Silver Mining and Milling at Talache, Idaho

A Narrow Silver Vein in the Coeur d'Alenes Which Is Being Successfully Worked—Modern Flotation Plant Built to Treat 150 to 200 Tons per Day—Pittman Act Influenced Design and Operation of Equipment

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ONE MIGHT HAVE TO LOOK long and hard at a map of Idaho to find the location of Talache. A few years ago the name of this village in Bonner County would have passed unnoticed, but the development of an extremely interesting silver deposit, with its attendant activity and settlement, has added

Lake Pend Oreille looking northeast

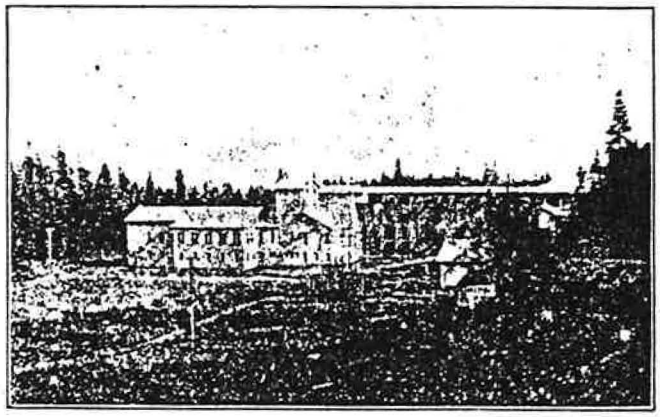
greatly to Talache's prominence. In fact, the visitor traveling by rail from Spokane sixty-five miles to Sagel —a typical Western box-car station near Talache—will notice the new ore bins situated alongside the railroad tracks and can readily sense the presence of a mine. It is six and one-half miles from Sagel to Talache over the Talache Mines Co.'s new road, but the camp can hardly be termed isolated. The village of Sandpoint is twelve miles north and Spokane two and one-half hours, traveling south. Its proximity to larger communities and beautiful location combine to make Talache an ideally placed small mining center.

The mine is situated about three-quarters of a mile from beautiful Lake Pend Oreille, in a heavily wooded area. The panorama of mountains and lakes unfolded from various points near the mine is magnificent. The cleanliness and newness of everything about Talache are in keeping with its surroundings. I am informed that Talache is the Mexican name for a crude form of pick which was extensively used in earlier days for mining purposes. A certain tribe of Mexican Indians was almost entirely engaged in the mining of silver ores, and finally came to be known as the Talache tribe, from their universal use of the crude pick, *talache*.

In the fall of 1916 an option was taken by Major H. H. Armstead on the Little Joe, Keystone, and other groups of claims. In February, 1917, the properties were purchased by Major Armstead and associates, and title passed to the Armstead Mines, Inc. In the spring of 1922 Major Armstead sold his interest in the mine, and the name was changed to Talache Mines Incorporated. A long tunnel was driven to cut the main silver vein on the property, the "Little Joe," and at 3,500 ft. February, 1918. The tunnel is the main entrance and corresponds to the 1,200 level of the mine. At 4,000 ft. it connects directly with an inclined raise driven at 60 deg. to the horizontal for a distance upward of 916 ft. The 1,200 level gives a depth of about 1,750 ft. on the vein, which strikes north 10 deg. east and has a dip of 30 to 60 deg. east. As the vein and inclined raise have different dips they intersect at the 700 level—levels being 100 ft. apart vertically. Drifts, crosscuts, and raises have developed the vein on its various levels.

The Talache mine at present draws its entire output from the Little Joe vein, one of the series of parallel veins on the property of the company. The vein is narrow but persistent, and roughly parallels the bedding of the metamorphosed country rock or part of the Belt series in which it is located. A slight difference, amounting to perhaps 10 deg. between the dip of the country rock and the vein, would indicate by its persistence that it will extend to a greater depth than anticipated. It is a typical fissure vein, in many places exhibiting a banded structure. The country rock is either the St. Regis or some equivalent shaly quartzite characteristically deep purple and green in color, which lends an attractive color scheme to the mine dumps.

