

GOLD MINING IN THE WILLOW CREEK DISTRICT.

By STEPHEN R. CAPPS.

INTRODUCTION.

Mining in the Willow Creek district was continued in 1915 on about the same scale as in the preceding year. The output was derived mainly from the three mines that have been in active operation for several years, although a small single stamp mill was erected on one claim that has heretofore not been among the producers. As a result of the beginning of construction on the new Government railroad, which will pass along the edge of this district, prospecting was active, and plans are under way for active mining on several properties. A report on the Willow Creek district, describing the developments up to the fall of 1913, has recently been published.¹ In September, 1915, the writer spent about a week in the Willow Creek district, and visited all the working mines and many of the more promising prospects. The following notes on the various properties are not intended to be complete in themselves, but to supplement the more complete report by carrying the account of mining developments up to the fall of 1915.

In the following table the figures for 1914 show a larger apparent than actual increase in the production of the mines over 1913, for in 1914 a considerable proportion of the output was obtained by cyanidation of tailings that had been accumulated during milling in earlier years. The output in 1915 came in large part from ores mined during that year.

Gold and silver produced at lode mines in Willow Creek district, 1908-1915.

Year.	Gold.		Silver. ^a	
	Quantity (ounces).	Value.	Quantity (ounces).	Commer- cial value.
1908.....	87.08	\$1,800	6.86	\$3.64
1909.....	1,015.87	21,000	80.25	41.73
1910.....	1,320.15	27,290	104.29	56.31
1911.....	2,505.82	51,800	197.95	109.91
1912.....	4,673.02	96,600	369.07	226.97
1913.....	4,883.94	100,960	385.83	233.42
1914.....	14,376.28	297,184	1,330.00	735.00
1915.....	11,961.55	247,267	811.00	421.00
	40,823.71	843,901	3,285.27	1,827.98

^a The silver content recovered from the gold bullion is estimated.

¹ Capps, S. R., The Willow Creek district, Alaska: U. S. Geol. Survey Bull. 607, 1915. See also abstract in U. S. Geol. Survey Bull. 592, pp. 255-272, 1914.

ALASKA FREE GOLD MINING CO.

The Alaska Free Gold Mining Co. operated throughout the open season and employed on an average about 50 men. The mill was run in three shifts of eight hours each, as was also a part of the mine. In other parts of the mine two shifts only were worked. The capacity of the mill has been greatly increased by the installation, in 1914, of an additional Lane mill of 40 tons capacity and a 40-ton cyanide plant and by the elevation of the flume to give a head of 54 feet at the Pelton wheel, instead of the 35-foot head formerly used. During the season of 1915 both mills were in operation only a part of the time, there being either not enough water available to operate both or not enough ore mined to keep both working to their capacity. All the tailings from the mill are now treated by cyanidation. It is reported that even with the greater depth below the surface from which the ore is now taken the tenor of the tailings after amalgamation remains fairly constant and is much the same for tailings from rich and poor ores alike. This fact indicates that even at considerable depth the gold in the veins is likely to be present predominantly in the form of free gold, and the ore from even deeper levels will probably be free milling. Three aerial tramways are in operation—two extending to openings on the Smuggler-Union vein and one to the Eldorado vein.

Since this mine was last visited, in 1913, much underground work has been done on the upper of the two main veins on the property. On this vein, referred to previously as the Skyscraper vein but now known as the Smuggler-Union vein, the main tunnel has been driven along the vein to its outcrop on the southeast side of the mountain, a total distance of 380 feet, and from it stopes and winzes have been made. Two additional tunnels on the same vein have been driven. The upper one, about 100 feet below the main tunnel, is over 250 feet long, and the lower one, 175 feet below the main tunnel, is 175 feet long. Both the vein and the ore shoots have been shown to be continuous between the several levels. The vein, so called, in reality consists of two nearly parallel veins, of which the upper is locally referred to as the hanging-wall vein and the lower as the footwall vein. These veins are in most places separated from each other by several feet of diorite, though they are connected by numerous quartz stringers. Locally they diverge somewhat or approach rather closely, but in general each of the two maintains its own individuality.

