51, Session Laws of Alaska, I have the honor to submit to you my report, covering the calendar year 1920.

This report likewise covers certain data for the years 1918 and 1919, for which years no separate reports were rendered.

Respectfully,
B. D. STEWART,
Territorial Mining Inspector.

ANNUAL REPORT
of the
TERRITORIAL MINE INSPECTOR

1920

REPORT OF INSPECTOR'S WORK AND RECOMMENDATIONS.

During the calendar years 1919 and 1920 inspection was made by this office of all the operating lode mines and of the principal placer mining districts of the Territory with the exception of Seward Peninsula and some small properties elsewhere, too remote to permit of visit in the time available for the work. In addition to the operating mines, numerous properties under development in widely scattered sections of the Territory were visited and data collected as to mineral resources. The territory to be covered is altogether too vast to allow of all sections being visited by one man in the course of a year, due regard being had to requirements as to necessary office work.

On July 1, 1911, the President appointed a Federal Mine Inspector for the Territory of Alaska. That office was in active operation from that time until the commencement of coal-mining operations in the Matanuska Field, when the then incumbent of the office was assigned to duties exclusively connected with the coal-mining operations in that field.

From 1913, when the office of Territorial Mine Inspector was created, until 1918 the Federal and Territorial Inspectors cooperated in the inspection of mines and gathering of statistics, dividing the Territory into districts so that each covered separate sections. By this arrangement also benefit was secured by the Territorial Inspector of the services of a trained office assistant, assigned by the Government to the office of the Federal Inspector.

With the transfer of the Federal Inspector to the Matanuska field, his office at Juneau, theretofore available for the use of the Territorial Inspector, was abandoned and the services of the office assistant done away with. Since that time no adequate provision has been made for office space or clerical assistance for the Territorial Mine Inspector's office, notwithstanding the fact that at the last session of the Legislature an act was passed adding the duties of Labor Commissioner to those of Mine Inspector, without additional compensation. The gather-

ing and compilation of the statistics contemplated by this act involve a great deal of office work and the value of the data obtained justifies provision for proper office space and clerical assistance.

I would respectfully recommend that this matter be given consideration by the Legislature during the coming session.

COOPERATION WITH THE BUREAU OF MINES AND U. S. GEOLOGICAL SURVEY.

The Bureau of Mines has recently assigned a new Federal Mine Inspector to the work in the Territory, with headquarters at Anchorage. While his time will necessarily be largely occupied with matters pertaining to the operation of coal mines, over which he has exclusive jurisdiction in the matter of inspection and granting of mining permits, arrangements have been made whereby he and the Territorial Inspector are cooperating to the greatest possible extent, in dividing the work to be done. This plan will result very beneficially to the work of this office and permit of districts being visited and data being secured which would, otherwise, not be possible.

It has been and is the policy of this office to cooperate also with the United States Geological Survey to the greatest possible extent. It has been found that very great mutual benefit is to be derived by an interchange of data. With the greatly curtailed appropriations covering work in Alaska on the part of the Geological Survey and the consequent difficulty in getting a sufficient number of men to carry on the work it is felt that material assistance may be rendered the Survey in the matter of gathering data relative to the mineral resources and mining operations of the Territory.

It is to be hoped that this plan of cooperation with the Geological Survey and Bureau of Mines may not only continue but develop to the end that eventually a definite cooperative program may be put into effect on a basis similar to that which obtains in many of the States between these Government departments and the offices of State Mineralogist or Geologist.

I believe the scope of the work of this office should be amplified especially in the direction of assisting to devise means and execute plans to aid prospectors and generally encourage mining development in the Territory. Observations made during my journey through the Interior during the past season serve to convince me that much can be done in this direction. I know from experience that the mere fact that a Territorial official makes a visit to the prospector or the small operator in his out-of-the way haunts is deeply appreciated by them. The opportunity given to discuss their problems and tell of their difficulties and needs to one whom they feel may be of assistance in ways not open to themselves brings encouragement and lends fresh impetus to their efforts. Aside from such encouragement which, while more or less psychological in its operation, is important, immediate and more definitely practical assistance may be rendered the prospector and operator by the visiting inspector. Among these may be mentioned the identification of minerals in the field for the prospector,—a small field blow-pipe and chemical kit may be carried for this purpose,—suggestions as

to effective means of developing his prospect; advice to cease useless work on a prospect which may not warrant development; recommendation to the proper authorities to build trails or roads whereby promising properties or districts may be reached; the making of rough surveys and sketches in the field of work done on deserving prospects and a descriptive outline of the nature and extent of the mineralization on the property for publication, etc. By this latter means unbiased information as to the showing on prospects may be furnished prospective investors through this office and its publications and valuable assistance thereby rendered to the prospector who may lack other means of getting in touch with those possessing the capital necessary for the development of his property.

A plan such as that outlined above is in successful operation throughout British Columbia. Each mining division has a resident engineer whose duties are substantially to do the work outlined above. The encouragement given prospecting by this system without doubt goes far to account for the remarkable development of the mineral resources of British Columbia during the past few years.

I believe that, with a suitable working agreement between the Geological Survey, the Bureau of Mines and this office, a plan to carry such activities as above suggested into effect can be arranged and would result in great benefit in disclosing and aiding in the development of the mineral resources of the Territory. The advisability of providing additional assistance for the work of this office so that the scope of its activities may be enlarged along the lines above indicated is respectfully recommended to the Legislature for its consideration.

AMENDMENT TO SECTION 23, CHAPTER 51, SESSION LAWS OF ALASKA FOR 1917.

The Director of the U. S. Bureau of Mines calls attention to the fact that the provisions of this section, as it appears in the present law, do not properly cover the subject of ventilation insofar as coal mines are concerned. This is true and I would respectfully recommend the passage of such an amendment as the Director suggests, the same to be framed by the Federal Mine Inspector, who has exclusive oversight of the coal mining industry.

MINING DEVELOPMENTS.

Lode Mines.

Notwithstanding the generally depressed condition of the mining industry in the Territory during the year 1920, much active development work was carried on in various localities and a surprising interest in prospecting was manifested.

The most notable work was done in the development of lode properties in the Interior of Alaska. The principal scenes of activity of this character were the Nixon Fork district near McGrath in the upper Kuskokwim Valley and the Kantishna district bordering the northerly foothills of the Alaska Range in the general vicinity of Mt. McKinley.

The promising disclosures made in these two districts give basis for the belief that a start has been made in establishing lode mining as an important and permanent factor in the mineral production of the interior, a condition which, heretofore, has not existed. Whether or not further work on the properties being developed in the districts named results in their becoming productive in the near future, the interest already aroused by them has been a powerful agent in directing attention to the possibilities of lode mining in the interior. It is generally conceded that many localities in Interior Alaska amply justify prospecting for lode deposits. The superior attractions possessed by prospecting for bonanza placer ground, the fact that the miners of the interior are predominantly skilled in placer rather than lode operations, the high cost of outfits and the baffling problem of transportation have combined in the past to prevent the disclosure of workable lode deposits which there is good reason to believe are to be found in the Interior.

The announcement of the comprehensive and well planned program outlined by the Alaska Road Commission covering the road and trail work contemplated by the Commission, backed by substantial accomplishments in actual building operations during the past year has unquestionably been of enormous value in sustaining interest in mining operations throughout the Territory.

Along the line of the Government Railway and especially in the Willow Creek district, while little actual production is to be recorded, active development work was prosecuted on numerous properties with encouraging results.

In Southeastern Alaska the most notable event in lode development during the past year is the acquisition by the Chichagof Mining Company of the property, discovered in the fall of 1919 and generally referred to as the "Cann Property" or Apex Group. This property is situated on the west shore of Lisianski Inlet on the west coast of Chichagof Island and active development work has continued upon it throughout the year. Surface samples of the ore show a very high gold content. In June, 1920, another lode bearing high grade ore was discovered adjoining the Apex Group on the east and known as the "El Nido" lode.

Active steps were taken during the summer looking to a revival of mining in the Porcupine District near the headwaters of Chilkat River. While this district is in British Columbia it is tributary to Haines and its development is therefore important to Alaska.

Similarly important are the developments in the Salmon River District at the head of Portland Canal. All supplies and ore-shipments pass through the Alaskan port of Hyder. A threatened stampede into this district during the spring of 1920 was averted by timely warning by the press that the much-heralded district did not possess the get-rich-quick possibilities of the Klondike. Substantial progress was made in lode mining during the year, in both the Salmon and Bear River valleys. Regular shipments of ore have been made from the Premier Mine, now controlled by the Guggenheim interests. A small tonnage was also produced by a property under an option to the Algonican Development Co., Belgian capitalists, who still hold an option on the Jualin mine

in the Berner's Bay district. Developments made in the Portland Canal district stimulated prospecting on the American side of the boundary in the same general region.

Some development work is reported on the Cleveland Peninsula, a short distance north of Ketchikan.

With the exception of the two producing mines on Kasaan Bay, little mining was carried on on Prince of Wales Island. The low price of copper, which prevailed throughout the year, operated to discourage interest in copper properties which predominate on the island. The Treadwell Company performed their annual assessment work on the molybdenite property held by them at Shakan.

Placer Mines.

Taken as a whole, placer mining in Alaska was at a low ebb during 1920.

General conditions were such as to discourage attempts at extensive prospecting. Nevertheless, considerable activity was manifested in numerous localities.

In the general region of which Fairbanks is the center, most active work was done on the Upper Chena, Beaver Creek, Shaw Creek and Goodpaster.

Extensive preparations were being made looking toward large placer operations in the Kantishna District on Moose, Glacier and Caribou creeks. A large outfit is now on the latter creek, and one is enroute to the former. One of the most interesting developments in placer work in this district during the past season was the discovery that previous operations on Little Moose Creek had been conducted on false bedrock. The accidental overturning of a large boulder disclosed this fact, and subsequent operations carried to true bedrock resulted in a cleanup of about \$7,000 by two partners, on ground hitherto practically non-productive.

The region lying between Iditarod and Ophir, on tributaries of the Innoko River, was the scene of much work, preparatory to more extensive placer operations next season. Development work along the lower Kuskokwim, in the vicinity of Aniak River, was reported, though definite information as to its extent is lacking.

Successful operations were continued on Candle Creek, a tributary of Takotna, near McGrath.

Cache Creek also is preparing for more extensive work next year. With a wagon road in sight, a new impetus is given to work there.

Encouraging reports were received as to results obtained from work carried on in the Chandalar District during the season. Those engaged in work in this district are very optimistic as to the ultimate outcome of their work. They have been badly handicapped by the difficulty of getting supplies to their camps, as the roads and trails leading to the district have fallen into illrepair. One operator writes: "The distance from Beaver (on the Yukon) to the diggings, is about 120 miles of good, smooth, rolling country, and poor trails and faulty

mail service are the two main factors in keeping a good country down."

Prospecting on a gigantic scale is reported to be in progress on Chicken Creek and Denison Fork in the Forty Mile District. Thousands of acres of ground extending over almost 130 miles of river bed are being tested by the Forty Mile Power & Dredging Company. It is understood that financially powerful New York interests are back of this project.

Other prospecting on a smaller scale is also being carried on in the Forty Mile region.

The physical factors affecting placer mining in the Forty Mile district are said to closely resemble those obtaining in the Dawson country, where, for some years, dredging has been carried on on a very large scale.

Coal and Oil.

Aside from the operations of the Federal Government in the Matuska field, and along the line of the Government Railroad, numerous private concerns mined coal in Alaska during 1919-20 under the free permit and leasing system inaugurated with the passage by Congress of the Act of Oct. 20, 1914. These operations are in widely scattered districts. In the Nenana field, mining was conducted by two private companies, one mine being on the Government Railroad at the mouth of Healy Creek, and one on the left limit of Lignite Creek, 1½ miles from the railroad, and across the Nenana River. From these two leases approximately 21,000 tons of coal were mined during 1919 and 1920. A considerable amount of this coal was disposed of to private buyers at Nenana and Fairbanks, the remainder being used by the Alaskan Engineering Commission.

Coal is now being delivered at Fairbanks for \$9.00 per ton.

Next in importance are the operations which have been conducted during the past three years by McNally & Maitland, five miles from Homer, on the north shore of Kachemak Bay, on the west side of Kenai Peninsula. A good grade of lignite is mined here. A market for this coal is found among the canneries along the coast of Cook Inlet and the Alaska Peninsula.

Operations were also conducted under permit in the Forty Mile District.

One property is being worked at the mouth of Coal Mine Creek on Norton Sound, one 22 miles south of Haycock, near the Mouth of the Koyuk River, and two on the Krugruk River. Coal from lease on the Krugruk River is used in dredge operations.

As a result of the passage of a liberal oil leasing law on February 25, 1920, great interest has been aroused in the potential oil fields lying along the southern coast of Alaska.

Many representatives of eastern oil interests have visited Alaska during the past year investigating the various fields and actual drilling operations may undoubtedly be looked for during the coming year.

Three hundred and thirty-five permits were granted during the year 1920 covering prospecting rights over an area of 762,532 acres, or approximately 1200 square miles.

The number of applications, and the area involved, are as given below:

Oil Permit Applications to January 1, 1921

Cold Bay	168 applications	431,040 acres
Katalla	63 "	98,053 "
Yakataga	36 "	75,520 "
Illiamna	30 "	69,400 "
Kootznahoo	15 "	33,280 "
Cape Spencer	3 "	7,680 "
Chinitna	3 "	7,680 "
Seward	2 "	5,320 "
Wasilla	2 "	5,120 "
Anchorage	9 "	19,200 "
Aniakshak	4 "	10,240 "
Total	335 "	762,532 "

REVIEW BY DISTRICTS.

THE KANTISHNA DISTRICT.

In respect to the number of men engaged in lode prospecting, and the extent of country covered by their operations during the seasons of 1919 and 1920, the Kantishna District is the first in importance in the Territory.

Approximately one hundred men were in this district during the season of 1920.

The operations conducted were successful in disclosing notable surface exposures of high grade silver bearing galena and gray copper ores. At least one specimen of stephanite was observed.

So far as observed these ores occur in fracture zones in the Birch Creek schist formation. While sufficient work has not been done to demonstrate the depth to which mineralization extends in these deposits (100 feet being the deepest excavation) their lateral extent has been shown, by recent work, to be considerable.

The Kantishna region has been thoroughly described by the United State Geological Survey in Bulletin No. 687, by Stephen R. Capps, to which reference is made.

The district lies just outside and to the west and north of the boundaries of Mt. McKinley National Park.

Supplies purchased in Fairbanks or Nenana are delivered to the district by way of the Tanana River to the mouth of the Kantishna River near Tolovana, thence up the Kantishna River by small river steamers to Roosevelt. The latter place serves as a supply depot for the camp which lies 30 miles to the south. During the summer and fall of 1920 the Alaskan Engineering Commission completed the cutting out of a wagon road through from Roosevelt to Friday Creek making it passable for the full thirty miles. Work is continuing on this road during the present winter, principally getting out and distributing timber for corduroy.

Access to the Kantishna District is also to be had by trail from Nenana over either of several routes. The airline distance from Nenana to Eureka (Kantishna Postoffice) is ninety miles.

One route leaves the Government Railroad at the Jap Roadhouse thirty miles out from Nenana. This route involves crossing the Nenana River, and is not feasible during the open water season. It is much better during the cold weather when the trail is frozen. There are cabins and roadhouses stationed along this trail.

Another route leaves the railroad at Singleton's roadhouse opposite the mouth of Lignite Creek, and follows the low divide between the Kantishna Hills and the foothills of the Alaska Range to the Toklat River.

There is also a third route which is mentioned by S. R. Capps in Bulletin No. 687 of the U. S. Geological Survey. This route leaves the Government Railroad at Merino's Roadhouse and follows a series of passes bordering the Alaska Range and parallel to it. This route has the advantage over the lower routes of crossing the Toklat and other rivers near their sources thereby doing away with the necessity for the construction of expensive bridges. The Alaska Road Commission is investigating the feasibility of utilizing the Capps route for a permanent wagon road into the Kantishna Mining District. Such a route would serve admirably as an entry to the McKinley National Park.

