

MINING IN THE JUNEAU REGION.

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The Juneau gold belt comprises a mainland strip running from Windham Bay northwestward to Lynn Canal at Berners Bay. It contains some mines and prospects south of Juneau, those in the vicinity of Juneau, including Douglas Island, those in the Eagle River and Yankee Basin region, and those in the vicinity of Berners Bay. The geology and mineral resources of this region have been described in full by Spencer¹ and Knopf,² but as noteworthy developments have been made in this belt since their investigations were completed, the writer was detailed to visit Juneau and Berners Bay in 1914. Only about ten days was devoted to the work, and it was impossible to visit any except the larger mines and a few of the smaller properties that lay on the route of travel. It is regretted that opportunity was not given to visit the prospects at Taku Harbor and Limestone Inlet, south of Juneau, where some developments are reported. This report is therefore not to be considered an exhaustive statement of the mining developments near Juneau but will serve to record some of the principal features.

The developments near Juneau, because of their magnitude, overshadow the operations in other parts of the gold belt, yet some of these, too, are of importance. The active small-scale mining and milling operations that were conducted a few years ago in the Eagle River and Berners Bay districts have recently experienced a decided falling off, due in part to a failure of some of the properties to meet expectations and in part to consolidations preliminary to operations on a larger scale.

Gold lode mining in this field, already developed on a scale that ranks the Juneau district with the foremost in the industry, is rapidly assuming still greater proportions. The growth is a natural response to a fuller knowledge of the size and character of the ore bodies and the economic possibilities of large-scale operations.

Climatic conditions are favorable to continuous operation. The large size of some of the ore bodies, the physical character of the ores,

¹ Spencer, A. C., The Juneau gold belt, Alaska: U. S. Geol. Survey Bull. 287, 1906.

² Knopf, Adolph, Geology of the Berners Bay region, Alaska: U. S. Geol. Survey Bu l. 446, 1911; The Eagle River region, southeastern Alaska: U. S. Geol. Survey Bull. 502, 1912.

and a strong topographic relief favor the production of large quantities of ore with a minimum of labor and power. Water power, marine transportation, and a local supply of timber and lumber reduce general expenses to a low point. The extraordinarily low costs of operation make available low-grade ores that under conditions only slightly different would be valueless.

The chief productive mining activity in the Juneau district in 1914 was at the four mines of the Treadwell group, on Douglas Island, where lode mining has been done since 1882 and large-scale operations have been in progress since 1887. The most important development work in progress in 1914 was that of the Alaska-Gastineau, Alaska-Juneau, and Alaska-Ebner mining companies, operating the mines of Silver Bow Basin and Gold Creek, on the mainland a few miles east of Juneau. Prospecting work on a smaller scale was being done at the Salmon Creek mine, near the mouth of Salmon Creek, and at the Alaska Treasure mine, on Douglas Island, about 4 miles southwest of the Treadwell.

The milling operations in the vicinity of Juneau in 1914 were equivalent to the constant operation of about 1,000 stamps. Mining and milling operations combined gave employment to an aggregate of about 2,250 men.

The Treadwell group of mines consists of the Treadwell, Seven Hundred Foot, Mexican, and Ready Bullion mines, on the east side of Douglas Island near the shore of Gastineau Channel, along the strike of a single lead. In the first three mines the lode has been developed continuously for about 3,500 feet. Between the Mexican and Ready Bullion mines is an undeveloped interval of about 2,500 feet.

The ore deposits consist of mineralized dikes of albite diorite intrusive in black slates and belonging to a series of intrusive bodies that appear at intervals along a zone approximately 3,000 feet wide and 3 miles long.¹ The mineralized dikes are cut by reticulating veinlets of quartz and calcite. Both dikes and veinlets may carry metallic sulphides and gold. Although a high gold content may be found in picked specimens, the commercial value of the deposits lies in the wide dissemination of mineralization that renders great bodies of dike material available as ore.

The claims of the Treadwell group were located in 1881. The first mining activity was the recovery of gold from the residual placers over the lode outcrops, and it is reported that \$60,000 in all was produced from this source from 1881 to 1883. The first lode development was at the Treadwell. In 1883 a 5-stamp mill that had been erected the previous year was in operation, and several bullion shipments were made. Development continued on a small scale

¹ Spencer, A. C., *The Juneau gold belt, Alaska*: U. S. Geol. Survey Bull. 287, pp. 95-97, 1906.

until 1887, when a 120-stamp mill was erected. The next year 120 stamps were added to this mill. Between 1893 and 1896 the Mexican, Seven Hundred Foot, and Ready Bullion mines were equipped with mills and a new 300-stamp mill was installed at the Treadwell. These mills aggregated 880 stamps. In 1911, 20 stamps were added to the Seven Hundred Foot mill, bringing the aggregate up to the present total of 900 stamps.

