

## THE MCKINLEY LAKE DISTRICT.

By THEODORE CHAPIN.

The present report is based on a hasty examination made by J. B. Mertie and the writer in October, 1912. The claims visited are described in some detail because no other account of them has been published recently by the Survey.

The McKinley Lake properties are situated on the northwest shore of McKinley Lake, a body of water  $1\frac{1}{2}$  miles long, which empties into the head of Alaganik Slough, 2 miles from Alaganik and about 20 miles east-southeast of Cordova. (See Pl. III.) They are easily reached by rail from Cordova to Alaganik and thence by a trail 2 miles long. The trail is very swampy but can be traveled by horses in dry weather. The region may also be reached by boat from Alaganik by way of the slough.

McKinley Lake was visited in 1900 by Spencer,<sup>1</sup> who says:

At this place several veins of quartz have been opened and found to contain gold in varying quantities. A short study of this field was sufficient to show that the principal veins lie parallel to the stratification of the sedimentary rocks and that they usually follow the contact of two beds of different character, as of massive arkose sandstone against shale. In many cases ledges varying in width from a few inches to several feet may be traced for long distances. In one claim the quartz shows a large amount of free gold in small stringers, but this claim has not been sufficiently exploited to determine either the permanency of the vein or its character.

Besides these veins in the planes of stratification there are others transverse to the bedding which have a width up to 4 feet and are known to be continuous for 100 feet or more. One of these which shows no free gold was sampled and found to contain 0.64 ounce of gold. On the whole the Alaganik region seems worthy of the further attention of mining men.

Interbedded slate and graywacke of the Orca group constitute the country rock of the region adjoining McKinley Lake. The dominant strike of the beds is about east and west, and the dip ranges from nearly  $0^{\circ}$  to about  $45^{\circ}$  N. The region is cut by a series of gold-bearing quartz veins ranging in thickness from a few inches to 20 feet. These show a tendency to parallel rather than to cut the beds and occur as tabular bodies between the graywacke and slate. The graywacke has been extensively brecciated and subsequently mineralized

<sup>1</sup> Schrader, F. C., and Spencer, A. C., The geology and mineral resources of a portion of the Copper River district, Alaska: U. S. Geol. Survey Special Pub., p. 90, 1901.



by an intricate network of quartz veins and veinlets. In the interbedded slate, however, dynamic action has expressed itself in movement along the cleavage planes rather than in the formation of zones of brecciation, and the argillaceous beds are therefore not extensively mineralized.

Small crystals of pyrite and arsenopyrite occur throughout much of the ledge matter, both in the quartz and in the inclosed sediments. Locally the arsenopyrite is very abundant, forming small bodies several centimeters in length and composing a large proportion of the rock. When struck with the hammer it gives off the characteristic garlic odor of arsenic minerals, and it is offensive to the miners who work it. The gold occurs free in the quartz and inclosed in the sulphides, from which it weathers out into little lumps of brown alteration product.

The Lucky Strike Mining Co. has six claims in this region, on which three tunnels with a reported total length of about 400 feet have been driven. Two of the tunnels are on a ledge 20 feet wide, which consists of a brecciated mass of graywacke healed with quartz and carrying considerable amounts of arsenopyrite together with small specks of gold. No samples were collected by the writer, but assay returns from this ledge are reported by the owners to show from \$8 to \$10 a ton.

The Stringer tunnel follows a well-defined vein with gouge above and below. Vein matter next to the footwall is said to assay \$80 to the ton and to have an average value of \$15. A mill test on individual stringers of this ledge is reported to have yielded returns as high as \$100 a ton. The country rock adjacent to the ledge also contains considerable pyrite and arsenopyrite, with some free gold, and is said to assay about \$1.85 a ton.

On the Tiptop claim an open cut has exposed vein matter about 20 feet in width, which cements large brecciated masses of graywacke and slate.

The ledge matter in the main workings of the McKinley Lake Mining Co. is a mass of quartz veins inclosing some blocks of graywacke. On this ledge are two tunnels with an aggregate length of over 600 feet, besides several open cuts. The entire mass is more or less mineralized with pyrite, arsenopyrite, and free gold. The surface outcrop is said to have assayed \$100 a ton, and \$10 is reported by the owners as an average for the ledge. A small mill was operated on this property for a number of years but was subsequently removed.

The property of the Bear Creek Mining Co. is situated on Bear Creek, a tributary of Salmon Creek, a few miles above McKinley Lake. It was not visited, but the formation and geologic relations as reported are much the same as those on McKinley Lake. The property comprises several claims on which some development work has been

done. Several other properties situated on the lake were not examined but are reported to carry small quantities of gold.