Aitken Property.

The twenty odd claims comprising this property, owned by Quigley & Dalton, are being worked under option by Mr. Thos. P. Aitken. The group practically covers the ridge forming the divide between Friday and Eureka Creeks (known as Quigley Mountain) and extends from the low bench bordering Moose Creek to the summit of Quigley Mountain.

Work under this option has continued throughout the past two seasons and a considerable amount of high grade ore has been shipped to the Selby Smelter at San Francisco.

Mining and shipping costs under present conditions make shipment of ore running less than 200 ounces in silver to the ton, prohibitive. The ore consists principally of silver bearing galena and gray copper (tetrahedrite.)

The mine equipment at the Aitken camp consists of a blacksmith shop, ore assorting table and grizzly, and a combined bunkhouse and boarding house with bunks for fifteen men. Eleven men were employed at the time of visit.

Shipments have been made from two distinct ore shoots. These are practically parallel, running northeasterly and southwesterly and separated by a distance of a few hundred feet.

During the season of 1919 work was confined to the upper or southerly one of these two ore bodies. The workings consist of a shaft 100 feet in depth from which drifts were run at the 30 and 60 foot levels below the collar. As mined, this shoot has been shown to be over 200 feet in length. A crosscut tunnel was run, at the elevation of the bottom of the shaft, having a length of approximately 300 feet, and from this a drift was run to connect with the bottom of the shaft

No work was being done on this shoot and the workings were obstructed by ice at the time of visit in October, 1920.

The ore body now being exploited is opened by a shaft 40 feet deep, connection with the bottom of which is made by a crosscut tunnel, known as the main tunnel, 130 feet long, and a drift on the ore shoot approximately 75 feet in length. A second crosscut 90 feet long has been driven at a distance of about 40 feet from the main tunnel and parallel to it, from which a drift has been run westerly, almost connecting with the main tunnel.

At the time of visit, stoping was in progress in the vicinity of the shaft above the main level. A shaft located on the strike of the above-described ore body and about 150 feet east of the main tunnel, had been started on the outcrop and was down about 20 feet, with work still proceeding in it. Very good ore was being secured from this shaft.

Galena Lode.

The Galena Lode prospect is described in United States Geological Survey Bulletin No. 687, pp. 105-106.

This property is now controlled by Mr. James Haney who has established a camp on the ground and has outlined a systematic program of development which is being put through this winter.

A sled road has been built to the workings and a season's supplies laid in at the camp.

At the time of visit (October, 1920) approximately fifty tons of high grade ore had been taken out and sacked for shipment, and it was estimated that at least an additional one hundred tons would be sacked during the winter. Surface prospecting had been carried on at numerous places with encouraging results.

During the present winter it is planned to drive a 75 foot crosscut on the ground and then sink a winze on the ore zone in order to prospect the deposit at greater depth. If conditions prove favorable, a lower tunnel is proposed. With a length of 507 feet this tunnel would give a depth of 228 feet below the present tunnel.

As at the Aitken property, the ore on the Galena prospect is steel galena and gray copper, both carrying high silver content.

Red Top Lode.

The Red Top Lode, owned by Joseph Quigley, lies at the foot of Quigley Mountain on the bench, a short distance south of Friday Creek near its confluence with Moose Creek, and adjoins the Aitken group on the west. Numerous well-constructed and well-planned open cuts expose the outcrop of the ore shoot over a strike length of about 300 feet. The average width of the ore body appears to be about 9 feet.

The work done reveals a very encouraging showing of galena and gray copper ore which is deserving of thorough exploration.

Apex Lode.

O. M. Grant has located the Apex Lode, adjoining the Galena Lode on the west, and lying on the bench between the Galena Lode and Moose Creek. An open cut was driven during the 1920 season.

Dalton Claims

Northwest of the Apex Lode, and lying southwesterly from the Red Top Lode, are the Star, Jumbo and Caribou Lodes, located by Joseph Dalton, who has done some open cut work upon them.

Eldorado Creek.

During the past season numerous locations were made and considerable prospecting was carried on on the ridge lying on the opposite side of Moose Creek from Quigley Mountain and bordering on Eldorado Creek. Here, also, silver bearing tetrahedrite and galena ores were found, in all respects similar to those exposed on Quigley Mountain. The fact that ore of this type occurs along Eldorado Creek and on a line which appears to closely approximate the westerly extension of the general strike of the deposits on Quigley Mountain, gives basis for the belief that a continuous system of fracturing exists connecting the two areas, and characterized by a uniform type of mineralization. Of further interest in this connection is the fact shown by the past season's work that ores of the type described, occur some distance easterly from Quigley Mountain, on the general strike of the above-described lodes, on Yellow Creek, where J. H. Ritter had three claims. Open cut and trench work on these claims has resulted in the discovery of silver bearing galena ore. The distance intervening between the discoveries on Yellow Creek and those on Eldorado Creek is approximately seven miles. Locators of claims on the Eldorado side are Harry Ralston, Brooker & Farrar, Frederick & Bigelow, O. M. Grant and C. H. Wilson. An occurrence of copper ore was reported near the foot of Muldrow Glacier by J. Quigley.

This district is seriously handicapped by a scarcity of wood. Wood for fuel has to be hauled a distance of ten or twelve miles on an up-hill grade. Deposits of lignite exist at several known points near the headwaters of Moose Creek not more than eight or ten miles above Kantishna post-office. It is expected that a wagon road will be built to these deposits at an early date as they have been proven to be of sufficiently high grade for use in blacksmith work, etc. These deposits should be made available as soon as possible as the continued use of the scanty supply of timber as fuel will bring about a serious shortage for use as mine timbers later, if the mines reach a point in their development where timbering is necessary.

Placer Operations.

Placer operations were successfully conducted on numerous creeks in the Kantishna District during the season of 1920, and preparations are being made for more extensive work next year.

Eureka Creek.

Nine men, representing four outfits, were engaged in placer mining on Eureka Creek. Joseph Dalton on No. 10 Above and Pete Nelson on No. 13 Above, worked virgin ground; the others were "sniping."

Hydraulic dams are being employed on the virgin ground and the entire creek is being gone over with this equipment.

Friday Creek.

Two men were engaged in "sniping" on Friday Creek.

Moose Creek.

Road work as representation work was done on a group of eighteen claims, including three associations, on Moose Creek, extending from the mouth of Eureka to "the canyon," a distance of 3½ miles.

This group is held by the Kantishna Hydraulic Mining Company. It is proposed to work Moose Creek by hydraulic methods and equipment, including 3200 feet of pipe, two giants, a No. 2 Campbell hydraulic lift, etc. which were in transit from Fairbanks at the time of visit. This material was held up at Tolovana by the early freeze-up, but will be moved to the creek in May and will be on the ground in June, 1921, according to the present plans. Work should start by July when twelve to fourteen men will be employed. In connection with this project a power scheme is proposed, involving the construction of a hydro-electric plant, utilizing the waters of upper Moose Creek and Wonder Lake.

Eldorado Creek.

(No operations.)

Glen Creek.

Eleven men were engaged in "shoveling in" operations on Glen Creek during 1920.

Glacier and Caribou Creeks.

Open cut work was carried on by five men on Glacier Creek during the 1920 season.

In addition to this work, extensive preparations were in progress looking to next season's operations on Glacier and Caribou Creeks by the Mt. McKinley Gold Placer Company. A large amount of supplies and equipment were started up the Kantishna River and the Bearpaw River for this project, but it was reported they were held up by low water in the latter river, and early freeze-up.

A large motor tractor is on the ground and is to be employed in transferring freight from the boat landing to the scene of operations.

Yellow Creek.

Two men sniping on Wilson's ground.

Spruce Creek.

Two men employed.

Little Moose Creek.

Good ground has been uncovered by Hauselman and Weisel on true bedrock. Five men are employed in all.

Wickersham Creek.

Five men employed.

Canyon Creek.

A new discovery was made on this creek by Dan Cook.

Clearwater.

Four men are employed.

Rainy Creek.

Three men are employed.

NIXON FORK DISTRICT

General Statement.

Widespread interest has been aroused by developments which have taken place in this district during the past year, largely on account of the acquisition of a large group of claims in the district by the Alaska Treadwell Company, so long identified with the immense output of low grade gold ore in Southeastern Alaska.

The first announcement of the discovery of gold in this district occurs in U. S. Geological Survey Bulletin No. 410, A. G. Maddren, Mineral Resources of Alaska for 1917, p. 40, reference apparently being made to placer discoveries on Hidden Creek, a tributary of Nixon Fork, by F. E. Matthews on June 30th, 1917. In the fall of that year the discovery of gold bearing quartz was made by John Strand of the partnership of Pierson & Strand, when the Crystal Claim was located near the head of Ruby Creek on the divide between the Nixon Fork and the North Fork of the Kuskokwim River. In the spring of 1919 the Crystal Lode was bonded to Thos. P. Aitken who sank a 65 foot shaft and made one shipment of high grade ore from the claim. The Crystal Claim now forms a part of the group controlled by the Alaska Treadwell Company.

The Nixon Fork District lies in a heretofore little known region near the first forks of the Kuskokwim River, which occurs approximately eighty miles (by river) above the town of McGrath, the present head of steamer navigation at the confluence of the Tacotna River with the Kuskokwim. The location of this district may otherwise be stated as being almost due east of the town of Ophir at an air line distance of approximately sixty-five miles therefrom.

The course of Nixon Fork practically parallels that of the main Kuskokwim River above McGrath and lies north of and at an average distance of from 15 to 20 miles from the Kuskokwim. The two rivers are separated by a very low divide for some distance above McGrath. This divide gradually increases in elevation as one proceeds easterly, and culminates in rugged peaks of considerable altitude at the headwaters of Nixon Fork,—fifty miles (by river) above the present mining district.

The Nixon Fork landing on the Kuskokwim is 75 or 80 miles by

river above McGrath and is practically opposite the mouth of the South Fork of the Kuskokwim. At this point, which is on the right limit, is a large roadhouse and a warehouse belonging to the Alaska Treadwell Co.

At the mouth of the South Fork is a sawmill capable of cutting about eight thousand feet per day.

From this landing a wagon road running almost due north, twelve miles in length, extends to the mining camp on the Nixon Fork side of the divide. From the landing the road crosses a flat, swampy, tundra country for a distance of five or six miles. From there on it follows a gulch in the ridge and has a good bed.

During the summer and early fall of 1920 several steamer trips were made with freight from Seattle to Bethel near the mouth of the Kuskokwim River. At Bethel, freight is transferred to river steamers. Two river steamers were in operation during the season of 1920. These steamers ply the Kuskokwim as far as McGrath. From McGrath the stern wheel gasboat "Thor," handling fifteen to twenty tons per trip, was operated to Nixon Fork Landing, and also up the Tacotna River to the town of Tacotna.

Access to this region for light travel is to be had by pack trails from Iditarod and Ophir, which, in turn, are to be reached in summer by gasboat from Holy Cross on the lower Yukon, or in winter by sled trail from Ruby. Also, in winter, travel by dog team is feasible from the Kantishna District, with competent guides. If the camp proves permanent, this will undoubtedly prove the principal winter route from the Government railroad.

In the summer, small gasboats may ply the Kantishna River from its confluence with the Tanana, near Tolovana, to Lake Minchumina which it drains, and across the lake to its western shore, a distance of fifteen miles. From here a trail used by the Indians leads southwesterly, by way of Mt. Sutli, to the Indian village near Lake Telida. It takes the Indians two days to make this trip afoot in summer. Telida Indian Village is on the McKinley Fork of the Kuskokwim River, and one day's journey from its junction with the North Fork. From this junction gasboats may navigate the Kuskokwim River to Nixon Landing at all stages of water.

Another trail, known as "the Portage," leaves Lake Minchumina and at a distance of twelve miles terminates at the North Fork of the Kuskokwim River. From this terminus small boats descend the North Fork. In low water stages, owing to numerous riffles in its upper reaches, the North Fork is navigable with difficulty with gasboats from the portage to its junction with the McKinley Fork, a distance of perhaps 200 miles by the river. Its course is extremely tortuous and, except at the riffles, the gradient very slight.

The ore deposits of the Nixon Fork District occur along an extensive contact zone between limestone and granite. This contact has been identified over a considerable distance, and already a large amount of work has been done to determine the true nature and extent of the mineralization.

With the exception of detached spots along the summit of the divide, along which the contact occurs, surface exposures are poor,

the ground being covered by moss, brush, and more or less timber. Surface exploration of the zone therefore requires much open cut work and trenching. The high grade ore recovered to date has come from the zone of oxidation which has been proved to extend to a depth of at least 100 feet below the present surface.

The ore bodies conform to the usual characteristics of most contact zones, in that the mineralization is not confined to well defined and continuous ore channels, but is represented by more or less discontinuous masses scattered irregularly throughout the zone.

Treadwell Property.

At the time of visit (September, 1920), the amount of development work which had been accomplished on this property was remarkable when account is taken of the remoteness of the camp, the crude working methods necessitated thereby, and the few months which had elapsed since the acquisition of the property and the commencement of the work upon it. Three timbered shafts had been sunk, aggregating 220 feet in depth, from which drifts totaling 215 feet and crosscuts totaling 110 feet in length, had been driven. The drilling had all been done by hand, and the hoisting by hand windlasses. The hoisting buckets were of wood and had a capacity of 1 3-4 cubic feet (ten pans).

These buckets were also used to transport muck from the drift faces to the shaft, being skidded along the drift on pole tracks.

Ventilating conduits consisting of wooden pipes of square cross section were in use in the shafts.

Ore was being hand-sorted on a table, the large pieces being broken by hand for examination before sorting.

A new camp was erected at the head of Ruby Gulch near the Whalen shaft and at approximately 1800 feet elevation. This was almost ready for occupancy at the time of visit, and consisted of a bunk house, boarding house (these two being of frame construction) assay office, foreman's residence, and a stable,—all of log construction. A warm storage was built, consisting of a well timbered tunnel 7x9 to 10 feet in the clear and 60 feet in length, driven in partially disintegrated granite bedrock.

Twenty-five men were employed on the works. The labor in this district is of a high type and receive wages of \$6.00 a day and board.

Prospecting.

Attracted by the news that a gold strike had been made on the Kuskokwim, many prospectors from outlying districts in the Interior, especially from the Iditarod, Flat and Ophir regions, went to the new diggings to try their luck, and indications point to a greater influx during the present winter. It is estimated that thirty or more prospectors were at work in the district, aside from the men employed by the Alaska Treadwell Company.

It would seem that the most promising area for further exploration lies to the northeast of the Treadwell property, along the Nixon Fork-Kuskokwim divide. Owing to the more rugged character of this country, bedrock exposures should be more numerous.

McGrath furnishes a supply point where, normally, everything needed by prospectors may be obtained. The Northern Commercial Co. has a large store here. Stock during the present season, however, has been limited owing to inadequate transportation and boats being frozen in early 150 miles below the town. Small game, especially grouse, is quite plentiful, and moose meat is not difficult to obtain.

PLACER OPERATIONS

Ruby Creek.

On Ruby Creek, just south of the lower camp of the Alaska Treadwell Co., O'Mally and Waldem are drifting from the foot of a forty foot cribbed shaft on a placer property discovered three years ago. About 1500 sq. ft. of bedrock was opened during the past season, with two men engaged in the work.

Hidden Creek.

The original discovery of placer gold in the North Fork District was made on Hidden Creek in June, 1917, by F. E. Matthews. Two thousand sq. ft. of bedrock was stripped by Matthews during the past season. Goebel & Blackburn have taken a lay on this ground and were preparing for fall and winter mining at the time of visit.

On Whalen Pup, a branch of Hidden Creek, some work was done during the summer by Whalen and Griffin.

SOUTHEASTERN ALASKA.

Gastineau Channel, etc.

Production by the low grade gold mines of Gastineau Channel was maintained throughout the years 1919 and 1920 on about the usual scale, in spite of serious handicaps.

A pronounced shortage of competent labor threatened the operations of these mines for many months and relief was not had until the fall of 1920. Since that time labor conditions have been normal and an increased output has been made possible.