During 1914 all the stamps of the Treadwell group were in practically continuous operation. During this period 1,602,156 tons of ore was crushed, yielding a total output of gold valued at \$3,743,944.

Of the total yield, \$2,004,527 was recovered as free gold and \$1,739,417 was recovered from the sulphide concentrates. The average yield per ton of ore milled was \$2.34 and the average operating costs were \$1.20, giving a net revenue of \$1.14 a ton.

A total of 22,814 feet of development work was done in the four mines, 10,036 feet in ore and 12,778 feet in waste. This work was directed chiefly toward the development of the ore bodies on the lower levels, especially the 2,100-foot level in the Treadwell, the 1,460-foot level in the Mexican, and the 1,570 to 2,200 foot levels in the Ready Bullion and Seven Hundred Foot mines.

The subjoined table shows the value of the gold produced at the Treadwell group of mines since operations were begun:

Value of gold production of Treadwell group of mines, Douglas Island, Alaska.

1882-1884.....	\$10,902	1895.....	\$852,585	1906.....	\$3,085,324
1885.....	280,479	1896.....	1,028,691	1907.....	2,520,000
1886.....	366,180	1897.....	1,011,693	1908.....	3,124,047
1887.....	476,934	1898.....	1,010,235	1909.....	3,534,871
1888.....	429,889	1899.....	1,611,857	1910.....	3,737,498
1889.....	652,490	1900.....	2,081,840	1911.....	4,983,474
1890.....	160,681	1901.....	1,665,373	1912.....	4,080,300
1891.....	769,765	1902.....	2,223,373	1913.....	3,904,066
1892.....	707,017	1903.....	2,667,914	1914.....	3,743,945
1893.....	694,658	1904.....	2,845,994		
1894.....	909,990	1905.....	3,146,715		
					58,318,780

The Alaska Treasure Consolidated Mines property is situated on Nevada Creek, Douglas Island, about a mile from the shore of Gastineau Channel and about 4 miles southwest of the Treadwell. The country rock at this locality is a schistose greenstone which shows considerable alteration and mineralization over an area 1 mile wide and 1½ miles long in the direction of the strike of the principal structure. Within the mineralized area is a zone averaging about 90 feet in width and traceable for 2,000 feet on the surface, said to consist largely of commercial ores. A total of 3,650 feet of development work has been done on the property, of which 365 feet is in ore. The ore body is tapped by an adit 2,580 feet in length, 206 feet above

sea level and about 600 feet below the highest outcrop. Part of the development work in ore is credited to operations during 1914, when three men were employed in driving prospecting tunnels.

Prospecting work has been done recently on the Jersey City group of claims and adjoining properties, half a mile west of the Treadwell. Most of it has been surface open-cut work. The bedrock exposed in the cuts is chiefly schistose greenstone interbedded with thin bands of slate. Both greenstone and slate carry more or less of metallic sulphides, which are locally abundant. A shaft and crosscut have been driven on one of the richer spots of sulphide mineralization in a band of slate on the Jersey City property, and encouraging assays are said to have been obtained. The geology of the deposit is closely related to that of the Alaska Treasure property, which is quite different from that of the Treadwell. Should the existence of commercial deposits be demonstrated here, it would greatly enlarge the known area of possible economic development on Douglas Island.

The mining properties of Silver Bow Basin and Gold Creek, on the mainland near Juneau, have entered upon a new era of development under the activities of the Alaska-Gastineau, Alaska-Juneau, and Alaska-Ebner gold-mining companies. Although the deposits held by these companies have been known to exist since practically the first activities in the Juneau region, they had experienced only desultory development on a moderate scale until recently. With the completion of the enormous projects now under way the Juneau district will be placed in the front rank of the gold lode mining centers of the world.

The lode systems on which these properties are situated extend northwestward from Sheep Creek, across Silver Bow Basin and beyond Gold Creek. According to Spencer¹ the principal lodes are near the footwall of a broad band of slates that is bordered on the west by greenstones and on the east by schists. The slaty structure has a general northwesterly strike and dips strongly to the northeast. The slates are intruded by diorite dikes that vary in size and abundance from place to place. The dikes are evidently controlled in strike and dip by the structure of the slates.

