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RECENT MINERAL DEVELOPMENTS IN THE COPPER RIVER REGION, ALASKA

BY

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RECENT MINERAL DEVELOPMENTS IN THE COPPER RIVER REGION

By FRED H. MOFFIT

INTRODUCTION

The Copper River region has long held its place as one of the chief mining sections of Alaska and for that reason merits the attention it has received from mining engineers and members of the United States Geological Survey for many years. The first geologic work in the valley was that of F. C. Schrader (1898), who was attached to the military expedition under Capt. W. R. Abercrombie, sent to Valdez to explore routes to the interior of Alaska. Since then most of the Copper River Basin has been represented on topographic and geologic maps, but small areas within the basin and some adjacent areas generally considered in connection with the Copper River remain to be mapped. Also some revision of the earlier work has been found desirable. This work is in progress.

In 1935 topographic and geologic reconnaissance surveys were continued in the section of the Alaska Range between the Copper and Tanana Rivers. Two parties were at work, using the Slana roadhouse, on the highway at the mouth of the Slana River, as point of departure. A reconnaissance topographic survey of the district that includes the upper Slana and Tok Valleys and the Robertson River Valley was made by Gerald FitzGerald. This work was an extension westward of similar work that he did on the Little Tok River in 1934. The area was previously unmapped, even in an exploratory way, and was little known and rarely visited except by a few prospectors and hunters and the natives. It is a rugged country with high mountains, glaciers, and swift glacial streams that are often dangerous to cross even with horses, so that travel is confined to the valley bottoms, and routes for pack animals are narrowly restricted.

The geologic work was the reconnaissance of an area that includes most of the valley of the Little Tok River, the lower valley of the Big Tok River, and mountains between the Little Tok River and the Tetling Lakes. Further geologic work, an extension of previous surveys, was done by the writer in the Ahtell Creek Valley, where placer gold is being mined.

Among the chief duties of the Alaskan branch of the United States Geological Survey are the collection of information on mining districts and the publication of this information for the benefit of the public. Accordingly, some time at the end of the field season referred to above was devoted to this part of the work.

The centers of mining in the Copper River Basin are widely distributed, and not all of them could be visited, although some comment on most of them will be given. At present the active mining centers of the upper Copper River Valley, including some of the Tanana Valley, are the Nabesna mine, the Chisana (Shushanna) district, Ahtell Creek, and the Slate Creek district. The remaining districts are the Nizina and Bremner River districts. Unfortunately the writer did not visit the Slate Creek district and had little opportunity to discuss developments in the district with men from that district after the placer-mining season ended.

CHITINA VALLEY AND BREMNER RIVER

CHITINA VALLEY

The outstanding event of 1935 in the mining history of the Chitina Valley was the reopening of the Kennecott mines, after a little more than 2 years of idleness occasioned chiefly by the unsatisfactory price of copper, although the immediate cause of the shut-down was the washing out of the Copper River bridge at Chitina late in 1932 and the difficulties of operating the railroad in the following winter. Activity did not cease, however, for during the time when mining was suspended a small force was retained at Kennecott to protect the property and keep it in condition. This involved among other things maintenance of the tram line and repairs to the shafts, as well as care of the machinery and buildings. Mining was resumed on a somewhat reduced scale early in the summer of 1935, and because of reserves of ore stored in the mine a large amount of ore was shipped to the smelter during the summer and fall. About 175 men were employed at the mines, and additional men were required by the railroad, so that the reopening of the mines was of great local importance.

Little interest in copper developments was evident in other parts of the Chitina Valley, and both mining and prospecting were restricted to gold. Placer mining on Dan and Chititu Creeks was continued by the two larger companies on practically the same scale as in previous years and with about the usual results. There were also several smaller placer-mining operations on those streams, and at least one gold lode was under development, that of J. E. Barrett, who employed two or three men in prospecting a gold-bearing vein on Williams Peak.

BREMNER RIVER

For several years much interest has been shown in the possibilities of gold production from quartz veins in the Golconda Creek district of the upper Bremner River Valley. This interest has resulted largely from the development work of the Bremner Mining Co. and the starting of its new mill in 1935 and has led many prospectors into the district, which was formerly known better for its placer deposits.