An interesting development in connection with these plants is the radical change in the flow sheet of the Alaska Juneau mill. An elaborate ore sorting arrangement has been installed and is now in operation.

It is stated that with the new flow sheet fully developed, a mine tonnage of 16,000 tons per day can be handled by the mill.

The Alaska Ebner Gold Mining Company continued development work on its property, adjoining the Alaska Juneau on the northwest, throughout the year.

Much interest has been taken in the announcement that plans are in progress for the utilization of the surplus power developed by the hydro-electric plants of the Alaska Gastineau Mining Company in the operation of a paper mill to be erected at Thane. It is not thought that this plan contemplates the early closing of the Perseverance Mine as has, at times, been predicted.

Nothing more than the performance of assessment work is reported on any of the properties of the Juneau Gold Belt lying to the north of Juneau, including the districts of Auk Bay, Yankee Basin, Eagle River and Berners Bay.

Jualin Alaska Mines Company.

In the latter district the Jualin Mine, under option to Belgian capitalists, was operated for a portion of the past year, but was forced to close down owing to the prohibitive exchange rates which made the attempt to supply funds from a foreign source disastrous. An unfortunate circumstance also was the loss of their ten stamp mill by fire. With a return of more favorable operating conditions and improvement in the international situation affecting foreign exchange rates, this meritorious property will undoubtedly be operated again.

Much credit is due the Belgian company for their persistent efforts in endeavoring to continue work on the Jualin property under the almost overwhelming handicaps brought on by war conditions.

To the south of Juneau on the mainland, some development was carried on at Snettisham, Sumdum and Windham Bay.

Alaska Peerless Mining Company.

In the latter district, during 1919, the Alaska Peerless Company drove approximately 500 feet of tunnel and crosscuts on the Basin Queen Lode. This work exposed an extensive belt of highly mineralized talcose schist, approximately 70 feet in width, constituting a showing which appears to be well worthy of further exploration.

The main tunnel is now 400 feet in length, and from it five crosscuts have been driven aggregating 300 feet in length. It was planned by the Alaska Peerless Company to drive a crosscut adit 630 feet vertically below the present drift adit, and 5,000 feet in length, to cut the above described zone at this horizon.

This work was started, and 50 feet of open cut work and 30 feet of tunneling completed. Work on the property was discontinued in the fall of 1919 and only assessment work was done during 1920.

A group of claims lying across Spruce Creek, and on the northerly extension of the Alaska Peerless property, is controlled by Mr. C. W. Fries of Juneau.

Independent Gold Mining Company.

On the beach at the head of Windham Bay the Independent Gold Mining Corporation completed approximately 150 feet of tunnel work during 1920 on a belt of silicified schist averaging about ten feet in width, and containing gold, galena and sulphides of iron. This mineralized belt has been followed on the surface for a long distance south-easterly from the tunnel and appears on the opposite shore of the bay where claims have also been located upon it.

Near the head of Spruce Creek, southeast of the Alaska Peerless property, an extensive group of claims is held by Mr. Gudman Jensen of Juneau. Assessment work has been kept up on this group.

ADMIRALTY ISLAND.

Admiralty-Alaska Gold Mining Company.

At Funter Bay work was continued throughout 1919 and 1920 on the active development of a large group of claims by the Admiralty-Alaska Gold Mining Company.

This property is well equipped, considerable waterpower having been developed and a compressed air plant installed. The main crosscut tunnel had been driven a total length of 1045 feet by July, 1920. It is reported that work is to be commenced this winter looking to the further development in depth of veins outcropping near the mill on the beach, with the idea of milling the ore extracted. These veins have been mined in the past by the Funter Bay Mining Company, predecessors to the Admiralty-Alaska Gold Mining Company in the ownership of the claims, and have yielded a considerable output of gold.

Nowell-Otteson Group.

Adjacent to the Admiralty-Alaska Group is a group of claims held by Nowell and Otteson, from which some very high grade gold ore has been obtained. Assessment work has been done on this group and plans for more active development work are in progress.

Hawk Inlet.

On the opposite side of Mr. Barron from the two properties above described, on the Hawk Inlet drainage, work has been done during 1919, and 1920, the results from which are reported to be very encouraging.

Coal and Oil.

As a result of the passage of the oil land leasing law, renewed interest has been aroused in the coal bearing rocks known to exist in the southerly portion of Admiralty Island. During 1920 fifteen applications were filed for prospecting permits, covering an area of 33,280 acres in the Kootnahoo Inlet district.

Some prospecting for coal has been done during the past season in the vicinity of Chapin Bay on the southern extremity of the island.

CHICHAGOF ISLAND.

Chichagof Mine.

The operation of the Chichagof mine continued during 1919 and 1920 on the same scale as in previous years.

There was an average of 150 men employed during the two years, and little difficulty was experienced on account of shortage of labor. A

modern concrete bath and dry house was completed for the use of the employees and living conditions for the miners thereby greatly improved. During the year 1920 the splendid new mine tender "Ambassador," built on Puget Sound, was delivered to the company and put in commission. This boat is now employed in handling most of the local transportation business between Juneau and the mine, and also in transporting concentrates to the smelter at Tacoma, and supplies for the mine from Puget Sound points. A large barge in tow is also employed in the latter service.

The cutting of a hoist station was completed and the sinking of a new shaft begun on the seventh level below the main adit tunnel, 800 feet northwesterly from the present working shaft. A new hoist for use in this shaft is in transit and will be installed during the coming summer.

Gypsum Mine.

Production of gypsum from the mine of the Pacific Coast Gypsum Company at Iyoukeen Cove has been resumed with 25 men employed.

A new shaft is to be constructed to replace the present one as a working shaft, and to provide a second entry to the mine. The present shaft will be sealed, leaving a manway compartment. The purpose of this move is to provide against the flooding of the mine by surface waters and underground springs, such as has occurred twice in the past. An average of 1000 gallons of water per minute is pumped from the mine by electric and steam pumps whose aggregate capacity is 2800 gallons per minute. The mine is operated to a depth of 300 feet.

Hirst-Chichagof Property.

Active development was continued on the Hirst-Chichagof property at Hirst Cove on the opposite side of Doolth Mountain from the Chichagof Mine.

During the winter of 1919 and the spring of 1920 a stamp mill which had been installed at Windham Bay was dismantled and moved to the Hirst-Chichagof property. A mill building was constructed but the mill has not yet been installed.

A wharf has been built and a comfortable bunk house and boarding house completed at the property. Difficulty was had with the compressor formerly in use and a new machine has been installed. Following this improvement, work was resumed on the crosscut tunnel at the mill level, and about 300 feet driven, making a total of about 1100 feet. It is understood this tunnel has reached the vein and exploration of the ore zone at the mill tunnel level has begun. This vein is very similar in type to the Chichagof vein and the results of development work upon it are being looked forward to with interest.

Lisianski Inlet—Apex Group.

The Chichagof Mining Company has acquired control of the Apex Group of claims lying across the divide between the head of Cann Creek on the west shore of Lisianski Inlet and Stag Bay, an arm of Lisianski Strait.

The discovery of the Apex vein was made in October, 1919, and development work was commenced upon it as soon as the snow had left in the early summer of 1920. The vein on the surface averages about 20 inches in width, and its outcrop has been traced for a considerable distance. Patches of exceedingly high grade gold ore appear on the outcrop at several places.

A camp was built on the beach at the mouth of Cann Creek and a pack trail about two miles in length constructed, leading to an upper camp and the lowest showings on the outcrop. The upper camp is at an altitude of 800 or 900 feet, and the discovery about 1300 feet. It is understood that a tunnel 50 feet in length has been driven on the vein commencing at the discovery since July, 1920. A lower tunnel commencing at a point near the upper camp is understood to be under construction at the present time.

The Apex vein is practically solid quartz in unaltered hornblend diorite. A very fine grained porphyritic acidic dike, a few inches in thickness, lies along the walls on either side of the vein. This dike closely resembles quartzite in appearance, and weathers brown on the surface.

El Nido Group.

Adjoining the Apex Group on the east is the El Nido group of claims controlled by Mr. J. H. Cann, who was also one of the discoverers of the Apex Lode. The El Nido Lode was discovered in June, 1920, and some development work consisting of open cuts and trenching had, at the time of visit (July, 1920), exposed the outcrop for a length of about 200 feet. Some exceedingly high grade samples were secured from this crop, hand specimens being said to run as high as \$5.00 per pound. The El Nido Lode at the outcrop is from 3 to 3½ feet in width, consisting of alternating pure white quartz and dike material, similar to that referred to above in connection with the Apex Lode. No report has been had on developments made on this lode since July, 1920.

Owing to the high grade of the gold ore found on the Apex and El Nido Lodes, considerable excitement was caused by their discovery and much prominence was given in the press to the early reports as to the finds. Numerous prospectors put in the summer in the district and several additional groups of claims were located.

The geological formation in which these lodes are found strikes northwesterly and southeasterly, and is shown in the maps of the United States Geological Survey to extend from a point about three miles in from the Cross Sound entrance of Lisianski Strait to Fish Bay in Peril Strait and Moser Island in Hoonah Sound.

The geological conditions along the west coast of Chichagof Island are very favorable to the occurrence of ore deposits and the region offers a very attractive field for further prospecting. A description of the mining properties and the geology of the west coast of Chichagof Island is to be found in U. S. Geological Survey Bulletin No. 692-B. by R. M. Overbeck, including developments in 1917.

Pinta Bay.

Development work has been done on a group of six claims known as the Gold-Copper Group, lying in the vicinity of Mt. Baker at the head of Pinta Bay, an inlet from Portlock Harbor. A description of this property, together with developments to the end of 1917, are to be found in Bulletin No. 692-B issued by the U. S. Geological Survey.

Since 1917 some further work has been done on the property, the nature and extent of which is not known.

Falcon Arm.

The Falcon Mining Company prosecuted work on a group of nine claims, said to cover three distinct lodes, during the 1920 season. Eight miners were employed in this work. At the time of visit in July, 1920, the crew were temporarily absent and the outcrops were not seen by me, the one man in camp not being able to direct me to them.

The equipment of this property is very good. A small wharf has been constructed connecting with the base of an incline train 600 feet in length leading to the portal of the crosscut tunnel which was being driven. The tunnel is at an elevation of 165 feet above the beach, is 7x7 feet in the clear, is well timbered and approximately 100 feet in length. At the portal is a well equipped tool house and compressor building. A jackhammer drill was in use, air for which was supplied by a Chicago Pneumatic Tool Co. heavy oil compressor. On the beach is a comfortable bunk and boarding house provided with wash and bath rooms.

Miners were receiving \$4.00 per day and board.

BARANOF ISLAND.

While no developments of note were made in the Sitka District, considerable interest was being manifested in mining properties, especially in the area adjacent to Silver Bay, and plans were being made for further active work on several properties.

PRINCE OF WALES ISLAND.**Kasaan Bay.**

The principal mining activities carried on on Prince of Wales Island center about the head of Kasaan Bay on the east coast.

A description of a number of the mining properties now operating in the Kasaan Bay and Twelve Mile Arm districts is contained in Bulletin No. 692 of the U. S. Geological Survey, "Mineral Resources of Alaska, 1917."

Rush and Brown Mine.

The Rush and Brown copper property continued to operate throughout the past two years in spite of unfavorable local conditions and a poor copper market. Seventeen men were employed, receiving wages at the average rate of \$5.00 per day of 8 hours.

Salt Chuck Mine.

The Salt Chuck mine situated at the head of Kasaan Bay, has come into prominence during the past three years as a producer of palladium and platinum ores.

Originally operated as a copper property it was not until a flotation mill had been built and thorough tests made of the ores that the presence of these rare metals was recognized. A crew of twenty-five men are employed and in addition to the work of actual production being carried on, extensive development of the ore zone has been prosecuted.

Dutton Mine.

The Dutton Mine at Harris Creek on Twelve Mile Arm, a narrow inlet extending southerly from Kasaan Bay was operated on a small scale during the past season. This property is the only producer of gold ore on Prince of Wales Island and lies in a belt of country said to offer good opportunities for further prospecting.

Granby Consolidated.

The Granby Consolidated Mining, Smelting & Development Co., which formerly operated the "IT" and "Mamie" mines, ceased operations at about the time of the signing of the armistice and the properties under their control have remained idle since then.

Hetta Inlet.

The copper properties on Hetta Inlet, some of which have been steady producers for the past ten years or more, were forced to cease operations following the drop in the price of copper at the beginning of the year 1919, and are still idle.

At the Jumbo property of the Alaska Industrial Company, commonly known as the "Sulzer Mine," an extensive zone carrying low grade copper ores remains to be explored and will undoubtedly be reopened when more favorable conditions prevail.

Shakan.

Owing to the slump in the market for ores of molybdenum, only assessment work has been done on the group of claims at Shakan acquired in 1917 by the Alaska Treadwell Gold Mining Company. Molybdenite ores were in great demand during the war, but with the cessation of hostilities the market practically ceased to exist and the mining of such ores became unprofitable.

Marble Quarries.

The marble quarries adjacent to the west coast of Prince of Wales Island, continue to produce and ship marble at about the same rate as in former years. Attention is directed to an interesting and handsomely illustrated publication recently issued by the U. S. Geological Survey,—Bulletin No. 682,—containing a full description by Ernest F. Burchard, of the marble deposits of Southeastern Alaska.

PRINCE WILLIAM SOUND.

While the falling copper market bore heavily upon the smaller producers of copper ores on Prince William Sound, forcing several to suspend operations entirely, the principal producer, the Beatson Mine of the Kennecott Copper Corporation on Latouche Island, largely increased its output during 1920. An average of 270 men were employed during 1920 as compared with 196 during 1919. Wages paid to miners during 1920 continued as in 1919, namely, \$5.75 per eight hour shift.

No information is at hand as to the operation of the Girdwood Mine on Latouche Island, which property has been acquired by the Ladysmith Smelting Corporation, other than that preparations have been in progress for the installation of a milling plant.

During 1919 thirty-two men were employed by the Ellamar Mining Company at its copper property, but operations were entirely suspended in 1920.

The Alaska Mines Corporation, operating the property formerly known as the Schlosser Mine, at Fidalgo Bay, employed twenty-two men during 1919. No information was obtained regarding the operations of this mine during 1920.

At the Fidalgo Mine of the Fidalgo Mining Company, six men were employed during 1920 and 284 feet of development work was done.

Early in 1920 announcement was made of plans to unwater the workings and resume mining at the Cliff Gold Mine near Valdez, at one time an active producer of high grade gold ore. A small crew was employed during the year and 119 feet of crosscut was driven on the property.

COPPER RIVER REGION.

Development work on several properties in the Kotsina-Chitina District is reported but the only production came from the mine at Kennecott. Here, as at Latouche, the output was materially increased in 1920 over that of the previous year.

Placer operations continued in the Nizina District and also at Slate Creek near the headwaters of Chistochina River. At the latter camp twenty men were employed in hydraulic operations during 1920. Prospecting was done on Miller Gulch, a tributary of Slate Creek, and also on the Chesna, across the divide east of Slate Creek.

Four miles out from Chitina on the Richardson Highway a group of three claims is being developed by H. S. Dean of Chitina. Tunnels aggregating 84 feet in length have been driven on this property exposing a vein ten inches to two and a half feet in width, samples from which are said to have returned assays of \$34.00 per ton in gold.

Some interest was being taken in a reported find of asbestos near Chitina. The deposit is said to consist of a thirty inch streak made up of stringers of asbestos four to eight inches in width. Samples of this material have been sent out for analysis and determination of its possible commercial value.

FAIRBANKS DISTRICT.

General Statement.

The most important phase of placer mining in the immediate vicinity of Fairbanks during the past year consisted of the dredging operations on Fairbanks Creek, in which two dredges were employed throughout the season. While more or less activity continued on nearly all the creeks in the district and a considerable output was made, most of the individual operations were small, consisting of open cut work and drifting on a small scale. It is estimated that about 150 men were employed in the district during the 1920 season, thirty of these being engaged in the Fairbanks Creek dredging operations.

Two quartz properties were operated throughout the year of 1920 and a third is to be worked this winter.