The lodes are in general of the stringer-lead type, consisting of zones of the country rock cut by numerous irregular, closely spaced veins of quartz, the whole being more or less thoroughly impregnated with metallic sulphides and small amounts of gold. Considered in fine detail there is considerable variation in the gold tenor of different parts of the same lodes, but the richer bodies are not sufficiently large or persistent to permit their being selectively mined. The mineralization is so generally disseminated in the lodes that the average tenor

¹ Spencer, A. C., *op. cit.*, pp. 23-50.

of the high and low grade materials together is reported to be sufficiently high to render great bodies available as commercial ore. Some of the ore bodies are continuous for more than 100 feet in width and thousands of feet in length and offer a large quantity of ore reaching values of several dollars a ton.

The Alaska Gastineau Gold Mining Co. is developing the properties of the Alaska Gold Mines Co., which comprise mineral lands in the Sheep and Gold creek basins, a mill site at the mouth of Sheep Creek, and a reservoir and water-power site on Salmon Creek. The initial plan of development, as outlined in 1912, when the properties were acquired, contemplated the development of the Perseverance mine to a daily capacity of 6,000 tons, the construction of a mill of like capacity at the mouth of Sheep Creek, and the installation of an 8,000-horsepower hydroelectric plant on Salmon Creek, together with the necessary subsidiary improvements. These plans were being carried rapidly toward completion in 1914. During the year mine development reached the required point, the water-power project was practically completed, and construction on the first 1,500-ton section of the mill was being pushed, with the expectation that it would be ready to operate by the end of the year. Mine development work, not including diamond drilling, has progressed at an average monthly rate of about 3,500 feet. The larger part of this work has been directed to opening the mine preparatory to stoping on the No. 10 and higher levels. On No. 13 level the Sheep Creek adit, 10,000 feet in length, was driven to serve as an ore outlet, completing the transit connection between No. 1 shaft and the mill. All working tunnels as driven were permanently equipped with tracks, electric lights, and telephone lines.

The Salmon Creek water-power project involved the construction of a dam at the lower end of the upper basin and the installation of two hydroelectric generating plants, one a mile below the dam and the other on the shore of Gastineau Channel. The dam was completed in August, 1914. It is of concrete, 700 feet long and 165 feet high, and furnishes a storage reservoir having a capacity of 19,000 acre-feet. When filled the water surface is 1,165 feet above sea level. The two generating plants are similar, each being equipped with two 1,500-kilowatt generating units operating independently. The upper plant operates under 600-foot and the lower under 500-foot heads. The upper plant was completed in 1913 and the lower was under construction and expected to be completed in 1914. The two plants are planned to develop 8,000 horsepower. An auxiliary power plant with a capacity of 2,000 horsepower is contemplated for construction on Granite Creek, to furnish extra power during the summer, so that a larger storage of flood waters may be effected in the Salmon Creek reservoir for winter use.

The milling plant under construction is to consist of four units, each with a daily capacity of 1,500 tons. The first unit was well along toward completion in September, 1914, and was expected to be ready for operation before the end of the year. The ore is to be drawn from the chutes into 10-ton cars and hauled in trains of 30 cars to the coarse crushing plant situated on the hillside above the main concentrating plant. The coarse crushed ore is to be dumped into underground storage bins and thence drawn on conveyors to the fine-crushing department. This is 150 feet above the lower floor of the mill, which is 200 feet above sea level, permitting the use of a full system of gravity conveyors in the mill and giving adequate room for the disposal of tailings. The old 30-stamp mill on Sheep Creek has been repaired and is in use as an experimental and ore-testing plant.

Accommodations have been built at the mine and at the mill for the full force of men required to operate at a daily capacity of 6,000 tons. An average of 775 men were employed in all departments during the first eight months of 1914.

The property operated by the Alaska-Juneau Gold Mining Co. is in Silver Bow Basin, on upper Gold Creek, and adjoins those of the Alaska-Gastineau Mines Co. on the north. The extensive development work now in progress on this property was begun in August, 1912. The chief work done so far has consisted of mine development, surface improvements, and the establishment of transit connections between the mine and the mill site on Gastineau Channel just south of Juneau. The mine and mill are connected by a 10,000-foot tramway and a 6,538-foot adit. The adit and a 750-foot upraise to the surface at the mine were the principal achievements in 1913. During 1914 an average of 200 men were employed. The chief activity was directed to running crosscuts and opening out preparatory to stoping. Milling operations were also under way, 50 stamps being used to test ores and methods of treatment. The 50 stamps in operation are a part of the first 150-stamp unit of the permanent mill. The installation of four such units is proposed when mine development has reached a point to justify this equipment.

Power for these operations is obtained from the Treadwell plant. The larger operations contemplated for the future will be supplied from the same source, and it is planned to increase the capacity of the Treadwell power plants to meet this requirement.