Golconda Creek is a tributary of the North Fork of the Bremner River (fig. 4), but the best route of approach to the mining camps on that stream leads from McCarthy, on the Copper River Railroad, by the highway as far as the Nizina River and thence by trail across country to the Chakina River and thus to Golconda Creek. This route involves crossing the Chitina River and offers serious obstacles to quick and easy transportation, so that many travelers use the airplane instead.

Golconda Creek lies near the northern margin of the great mass of alternating slate and graywacke beds that forms a large part of the Chugach Mountains and extends westward beyond Cook Inlet. This great thickness of beds is characterized by its monotonous character, the dearth of fossil remains by which its age might be determined, and the fact that in all the districts where it occurs it is cut by light-colored porphyritic dikes and by quartz veins, many of which contain gold. Placer gold was discovered on Golconda Creek in 1901, only a short distance below the area where gold-bearing quartz veins are now being mined or prospected, and it seems highly probable that the gold of the creek gravel was derived from these or similar nearby veins still undiscovered or already removed by erosion.

Bremner Mining Co.—The principal mining operation on Golconda Creek in 1935 was that of the Bremner Mining Co. on its property just west of the divide between Golconda Creek and Monahan Creek, one of the larger tributaries of the Chakina River. Gold-bearing quartz veins were found at this locality many years ago, but little development work was done until the organizers of the present company, of which Lee Ramer is president, prospected the ground systematically and undertook the task of raising money for opening the mine and erecting a mill. Golconda Creek was not visited by the writer in 1935, but the facts here presented were obtained from reliable sources.

Two veins are being mined by the Bremner Mining Co. The upper one, known as the Grand Prize, is at an elevation of nearly 5,900 feet, or almost 2,000 feet above the floor of the pass between