On the Eldorado vein, which is apparently the southward continuation of the Smuggler-Union vein, an incline now 40 feet long has been driven, and from it an aerial tram leads to the mill. It is expected that considerable ore will be supplied to the mill from this claim.

It is proposed to install a tramway from the mill to the Rosenthal property, on the high ridge that borders the Fishhook Creek basin on the northeast, in the spring of 1916, in order to provide an additional supply of ore to the mill.

GOLD BULLION MINING CO.

The Gold Bullion mine was operated in 1915 throughout the open season, beginning June 3. During that period the stamps were dropping for 24 hours a day, and two shifts were worked at the mines. About 60 men were employed. No increases were made in the mill capacity, but a 45-ton cyanide plant, installed in 1914, was operated, all the tailings from the mill and a quantity of stored tailings being treated by cyanidation. As the length of the milling season is controlled mainly by the period of adequate run-off in Craigie Creek, from which water for power is taken, a dam 13 feet high was built across the basin of that stream, thus forming a storage reservoir of $13\frac{1}{2}$ acres. Two smaller dams above give additional storage capacity, and the water thus impounded was expected to be sufficient to keep the mill in operation for a season several weeks longer than heretofore.

A large amount of underground work has been done since the property was last visited in 1913. In the fall of 1915 the No. 2 tunnel had over 930 linear feet of underground workings, not including considerable stopes. From this tunnel about half the ore mined in 1915 was taken.

The new Gold Dust tunnel was 360 feet long in 1915, and the nearby No. 1 Gold Dust tunnel 200 feet long, and a large area of the vein between them was stopeed out, furnishing about half the season's supply of ore. The No. 3 Gold Dust tunnel had been driven to a length of 139 feet, the No. 4 Gold Dust tunnel about 45 feet, and the No. 2 Gold Dust, which contains a large stope, 65 feet.

The result of this underground development has been to keep the mill supplied to capacity with ore during the 1915 season, and to block out considerable ore bodies for future mining. The Gold Dust No. 3 tunnel follows a thick, strong vein said to be exceptionally high in gold.

INDEPENDENCE GOLD MINES CO.

The property of the Alaska Gold Quartz Mining Co. was taken over by the Independence Gold Mines Co. in 1914. Since the transfer no important changes have been made in the surface equipment, although plans have been made for the installation of a new crushing mill. In 1915 the mill was put into operation on May 19 and, except for some short stops for repairs, was run continuously until the cold weather cut off the water supply. About 18 men were em-

ployed in two shifts. Although sufficient ore to keep the mill running was mined, the developments of the year were directed primarily to blocking out ore, in order to determine whether or not the installation of a new mill would be justified. The main tunnel, on the Granite Mountain vein, was driven to a total length of 540 feet along the vein, and at a point 400 feet from the portal a winze follows the vein down the dip for 70 feet. These additional developments show little change in character or gold tenor of the vein with increase in depth, although the breast of the main tunnel is now estimated to be 300 feet below the surface. The veins show the same tendency to pinch and swell that they display nearer the surface; the ore shoots continue, and the ore is apparently as free milling as that taken from shallower parts of the vein. The driving of a long tunnel, to tap the vein at a lower level, is among the plans now being considered.

The upper or Independence vein was opened in 1914 and 1915 by one tunnel 105 feet long and another 15 feet long, and 240 feet of stripping was done on the vein outcrop. The vein is in places 3 feet thick, but in general has not been found to contain as much gold as the Granite Mountain vein.

MABEL MINE.

At the Mabel mine development work has been continued. The adit tunnel, begun in 1913, was driven about 75 feet to the vein, and short drifts were run along the vein in both directions. In these workings the vein pinches and swells within short distances, and the quartz ranges from a mere stringer to a band 1 foot wide. On the surface the vein has been exposed by stripping and open cuts almost continuously for a distance of about 2,000 feet and shows a persistent quartz vein from a few inches to about 2 feet in thickness. The assay values are said to be encouraging. An aerial tramway to extend from the vein croppings to the mill site is on the ground, and it was said that a 20-ton mill was to be installed during the winter of 1915-16, to be run by water taken from Reed Creek.