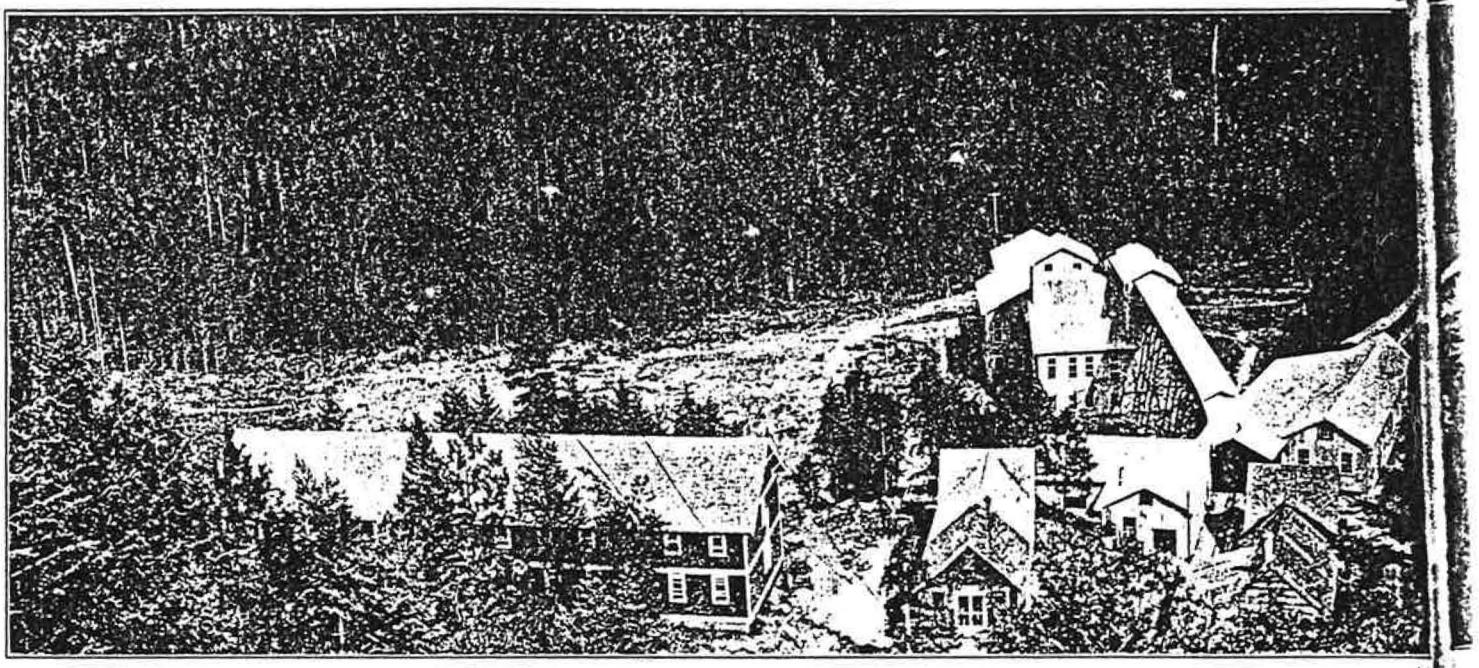
The Little Joe vein may be traced for one-half mile on the surface, but faults of evidently large displacement and heavy overburden prevent its being exposed over a longer distance. Underground it has been developed in a northerly and southerly direction for about



View of north side of the Talache mill

1,700 ft. The vein varies in width from one inch—or pinches out entirely—to five or six feet. Its average width is 16.5 in., and average dip is 45 deg. Occasionally the vein is frozen to its walls, but usually it breaks cleanly from them. It has been estimated that in only about 20 per cent of the working places is the vein so frozen.

Besides deing irregular in width, the vein has been subjected to normal faults of moderate and small displacement, the largest movement being about 150 ft.



Company hotel Post Office Mill, tunnel entrance and shops

Panorama of Talache, Idaho, showing entire surface plant

and swells add to the intricacy of the geology and irregularity of the vein. In short distances it is not uncommon to witness the vein swell from a few inches to five feet. Small basic dikes in the mine and exposures of granite rocks close to the mine attest to the igneous origin of the deposition. Although conditions, broadly speaking, are similar to those found in the lead silver mines of the Coeur d'Alene around Wallace, silver is found chiefly in tetrahedrite, not in galena.