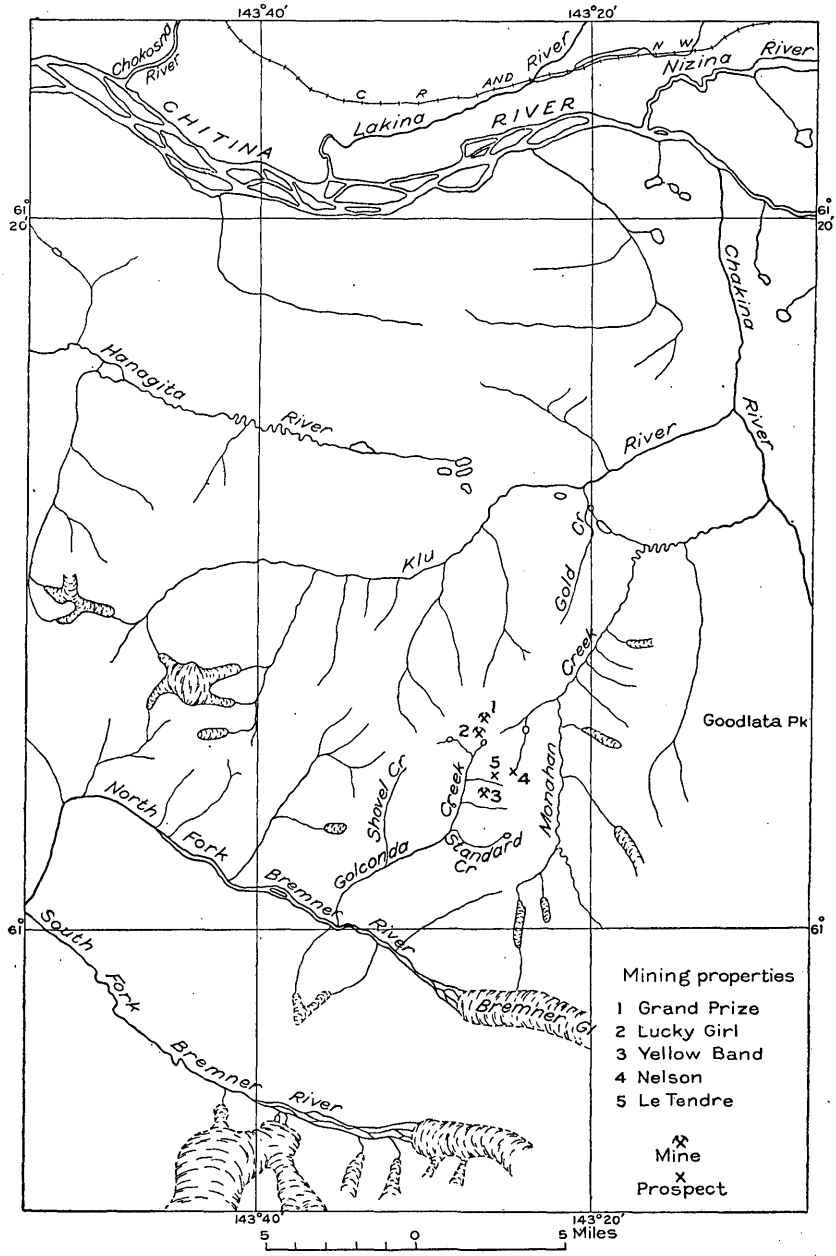

FIGURE 4.—Sketch map of Golconda Creek and vicinity.

Golconda Creek and the small tributary to Monahan Creek. South of the Grand Prize is the Lucky Girl, extending from 4,190 to 4,530 feet above sea level. Mining began on the Grand Prize, where the ore body lies on the upper or east side of a dike that cuts the slate-graywacke country rock and trends north-northwest. This vein was developed by an adit, crosscut, and drifts.

The Lucky Girl vein is a quartz vein in slate and graywacke and is being developed by two tunnels, about 90 feet apart vertically, between which most of the ore mined so far has been taken. More than 2,000 feet of drifts, crosscuts, and raises have been driven on this vein.

Much of the two seasons 1934 and 1935 was devoted to installing mine buildings and machinery, although part of the equipment was installed earlier. At present a 3,600-foot 2-bucket gravity tramway connects the lower camp with the upper workings of the Grand Prize vein. From the lower terminal a 2,500-foot tramway runs to the concentrating mill, near the mouth of the lower tunnel on the Lucky Girl vein. The mill, which was completed and put into operation in July 1935, is rated at 50 tons a day and receives its power from a 156-kilowatt hydroelectric plant on Falls Creek, a western tributary that joins Golconda Creek a short distance south of the camp. A compressor plant, rated at 610 cubic feet, was completed in 1934 and is augmented by a portable compressor with a capacity of 120 cubic feet. Two caterpillar tractors are used for hauling. This equipment is supplemented by necessary buildings, such as a blacksmith shop, which is combined with the compressor plant, an assay office, a mess house, and houses and framed tents for living quarters.

The mill made a short run on ore from the Grand Prize and Lucky Girl veins and was closed about the middle of September because of a shortage of water for the power plant. Apparently the mill and the mine are in condition for a full season's run in 1936.

Yellow Band group.—The Yellow Band group is on the east side of Golconda Creek, 1¼ miles south of the divide between Golconda and Monahan Creeks. It is the property of Joe Meloy and Jack O'Hara, oldtime prospectors in the district, and is now under lease to Asa C. Baldwin and an associate, of Seattle, who carried on exploration work in 1935 and propose to continue it in 1936.

The country rock is slate and graywacke cut by light-colored porphyritic dikes. The first work done on the claims was a tunnel driven along a quartz vein that follows a shear zone in slate and graywacke about 1,600 feet above Golconda Creek. Work on this tunnel was discontinued in 1935, and attention was directed to

another vein 800 feet higher on the mountain and 4,000 feet east of Golconda Creek. The ore, or mineralized body, is in the hanging-wall half of a light-colored porphyritic dike of diorite or quartz diorite, from 12 to 15 feet thick, which strikes N. 5° W. and dips east. This part of the dike is faulted and crushed and filled with mineralized quartz. A little calcite is present also. The dike has been traced for over 4,000 feet and appears to cut an older east-west dike, which is offset by it somewhat. Gold was panned below the dike for a distance of 500 feet but was not found above it.