While the high cost of supplies and the unfavorable situation as affecting gold mining generally have forced many of the small lode operators in the Fairbanks District to cease work on their properties, I believe the future of this branch of mining in this district holds much of promise. Explorations for lode deposits thus far have been confined to limited areas and have been conducted on a small scale. Geological conditions in the district are distinctly favorable for the occurrence of lode deposits and are such as to warrant the belief that mineralization of the types already disclosed will continue to a considerable depth below present workings. Reference is made to U. S. Geological Survey Bulletin No. 525 for an enlightening discussion of this subject.

Cold Water Thawing.

An interesting feature connected with the dredging operations on Fairbanks Creek was the successful use of the cold-water thawing process as a substitute for steam points in preparing frozen ground for dredging operations.

At the place where the dredges were operating, the overburden averages about twenty-six feet in depth, consisting of about 14 feet of comparatively fine frozen gravel overlain by about 12 or 13 feet of frozen muck.

The thawing apparatus is very simple in design, consisting merely of a manifold made of six inch riveted steel pipe fed by a flume and pipe line, and with eight outlets leading to the points.

The points are twenty-six feet in length and consist merely of ordinary 3-4 inch pipe, not tapered at the end as in the case of steam points, but discharging full bore. These points are set at five foot intervals. They are not driven, but settle of their own weight the full depth of 26 feet as the thawing process proceeds.

Three manifolds were employed this year on Fairbanks Creek. Their use is reported to be most successful under the conditions obtaining on this stream. Thawing is accomplished with but a fraction of the expense involved in the use of steam points and with results that compare very favorably with steam in the matter of time, and surpass it in the thoroughness with which the frost is removed. An interesting opportunity for observing the comparative efficiency of the

two methods was given at the time of my visit. Two contiguous blocks of ground were being thawed, one with steam points and one with water, the spacing between points being the same in both blocks. Between each two steam points a rib or comb of unthawed ground remained which had to be removed by the dredge. The block on which cold water was being used was uniformly and completely thawed throughout.

The principal essentials for successful thawing with cold water appear to be ground which is sufficiently free from boulders to allow the points to settle without serious interference, and an adequate supply of water at a temperature sufficiently above the freezing point to thaw the frost readily. The critical temperature for this purpose seems to be in the neighborhood of 40° F.

The feasibility of drilling ahead of the points in boulder-infested ground has not been determined so far as is known. During the past season the water used in thawing was under but slight pressure at the manifold,—not more than two sluiceheads. It is proposed to construct a ditch next season, however, leading from Claim No. 8 Above, which will supply water at the discovery claim, where the dredge is operating, under a head of 120 feet.

LODE PROPERTIES

Crites and Feldman Property.

This property is located on Too-Much-Gold Creek, a tributary of Fairbanks Creek. It was operated in 1912 and has been steadily developed since that time.

The group now comprises ten lode claims and one placer.

An adit tunnel 1300 feet in length has been driven on the property, stopping above which was in progress during 1920.

Aside from the adit tunnel numerous open cuts and shallow shafts have been excavated, exposing the outcrop at widely separated points.

It was planned by the owners to let a contract this fall for the driving of a second adit 200 feet in elevation below the present one. Work was also in contemplation looking toward the future development of a second vein, the outcrop of which has already been exposed for a considerable distance. This second vein is considerably larger than the one being mined, and according to surface indications the two join not far from the present workings.

The Crites and Feldman property is equipped with a 5-stamp mill and Blake crusher, power being furnished by a 40 h.p. steam boiler operating a 10x12 Atlas engine. A 12x10 Ingersoll Rand air compressor is in use, as is also a drill sharpener operated by compressed air.

While the output from this mine is small, the tenor of the ore is such as to allow of profitable operations even under the present unfavorable conditions.

"Billy Sunday" Mine.

The "Billy Sunday" Mine is located on the east flank of Easter Dome at the head of St. Patrick Creek, a tributary of Happy Creek. Work continued on this property throughout the past year resulting in the completion of approximately 150 feet of additional workings. In-

cluded in the development work done were 55 feet of winzes, 32 feet of crosscutting and about 70 feet of drifting. The convergence of two veins with separate outcrops on the surface was demonstrated in the shaft, and the main vein followed to a total depth of 175 feet,—measured on the dip. The vein was found to be offset a horizontal distance of 53 feet on the 120 foot level, but efficient mining resulted in its downward extension being found, with almost no dead work.

A winze has been sunk on the recovered portion of the vein to a depth of 55 feet below the 120 foot level, and 40 feet of drifting done upon it from the foot of the winze. Above the 120 foot level, considerable stoping has been done. This stope averages nearly seven feet in width. While the tonnage milled during the past year was small, very satisfactory returns were had, and the outlook is promising for a successful run during the coming year.

Nothing more than assessment work was done on other lode claims in the Ester Creek district.

Rainbow Mine.

A description of the Rainbow Mine prepared from observations made in 1912 is given by Mr. Philip S. Smith in Bulletin No. 525, of the U. S. Geological Survey.

This property is now controlled by Roth & Maddox who planned to operate it during the present winter on a larger scale than has hitherto been employed. It is understood that new equipment has been secured, and that with its installation working conditions at the property will be materially improved.

PLACERS

Ester Creek.

From fourteen to seventeen men are reported to have been employed in placer work on Ester Creek during 1920. These men represent five outfits doing shaft work, principally on the Gold Hill, No. 7 Below and Emma Claims.

It is understood that during this winter two men were to work the George Ray property on Ester Creek, that a 40 foot shaft to bedrock was to be sunk to prospect No. 1 Above Discovery, and that a lay was taken on No. 6 Bench Claim on the right limit for winter work.

Dome Creek.

Kennedy-Schoesser & Co. are engaged in sinking two working shafts on No. 8 Below on Dome Creek preparatory to prosecuting winter work. The depth to bedrock at this claim is about 150 feet.

Little Eldorado Creek.

Burns & Co. employed about twelve men, and Anderson three or four men, in shaft work on Little Eldorado Creek.

St. Patrick and Happy Creeks.

Sandy Stay and partner will take out a winter dump on St. Patrick Creek, a branch of Happy Creek, and on the latter stream a shaft is being sunk by Cosgrove & Co.

Cleary Creek and Chatanika River.

On these streams operations were conducted, representing two outfits working through shafts, one by open cut, two by scraper and one by hydraulic equipment, and employing in all seventeen men.

It is reported that a large section of the Cleary Creek Valley is held under option by the Fairbanks Dredging Company who operate dredges on Fairbanks Creek and are said to contemplate similar work on Cleary.

Fairbanks Creek.

Reference has already been made in the general statement above to the coldwater thawing operations conducted on Fairbanks Creek during the past season by The Fairbanks Dredging Company. This company employed thirty men on two dredges. One of these dredges has been in operation for a period of eleven years. This is a Risdon dredge with a capacity of 1000 cubic yards per day. The newer dredge, built by the Union Construction Co. of San Francisco in 1918, has been in operation but two seasons. It is equipped with close-connected bucket line, the buckets having a capacity of 4 cubic feet each. This dredge is capable of handling 2500 cubic yards of material per day. Power is furnished by two Scandia-Pacific semi-Diesel engines of 120 h.p. each,—fuel oil and distillate mixed being employed as fuel. The operations of this company were handicapped during the latter part of the season by delay in the arrival of shipments of fuel oil from the States. A complete shut-down on this account was narrowly averted.

James, Griffen and Eagan, and McNeill also, did some work on Fairbanks Creek.

Gilmore Creek.

Operations on Gilmore Creek were conducted by Chas. Gins & Co. This work consisted of open cutting with a crew of six men.

Steele Creek.

On Steele Creek, Westenock Bros. and Gisler employed three men on their property, which is worked through a shaft.

Practically all of Steele Creek is said to be under option to Mr. Jake Howell, who drilled the stream bed during the winter of 1919. Drilling this winter is being done on the benches.

Engineer Creek.

Goves and Sampson employed five or six men in shaft mining on Engineer Creek during the 1920 season.

Pedro Creek.

Nelson & Co. conducted hydraulic operations, and two other outfits used dragline scrapers in work on Pedro Creek. Each outfit employed three or four men.

Goldstream.

The following operators were engaged in placer work on Goldstream during the past season: Chas. Grill with three men, using a slip scraper; Wagner, with seven or eight men; Rogge, with five men; Flecker and Collins with five men; and Harry Atwood with six men; all using dragline scrapers; and Walter Fisher with one or two men doing shaft work.

It is stated that Mr. Jake Howell controls fifty-two placer claims on lower Goldstream, opposite the mouth of Nugget Creek and the drilling of these claims is contemplated this winter.

Sheep Creek.

This stream, which is a tributary of Goldstream and drains the northeasterly slopes of Ester Dome, is said to be entirely controlled at the present time by Mr. Jake Howell. It is understood the right limit of Sheep Creek was drilled in 1911 and the drilling of the left limit is planned for this winter.

Beaver Creek District.

The Beaver Creek District lies fifteen to twenty miles northeasterly from Chatanika post-office, measured in an air line.

Urgent need is reported for a trail into this district, where from twenty to twenty-five people will be engaged in placer mining and allied activities during this winter. The district is reached at the present time from a point on the Fairbanks-Circle trail, sixteen miles from Chatanika. From the nearest point on this trail to the junction of Ophir and Nome Creeks,—the two streams upon which most work is being done,—the distance is about seventeen miles. A favorable route for a trail into the district is said to commence at the relief cabin on the Chatanika River at the mouth of McKay Creek, thence up McKay Creek and across the divide to Ophir Creek.

Six men were at work on Ophir Creek during 1920.

At the head of Nome Creek three men put in a bedrock drain during the past summer. Next year a trolley scraper will be installed and later a dragline outfit.

On No. 1 Above lower Discovery pay was found during the past summer by the Fowlers, on whose ground six men were employed.

Also at the head of Nome Creek, Updike and McClellan have worked since the fall of 1917. It is said that holes sunk by them have demonstrated to pay streak $3\frac{1}{2}$ miles in length. The gravel averages eleven feet in depth. Sluicing will start on this property next season. **Shamrock Creek and Chena River.**

A hydraulic outfit was delivered at Fairbanks this summer for use on Shamrock Creek, a tributary of Chena River above the West Fork.

Considerable activity in prospecting is reported from the general region about the upper reaches of the Big Chena.

Forty Mile District.

Reference has hereinbefore been made to the very extensive prospecting work on prospective dredging ground by the Forty Mile Power

& Dredging Company, operating on Chicken Creek and Denison Fork.

There was a general lack of water during the past season throughout the Forty Mile Section.

Some work is reported to have been done on Dome Creek twenty-seven miles above Eagle, consisting principally of ditch construction.

Four thousand feet of ditch was also completed on Jack Wade Creek where extensive hydraulic operations are contemplated next season.

Circle District.

The extreme dryness of the season resulted in a material reduction in the output of the Circle District below what would otherwise have been taken out. As it was, the district is credited with a total production of approximately \$52,000.00 from Deadwood, Mastadon, Miller, Independence, Mammoth and Eagle Creeks. Two hydraulic outfits and the dredge were idle as a result of the dry season.

Winter dumps were taken out on Deadwood Creek by eight outfits and hydraulic operations, with about thirty men engaged, were conducted on the other creeks above named.

Hot Springs District.

An excessively dry season seriously interfered with sluicing operations in the Hot Springs District during 1920.

Numerous winter dumps are reported to have been taken out during the winter of 1919 but these could not be handled on account of lack of water. This situation largely accounts for the diminished output of the district in 1920 as compared with that of 1919.

On Eureka Creek J. R. Franks, with four or five men, operated a hydraulic outfit. At Tofty, Mr. Jake Howell had four men also hydraulicing. On Woodchopper a winter dump was taken out and sluiced by Hosler. On American Creek two outfits are reported to have operated.

Prospecting on lode quartz properties was carried on four miles from Hot Springs, the nature and results of which are not known.

Tolovana District.

This district was also affected by the dryness of the season and the consequent inability to conduct sluicing operations. From seventy-five to a hundred men are said to have been engaged in placer work in the Tolovana District.

Ruby District.

The principal development of interest in the Ruby region was the work done by Thos. P. Aitken in prospecting a silver-lead lode property at the base of the Kaiyuh Mountains in the vicinity of Loudon. The latter point is a river landing on the left limit of the Yukon, about forty miles below Ruby. The Aitken property lies about twenty miles southerly from Loudon. It was reported that by September 1st, 1920, a shaft was sunk to a depth of thirty feet. The ore is said to be silver-bearing steel galena and to be of very high grade.

Iditarod District.

The Beaton & Donnelly and Riley Investment Company dredges both operated throughout the seasons of 1919 and 1920, as theretofore, on Otter Creek.

The principal operations on Flat Creek were conducted by David Strandberg on the Wildcat Association claims and on the Upgrade. These operations were quite successful in spite of more or less handicap from water shortage and scarcity of labor. The Upgrade property is unique in type, lying as it does on a steeply sloping hillside, composed of monzonite, the undoubted source of the gold being decomposed stringers of quartz in the monzonite. Huge boulders must be removed in order that sluicing operations may be conducted on the decomposed surface of the bedrock. A novel and cleverly devised arrangement of cables and carrier enables the removal of these large boulders to be accomplished with surprising facility and with a minimum of manual labor.

On the divide between the heads of Flat Creek and Happy Creek is another interesting type of placer known as the Summit Claim. This property lies on the extreme summit of the divide and has yielded a good output during the past two seasons. Snow water is impounded in a reservoir for use in sluicing operations, this being the only source from which water is procurable.

Small operations are reported on other streams in the Flat District, including Willow, Happy and Chicken Creeks.

Kuskokwim Basin.

Considerable work by small operators is reported in the general vicinity of Georgetown on the Kuskokwim River.

On Crooked Creek, Harry Stevens and Joe Kenosky worked by open cut methods and ground sluicing. On Donlan Creek, a branch of Crooked Creek, Jack Smeaton did some work. On Julian Creek, a tributary of Ugnilnik or George River, winter and summer operations were carried on by Tom Anderson and Gus Renos and on Willow Creek, Itley and Duffy were ground sluicing and hydraulicking.

On the Lower Kuskokwim work is reported on the Aniak River and also on Ophir near Whitefish Lake at the head of the Tuluksak River.

Cinnabar.

Development work was done and some new equipment placed on the Parks cinnabar property a short distance above Georgetown on the right limit of the Kuskokwim River. Numerous reports were had as to new discoveries of cinnabar near the headwaters of the Iditarod River in the general vicinity of Georgetown. Some of the reports as to the extent of these deposits were quite glowing but no means was had of substantiating them.

Candle Creek.

Operation of the dredge on Candle Creek, a tributary of Tacotna River, was witnessed during a visit to the property in September, 1920.

A crew of twenty-five men were engaged in the operation of this dredge which is being conducted by Thos. P. Aitken.

The presence of large boulders in the gravel, which is from 14 to 16 feet in depth, constitute an obstacle to successful dredging operations which is, at times, serious. Nevertheless, owing to the high grade of the gravel handled, it is understood the output was very satisfactory for the past season.

Moore Creek.

Keller and Dawson continued hydraulic operations on their ground on Moore Creek, a tributary to the Kuskokwim River. They employed a crew of about six men. This camp lies about midway between Iditarod and Tacotna and near the trail at present used between these two points. The ground is shallow and the situation generally favorable for hydraulic operations.

Ganes Creek.

Extensive preparations were being made at the time of my visit for the installation of a dredge on No. 6 Above, Ganes Creek, property controlled by Thorne and Higgins. The dredge to be used is that heretofore operating on Greenstone Creek in the Ruby District.

It was planned to dismantle the dredge and move it with horses after the freezeup, following the trail from Ruby to Ophir and thence up Ganes Creek from its junction with the Innoko River. The total distance involved is approximately 130 miles, and the weight to be moved totals about 250 tons.

Seventy tons of equipment in addition to the above is to be handled by way of the Kuskokwim River to McGrath, thence to Tacotna by launch, and then over the initial section of the Alaska Road Commission's auto road from Tacotna to Ophir, four miles of which is completed. An additional section of this road will be "swamped out" as far as the divide between the Tacotna and Innoko River, to enable the freight to be moved to that point. From there to the mouth of Ganes Creek a down-hill grade will be had.