Despite the smallness of the vein, it is rich in minerals. Siderite, pyrite, chalcopyrite, sphalerite, galena, arsenopyrite, tetrahedrite, and quartz are the most prominent, but bornite, stibnite, and hübnerite have also been identified. A typical analysis of Talache ore follows:

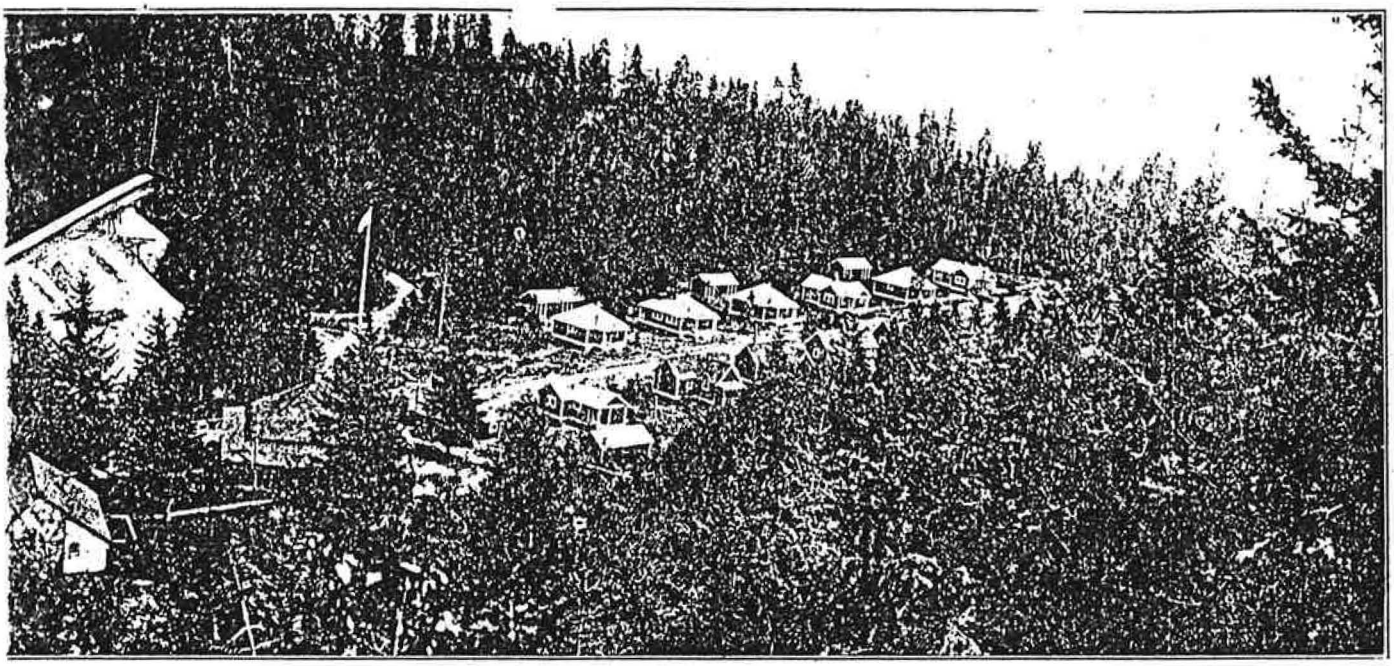
	Per Cent
Silica	67
Siderite	12
Pyrite	6
Chalcopyrite	2
Sphalerite	3
Galena	1
Arsenopyrite	1
Gouge and other material	8

The silver content of the vein averages 12 to 20 oz. Up to Jan. 1, 1922, over 16,000 ft. of development was recorded, and at that time ore reserves were estimated to be 110,000 tons, carrying 0.09 oz. gold and 17.5 oz. silver. Pockets of very rich ore are found at times. Along the intersection of a small cross fissure and the vein on the 700 level there is a small body of ore assaying 1,000 oz. in silver. Pockets of high-grade ore are found in other parts of the mine and tend to bring up the average grade. Sorted ore received from lessees averages about 350 oz. silver.

The inclined raise connecting the 1,200 or adit level and the 400 or old working level is constructed in three compartments. The center compartment contains rails and a skip specially built for the hoisting and lowering of men, timbers, and supplies. The two outside compartments are respectively waste and ore chutes through which the ore and waste are passed from the upper to the lower levels, ultimately reaching the 1,200, where they are hauled by storage-battery locomotives in its fall in the chutes by arc gates on each level. Thus the mine is not subjected to any ore-hoisting expense and only men and supplies are hoisted. The ore chutes give a fair amount of storage space. Drainage on the various levels is toward the "Main Raise." The water is collected at the different level stations and piped to the 1,200 level, where it flows by gravity to a tank at the portal and is used in milling without pumping.