Three open cuts were made along the vein in 1935, the two end ones spaced at distances of 50 feet north and 80 feet south of the middle cut. The dike shows shear planes and slickensided surfaces where the faulting took place and has a talcky feeling. Gold is seen on the iron-stained faces of the sheared blocks and is contained in the crushed, iron-stained breccia of the dike. It is distributed through the dike material and not in the slate and graywacke but plainly was introduced after the dike was formed. Some evidence appears to indicate that the intrusion may not have been completed at one injection of melted rock but was repeated.

The work done so far is entirely exploratory and is expected to be followed in 1936 by similar work, although an adit crosscut is proposed, in addition to any further work on the surface.

Other prospects.—Two other prospects in this district have received attention, although little work has been done on them. Both are on the east side of upper Golconda Creek a short distance north of the Yellow Band group.

The Nelson prospect is nearly a mile northeast of the Yellow Band group and lies at an elevation of more than 5,900 feet in the cirque at the head of Pocket Creek, a small northward-flowing stream that empties into the branch of Monahan Creek heading against Golconda Creek. It was discovered in 1935. The general geologic conditions here are similar to those already described. The local slate and graywacke of the prospect were intruded by three dikes trending north and south. The dikes are associated with five quartz veins averaging about 16 inches in width that were deposited in fracture zones in the country rock and trend northeast. Assay returns show a high gold content for some of the samples, but so far the gold content seems spotty.

The Le Tendre prospect is between the Yellow Band and Nelson prospects, on the Golconda Creek side of the ridge. Development work on this prospect has not been started, and little is known of it except that some rich specimens of gold-bearing quartz were obtained from it.

NABESNA GOLD MINE

The Nabesna Mining Corporation continued operations at its property on the mountain between Jack Creek and Jacksina Creek in the Nabesna Valley in 1935. This well-known property is a gold mine under the management of Carl F. Whitham, discoverer of the mine and president of the corporation, and the progress of its development has been described in previous publications of the United States Geological Survey.[1] The gold-bearing deposit was formed at the contact of a thick limestone formation and a large intrusive body of porphyritic diorite, a type of ore body that is characteristic of this district and is represented by others in the vicinity, notably the copper deposits of Orange Hill, near the foot of the Nabesna Glacier. The mine came into production in 1931 and has been in operation with little interruption since.

The Nabesna mine was visited by the writer in mid-September 1935 after a field season in the Tok River district, and most of the following statements are based on observations made at that time. A detailed description of the mine operations cannot be attempted, but an outline of what has previously been done is required for the sake of clearness.

The original discovery was in a little saddle on an eastward-trending spur of the high mountain on the west side of the Nabesna Valley, at a point about 1,100 feet above the present camp and mill. The first work was the sinking of a shaft at the discovery point in the saddle, followed by adits at the 100- and 250-foot levels below the saddle, from which the first ore was mined and trammed to the mill. Still later adits or tunnels were driven at the 650- and 350-foot levels. These levels all had as their objective the "Bear vein", which followed a fault zone along the contact of the limestone and diorite and was exposed in the shaft and at the surface.

The outstanding developments of the year 1935 were "holing through" a raise from the 650-foot to the 250-foot level, the installation of a cyanide plant for better treatment of the ore, improvement in the recovery of gold, and the completion of additional buildings, including a fine new kitchen and mess hall.

At the time of visit mining was in progress in stopes above the 250-foot level, but with the completion of the raise from the 650-foot to the 250-foot level mining in lower levels was planned. The raise is a double-compartment raise, providing room for a skip and an oreway and giving access to the ore body at intermediate levels. As might be expected from the type of ore deposit, the stopes are

[1] Moffit, F. H., The Suslota Pass district, upper Copper River region, Alaska: U. S. Geol. Survey Bull. 844–C, pp. 159–162, 1933. Smith, P. S., Mineral industry of Alaska in 1934: U. S. Geol. Survey Bull. 868–A, p. 21, 1936.

irregular in form and distribution. The ore is not confined to the contact of diorite and limestone; diamond drilling has shown its presence in the limestone, 100 feet from the diorite. So far as was known this is the limit of ore on the limestone side. The limiting distance in the diorite is much less, but apparently the richer ore is near the diorite. The crushed, frozen vein matter encountered in the higher workings diminished with depth, yet little change in the degree of oxidation of the ore body was noted. Pyrite carrying a little copper, galena, and zinc blende is associated with the gold in the ore, but lead sulphate, which was common in the highest level and created a milling problem, is less abundant in the lower levels.