Aside from the preparation for dredging on Ganes Creek, individual placer operations were conducted by Carlson and Hounan employing nine men on dragline scraper work on No. 10 Above; Hans Erickson with two men was ground-sluicing on bench ground on No. 3 Above; Connelly and Howie worked No. 4 Below with four men; John Griffin, alone, was on No. 12 Above; and Bob Evans on No. 20 Below. Prospecting work was also done by Gus Nelson on Glacier Gulch, a tributary to Ganes Creek.

Yankee Creek.

Two dredges are to be started on Yankee Creek next season. These dredges were shipped via Bethel and the Kuskokwim River last summer. One was at the "Forks" on the Tacotna River a few miles above McGrath at the time of my visit in September, 1920. It is understood the other dredge was caught in the freezeup on the lower Kuskokwim which may prevent its delivery and erection for work next season.

It is understood that the placing of these dredges on Yankee Creek is an enterprise carried on by the Flume Dredge Company.

Ophir Creek.

On Ophir Creek, open cut operations were conducted by Sotello and Staten with six men. B. B. Smith, with fourteen men, on two shifts, cleaned up 60,000 feet of bedrock by scraper operations. Similar type of work was done by the Johnsons with two men.

Spruce Creek.

On this stream Mr. Vinal did open cut work with six men; Jones and Edwards, with two men, also did open cut work; and Bob Jocamie, in addition to mining by open cut, ground-sluiced in preparation for further operations next season.

Victor Gulch.

Hill and Kevie operated on Victor Gulch with two men.

Little Creek.

Eighteen men were engaged principally in open cut work on Little Creek during 1920.

Dodge Creek.

Three men worked on open cutting on this creek during 1920.

Anvil Creek.

Anvil Creek lies between Spruce and Ophir Creeks. It is understood the first mining to be done on this stream was during the past season when four men were engaged in open cutting.

SEWARD PENINSULA.

Lack of time prevented a visit to Seward Peninsula and no authentic information is available as to mining conditions in that region.

Preliminary statements by the U. S. Geological Survey covering the year 1920 indicate, however, that production was very well maintained. According to these reports the total output of Seward Peninsula for 1920 was \$1,240,000.00, as compared with \$1,360,000.00 in 1919, and \$1,108,000.00 in 1918. In 1920 seventeen dredges operated on the peninsula and in 1919 twenty-one were working.

CACHE CREEK DISTRICT.

It is understood dredging operations will probably be resumed next season at Cache Creek where a hydraulic plant is being installed to furnish power for the operation of the dredge. Increased activity in the Cache Creek district will undoubtedly follow the completion of the road being built into the district by the Alaska Road Commission.

WILLOW CREEK DISTRICT.

Gold Bullion Mine.

During 1920 an average of about forty men were employed at the Gold Bullion mine. Aside from productive operations 700 feet of

drifting was done. A new 50 ton cyanide plant was installed this year.

Mabel Mine.

Twenty men were employed at the Mabel Mine during 1920 and one thousand feet of development work done.

Milling equipment giving a capacity of fifty tons per day is reported to have been installed. This includes ten stamps, a Gibson Mill and a Denver Mill. The erection of a cyanide plant is contemplated for next year.

Hatcher Property.

Two hundred feet of tunnel work with five men employed is reported as last season's work on a property situated on the Little Susitna River about two miles east of the Mabel Mine.

Rae-Wallace Mining Company.

A compressor plant and two Gibson Mills are said to be on the ground at this property for installation next spring.

Fern Gold Mining Company.

On this property located $3\frac{1}{2}$ miles above the Mabel Mine on Archangel Creek a cabin was built and 100 feet of crosscut tunnel driven.

Aside from the operations above outlined, assessment work and prospecting were done on numerous properties throughout the district.

Consolidation of a large number of properties in the Willow Creek District is announced, and plans for development work on a much larger scale than has been attempted in the district hitherto are contemplated under this arrangement.

MINERAL PRODUCTION OF ALASKA.

Owing to the superior facilities enjoyed by the U. S. Geological Survey for the gathering of statistics relative to the mineral output of Alaska and also in order to avoid duplication of the activities of the Survey in the Territory, which have been and are of inestimable value, no attempt has been made by this office to prepare independent data as to mineral production. The information given below is taken from the publications of the Survey and is here inserted in the belief that the wildest possible publicity should be given to the resources of the Territory.

Total Production.

The total estimated value of the mineral output of Alaska from the date at which mining in the Territory may be said to have begun, the year 1880, to the end of the year 1920 is, in round numbers, \$460,230,000. "About 75 per cent of this mineral wealth has come from the small but rich deposits termed 'bonanzas.'" * * * *

"The minerals won from the large low-grade ore bodies of Alaska have a total estimated value of \$105,000,000, most of it in gold, the remainder including the value of copper and other minerals.

Mineral Production, 1920.

"Though the mining industry of Alaska as a whole, suffered a serious depression in 1920, yet the value of the total mineral output was greater than in 1919, chiefly because of the great increase in the production of copper, largely to be credited to the four large copper mines of the Territory. The value of the total mineral production of Alaska was \$19,620,913 in 1919 and about \$22,070,000 in 1920. The output of the gold placers has decreased, but that of the gold lode mines has been maintained."

a—Value of Mineral Production in Alaska in 1919 and 1920.

	1919	1920
Gold	\$ 9,426,032	\$ 8,000,000
Copper	8,783,063	12,400,000
Silver	705,273	900,000
Platinum and allied metals	73,663	80,000
Tin	73,400	20,000
Lead	72,822	142,000
Coal	343,547	380,000
Petroleum, marble, gypsum, quicksilver, etc....	143,113	148,000
Total	\$19,620,913	\$22,070,000

a—Mining in Alaska, 1920, Advance Statement by U. S. Geol. Survey.

"During 41 years Alaska has produced gold to the value of \$320,000,000, of which \$221,642,000 is to be credited to her placer mines.

Placer Mining.

"In the following table the production of placer gold in Alaska in 1919 and 1920 is allocated by regions. This table shows clearly that the decrease in output is chiefly to the decline in the production of the more isolated districts."

a—Estimated Value of Placer Gold Mined in Alaska in 1919 and 1920.

Region—	1919	1920
Southeastern Alaska and Pacific Coast region ...	\$ 30,000	\$ 10,000
Copper River Basin	185,000	175,000
Cook Inlet and Susitna region	110,000	65,000
Yukon Basin	2,910,000	1,725,000
Kuskokwim Basin	350,000	400,000
Seward Peninsula	1,360,000	1,240,000
Kobuk region	25,000	15,000
	\$4,970,000	\$3,630,000

"Gold dredging has declined relatively less than other forms of placer mining, partly because some of the dredges are working on very rich ground, partly because investments in this form of industry are so large that many companies continue operation even with very small profits. In 1919 there were 28 dredges operated in Alaska, which produced gold worth \$1,360,000; in 1920 there were 22 dredges operated, which produced gold worth about \$1,020,000. * * * *

"In 1920 there were 17 gold dredges operated in the Seward Peninsula, 2 in the Iditarod and Fairbanks districts, and 1 in the Mount McKinley (McGrath) district. Improvements are being made in the Cache Creek dredge, in the Yentna District, and this will probably be operated next year. Plans are also being made for installing two dredges in the Innoko District, and for the exploitation of other dredging ground in the Kuskokwim region. * * * *

Gold Lode Mining.

"It is estimated that 15 gold lode mines and 5 prospects were operated in Alaska in 1920, producing about 3,270,000 tons of ore, from which \$4,360,000 worth of gold and 106,000 ounces of silver were recovered. The output in 1919 was 3,262,573 tons of ore, containing gold to the value of \$4,392,237 and 108,691 ounces of silver. Seven of the gold mines operated in 1920 were in Southeastern Alaska, 5 in the Willow Creek district, 2 at Fairbanks, and 1 in the Copper River region. * * * *

Copper.

"Eight copper mines were in operation in Alaska in 1920 and produced 330,000 tons of ore, from which 71,000,000 pounds of copper, 710,000 ounces of silver and \$12,000 worth of gold were received. This brings the total production of Alaska during the 20 years of mining up to 616,000,000 pounds, but much more than half of this is the output of the last decade. In 1920, as in past years, the only mines that made a large output of copper were those controlled by the Kennecott Copper Corporation, one on Prince William Sound, and three in the Cotsina-Chitina district.

"The Rush and Brown was the only copper mine operated in the Ketchikan district during 1920, though some copper was recovered from the platinum and palladium ores of the Salt Chuck mine. Developments were continued on a copper-gold property on William Henry Bay, in the Skagway district. On Prince William Sound the output of the Beatson-Bonanza overshadowed all other operation. * * * *

Miscellaneous Metals.

"In 1920 Alaska mines produced about 887,000 ounces of silver; in 1919, 488,034 ounces. The lead production increased from 564 tons in 1918 to about 880 tons in 1920. The increased output of silver was largely won from the copper ores, but this increase like the increase in the production of lead, was in part won from galena ores mined in a small way at several localities. The largest shipment of galena ore was made by a small mine in the Kantishna district.

"About 31 tons of stream tin concentrates were mined in Alaska in 1920, compared with 86 tons in 1919. Most of this tin was mined in the York district, at the west end of Seward Peninsula, where one dredge and several small operators were working on placer tin deposits. Several tons of stream tin were also recovered from gold-placer mining operations in the Hot Springs and Ruby districts, but this was not shipped. A total of 35 tons of stream tin was shipped from Alaska in 1920, but a considerable part of this was mined in previous years.

"The gold placers of the southeastern part of Seward Peninsula, from the Chistochina (Slate Creek) district, and from other districts, continued to yield some platinum in 1920. The Salt Chuck lode mine, in the Ketchikan district, also continued to produce platinum and palladium, as well as copper, in 1920.

"Work was continued at the Parks quicksilver mine, on lower Kuskokwim River, in 1920 and some cinnabar was produced. A small shipment of cinnabar ore was also made from a prospect in the same district."

Coal and Oil.

"The coal production in 1920 was about 68,000 tons; that in 1919 was 60,674 tons.

"The Chilkat Oil Co. continued to produce and refine petroleum in the Katalla field and brought in two new wells.

Miscellaneous.

"The production of marble continued in the Ketchikan district, Southeastern Alaska, on about the same scale as in previous years. The gypsum mine, in the Sitka district, which was flooded in 1919, was pumped out in 1920 and production was resumed. The Alaska Sulphur Co. completed its mining and reduction plant on Akun Island, in the eastern part of the Aleutian Chain, late in the summer of 1920. A shipment of garnet sand, to be used as an abrasive, was made from Nome, in 1920. It was mined in the beach sands of Imuruk Basin, a tidal estuary about 50 miles north of Nome."

Total Mineral Production of Alaska.

The following tables have been compiled by using the tables given in "Mineral Resources of Alaska, 1918 by G. C. Martin and Others," pp. 12 to 25 inclusive, and adding thereto data relative to production given in "Mining in Alaska in 1920. Advance Statement by U. S. Geological Survey," for the years 1919 and 1920. They serve as an interesting means of displaying the fluctuation of the mineral production of the Territory since mining operations began.

Value of Total Mineral Production of Alaska, 1880-1920.

By Years—		By Substances	
1880-1890.....\$	4,686,714	1906.....\$	23,378,428
1891.....	916,920	1907.....	20,850,235
1892.....	1,098,400	1908.....	20,145,632
1893.....	1,051,610	1909.....	21,146,953
1894.....	1,312,567	1910.....	16,887,244
1895.....	2,388,042	1911.....	20,691,241
1896.....	2,981,877	1912.....	22,536,849
1897.....	2,540,401	1913.....	19,476,356
1898.....	2,587,815	1914.....	19,065,666
1899.....	5,706,266	1915.....	32,854,229
1900.....	8,241,734	1916.....	48,632,212
1901.....	7,010,838	1917.....	40,700,205
1902.....	8,403,153	1918.....	28,253,961
1903.....	8,944,134	1919.....	19,620,913
1904.....	9,569,715	1920..a	22,070,000
1905.....	16,480,762		
		Total.....\$	460,231,005
		Total.....\$	460,231,005

a—Preliminary estimate.

b—Figures include only to end of 1918.

Note: The total output of gold, copper and silver as given in the latter half of the above table include figures for 1920 production which are estimated but which are thought to be within 5 per cent of the actual.

c—See following tables for values of separate minerals included in this total.

Gold and Silver Produced in Alaska 1880-1920.

Year—	GOLD		SILVER	
	Quantity (fine ounces)	Value	Quantity (fine ounces)	Commercial Value
1880	967	20,000		
1881	1,935	40,000		
1882	7,256	150,000		
1883	14,561	301,000	10,320	11,146
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	2,320	2,181
1889	43,538	900,000	8,000	7,490
1890	36,862	762,000	7,500	6,071
1891	43,538	900,000	8,000	7,920
1892	52,245	1,080,000	8,000	7,000
1893	50,213	1,038,000	8,400	6,570
1894	62,017	1,282,000	22,261	14,257
1895	112,642	2,328,500	67,200	44,222
1896	138,401	2,861,000	145,300	99,087
1897	118,011	2,439,500	116,400	70,741
1898	121,760	2,517,000	92,400	54,575
1899	270,997	5,602,000	140,100	84,276
1900	395,030	8,166,000	73,300	45,494
1901	335,369	6,932,700	47,900	28,598
1902	400,709	8,283,400	92,000	48,590
1903	420,069	8,683,600	143,600	77,843
1904	443,115	9,160,000	198,700	114,934
1905	756,101	15,630,000	132,174	80,165
1906	1,066,030	22,036,794	203,500	136,345
1907	936,043	19,349,743	149,784	98,857
1908	933,290	19,292,818	135,672	71,906
1909	987,417	20,411,716	147,950	76,934
1910	780,131	16,126,749	157,850	85,239
1911	815,276	16,853,256	460,231	243,923
1912	829,436	17,145,951	515,186	316,839
1913	755,947	15,626,813	362,563	218,988
1914	762,596	15,764,259	394,805	218,327
1915	807,966	16,702,144	1,071,782	583,393
1916	834,068	17,241,713	1,379,171	907,554
1917	709,050	14,657,353	1,239,150	1,021,060
1918	458,641	9,480,952	847,789	847,789
1919		9,426,032		705,273
1920		8,000,000		900,000
		\$319,664,993		\$7,203,587

Copper Produced in Alaska 1890-1920.

Year—	Copper Produced	
	Ore Mined (tons)	Quantity (pounds) Value
1880		3,933 \$ 826
1881-1900		
1901		250,000 40,000
1902	a 40,000	360,000 41,400
1903		1,200,000 156,000
1904		2,043,586 275,676
1905	52,199	4,805,236 749,617
1906	105,729	5,871,811 1,133,260
1907	98,927	6,308,786 1,261,757
1908	51,509	4,585,362 605,267
1909	34,699	4,124,705 536,211
1910	39,365	4,421,689 538,695
1911	68,975	27,267,878 3,408,485
1912	93,452	29,230,491 4,823,031
1913	135,756	21,659,958 3,357,293
1914	153,605	21,450,628 2,852,934
1915	369,600	86,509,312 15,139,129
1916	617,264	119,854,839 29,484,291
1917	659,957	88,793,400 24,240,598
1918	722,047	69,224,951 17,098,563
1919	a	44,800,000
1920	a 330,000	71,000,000

a—Estimated.

Lead Produced in Alaska 1892-1920.

Year—	Quantity		Year—	Quantity	
	(tons)	Value		(tons)	Value
1892	30	\$2,400	1907	30	\$ 3,180
1893	35	2,310	1909	69	5,934
1894	35	2,130	1909	69	5,934
1895	20	1,320	1910	75	6,600
1896	30	1,800	1911	51	4,590
1897	30	2,160	1912	45	4,050
1898	30	2,240	1913	6	588
1899	35	3,150	1914	28	1,344
1900	40	3,440	1915	437	41,118
1901	40	3,440	1916	820	113,160
1902	30	2,460	1917	852	146,584
1903	30	2,520	1918	564	80,088
1904	30	2,580	1919	a 800	
1905	30	2,620	1920	a 880	
1906	30	3,420			

a—Estimated.