The vein is narrow enough to cause difficulty in mining, especially at its lesser dips. The general practice followed is simply to provide a working space in the stopes just high enough for comfortable working, then to break the faces of the stopes in two steps, the first removing the waste and the second step mining the narrow vein. Especial care is exercised to avoid contamination of the rich vein matter with the country rock, and careful sorting underground is the rule. The waste forms convenient filling, which is carried as close to the faces as possible. More than enough waste is supplied for stope-filling purposes, and the excess is trammed to the dump. The ground only stands well for short unsupported distances, and although not so heavy as that in other Coeur d'Alene mines, requires constant timbering and filling to prevent caving. The vein is not wide enough for the use of square sets, ordinary lengths of stulls and headboards and subsequent waste filling being sufficient to support the mine workings. In many stopes the pitch of the vein is not steep enough for the ore to run smoothly, so that considerable shoveling is required, but generally only a small amount is necessary. A low pitch of the vein necessitates removing more of the walls to expose the vein in the stopes than where the pitch is steeper. Chutes have been provided at 33½-ft. intervals to minimize the amount of shoveling required. Owing to the narrowness of the vein, mining costs are high. For July, 1922, they were $6.48 per ton.

The Talache mine is a silver mine, and like many others producing the white metal is greatly affected by the operation of the Pittman Act. In fact, that bit of silver legislation has had a profound influence on



Offices *Employees' cottages*

h the exception of the compressor, boiler house and assay office

On March 1, 1922, the new mill was started, and concentrates were shipped to the East Helena lead smelter of the American Smelting & Refining Co. At the time the mill was designed a paramount consideration in operation was to take maximum advantage of the dollar silver provisions of the Pittman Act. Hence the mill was designed to treat a larger tonnage than originally contemplated, which naturally involved mining a larger daily tonnage of ore. Construction was rushed as quickly as possible under the circumstances, and the actual erection of the mill began on Aug. 1, 1921. It started operating on March 1, 1922.

Talache Mill Has Level Location

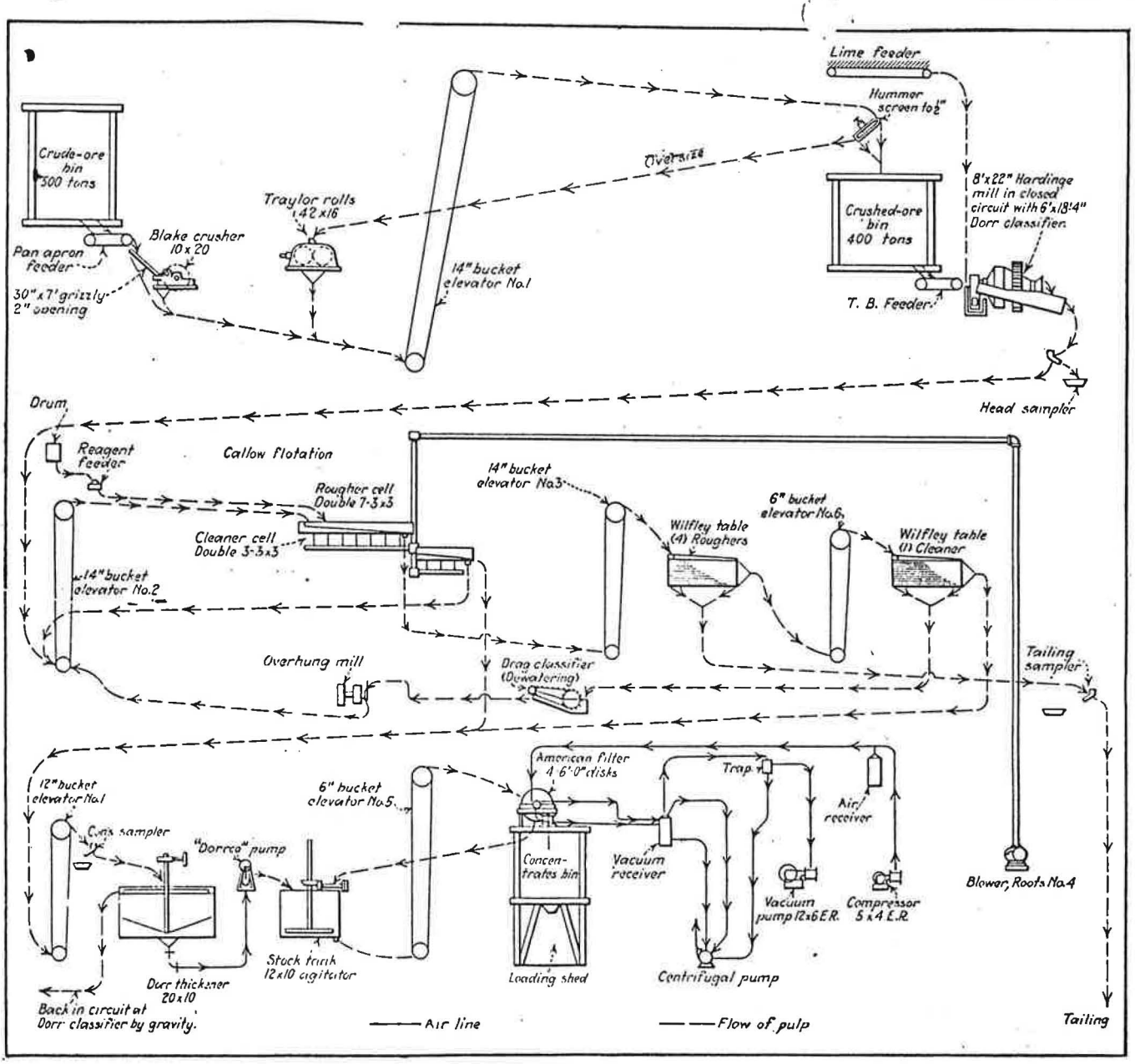
A brand-new mill or factory has something fascinating about it. The absence of dust and dirt, the sight of spick and span smoothly operating new machinery, and the odor of fresh timber combine to make it an attractive object—to an engineer, at any rate. So it is with the Talache mill, a compact modern flotation plant capable of easily handling 150 tons per day. It was designed by the General Engineering Co., of Salt Lake City, which acted as consulting metallurgical and construction engineers and supervised the construction of the mill. The company did everything to expedite its erection and operation that it agreed to do. The pleasant relations existing between mine management and the consulting metallurgical engineers, and the fact that the mill was built quite within its estimated cost, speak well for this arrangement. Some favorable purchases of machinery in a declining market and the ability to purchase lumber and other supplies locally helped to lower the estimated total outlay. The mill represents an investment of close to $120,000.