Since the writer visited the mine in 1931 a highway has been extended from Slana to the mine, giving direct access by truck to Chitina and Valdez. The original tents have been replaced by substantial wooden buildings, all of which are thoroughly insulated for protection against the winter cold, and a permanent camp, including the necessary water for mill supply, equipped for year-round operation, has been built up.

The mine is now equipped with two wire tramways, one from the mill to the 250-foot adit level, the other, of greater capacity, to the 650-foot level. This second tram also required the construction of a second ore bunker. Water for winter operation is pumped from springs near the camp. Freezing of the pipe line is prevented by a parallel pipe line through which hot water circulates. The mill has been enlarged and insulated, and changes in the treatment of the ore have been made as experience and changes in the ore itself have shown them to be necessary. Flotation was the first important change to be made in the original treatment of the ore, and in 1935 cyanide tanks were added. The cyanide treatment has two major purposes—improvement in recovery, which is now about 90 percent, and reduction of the quantity of concentrates that must be shipped away for treatment.

The present mill has a capacity of 120 tons a day, only part of which was employed when the mine was visited. Power is furnished by a Diesel engine of 120 horsepower.

During the summer from 50 to 55 men were employed in the various mining operations, which include not only the mining and treatment of ore, but also the operation of a fleet of trucks on the highway to Chitina and Valdez.

CHISANA DISTRICT

The Chisana district, or, as it is called locally, the Shushanna district, is one of the smaller placer-mining districts in the headwater area of the Tanana River but is commonly considered in connection

with the Copper River mining operations, as the usual route of approach is from the Copper River side. This is particularly true now that the highway has been extended from a point near Gulkana to the Nabesna River. Formerly the mail and much of the supplies were brought from McCarthy by way of Skolai Pass. At present most of the supplies for the district are freighted in winter over the highway as far as the Nabesna River and thence by trail to the various camps. In summer mail and minor supplies are carried by airplane.

In 1934 much interest was aroused by certain gold-bearing quartz veins that had recently been discovered, but in 1935 attention was directed chiefly toward the gold placers. In all there were about 10 different operations, employing approximately 20 persons, which indicates that part of the operations were 1-man projects, as the 4 or 5 larger camps employed more than 2. The largest camp was that of N. P. Nelson, who has a lease on the James property on Bonanza Creek. Six men were at work in this camp. The next largest was that of Earl Hirst, where four men were employed. In most respects the weather conditions were favorable, and the season was counted a particularly successful one.

CHISTOCHINA DISTRICT

The Chistochina district, the first large producer of placer gold in the Copper River Valley, has been in continuous production since 1899 and has yielded more than two and two-thirds million dollars in gold. In the early days it supported a large number of miners, but in recent years, since the more easily mined gold has become exhausted, it has produced at a lower rate and employs fewer men.

In 1935 there were 5 placer-mining operations in the district, employing 28 men in all. The largest operation was that of Arne Sundt on Slate Creek, where 13 men were at work. Next to that was the Cleveland project, employing eight men, on the Middle Fork of the Chistochina River.

Most of the placer ground that has yielded gold in this district is above timber line and has been mined under the disadvantages of a highly variable water supply and a short working season. Furthermore, the narrow valleys, such as that of Slate Creek, are subject to much trouble caused by flood waters and the movement of old tailings. Practically the whole season's work on Slate Creek in 1934 was lost from these causes, and much of the activity of 1935 was devoted to regaining the ground and equipment.