The mining conditions in this area are exceptionally favorable. Excellent timber is abundant and transportation facilities could easily be provided by a railroad branch from Alaganik. The location of the veins on the steep slopes of McKinley Mountain should afford natural dumps and gravity haulage. In 1912 only two men were at work in this region, but the owners of the claims hope to interest outside capitalists in the near future and to open the properties on a larger scale.

## MINING IN CHITINA VALLEY.

By FRED H. MOFFIT.

### INTRODUCTION.

The gold and copper deposits of Chitina Valley are commonly referred to more or less indefinitely as being in the Copper River region, and this practice has sometimes given rise to the idea that they are situated in the main valley of Copper River. This idea is not wholly correct, as most of them lie, not in the valley of the Copper, but in that of its large eastern branch, Chitina River.

The district has attracted attention from the beginning of active Alaskan exploration and its major geologic and geographic features have been described in various publications.

During the summer of 1912 a detailed investigation of the western part of the copper belt, including Kuskulana and Kotsina rivers, was begun, but owing to the shortness of the field season and to the unusually unfavorable weather conditions, it could not be completed. The topographic mapping done by Mr. Witherspoon included only the upper valley of Kuskulana River and of Strelna Creek, for the working season did not afford time to extend the mapping northward and westward to Kotsina River and Elliott Creek. Geologic mapping was carried on in connection with the topographic work and over, practically the same area, except that none was done east of Kuskulana River. Geologic work was begun about the middle of July by T. S. Chapin, who was joined in the middle of September by J. B. Mertie and the writer. Field work was continued till October 1, when it had to be given up because of a lack of feed for the horses.

The work of the season showed that the geologic structure of this part of the copper belt is much more complicated than had been supposed and that sedimentary beds (probably Carboniferous) older than any previously recognized in this vicinity are present. It also disclosed that in this district deposits of copper are associated with diorite intrusives as well as with the greenstones, a fact of importance not generally known.

Geologic conditions throughout the Chitina Valley have been considered to be almost alike, except for the character and occurrence of the ores. The stratigraphic succession throughout most of this

region, beginning with the oldest rocks, includes the Nikolai greenstone, from which most of the copper was derived, the Chitstone limestone (Upper Triassic), the McCarthy shale (Upper Triassic), and the Kennicott formation (Upper Jurassic). The three lower formations follow one another in unbroken succession, but the Kennicott rests **unconformably** on them. Sedimentary rocks older than any of those mentioned form part of the mountains about Strelna Creek and south of Elliott Creek. Field work has not progressed far enough to determine the area occupied by these rocks, but it is evidently small and does not extend far to the east. It is quite possible, if not probable, however, that some of the rocks on Kotsina River north of Elliott Creek, previously represented on the maps as being of unknown age, may belong among these older beds.

The season of 1912 was unfavorable for mining in the Chitina Valley, on account of the adverse weather conditions. Low temperatures and rain prevailed throughout most of the summer but did little direct damage to mining property till late in the season. Much damage was done to the railroad, however. Early in August the approach to one of the Copper River bridges was carried away and about the middle of September so much damage was done to the tracks by landslides that communication between Cordova and Chitina was interrupted for about six weeks. These difficulties were felt by the copper miners chiefly through shortage of supplies and especially of feed for horses; this shortage became serious by October 1. The floods were felt more directly by the placer miners of the Nizina district, where much damage was done to mining equipment.

### COPPER.

The copper prospects on which most of the development work is being carried on lie in two main districts, one centering in the Kennicott-Bonanza mine and the other in the properties on Copper Mountain, at the head of Clear Creek, near the head of Kuskulana River.

Shipment of ore from the Kennicott-Bonanza was begun at the completion of the Copper River & Northwestern Railway in April, 1911, and has continued to the present time. None of the other copper properties in the Copper River basin has yet made commercial shipments of ore, but the increased facilities for mining that came with railroad transportation have stimulated their development, and a large amount of money has been expended for this purpose.

The Great Northern Development Co. has a well-equipped plant on Clear Creek, about 3 miles above its mouth and about 2,900 feet above the flood plain of Kuskulana River. This company has other property on Kotsina River, at Iron Mountain, and near Kennicott,

but most of its development work has been done on its Clear Creek or Copper Mountain property, where approximately 40 or 50 men are employed. No ore has been shipped, but not far from 5,000 feet of tunneling has been driven and considerable ore is blocked out. The copper minerals are chiefly chalcopyrite and cupriferous pyrite, with a small amount of oxidation products, mostly carbonates. The ore is contained in a mass of diorite intruded into the Nikolai greenstone and is also found in the greenstone itself, and it is not yet proved whether it originated in the greenstone or in the diorite.

Electricity for light and for use underground is generated by gasoline power, the gasoline being freighted in over the snow in winter. Work was begun in 1912 on an aerial tramway to connect the mine with a projected spur from the railroad 13 or 14 miles long. Part of the preliminary survey has already been run. Strelna, at "mile 146" on the railroad, is the distributing point for this vicinity. A private telephone from Clear Creek to Strelna was recently completed and thus established communication with Cordova, on the coast.