The mill is constructed of wood, with corrugated galvanized-iron sides and roof. Two accompanying photographs show its outward appearance. Although advantage could have been taken of a hillside location for the mill, a flat site was chosen as being preferable. This arrangement gives a very compact plant, in which all machinery is readily and quickly accessible and under the supervision of two men at the most. It would not be difficult in a pinch for one man to look after the entire plant. A small amount of climbing is all that is necessary to visit any section of the mill. Bucket elevators have had to be used to convey the pulp from one unit to another, but their cost of operation is low and is offset by the important advantage of compactness. Ease of construction and the elimination of heavy grading costs are other advantages gained by construction on a level area. With the exception of filter, all operating equipment can be supervised from one working floor. The mill contains only one more bucket elevator than if it had been built on a hillside site. An additional advantage of the present location is the nearness of the mill to the mine portal and the greater compactness of the camp in general. These factors make for greater ease in supervising operations as a whole.

The ore is delivered to the mill in 2½-ton cars drawn by a storage-battery locomotive and dumped in a crude-ore bin having a capacity of 500 tons. From an ore-bin chute the ore drops to a Stephens-Adamson apron feeder and then to a 30-in. grizzly set to 1½ in. leading to a Traylor jaw crusher 10x20 in. The undersize of the grizzly and the product from the jaw crusher are elevated in a 14-in. bucket elevator (No. 1) to a Hummer screen sizing to ½ in. and discharging directly into a crushed-ore bin of 400 tons' capacity. The oversize of the vibrating screen is passed through Traylor rolls 42x16 in., set to ½ in., and discharging into bucket elevator No. 1. Thus all the crushed ore is reduced in fineness to a minimum of ½ in.