Tin Produced in Alaska, 1902-1920.

Year—	Quantity (tons)			Year—	Quantity (tons)		
	Ore	Metal	Value		Ore	Metal	Value
1902		15	\$ 8,000	1912	194	130	\$119,600
1903		25	14,000	1913	98	50	44,103
1904		14	8,000	1914	157.5	104	66,560
1905		6	4,000	1915	167	102	78,846
1906		34	38,640	1916	232	139	121,000
1907		22	16,752	1917	171	100	123,300
1908		25	15,180	1918	104.5	68	118,000
1909		11	7,638	1919	a 86		
1910		10	8,335	1920	a 31		
1911	92.6	61	52,798				

a—Estimated.

Antimony Produced in Alaska, 1915-1920.

Year—	Quantity of crude ore (tons)		Value
	Quantity	Value	
1915	833	\$ 74,000	
1916	1,458	134,000	
1917	165	28,000	
1918	36	1,500	
1919	none	none	
1920	none	none	
Total	2,492	\$237,500	

Platinum and Palladium.

A total of approximately \$160,000 worth of platinum and palladium ores have been produced in the Territory, most of which has been mined during the years 1919 and 1920.

ACCIDENT REPORT.

The following data relative to accidents occurring in and about the mines and milling plants of Alaska is complete, except for the number of men employed in the industry during 1920. Owing to delay on the part of operators in rendering annual reports, information in hand as to numbers employed during 1920 is insufficient for the preparation of statements of ratios of accidents to men employed. Tables showing the nature and results of all accidents reported will be found in the Appendix.

Summary of accidents reported as occurring at ALL LODE MINES AND ORE DRESSING PLANTS in Alaska for the year 1920.

No. of plants reporting	Group—	No. of Men Employed	Result of Accidents			Total Time Lost Days
			Fatal	Serious	Slight	
	All Gold Mines	5	37	102	1015	
	All Copper Mines	2	36	77	1055	
	All Gold Milling Plants	2	12	9	572	
	All Copper Milling Plants		4	25	189	
Totals		9	89	213	2831	

Summary of accidents reported as occurring at ALL LODES MINES AND ORE DRESSING PLANTS in Alaska for the year 1919.

No. of plants reporting	Group—	No. of Men Employed	Result of Accidents			Total Time Lost Days
			Fatal	Serious	Slight	
7	All Gold Mines	758	6	48	160	
8	All Copper Mines	624	4	32	85	
6	All Gold Milling Plants	314	2	2	13	
3	All Copper Milling Plants	61	1		10	
Totals		1757	13	82	268	

CAUSES OF FATALITIES.

During the years 1919 and 1920 a total of 22 fatalities occurred in and about the mines of Alaska. The causes to which these are to be attributed are as listed below. Details of fatalities are given elsewhere in this report.

Falls of rock or ore	4
Explosives	7
Underground haulage systems	1
Falling down raise	2
Electricity (underground)	1
Falls of persons on surface	1
Falling down shaft	1
Machinery (in mills)	1
Falls of persons (in mills)	1
Suffocation in mill ore bins	1
Electricity (in mills)	1
Railway cars (surface haulage system)	1

Summary of accidents reported as occurring at ALL MINES AND ORE DRESSING PLANTS of Alaska during the years 1912 to 1920, inclusive. Principal sources of data Annual Reports of Federal and Territorial Mine Inspectors.

Year	ALL LODE MINES AND MILLS		ALL PLACER MINES & DREDGES		Total					
	No. of Men Employed	Slightly Injured	No. of Men Employed	Slightly Injured						
1912	1914	15	(b)	(b)	6	(b)	(b)	5000(a)	21(e)	89(e)
1913	4500	15	(b)	(b)	10	(b)	(b)	8000(e)	25	29(e)
1914	(b)	19(e)	(b)	(b)	(b)	(b)	(b)	8000(e)	19(e)	260(e)
1915	(b)	19	92	387	4	(b)	(b)	8125(e)	23	512(e)
1916	4200	22	174	562	7	21	6	9125	29	763
1917	4320	24	104	601	9	4	7	8320	33	716
1918	1897	12	16	183	1			5510(e)	13	206
1919	1757(d)	13	82	268	5			4547	13	350
1920		9	89	213				9		302

(a)—Estimated.
 (b)—No data available.
 (c)—Advance Statement on "Mining in Alaska" for 1919, and 1920, U. S. Geological Survey.
 (d)—Includes producing mines only.
 (e) Metal Mine Accidents in U. S. during the Year 1918. Albert H. Fay, U. S. Bureau of Mines.

A LIST OF THE FATAL ACCIDENTS WHICH OCCURRED AT THE
MINES AND ORE DRESSING PLANTS OF ALASKA
DURING THE YEAR 1918.

Metal Mines.

February 12—ANDY PIKKALA, Finlander, shoveler, aged 47, employed by the Alaska Gastineau Mining Company at their Perseverance Mine near Juneau, was killed by an inrush of water in a tunnel under Lurvey Lake. He left no dependents or known relatives.

February 27—H. PETERSON, Swede, age 29 years, single, timberman, and JUAN LOJOS, Spaniard, aged 24 years, single, helper, were killed by a cave in No. 56 Stope of the Beatson Mine of the Kennecott Copper Corporation at Latouche.

March 9—JOHN MARES, a miner in the employ of the Kennecott Copper Corporation at the Beatson Mine at Latouche, was killed by falling from the 200 ft. station of the main shaft to the bottom of the shaft, a distance of 80 feet. The accident was thought to have been caused by defective attaching of the sinking bucket to the spiral hook of the cable. This act was performed by Mares himself who is reported to have been an experienced shaft miner. No particulars are on file as to Mares' nationality or age or as to whether or not he left any dependents.

January 26—WILLIAM DUNCAN, Scotch, age 40 years, employed by the Alaska United Gold Mining Company at their 700 Mill at Treadwell in the capacity of acting mill foreman, was killed by having his skull fractured by a fall of 12 feet from the timber on which he was standing. Duncan and a helper were engaged in lowering a line shaft in the mill with a small set of blocks and tackle. The timber to which the tackle was fastened was loose, allowing it to slip which caused the shafting to knock Duncan from the support on which he was standing.

May 28—MIKE PAROS, Greek, age 37 years, married, employed as a miner by the Kennecott Copper Corporation at the Bonanza Mine at Kennecott, fell down a raise as a result of the effects of gas from blasting. The company physician states that death may have resulted either from the direct effects of the gas or from the injuries sustained from the fall. Paros left a widow and three children under the age of sixteen.

July 27—ELI WAUTILA, Finlander, age 44 years, married, employed as shift boss by the Alaska Juneau Gold Mining Company at their mine at Juneau, was killed by being knocked from a ladder in a manway by a quantity of muck and rocks estimated at about twenty tons in weight, which came down the manway as he was descending the ladder. Wautila left a widow and four children.

August 20—ANDRO MONTELL, Spaniard, age 46 years, single, a miner employed by the Alaska Juneau Gold Mining Company at their mine at Juneau, met his death by coming in contact with the mine trol-

ley wire while he was standing in an ore car. Montell left no dependents.

October 27—DAVID BOGOFF, Russian, miner's helper, age 31 years, single, employed by the Kennecott Copper Corporation at the Beatson Mine, Latouche, was killed by being struck by falling rock and knocked from the bench on which he was working at the side of an open pit. He fell a distance of about 40 feet.

November 11—GOUST POULOS, nationality and age not given, employed by the Kennecott Copper Corporation at the Jumbo Mine, Kennecott was killed by being thrown from a skip which overturned in an incline shaft. The report of the accident does not state whether or not Poulos left any dependents.

November 11—AUGUST ROGERS, Belgian, mine contractor, age 31 years, employed by the Alaska Juneau Gold Mining Company at their mine at Juneau, was killed by a fall down the raise in which he was working. It is thought the fall was caused by a blast as, just prior to his death, workmen beneath heard a report followed by a small amount of rocks and dirt falling down the raise. Rogers left a dependent mother.

November 28—CHARLES M. PRESTON, American, superintendent of the electrical department, age 27 years, married, was badly burned by having the neck and left shoulder come in contact with a high tension electric circuit wire in the power plant of the Alaska Juneau Gold Mining Company at Juneau, by which company he was employed. An eye witness states that Preston was in the act of crawling beneath the wire when the accident occurred. Preston died at the hospital November 30. He left a widow and one infant child.

Placer Mines.

April 21—CHARLEY ERICKSON, Norwegian, placer miner, aged 55 years, working on placer claim No. 3 Below Discovery on Little Eldorado Creek, Fairbanks Mining District, which claim was owned by L. C. Hess and operated by Anderson and Erickson, was killed by falling down the shaft. Erickson was riding on a platform, swung from the hoisting cable, and was being lowered into the shaft. The platform caught on one side of the cribbed shaft causing it to tilt and Erickson to fall off. He fell a distance of about 100 feet and was instantly killed. He left no dependents.

A LIST OF THE FATAL ACCIDENTS WHICH OCCURRED AT THE
MINES AND ORE DRESSING PLANTS OF ALASKA
DURING THE YEAR 1919.

January 19—A. S. ALLEN, Scotch, shoveler, age 38 years, single, employed by the Alaska Gastineau Mining Company at their Perseverance mine near Juneau, fell down No. 1 oreway on the 10th Level of the mine and was killed. Allen together with Nick Perlain and Sam Novich was mixing a batch of concrete on the 10th level at a point about 16 feet from the opening of the oreway. At the conclusion of this operation Allen went to the opposite side of the drift and to a point about 6 feet from the oreway to secure an empty wheelbarrow. His partners heard an unusual noise and looking toward the oreway saw the wheelbarrow just disappearing into the opening. Allen's body was found at the bottom of the oreway on the 13th level having fallen a vertical distance of 500 feet. Just how he happened to fall into the oreway could not be determined. Allen had been employed in the mine only eleven days prior to the accident.

February 6—JOHN JANISEWSKI, Russian-Pole, age 35 years, single, employed by the Alaska Juneau Gold Mining Company at their Alaska Juneau mine at Juneau, was killed at 8:15 o'clock A. M. on the above date by a run of rock in No. 45 bulldozing chamber. Deceased had gone into the bulldozing chamber for the purpose of blasting some large boulders which were hung up in the stope above the chamber. Before blasting he went to No. 43 bulldozing chamber and asked Mike Pasich, who was drilling there, to stop his drill as the noise prevented him from determining whether the rocks which he intended blasting in No. 45 chamber were moving or not. Pasich stopped his machine and Janisewski returned to the No. 45 chamber. Shortly afterward Pasich heard a noise from the No. 45 chamber as of rocks rolling down. Shortly thereafter he determined to go to see if Janisewski was all right and called to Charlie Gray who was working near to accompany him. When they arrived at No. 45 chamber they heard groans underneath a large pile of boulders which had evidently just fallen from the stope. They immediately called the mine foreman and with his assistance uncovered the injured man. Janisewski was found to be very badly crushed, was removed to the hospital at once and died there at 9 o'clock P. M. of the day of the accident.

February 11—M. B. WILKERSON, American, track repairer's helper, age 35 years, employed by the Alaska Gastineau Mining Company at their Perseverance Mine near Juneau was electrocuted by coming in contact with an electric transmission wire in the drift of No. 11 level of the mine. The accident occurred at quitting time while the day shift was proceeding to the shaft station preparatory to leaving the mine. It is presumed by those who were near at the time of the accident that Wilkerson was walking on one rail of the tram track and, in order to balance himself, reached up and took hold of a wire of the electric transmission line. This

line carries a 440 volt current. Although the wire is insulated Wilkerson received sufficient of a shock to prevent his being able to release himself. His working partner, Bart Volpe, was walking about twenty five feet in front of him and Samuel Colen was also near. Upon hearing a groan both of these men turned and saw Wilkerson standing with one hand on the electric wire and went immediately to his assistance. Colen grabbed him by the overalls and freed him from the wire. First aid was administered and for two hours a Pulmotor was employed and artificial respiration given but without avail. It is probable that Wilkerson had a weak heart or other functional disorder. This accident was undoubtedly due to carelessness or ignorance on the part of the victim. The wire at the place of the accident was 6 feet, 4 inches above the ground. Wilkerson had been employed at the mine two months prior to the accident. He left no dependents.

February 16—DAN SULLIVAN, Irish, shoveler, age 53 years, employed by the Alaska Gastineau Mining Company at the Perseverance Mine, Silver Bow Basin, near Juneau, was killed in a drift on No. 9 Level by being struck and dragged by an ore train. The accident was witnessed by Pedra Reiga (Pajo Ryo), bulldozer, who was at work a short distance from Sullivan's working place. Reiga states that he had spit a fuse to blast some rocks in No. 2 chute. Sullivan was breaking rocks at No. 1 chute. Reiga called "Fire!" and together with Sullivan walked about 25 feet beyond No. 1 chute and stopped at the side of the drift. At that time the ore train approached the place where they were standing with the motor pushing the empty cars ahead of it. As the train was approaching Reiga looked toward No. 2 chute for an instant and saw that Sullivan was in the act of crossing the track to the opposite side of the drift. He called to him to stay where he was but Sullivan failed to heed him and was struck by the train and dragged along for some distance. No explanation can be offered why Sullivan should have attempted to cross the track as witnesses say there was ample room for the train to pass where he and Reiga first stood. Sullivan had worked on and off for a period of two years in the drift where he met his death and was thoroughly familiar with the movement of the trains, etc. He left no record of dependents or relatives.

March 31—ANDREW WOLD, Norwegian, Winley-table operator, age 21 years, employed by the Alaska Gastineau Mining Company at their mill at Thane, died as a result of injuries received in attempting to shift a belt from a tight to a loose pulley on the machine which he was operating. Wold used a small copper-wire hook in attempting to shift the belt and as a result his left arm was caught between the belt and pulley. His upper arm was held fast so that he could not release it and the belt continued to run over the arm. The arm was badly lacerated and nearly torn off before he was finally released by R. Spurgeon, oiler. He was taken to the hospital at Juneau and was advised by his doctor that the arm should be amputated at once. It is stated that he himself and relatives who

were present strenuously opposed amputation, however, and insisted that an attempt be made to save the arm. On account of the appearance of infection on the third day after the accident amputation of the arm was insisted upon but Wold was too weak to withstand the shock and died under the operation. He had suffered a great loss of blood at the time of the accident before he could receive assistance. Wold had been employed in the position which he occupied at the time of the accident for a period of three months. He was a single man and left no dependents.

May 30—RUDOLPH SCHWAMLE, German, age 38 years, single, employed by the Kennecott Copper Corporation at their leaching plant at Kennecott, Alaska, was killed by being suffocated in a leaching tank as a result of being caught by residue which fell from the side of the tank. The details of the accident, as given by the mine manager, are as follows: "The leaching tanks proper in the Leaching Plant are of steel construction, 30 feet in diameter and 20 feet deep, with dome shaped tops. In the top of each tank are two large doors for use in charging the tank and for general ingress and egress. On the side of the tank, just above the bottom, and 180 degrees apart, are 12 in. by 16 in. rectangular-shaped doors which can also be used for ingress or egress on particular occasions but which are not supposed to be used when there are any great amounts of leached residues in the tank awaiting excavation. During the present period of curtailment, there are but two men regularly employed on each eight hour shift. On the day shift May 29, extending from 8 o'clock A. M. to 4 o'clock P. M., Schwamle was one of these two men. He was last seen alive by his fellow shifter about 2:30 P. M. At 4:00 o'clock, when the shift was supposed to change, Schwamle did not show up at the change room and upon investigation he was found with his head and shoulders inside of one of the above described side doors of a leaching tank, the remainder of his body being outside the tank. Life was extinct when the body was removed from the tank some ten minutes after it was discovered in the above described manner, and it is the opinion of the local doctor that it had been extinct for perhaps an hour. Death was due to suffocation through a small amount of fine crushed ore having fallen off the side of the tank onto and around the head and shoulders covering the same to a depth of about 6 inches, and cramping the neck back against the side of the tank.