The Alaska Consolidated Copper Co. is said to own forty-five claims on Nugget Creek, thirty-five of which are patented. Most of the development work has been done on a claim described elsewhere<sup>1</sup> as the Valdez claim. A calcite vein containing bornite and a minor amount of chalcopyrite lies in a fault plane cutting greenstone at this locality. It has a maximum thickness at the surface of 24 feet but shows much variation. The claim has been developed by a shaft 163 feet deep and by approximately 900 feet of tunneling. Much ore has been piled on the dumps or sacked.

The Rarus group of claims, on the southeast side of Kuskulana River, is also being explored by the Alaska Consolidated Copper Co.

The Rarus group is adjoined on the southeast by what is known as "Ole Berg's property." A body of sulphide ore found on this property is considered by the miners to be the most important of the later discoveries in this vicinity. A wagon road is being built along the east side of Kuskulana River to connect the claims with the railroad and provide a means for freighting machinery to them.

The Alaska United Copper Exploration Co. continued work on the Blackstone group of claims on Porcupine Creek during the early part of the season. The Hubbard Elliott Copper Co. reports, besides assessment work on numerous claims, the completion of 118 feet of adit on the Albert Johnson claim, planned to undercut the outcrop of the ore body at a depth of about 500 feet. Preparations have been made to install an air compressor. Assessment work was done by other miners on many claims on Kotsina River and its tributaries, and it is

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<sup>1</sup> Moffit, F. H., and Maddren, A. G., Mineral resources of the Kotsina-Chitina region, Alaska: U. S. Geol. Survey Bull. 374, p. 72, 1909.

reported that an ore body of promise is being developed on Chesnina River. Details regarding these developments are lacking.

A very prosperous year is reported from the Kennicott-Bonanza mine, notwithstanding the fact that several unusual obstacles had to be overcome in the course of the work. Not only were the shipment of ore and the receipt of needed supplies interrupted during the later half of the summer by the suspension of railroad traffic, but some difficulty was encountered in operating the mill, owing to the unstable character of the morainal material on which it was erected, and operations had to be suspended till the defect could be remedied.

At least a part of the ore shipped from the Bonanza in the early summer was a concentration product from talus material on the mountain slope below the mine. This accumulation of loose rock fragments contains a large amount of chalcocite broken down from the ore body above and is looked on as an important source of copper. The owners of the Bonanza mine have also gone ahead with the development of the Jumbo chalcocite deposit, which is situated about a mile northwest of the Bonanza mine, and on which a considerable body of ore was in sight at the surface before any work was done.

Other companies operating in the vicinity of Kennicott were engaged in prospecting copper lodes 3 or 4 miles northwest of Kennicott, on the mountain in the middle of Kennicott Glacier, at the Nikolai mine on Nikolai Creek, and on the Mother Lode property northeast of Kennicott. A road constructed along McCarthy Creek for freight-machinery to the Mother Lode camp will also be available for the use of miners on Nikolai Creek, where development of the Nikolai mine has been carried on actively for the last two summers. None of these properties, nor the Westover claim on Dan Creek, are in a position to ship ore.

#### GOLD.

The Nizina gold placer district includes Dan, Chititu, and Young creeks. Most of the gold produced in this district in former years and also the larger part of the production in 1912 has come from Chititu Creek, though some was contributed by Dan Creek or its tributaries and some by Young Creek. The total production for 1912 is larger than for several previous years in spite of the unusual discouragements brought about by unfavorable weather.

The floods were felt most severely on Dan Creek, where a recently constructed and expensive hydraulic plant was destroyed by the September floods and a large part of the labor of two years was lost. The lower part of Dan Creek lies in a narrow valley where the water has little chance to spread and consequently is particularly liable to do injury in times of unusual flood. The miners on Copper Creek, in the upper part of the Dan Creek basin, escaped with less injury, for less water was concentrated there and the valley is relatively wider.

In the Chititu Creek basin three hydraulic plants were in operation in 1912. One was on the main stream and the other two were on Rex Creek, the northern branch of Chititu Creek. The plant installed on Chititu Creek several years ago was moved in 1911 to a point on Rex Creek not far above its mouth, and in 1912 a new and larger plant was built on Chititu Creek. The third plant in operation is near the head of Rex Creek. These three plants suffered less injury from the September storms than the one on Dan Creek but did not wholly escape. Unfortunately the high water came just before one of the lines of sluice boxes was to be cleaned up and buried everything, including the gold, under a mass of gravel, necessitating much extra work for its recovery. Better weather in the later part of September and early part of October, however, made it possible to work much later than has been customary, and the damage and loss of time had less effect on the season's gold production than they would have had in previous years.