Callow Flotation Equipment Used

Secondary crushing is done with an 8-ft. Hardinge mill operating in closed circuit with a 6x18½-ft. Dorr duplex classifier and fed by a belt feeder from the crushed-ore bin. The Hardinge mill is driven by a Link Belt silent chain drive and 125-hp. motor. It grinds to minus-80 mesh. Lime is added at this point, as flotation takes place in an alkaline solution with reagents the names of which I am not at liberty to state. Steam is discharged into the Dorr classifier to bring the pulp

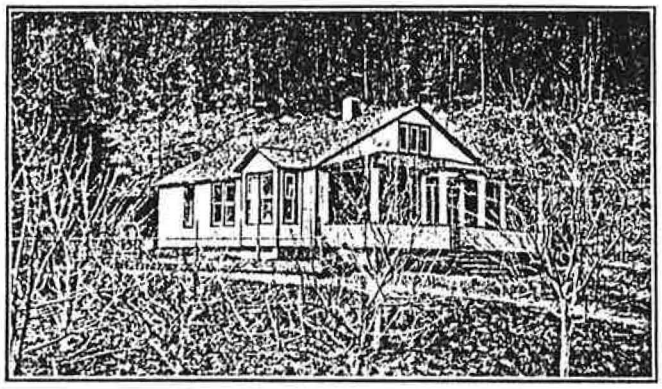


Flow sheet of 150-ton flotation mill

temperature between 60 and 70 deg. F. The discharge of the Dorr classifier passes to bucket elevator No. 2 and is delivered into the first Callow rougher cells, consisting of seven double compartments. The concentrate from the rougher cells drops to the cleaner cells of three double compartments. Tailing of the cleaner cells flows back to bucket elevator No. 2. The tailing of the rougher cells goes to bucket elevator No. 3, by which it is transferred to four Wilfley roughing tables making two products, a tailing passing out of the mill and concentrate lifted by bucket elevator No. 6 to one Wilfley cleaner. This table also makes two products, a tailing to be discarded and concentrate joining that from the Callow cleaner cells and passing to bucket elevator No. 4, which feeds a 20x10-ft. Dorr thickener. The overflow of the thickener is returned to the mill circuit at the Dorr classifier. The underflow is pumped by a diaphragm pump to a 12x10-ft. mechanical agitator that discharges to bucket elevator No. 6, leading to a four-disk American continuous filter with 6-ft. disks. The filter cake drops into a concentrate bin which is directly over a loading shed where motor trucks can be conveniently loaded. A Roots blower No. 4 supplies air at 3½ lb. pressure to the flotation cells and a small 5x4-in. air compressor and 12x6-in. vacuum pump serve the filter.

An accompanying flow sheet shows the relations of the units described and the flow of the pulp through the mill. Electric power is supplied by the Washington Water Power Co., but purchased from the Mountain States Power Co. The company built and owns 10.5 miles of 11,500-v. transmission line, with suitable transformer stations at each terminal. At the Sandpoint end, the voltage is stepped down from 66,000 to 11,500 v. and at the mine end from 11,500 to 2,300 and 440 v. A local power house contains 20-hp. and 100-hp. boilers and is the central heating plant. It also houses a 1,320 cu.ft. per minute direct-connected synchronous motor-driven air compressor.

Although the concentrating plant has been in operation only since March 1, 1922, results have more than come up to expectations. It is endeavored to keep heads at 15 oz. silver, but there are periods when they naturally run below and above that grade. A



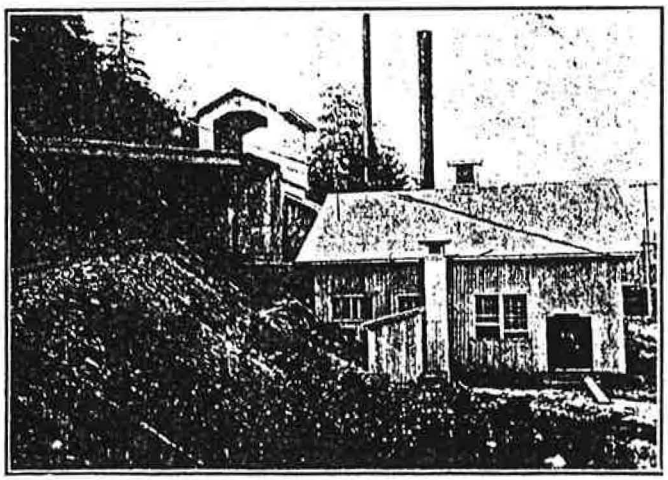
A staff cottage

typical assay of heads for one month this spring was 13.86 oz. silver, 0.069 oz. gold, 0.58 per cent copper, 0.79 per cent lead, 2.00 per cent zinc, 8.00 per cent iron, 0.75 per cent manganese and 75 per cent "insoluble." Average recovery for the months of March, April, and May was 93.8 per cent of the gold, 94.3 per cent silver, 98 per cent copper, 86 per cent lead and 15 per cent zinc. The concentrate in the first fifteen cars shipped ran 0.707 oz. gold, 152 oz. silver, 6 per cent copper, 7.21 per cent lead, 3.12 per cent zinc, 30.49 per cent iron, 1.5 per cent manganese, and 8.8 per cent "insoluble." The concentrate is now being shipped to the Tacoma smelter of the American Smelting & Refining Co.