Schwamle had worked in the Leaching Plant for a long time and was thoroughly familiar with all its details. On the occasion of his death he could not have been going into the tank with the idea of excavating tailings since no excavating tools were found therein. It is our belief that inasmuch as a watch which Schwamle had recently purchased was later found inside the tank almost directly under one of the top doors, evidently having fallen from his pocket while he was looking into the tank from one of the top doors he went down below and was just on the point of entering the tank by one of the side doors to recover it when some of the tailings feebly bound to the side of the tank were

jarred loose and fell on his head and arms in such a way as to make it impossible for him to extricate himself before he had smothered to death."

June 24—ELIAS DERENOFF, Native Alaskan, age 27, employed as shoveler by the Kennecott Copper Corporation at their Beatson Mine, Latouche, Alaska, was killed at about ten thirty P. M. of the above date by falling down the main shaft. The following affidavit of L. W. Storm, Mine Foreman, furnishes a complete description of the accident and the surroundings: "I, L. W. Storm, being first duly sworn on oath depose and say: That I am in the employ of the Kennecott Copper Corporation at Latouche, as mine foreman. I know nothing from my own observation about the accident through which Elias Derenoff was killed in the shaft on June 24th. I was not present at the time, although I had been at the scene of the accident at 8:25 P. M., about a half hour before it occurred. The following is the information that could be gathered from those working at various places near the shaft shortly before and after the accident. At 8:45 E. J. Jensen, a skip tender, and the two car pushers, Derenoff and Guiseppi Mafrice, completed a repair job by which the cage cars at the main level were raised about two inches in order to give a distinct grade away from the shaft to the car track, which had previously been nearly level. Then Smigovich, the cager, went down to the 200 foot level ore pocket and the hoisting of waste began. Mafrice had gone outside with the second car, leaving Derenoff to place the empty car on the cage and send it down the shaft. Jensen had been watching to see how the chairs were working. He was telephoning to the hoistman that everything was all right when he heard C. K. White ask for the cage on the 200 foot level. He sent it down and White came up, released the cage by giving the hoist engineer one bell and he and Jensen went out of the mine. The engineer, Ole Johnson, says when he got the release bell he hoisted the cage up to the shaft collar and let it down again. When Mafrice returned with his empty car, Derenoff and the car were gone and the empty cage was standing at the level. The cager called on the phone and asked him to come down. This he was unable to do as the cage stuck at a splintered guide near the 100 foot level. White returning also a few minutes later had the cage hoisted up again and after a little investigation phoned me to come up to the mine, as a car had fallen down the shaft and a car pusher was missing. On climbing down the ladders Derenoff's body was found in the car at the bottom of the shaft. Some minor repairs to the guides enabled us to take the cage down and bring up the body. The top of Derenoff's head was smashed, probably by striking on a wall plate. His death must have been instantaneous. Everything points to his having fallen into the shaft with the car while the cage was above for a few minutes as previously explained. There is no way of telling just how he did this. The station is well lighted and a man pushing a car onto the cage has an unobstructed view. A glance is enough to show whether the cage is at the station or not. As the grade of the track

is away from the shaft, the car would not have rolled into the shaft by itself. Absentmindedness or doing the work mechanically without any conscious attention to the situation seems the most reasonable explanation." Derenoff was married and left a wife and infant child, age 1 month.

June 26—GORDON M. THAYER, American, rigger helper, age 18 years, employed by the Alaska Gastineau Mining Company at their mill at Thane, was killed by falling into the ore pocket at the coarse crushing plant. Thayer was engaged in assisting in the erection of a staging over No. 2 gyratory crusher during the course of some repair work on the crusher. It seems that at the time of the accident he was standing on the cover to the chute leading into the ore pocket. The manner in which this cover or door to the chute had been placed or the support beneath it were defective and it gave way allowing Thayer to fall into the bin. The accident occurred at 10:15 a. m. and the body of Thayer was recovered at about 12:30 P. M. Neither of the two workmen who were with Thayer at the time actually saw him fall but became aware of the accident by the noise occasioned by his falling. Thayer was a single man or rather boy and left no dependents.

July 5.—ANDREW J. SEEVERS, American, laborer, age 43 years, married, engaged by the Alaska Juneau Gold Mining Company on surface work about the mine as laborer, was killed by falling while in the act of jumping from a car or truck. Seevers together with two other workmen under the guidance of Geo. Getchell, surface foreman at the mine, were engaged in moving a Pelton wheel on a small flat car to the top of No. 1 Raise at the South Ore body of the mine in Silver Bow Basin. This is a raise from the lower workings of the mine to the surface and over the top of it is a building. The Pelton wheel was to be lowered through the raise and was being moved into the building for that purpose. One end of a set of blocks and tackle had been made fast to a timber in the building and the other end was fastened to the wheel which was on the car. Seevers and William Hill were on the car with the Pelton wheel for the purpose of steadying and guiding it as it moved forward toward the raise. Getchell and Wido Majuskovich were pulling on the fall line of the tackle. Hill states that as the tackle tightened the wheel moved forward and also a trifle to one side and that he cautioned Seevers not to raise the weight of the wheel for fear it would cause the car to tip. Seevers however, did raise the wheel and the car commenced to tilt whereupon Hill and Seevers both jumped from the car. The platform of the car was approximately 12 feet above the ground on the side from which Seevers jumped. In landing Seevers fell and struck the back of his head against a rock. The skull was found to be fractured at the base of the brain. Seevers was taken to St. Ann's Hospital, Juneau, and died there on the day of the accident.

September 30—GEORGE PLEICH, miner, employed by the Kennecott Copper Corporation at their Mother Lode Mine at Kennecott,

Alaska, was injured by a blast from a missed hole and died in the Kennecott Hospital on October 7th as the result of his injuries. According to the statement of the mine manager, Pleich went to work at 7 o'clock P. M. in a chute-raise which he had started and had been working on for several days past. Going on shift, he found one missed hole from his previous round of blasting, and it was while endeavoring to remove the powder from this missed hole that the powder exploded, shooting out directly in his face. It also knocked down a C-C 11 stoper drill—which he undoubtedly had in his hand at the time—across his leg just above the knee, breaking the bone in three places. As Pleich was working just at the top of the chute timbers, he fell only four or five feet into the chute, from which he was immediately taken and removed to the Kennecott hospital. At the time the accident was first reported it was thought Pleich would lose the sight of the left eye and would possibly lose also the left leg, but it was not though his injuries would terminate fatally. No dependents were reported as being left.

November 9—TOIOJO FIORELLO, Italian, bulldozer, age 42, married, employed by the Alaska Juneau Gold Mining Company at their Alaska Juneau mine at Juneau, was killed by being struck by a rock while working in the bulldozing chamber at the top of No. 3 chute in the 400 stope. Some very large boulders were hung up in the throat of the bulldozing chamber and Fiorello was preparing to blast them. The details of the accident are given in an affidavit by J. D. Littlepage, who was present at the time and was the contractor in charge of the bulldozing work carried on in the mine at that time. The substance of this affidavit is as follows: At about 9:30 o'clock A. M. on the above date Littlepage went to No. 3 bulldozing chamber in 440 stope which was "hanging up" and where Luckini Luckino and Tiojo Fiorello were waiting for him to locate a place to put the powder in blasting the boulders which were hung up. Littlepage and Fiorello were up in the "draw" about ten feet with Luckino close behind. Littlepage was looking at the top of a large boulder and noticed some small rock start to slide from the top of it. He shouted a warning to the others to get out of the way and as he himself was rapidly leaving the draw he turned and saw a rock weighing about eight or ten pounds strike Fiorello on the head. As soon as Littlepage reached the bulldozing chamber he turned to assist Fiorello. The latter however fell between the bars of the grizzly and into the chute below dropping a distance of approximately 30 feet. Immediately a rope was secured and Henry and Julius Stragier went down into the chute where Fiorello lay. By means of the rope Fiorello was raised to the top of the chute and he was taken to the hospital at Juneau where he died at 1 o'clock P. M. Fiorello left a wife and five children under the age of 16 years.

November 30—FRANK MORAN, Irish, miner, age 43, single and HENRY COTTENIE, Belgian, age 44 years, widower, machine helper, both employed by the Kennecott Copper Corporation at the Beatson Mine,

Latouche, Alaska, were blasted by drilling into a missed hole. Moran was killed almost instantly and Cottenie, as a result of his injuries, died at the mine hospital at 3:30 P. M. December 2nd. The following extract from the affidavit of L. W. Storm, mine foreman, gives the details of the accident: "The death of Frank Moran and Henry Cottenie came about as follows: Moran and his partner, Henry Cottenie, had been working together for several shifts in a drift which was being driven from No. 60 grizzly chamber to No. 61 chamber to connect the two, so that a man working in either place could get help from the other if need be. They blasted a round before quitting at 4 A. M. November 30th and reported 13 holes blasted, 12 explosions, indicating one missed hole. This information was posted on the blackboard used for that purpose. The opposite shift naturally found the face nearly full of broken rock and after setting up the bar near the top of the drift the miner proceeded to drill the upper part of the round while his partner cleaned out the muck and dumped it into No. 60 grizzly. By quitting time most of the muck was out and five holes drilled. The missed hole was not found. On returning to work on the evening of November 30th Moran went ahead drilling the round and Cottenie finished cleaning out the muck. The missed hole turned out to be near the center of the bottom row of holes. Moran finished four holes before lunch at 11 o'clock P. M. and must have started work on the middle lifter of the new round about 11:40 P. M. About 11:50 Tony Zuanich, who was at the station about 100 feet away from the foot of the raise going up to No. 60 grizzly, heard calls for help and going to the foot of the raise found Cottenie, whom he saw at once had been blasted and had climbed down the ladder. Cottenie was taken to the hospital and there said they had drilled into a missed hole and that his partner was still there. This was all the information he ever gave as he was given an anaesthetic at once and his wounds dressed. He never fully regained consciousness, although he lived about 40 hours after he was injured. Both eyes were cut to pieces, his skull was fractured and there were bad cuts on the upper part of his body. Frank Moran was found unconscious about two feet from the face of the drift shortly after Cottenie was taken out. His injuries were nearly the same as those of Cottenie, but he died as he was being taken out of the mine. The machine was found with the bit of the drill steel against the rock a few inches from the gun of the old hole which had undoubtedly exploded. The sack of powder in preparation for blasting the round which was nearly drilled was found around a corner in No. 60 grizzly chamber and on top of it, but not in the sack, was a stick of powder which was split lengthwise and crumpled as though it had been tamped into a hole. This stick, it is surmised, was taken out of the missed hole by Moran or Cottenie. Evidently they were starting a new hole beside the old one, believing all powder to have been removed. In any case, the two men were undoubtedly close together and directly in front of the hole, with their faces turned straight toward it, when it exploded, shooting small pieces of rock into their eyes, faces and

breasts. Cottenie left three dependent children residing in Belgium. Moran left no dependents.

A LIST OF THE FATAL ACCIDENTS WHICH OCCURRED AT THE
MINES AND ORE DRESSING PLANTS OF ALASKA
DURING THE YEAR 1920.

- March 25—FRANK G BRAEM, American, car repairman, age 25 years, unmarried, employed by the Alaska Gastineau Mining Company at the car repair shops for the mine railway near the tippie at the coarse crushing plant of the mill at Thane, was killed by being run over by the ore train. On the day of the accident deceased was acting as substitute for the regular conductor of the ore train. The ore train is made up of forty 10-ton cars, four cars of which at a time are spotted in the tippie when ore is being dumped into the bins of the coarse crushing plant. The conductor of the train stands at the edge of the tippie and operates the switch which controls the dumping of the same and also uncouples and couples the cars of the train as they are moved into and out of the tippie. The motorman moves the train in response to signals given by the conductor. At the time of this accident it appears that the first four cars had been spotted in the tippie and the motorman had drawn the remainder of the train away, as is the custom as soon as he receives the signal that the cars are properly spotted. The motorman then received another signal to come back again, as the cars in the tippie had evidently not been properly spotted. He did so and then immediately drew away. At this time Braem in some way fell between the moving cars of that portion of the train which was being withdrawn from the tippie and was run over. Just what caused him to slip and fall could not be determined.
- April 17—SWAN HELLGREN and L. ANDERSON, both Swedes, contract miners, employed by the Kennecott Copper Corporation at their Bonanza mine, Kennecott, Alaska, met their death by suffocation from powder gas at the face of the main level, which they were driving. Hellgren and Anderson were working on the night shift, which lasts from 7 o'clock P. M. until 3 o'clock A. M. Their working place was on the main level which is at the same elevation as the surface buildings. They had drilled a round of holes during the night and had blasted them at 2:30 o'clock in the morning. On account of some of the holes not having broken properly, they returned to their working place at 4 o'clock for the purpose of reblasting. The shift boss in charge of the main level remained on duty until the completion of this second blast. As Hellgren and Anderson did not return within the time he considered reasonable, he started back into the mine to look them up. He met them coming out and went to the bunk house with them, leaving there at 4:30 o'clock A. M. At the time he left them they were changing their clothes and made no mention of their intention of again going into the mine. They had however stated

that the second round they had blasted was one shot short. Evidently with the purpose of shooting this one hole a third time they decided to return to their working place. They were found there at 7 o'clock A. M. It was found that they had taken three sticks of powder and a primer into the drift as also a scraper used for cleaning out holes. From all appearances they had been engaged in cleaning out the remaining missed hole when they realized that the gas was bothering them and they then attempted to leave the place. They were however able to proceed only part way over the muck pile upon which they were found lying. Both Hellgren and Anderson were experienced miners and had previously been employed in various camps throughout Southern Alaska. Hellgren is reported to have a brother in Sweden but neither of the men had relatives in this country.

April 22—ERNEST M. WILLIAMS, American, switch-board operator, age 35 years, employed by the Alaska Gastineau Mining Company at their gold-milling plant at Thane, was electrocuted in the substation at the mill at 4:30 A. M. on the above date. The electric substation at the mill is located in a wing of the main building. In it are installed the switch-board and other appliances which control the electrically operated machinery in the mill, and, in addition to these, a set of the General Electric Company's "Electrolitic" lightning arresters. These latter have a rated capacity of from 22,000 to 27,000 volts. In the course of the operation of charging the tanks of the arresters, which is done once in each shift or three times per day, it is necessary to throw a "horn" switch. This switch is installed at an elevation of several feet above the head of an operator standing on the floor of the station and is well within the confines of a metal grating placed about the entire apparatus. Ordinarily this switch is operated by means of a wooden handle attached to the end of a cord suspended from one end of a pivoted beam, the other end of which trips the switch. This cord and handle hang outside the metal grating above referred to, allowing the operator to throw the switch without coming into contact with any of the apparatus. At the time of the accident Williams was evidently in the act of throwing the switch. Instead, however, of following the usual procedure, as above outlined, he is presumed to have attempted to reach through the grating from the side in order to reach the cord and in doing so to have slipped and fallen against the side of one of the tanks of the arrester, with the cord still in his grasp. This caused a short circuit allowing the entire charge to pass through his body. Williams was an experienced man in the work in which he was engaged and had been employed in the position he was occupying at the time of his death for a period of fifteen months. He left no dependents.

May 27—NATHANIEL SWANSON, Swede, shift-boss, employed by the Alaska United Gold Mining Company at their Ready Bullion mine at Treadwell, was killed by a fall of rock in the crosscut leading from the main drift to No. 4 stope bull-dozing chamber on the

2000 foot level at 10:30 A. M. of the above date. Swanson was making his regular rounds of the mine and entered the crosscut to visit the bulldozers who were at work in the chamber. After proceeding a few feet from the drift he stood for an instant and called to the workmen. Just at that instant a slab of rock, 10 feet long, 5 feet wide and 2 feet thick, weighing approximately eight tons, fell from the angle formed by the roof and wall above where Swanson stood, pinning him beneath one end of it and crushing his skull. After the slab had fallen, a slip containing gouge was revealed along the surface which had formed the upper side of the slab. The only support of the slab therefore was through its adherence to the wall of the tunnel. Repeated blasting in the bulldozing chamber a short distance away had evidently weakened this bond and allowed the rock to fall. Swanson was 34 years of age, unmarried, and left no dependents.