The company suggests that the present outlook as regards reserves justifies the expectation that within a few years 12,000 tons of ore will be handled daily by its plants.

The Alaska-Ebner holdings adjoin those of the Alaska-Juneau on the northwest and are divided into two almost equal parts by Gold Creek. This property comprises some of the first quartz loca-

tions in the Juneau region and was one of the first to be developed. A 15-stamp mill had been in operation for several years preceding 1903, and the value of the production to the end of that year was estimated at \$600,000. The total underground development at that time comprised about 1,500 feet of tunneling. Development of the property continued on a small scale until August, 1913, when it was bonded by the United States Smelting & Refining Co. This company has undertaken a comprehensive plan of prospecting and development. An average of about 100 men were employed exclusively in the mine. A 3,500-foot adit, undercutting the old Ebner workings by 430 feet, driven from the Last Chance basin, was completed during the summer of 1914. Further development of the ore body by crosscuts was being pushed during the later part of the year. The present operations are considered to be strictly in the nature of prospecting, and the planning and installation of a reduction plant other than the old Ebner mill awaits future showings of the mine.

The Salmon Creek Gold Mining Co. is said to control 25 claims in the vicinity of the mouth of Salmon Creek. The deposits receiving attention consist of four or five separate veins 6 to 20 feet thick. A total of 1,150 feet of development work has been done on the property, 300 feet of it recently by the present operators. A 20-ton tubular mill was in operation and a 15-stamp mill was under construction at the mouth of Salmon Creek. Water power for the plant is developed on Salmon Creek. The work of the company is regarded strictly as prospecting, and its efforts will be chiefly toward mine development until the construction of a larger reduction plant seems justified by the mine showings.

Most of the work in the Eagle River region during 1914 was prospecting. At the Eagle River mine an adit 1,800 feet long and 700 feet below the old workings was driven along a zone of slate in the graywacke series in an attempt to pick up the lode that was lost when the mine was closed several years ago. Several chimneys of ore are said to have been encountered by the adit, one of which is considered an extension of the lost lodes. Active mining and milling was resumed on a small scale September 1 and was continued the rest of the year.

In the Berners Bay region the Kensington and Jualin mines represented the important activities in 1914. At the Kensington mine a 4,700-foot adit was driven at an elevation of 2,018 feet to undercut the Eureka, Kensington, and Johnson lodes. Further work in cross-cutting and opening out for stopes is in progress. About 50 men were employed. A 500-ton mill is contemplated for early construction to reduce the ores from these lodes. The project only awaits

financial arrangements, as sufficient ore is said to be blocked out to justify this equipment.

The Jualin mine was being developed on a very substantial scale up to the beginning of the European war, when operations were practically discontinued. The effects of the war were especially felt by the Jualin mine because it was being developed by Belgian capitalists. In addition to the 20 claims already held by the company, the Greek Boy property had been bonded. Since work was resumed under the present management, in July, 1913, an average of about 200 men have been employed. The old Jualin shaft was sunk from 160 to 360 feet, crosscuts and a station were opened on the 300-foot level, and 2,000 feet of a projected 7,500-foot adit was driven. At present 400 horsepower is developed by the company's hydroelectric plant on Johnson Creek. Machinery to develop 600 horsepower additional by the hydroelectric plant and 600 horsepower by Diesel engine, had been ordered and was in transit when operations were reduced. About 20 men are still employed in keeping the mine in condition and in crosscutting to a new ore body discovered by diamond drilling.

The following additional data are not based on the writer's own observations, but were gleaned from what are believed to be reliable sources. The Penn-Alaska Mining Co. is developing some quartz claims near Taku Inlet, south of Juneau. Some stripping was done during the year and a small power plant installed. Some work was done on the Boston claim, at the mouth of Gold Creek, near Juneau. Assessment work was continued on the Peterson group of claims,¹ near Pearl Harbor. Some developments are also reported on the Mitchell and McPherson, Canyon Creek, and Yankee Basin prospects. There are also many other properties in the district on which work was done of equal importance to that recorded, but there is no information about them.²

¹ Knopf, Adolph, The Eagle River region, southeastern Alaska: U. S. Geol. Survey Bull. 502, pp. 53-54, 1912.

² Attempt is made by the Geological Survey to obtain a full list of mining properties in Alaska on which work is in progress, whether productive or not. The list is, however, far from being complete, and operators will confer a favor by sending each year a brief statement of the work accomplished, even if they do not receive the schedules of production. Information should be sent to division of Alaskan mineral resources, U. S. Geological Survey, Washington, D. C.