Prior to July 1, the mill was operating on two shifts and handling 95 to 96 tons in fifteen hours, but is now running on three shifts. Over 160 tons have been treated without difficulty. Concentrate is running close to 200 oz. For the last sixteen days in July the mill treated 163 tons of ore per day, with the following result:

	Au	Ag	Pb	Cu	"Ins"	Fe	Mn	Zn
Feed	0.065	16.92	0.72	0.67	74.4	7.0	2.9	2.9
Tailing	0.005	1.00	0.08	0.02	76.3	4.5	2.8	2.8
Concentrate	0.66	190.0	7.3	6.55	9.3	28.6	1.0	3.5
Recovery, per cent	93.0	94.5	89.9	97.6	....	....	....	...

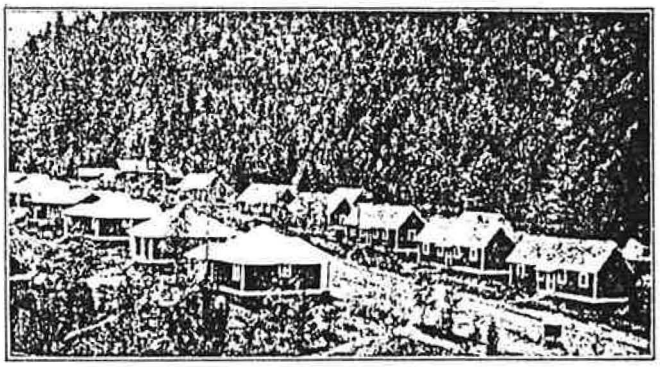
In July the mill treated an average of 155 tons per day at a cost of 93c. per ton. Tests have been made to determine the capacity of the mill. During the first fifteen days of August 180 tons per day was treated, with results corresponding to those given above. On one or two days the mill was operated at the rate of 200 tons per day, and the management is confident it can successfully treat this daily tonnage. The larger tonnage was obtained mainly by decreasing the mesh of the Hum-mer screen. Recovery fell 1 per cent and less.



The mine boiler room and compressor plant

At present, additional housing facilities are being provided. When this construction work is completed the company will be able to employ the additional miners required to mine 200 tons per day. New stopes are now being opened and extensive development is under way. By the end of October the company expects to be operating on a basis of 200 tons per day.

Not only the mechanical equipment of the Talache mines but also the accommodations for the miners and their families are in keeping with the attractive appearance of the camp. Single miners are given rooms in the company hotel, which contains 44 rooms, two men to a room, single beds, electric lights, steam heat, and hot and cold running water. The men are supplied with bedding, showers, and means of recreation. Charges are $5 per month per man. Two rows of charming small cottages have been built for the men with families. It is not difficult to observe that the management believes in having a contented force of co-workers and has done more than has been called for in providing pleasant homes for the community. Everything considered, location, technical equipment, and conditions of work, mining at Talache may well stand for the ideal small mine and its community.



Employees' cottages near the mill

The mine is owned by A. H. Burroughs, Jr., and associates. Mr. Burroughs is vice-president and manager of the company. I am greatly indebted to him for permitting me to visit his operations and for furnishing me with many data regarding his plant.

If there is any lesson to be learned, or if there are conclusions to be drawn, from an inspection of the work at Talache it is the fact that a few men have taken a small, unspectacular silver vein, have painstakingly worked out its geology, developed it, provided working capital, built a mill to treat its ore, and have done so successfully despite the abnormally high costs of the last few years. I do not doubt that there are other Talaches in the western United States, but none so beautifully situated. The prospector who is dismayed and discouraged at statements inferring that the mineral wealth of the United States has all been discovered and that the large exploration companies have thoroughly combed the country may well take heart at this example of intelligent mining and careful planning to make the most of economic conditions. Unfortunately, a year and a half will probably witness the end of the purchases of dollar silver under the Pittman Act, but the principle holds. The small mine still has a chance when properly handled.