ROSENTHAL CLAIMS.

The Rosenthal claims, on the ridge between the basins of Fishhook Creek and Little Susitna River, promise to become productive soon. Some additional underground work has been done since 1913, and the extent of the ore body is now fairly well known, as the flat-lying vein crops out around the mountain top and tunnels pierce almost through the center. The ore broken in driving the tunnels has been banked at the portal and in the drifts, and a considerable

amount is ready to be trammed to the mill. Control of the property has recently been acquired by the Alaska Free Gold Mining Co., and it is planned to erect an aerial tramway from this ground to the mill in the valley of Fishhook Creek.

SHOUGH CLAIMS.

Prospecting has been vigorously carried on during 1914-15 on the claims of the Oregon group. A winding tunnel with a total length of 150 feet has now been driven along an irregular quartz vein. The quartz is said to contain only moderate quantities of gold, but the main objective of the tunnel is to crosscut a fault zone that may be traced along the surface for some distance. It is estimated by the owner that a distance of 50 to 70 feet still remains between the breast of the tunnel and this fault zone. It is said that at a point about three-eighths of a mile southwest of the tunnel the fault zone was ground-sluiced off to a depth at which the clayey gouge began to give place to solid pieces of quartz. The whole zone, to a width of 60 feet, is said to carry several dollars a ton in gold.

JAP CLAIMS.

Prospecting has been done for some years on ground locally known as the Jap claims, lying on the northwest side of upper Willow Creek, opposite the Gold Bullion mine. No one was resident on this property at the time the district was visited, in September, 1915, but it is reported that a small 1-stamp mill, with a daily capacity of 200 to 300 pounds of ore, was installed and in operation part of the 1915 season, milling ore of encouraging gold tenor.

MAMMOTH CLAIMS.

Some additional underground development work has been done on the Mammoth claims, in the upper Willow Creek basin, since that property was visited in 1913. It is reported that a crosscut 100 feet from the portal of the main tunnel has been driven an additional distance of 30 feet, and from it a 40-foot raise has been made. About 30 feet of miscellaneous raises and drifts were also opened.

McCoy CLAIMS.

The McCoy claims, on the east slope of the mountain west of lower Reed Creek, were further prospected in 1914 and 1915. The work done was confined for the most part to stripping the surface croppings of the vein. It is said that the thickest part of this vein, as now uncovered, shows 9 to 10 feet of quartz, some of which contains much gold. Very little underground work has yet been done on this property.

OTHER PROSPECTS.

Brief reports on the developments during 1914-15 at a number of properties not visited in 1915 were obtained from a number of sources and are given below.

On the ground of the Matanuska Gold Mining Co. only assessment work was done.

The Gold Quartz claims, on the Archangel Creek side of the point lying between that stream and Reed Creek, have been prospected by two tunnels 20 and 30 feet long. The vein is said to reach a maximum thickness of 2 feet and to contain considerable gold.

A short tunnel is said to have been driven on the Hatcher claims, in the Archangel Creek basin.

Some further underground work is reported on the claims known as the Arch prospect, between lower Sidney and Archangel creeks. Four claims called the Archangel group, lying on the mountain east of lower Reed Creek, have been prospected by two tunnels, each about 35 feet long, one on the Reed Creek side and one on the opposite side of the same ridge. It is said that the vein shows a maximum thickness of 38 inches of gold-bearing quartz.

GOLD PLACERS.

The only placer-mining operations of note within this district in 1915 were those on lower Grubstake Creek and on adjoining portions of Willow Creek. These operations were directed to prospecting the gravel benches, and hydraulic methods were available, as the hydraulic plant formerly used for mining on this creek is still in working condition. Work was carried on for only a part of the season.