On the Middle Fork of the Chistochina a large part of the last two seasons was employed in prospecting the ground preparatory to installing mining machinery and beginning the exploitation of the

gold-bearing gravel deposits on a more extensive scale than has been reached in the past.

The Chistochina district appears to have produced less than usual in 1935, as much of the time and labor was devoted to what is commonly called dead work, the benefits of which, however, should be reflected in the production of the next few years.

AHTELL CREEK

A small placer-mining operation in the Ahtell Creek Valley was reported [2] as one of the new mining developments of the upper Copper River Valley in 1934. This operation stimulated local interest in the mining possibilities of the Ahtell Creek Valley, so that additional prospecting was done in the winter of 1934–35, and many placer claims and a few lode claims were staked.

Work on the original placer was renewed with improved equipment and a slightly increased working force when the placer-mining season opened in 1935. The gravel being mined occurs on Grubstake Creek, a small eastern tributary that comes into Ahtell Creek nearly 5½ miles above its mouth near the Slana roadhouse. The presence of gold in paying quantity was demonstrated by Charles Swanson and M. G. Olson in 1934. Additional labor and capital for developing the property were provided by Gus F. Johnson and Lawrence DeWitt, and the partnership now includes the four men named.

The mining property includes a group of placer and lode claims on Grubstake Creek, Ahtell Creek, and Quartz Creek, a small stream north of Grubstake Creek. The streams head in the high mountains between the Ahtell Creek Valley and the old Eagle Trail and have only a small drainage area, so that one of the problems of mining at present is that of getting sufficient water supply.

The country rock of these small valleys is almost wholly igneous and includes dark heavy fine-grained rocks that may be in part volcanic and coarse-grained dark dioritic intrusives. A small proportion of silicified sedimentary rock that was probably argillite or slate originally is associated with the fine-grained volcanic rocks. Faulting is common, and in places much pyrite, disseminated through the rocks, is present.

The unconsolidated gold-bearing deposit is made up of angular fragments of the adjacent country rock and a large proportion of foreign material brought in by glacial ice. Much of the foreign material originated in the upper Ahtell Creek Valley, but some possibly came from points to the south, for the glacial history of this vicinity is complicated.

[2] Moffit, F. H., Upper Copper and Tanana Rivers, Alaska: U. S. Geol. Survey Bull. 868–C, 1936.

The mining operations of 1934 were carried on at the forks of Grubstake Creek, about 1¼ miles from Ahtell Creek. Mining in 1935 was started about 700 feet below the forks and was carried upstream along the creek bed for 260 feet. The bedrock of the cut is diorite, which is crushed and sheared along a fault zone trending N. 75° W. It is probable that the course of the creek valley was determined by this fault zone. Near bedrock the loose deposit contains many boulders of greenstone. Slightly higher rounded boulders and cobbles of diorite or granite appear. The upper part of the deposit is made up largely of angular fragments from the hills nearby. The gold in this part of the creek showed a much greater tendency to be concentrated into a channel or pay streak than that near the forks. It also shows more wear and differs slightly in color. It is associated with much silver and a little copper. Magnetite is abundant.

The working season of 1935 was shortened because of a light snowfall the previous winter and the consequent failure of water for sluicing in the summer, but the yield of gold was sufficient to pay for the cost of operations and was regarded as a satisfactory return on a new project. The later part of the summer was devoted to prospecting the lower stretches of the creek, and in continuation of this work of prospecting it was planned to do drifting in the deeper gravel during the coming winter in order to find out definitely the course of the old bedrock channel at the cut. A possible additional source of gold, discovered during the summer, consists of the fan-shaped gravel deposits beginning where the creek flows out from its narrow canyon into the open valley of Ahtell Creek. These fan deposits carry gold, as was shown by panning, but have not yet been prospected to find out whether they carry it in paying amount.

The early part of the year, before the break-up, was devoted to such dead work as was necessary before sluicing could begin. These preliminary operations included work on the trail connecting the camp with the highway, freighting supplies, building sluice boxes, and establishing a working camp at the cut, all of which was facilitated by the use of a caterpillar tractor that was brought into the valley before the snow had gone.

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