September 3—JULIUS STRAGIER, Belgian, contract miner, age 36 years, employed by the Alaska Juneau Gold Mining Company at their Alaska Juneau mine at Juneau, was overcome by powder smoke in the main drift opposite No. 29 Raise and died from the effects before help reached him. Stragier, together with his partner, Gust Erickson, had completed the blasting of a round of about twelve holes in the drift and were preparing to leave the mine. They waited however until they had counted the reports and made sure that all the holes of the round had exploded. Smoke became quite thick in the drift where they were by the time all the round had been fired and Erickson and Stragier became separated in going for their lunch buckets. Erickson made his way to the No. 3 station, away from the area affected by the smoke, not knowing whether Stragier was following him or had waited for the smoke to pass out of the drift, which requires about seven minutes. After waiting at No. 3 station for about five minutes Erickson and another miner returned to where Stragier had been and found him lying dead on the track. Artificial respiration was applied but without success. Stragier was an experienced man, having been employed in the position occupied at the time of his death for a period of sixteen months. He left no dependents.

October 5—STEVE PULETICH, Montenegrin, bulldozer, age 30 years, employed by the Alaska Gastineau Mining Company at their Perseverance mine near Juneau, was killed by a blast in a chute on the 11th Level. Puletich was found in the chute with his feet protruding over the check-board. It is presumed he had attempted to blast a boulder in the chute as a large one was lodged about six feet above where his body was found. The presumption is that the powder which he had with him was accidentally exploded in his attempt to get into the chute and reach the boulder.

October 29—FRED PETERSON, Swede, contract miner, age 35 years, employed by the Alaska Gastineau Mining Company, at their Perseverance mine near Juneau, was caught by a slide and cave of rock about his working place and was killed. Peterson was drilling a hole with a machine drill in the No. 5 East Slope of the No. 10 Level when the fall of rock occurred. August Nelson, another con-

tract miner, was also drilling about twenty feet away from Peterson. The fall of rock apparently occurred without warning. W. H. Ireland, shift boss stated that he was at Peterson's working place an hour and a half prior to the accident and that at that time the roof from which the rock fell appeared to him to be perfectly safe. Peterson was unmarried and left no dependents other than the father and mother. He had been working for eight days at the place where the accident occurred and had been in the employ of the company somewhat more than three months.

December 3—CHARLES FREDEN, Swede, timberman, age 34 years, employed by the Alaska Gastineau Mining Company at their Perseverance mine near Juneau, came to his death by falling down No. 1 oreway from the 9th to the 13th level, a distance of 800 feet. Freden, together with his helpers, Tony Porter and Joe Revis were engaged in putting a timber into a chute located about twenty feet away from the oreway, and on No. 9 level. While they were thus engaged powder smoke began to issue from the oreway, as a result of blasting on the next level below, in such volumes that they were unable to see. Freden, with an axe in one hand and his hat and lamp in the other, started toward the shaft station. The shaft station is situated in the opposite direction, with reference to the chute at which they were working, from the oreway. In order to reach it, however, it is necessary to pass around one side or the other of a pillar which intervenes between the chute and the shaft station. Being undoubtedly confused by the dense cloud of smoke in the drift, Freden lost his bearings and walked into the oreway. In reaching the oreway from his working place, Freden took a route which was almost directly away from the shaft station for which he started. He also passed almost entirely around the dump rail for the "Granby" type ore cars which stands just across the track from the mouth of the oreway. This dump stands about 2½ feet above the ground and is approximately 20 feet long and it would seem should have served as ample warning of the proximity of the oreway. It is probable the powder smoke affected Freden to such an extent as to dull his perceptive faculties and rendered him incapable of promptly realizing his surroundings. Freden had been employed at the mine one month prior to the accident. He was unmarried and left no dependents.

Appendix

LIST OF ALL ACCIDENTS REPORTED FROM GOLD MINES OF ALASKA
FOR THE YEAR 1919, CLASSIFIED AS TO CAUSES
AND RESULTS OF ACCIDENTS.

Causes	Killed	Permanent total disability-A	Permanent partial 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		1	6	6	13
2. Rock or ore while loading at working face or chute				11	60	71
3. Timber and hand tools					3	3
4. Explosives					6	12
5. Haulage system (mine cars, mine locomotives, breakage of rope, etc.)	1					
6. Falling down chute, winze, raise or stope	1		1		8	9
7. Run of ore from chute or pocket					11	11
8. Drilling accidents (by machine or hand drills)						
9. Electricity	1					
10. Machinery (other than locomotives or drills)					1	1
11. Mine fires						
12. Suffocation from natural gases						
13. Inrush of water						
14. Nails, splinters, etc.					1	1
15. Other causes				11	30	41
Total number killed or injured underground	5	—	2	34	126	162
Shaft Accidents						
Number killed or injured by:						
16. Falling down shafts						
17. Objects falling down shafts						
18. Breaking of cables						
19. Overwinding						
20. Skip, cage or bucket				5		5
21. Other causes						
Total number killed or injured by shaft accidents	—	—	—	5	—	5
Surface Accidents						
(At surface yards and shops)						
Number killed and injured:						
22. Mine cars and mine locomotives, gravity or aerial trams				1	1	2
23. Railway cars and locomotives					3	3
24. Run or fall of ore in or from ore bins						
25. Falls of persons	1			5	4	9
26. Nails, splinters, etc.						
27. Hand tools, axes, bars, etc.					1	1
28. Electricity						
29. Machinery					3	3
30. Other causes				1	22	23
Total number killed or injured by surface accidents	1	—	—	7	34	41
Grand total	6	—	2	46	160	208

(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.

3).—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.

4).—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.

Number of men reported as employed at all Gold Mines during 1919—758

LIST OF ALL ACCIDENTS REPORTED FROM COPPER MINES OF ALASKA
FOR THE YEAR 1919, CLASSIFIED AS TO CAUSES
AND RESULTS OF ACCIDENTS.

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	9	11
2. Rock or ore while loading at working face or chute				1	7	8
3. Timber or hand tools						
4. Explosives	3			6	1	7
5. Haulage system (mine cars, mine lo- comotives, breakage of rope, etc.)				2	5	7
6. Falling down chute, winze, raise or stope				1	2	3
7. Run of ore from chute or pocket				1		1
8. Drilling accidents, (by machine or hand drills)				1	8	9
9. Electricity						
10. Machinery (other than locomotives or drills)						
11. Mine fires						
12. Suffocation from natural gases						
13. Inrush of waters						
14. Nails, splinters, etc.					2	2
15. Other causes				6	24	30
Total number killed or injured underground	3	—	—	20	58	78
Shaft Accidents						
Number killed or injured by:						
16. Falling down shafts	1					
17. Objects falling down shafts						
18. Breaking of cables						
19. Overwinding						
20. Skip, cage or bucket				2	1	3
21. Other causes					4	4
Total number killed or injured by shaft accidents	1	—	—	2	5	7
Surface Accidents						
(At surface yards and shops)						
Number killed or injured by:						
22. Mine cars or mine locomotives, gravity or aerial trams				1	3	4
23. Railway cars and locomotives						
24. Run or fall of ore in or from ore bins						
25. Falls of persons				3	4	7
26. Nails, splinters, etc.					1	1
27. Hand tools, axes, bars, etc.				2	4	6
28. Electricity						
29. Machinery			1			1
30. Other causes				3	8	11
Total number killed or injured by surface accidents	—	—	1	9	20	30
Open Pit Accidents						
Number killed or injured in pit by:						
Miscellaneous					2	2
Total number killed or injured by open pit accidents	—	—	—	—	2	2
Grand total	4	—	1	31	85	117

- (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.

Number of men reported as employed at all Copper Mines during 1919—624.

LIST OF ALL ACCIDENTS REPORTED FROM GOLD MILLING PLANTS OF ALASKA FOR THE YEAR 1919, CLASSIFIED AS TO CAUSES AND RESULTS OF ACCIDENTS.

Causes	Killed	Permanent total disability-A	Permanent partial 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 systems (cars, motors, etc.)				1		1
2. Railway cars and locomotives					5	5
3. Crushers, rolls or stamps					1	1
4. Tables, jigs, etc.					3	3
5. Other machinery	1			1		4
6. Falls of persons	1					1
7. Suffocation in ore bins					1	1
8. Falling objects (rocks, timbers, etc.)						
9. Cyanide or other poisoning						
10. Scalding (steam or water)						
11. Electricity						
12. Hand tools, axes, bars						
13. Nails, splinters, etc.						
14. Flying pieces of rock from sledging or crushing						
15. Other causes					3	3
Total number killed or injured	2			2	13	15
at mills	2			2	13	15
Grand total	2			2	13	15

- (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:—Ore dressing plants include stamp mills, sampling works, slime plants, lixiviation, leaching, cyanide and flotation mills.

Number of men reported as employed in all Gold Mills during 1919—314.

LIST OF ACCIDENTS REPORTED FROM THE COPPER MILLING PLANTS OF ALASKA DURING THE YEAR 1919, CLASSIFIED AS TO CAUSES AND RESULTS OF ACCIDENTS.

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 (cars, motors, etc.)						
3. Crushers, rolls or stamps						
2. Railway cars or locomotives						
4. Tables, jigs, etc.						
5. Other machinery				1		1
6. Falls of persons						
7. Suffocation in ore bins	1					
8. Falling objects (rocks, timbers, etc.)						
9. Cyanide and other poisoning						
10. Scalding (steam or water)						
11. Electricity				1		1
12. Hand tools, axes, bars, etc.				1		1
13. Nails, splinters, etc.						
14. Flying pieces of rock from sledging or crushing						
15. Other causes				7		7
Total number killed or injured at mills	1			10		10
Grand total	1			10		10

(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:—Ore dressing plants include stamp mills, sampling works, slime plants, lixiviation, leaching, cyanide and flotation mills.

Number of men reported as employed in all Copper Mills during the year 1918—61.

LIST OF ALL ACCIDENTS REPORTED BY GOLD MINES OF ALASKA FOR THE YEAR 1920, CLASSIFIED AS TO CAUSES AND RESULTS OF ACCIDENTS.

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		1	6	6	13
2. Rock or ore while loading at working face or chute				8	17	25
3. Timber and hand tools				2	2	4
4. Explosives	2			2	2	4
5. Haulage system (mine cars, mine locomotives, breakage of rope, etc.)				6	6	12
6. Falling down chute, winze, raise or slope	1				3	3
7. Run of ore from chute or pocket					13	13
8. Drilling accidents (by machine or hand drills)					6	6
9. Electricity					1	1
10. Machinery (other than locomotives or drills)						
11. Mine fires						
12. Suffocation from natural gases						
13. Inrush of water						
14. Nails, splinters, etc.					1	1
15. Other causes					18	22
Total number killed or injured underground	5		1	29	74	104
Shaft Accidents						
Number killed or injured by:						
16. Falling down shafts						
17. Objects falling down shafts						
18. Breaking of cables						
19. Overwinding						
20. Skip, cage, or bucket						
21. Other causes					1	1
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, gravity or aerial trams					4	4
23. Railway cars and locomotives						
24. Run or fall of ore in or from ore bins						
25. Fall of persons					2	2
26. Nails and splinters, etc.					3	3
27. Hand tools, axes, bars, etc.					4	4
28. Electricity						
29. Machinery					2	2
30. Other causes					3	3
Total number killed or injured by surface accidents			2	5	13	18
Grand Total	5		3	34	102	139

(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.

Number of men reported as employed in all Gold Mines during the year 1920—

LIST OF ALL ACCIDENTS REPORTED BY COPPER MINES OF ALASKA
FOR THE YEAR 1920, CLASSIFIED AS TO CAUSES
AND RESULTS OF ACCIDENTS.

Causes	Killed	Permanent total disability-A	Permanent partial 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. Falls of rock or ore from roof or wall				6	9	15
2. Rock or ore while loading at working face or chute				5	9	14
3. Timber or hand tools				1	1	2
4. Explosives	2				1	1
5. Haulage system (mine cars, mine locomotives, breaking of rope, etc.)				6	5	11
6. Falling down chute, winze, raise or slope				3	1	4
7. Run of ore from chute or pocket			1		1	2
8. Drilling accidents (by machine or hand drills)				1	11	12
9. Electricity						
10. Machinery (other than locomotives or drills)					1	1
11. Mine fires						
12. Suffocation from natural gases						
13. Inrush of water						
14. Nails, splinters, etc.					1	1
15. Other causes				3	8	11
Total number killed or injured underground	2		1	25	48	74
Shaft Accidents						
Number killed or injured by:						
16. Falling down shafts						
17. Objects falling down shafts						
18. Breaking of cables						
19. Overwinding						
20. Skip, cage, or bucket						
21. Other causes					4	4
Total number killed or injured in shafts					4	4
Surface Accidents						
(At surface yards and shops)						
Number killed or injured by:						
22. Mine cars or mine locomotives, gravity or aerial trams				3		3
23. Railway cars and locomotives					1	1
24. Run or fall of ore in or from ore bins						
25. Falls of persons				3	3	6
26. Nails and splinters					1	1
27. Hand tools, axes, bars, etc.					4	4
28. Electricity						
29. Machinery					1	1
30. Other causes				4	13	17
Total number killed or injured by surface accidents				10	23	33
Open Pit Accidents						
Number killed or injured in pit by:						
31. Falls or slides of rock or ore					2	2
Total number killed or injured by open pit accidents					2	2
Grand total	2		1	35	77	113

(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.

Number of men reported as employed at all Copper Mines during 1920.—

LIST OF ALL ACCIDENTS REPORTED FROM GOLD MILLING PLANTS OF ALASKA FOR THE YEAR 1920, CLASSIFIED AS TO CAUSES AND RESULTS OF ACCIDENTS.

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 systems (cars, motors, etc.)				2		2
2. Railway cars and locomotives						
3. Crushers, rolls or stamps				1	3	4
4. Tables, jigs, etc.					1	1
5. Other machinery						
6. Falls of persons					1	1
7. Suffocation in ore bins						
8. Falling objects (rocks, timbers, etc.)				2	1	3
9. Cyanide or other poisoning						
10. Scalding (steam or water)						
11. Electricity	1					
12. Hand tools, axes, bars, etc.			1			1
13. Nails, splinters, etc.						
14. Flying pieces of rock from sledging or crushing						
15. Other causes			3	2	3	8
Total number killed or injured at gold mills	1	—	4	7	9	20
Auxiliary Works' Accidents						
(Yards, shops, construction, etc.)						
Number killed or injured by:						
39. Failure of ladder, scaffold, or other support				1		1
32. Railway cars	1					
Total number killed or injured by shop and yard accidents	1	—	—	1	—	1
Grand total	2	—	4	8	9	21

(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:—Ore dressing plants include stamp mills, sampling works, slime plants, lixiviation, leaching, cyanide and flotation mills.

Number of men reported as employed at all Gold Mills during the year 1920.—

LIST OF ALL ACCIDENTS REPORTED BY THE COPPER MILLING PLANTS
OF ALASKA FOR THE YEAR 1920, CLASSIFIED AS TO
CAUSES AND RESULTS OF ACCIDENTS.

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 (cars, motors, etc.)..						
2. Railway cars and locomotives						
3. Crushers, rolls and stamps				1	1	2
4. Tables, jigs, etc.						
5. Other machinery				1	1	2
6. Falls of persons				1	5	6
7. Suffocation in ore bins						
8. Falling objects (rocks, timbers, etc.)				1	2	3
9. Cyanide or other poisoning						
10. Scalding, (steam or water)					1	1
11. Electricity						
12. Hand tools, axes, bars, etc.					1	1
13. Nails, splinters, etc.					2	2
14. Flying pieces of rock from sledging or crushing						
15. Other causes					10	10
Total number killed or injured --	--	--	--	4	23	27
at mills				4	23	27
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.					1	1
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 --	--	--	--	--	2	2
by shop and yard accidents					2	2
Grand total				4	25	29

(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.—Ore dressing plants include stamp mills, sampling works, slime plants, lixiviation, leaching, cyanide and flotation mills.