Item 5

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Item 5 (258)

*Note - Report mentions treating tails 1911-1914 Inc! On pg. 7 mentions Combined mines at Pioche developing "over a million tons" so the report must have been written not earlier than mid 1920's (Observation by Paul Jemmett)

Report by Alfred Merritt Smith

1913 *

THE BERLIN MINE,

Located in the Union Mining District, Nye County, Nevada.

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LOCATION

The Berlin mine is located 55 miles southwesterly from Austin, the county-seat of Lander County. Austin is the terminus of a narrow-gauge railroad 90 miles long, connecting with the Southern Pacific main trunk line at Battle Mountain. In an opposite direction, it is 45 miles southwesterly to Luning from Berlin mine. Luning is in Mineral County, and on the Tonopah and Goldfield branch of the Southern Pacific railroad. The nearest post-office is at Ione, 6 miles north of the mine, and the terminus of a stage line to Austin.

The dirt road from Berlin to Austin is well graded and improved. The road between Berlin and Luning, while travelled but little, is a naturally good dirt road and easily kept in repair. Both roads are level for long stretches, and neither has any steep grades.

TOPOGRAPHY

The mine is on the west side of the Shoshone mountain range, and at an elevation of about 6000 feet. To the west one overlooks a large desert plain, the Ione valley. The vein outcrop, over 400 feet long, is at the northern end of a rather uneven terrace of unconsolidated gravel and alluvium, one-fourth of a mile wide, which extends from the steep mountain side to the plain below.

WATER

During the period in which the mine was operated, by the Nevada Company, water was obtained through two separate iron pipe-lines, by gravity flow. One pipe extended from springs at Ione, distant 6 miles northwesterly, and the other from Knickerbocker springs, 4 miles northeasterly. The combined springs supplied sufficient water to operate the 30-stamp mill and a complement of Frue vanners, and for all the domestic needs of the camp. When operations are renewed it will be necessary to replace these pipe-lines for they have been destroyed by corrosion and long disuse. Possibly water can now be obtained from springs or shallow wells in Union canyon, sufficient in quantity for a drilling and development operation. Union canyon is only 2 miles distant, from the mine. This could be supplemented by water pumped from the mine, if necessary.

The amount of water encountered in the mine is not

known by the writer, but it was not excessive, for it was kept down by a small air-driven Dow reciprocating pump.

TIMBER AND VEGETATION

Near Ione, and in the mountains to the east, there yet remain groves of pinon pine, and also some juniper. Most of near-by timber and wood of this class was cut and used as fuel for the steam plans operating the mill and hoist, for the camp, and for mine timbering. Probably enough remains in the district, not too distant, to supply future mine-timber and fuel needs.

The vegetation consists of the ever-present black sage-brush, and the usual Nevada shrubs, weeds and grasses.

TITLE

The Berlin mine consists of a group of 16 patented mining claims, owned by The Nevada Company, 100 William St., New York. J. G. Phelps Stokes is president. Mr. Stokes is also president and J. M. Hiskey is general manager of the Nevada Central R. R. Co., owning the narrow-gauge between Austin and Battle Mountain.

In 1906 The Nevada Company owned several other mining properties in the Union and adjacent mining districts, to wit: The Shamrock group of 10 patented claims just east of Ione; the Richmond mine group of 3 patented claims one mile south of the Berlin mine; the Downieville and Sullivan group of 6 patented claims 6 miles south of Lodi, and, at a greater distance, the Golden Arrow group east of Goldfield. Shortly afterwardall of the Stokes properties were sold to the Goldfield Blue Bell Mining Co., which was never very active at the Berlin mine, and has been inoperative for a number of years. The Berlin mine, as well as the other adjacent mines sold by Stokes to the Goldfield Blue Bell, probably have reverted to the Nevada Company, or to the Stokes estate. Mr. J. M. Hiskey, of Austin, was secretary and treasurer for the Goldfield Blue Bell Co., and he is also resident agent for Mr. Stokes' Nevada Holdings.

QUOTED FROM USGS 1922

GEOLOGY

The Berlin mine lies entirely in an area of andesite of Tertiary age. A few miles to the east and south of it are shales, conglomerates and limestones of Carboniferous age. In 1912, A. M. Smith, while burning lime for use in cyanidation of the Berlin tailings, discovered fossil ammonites in Union canyon which he believed to be ~~Devonian~~, but which are probably ~~Carboniferous~~. Mesozoic.

HISTORY

The Berlin mine was discovered in

by and came into the possession of the Nevada Company about 1904. In 1905 a 30-stamp mill using amalgamating plates was built, with concentration by Frue vanners. The mill operated until sometime in 1908, during which time it treated about 35,000 tons of ore of an average value of $14.00 per ton. From 1½ to 2% of sulphides were recovered by concentration and shipped in sacks to Salt Lake smelters for reduction. The principal sulphides were of iron, (marcasite and pyrite) and iron-copper, (chalcopyrite) with smaller amounts of galena, stibnite and zinc blende.

The ration of gold to silver in the mine ore was from 7 to 12 ounces of silver to one ounce of gold. The greater part of the gold was free, and was liberated by crushing to 40 mesh. An extraction of about 75% was made by amalgamation alone.

Approximately 35,000 tons were ~~treated~~ mined and treated during the whole operation. About 25,000 tons of the tailings were saved by impounding in dams below the mill and near the valley floor. This may have been done more for the purpose of settling and re-using the water than to save the tailings. For some time the tailings were deemed too low in value- or too small a tonnage at that time- to warrant saving for cyanidation.

A small portion of the ore that was milled was obtained from the Bowler mine, which is half a mile or so north of the Berlin, and is also owned by The Nevada Company.

From 1908 to 1910 inclusive the mine and mill were operated by different lessees, for short periods. The last leasers were Messrs Farnum and Trenaman, who operated during the season of 1910.

In 1911 the tailings were acquired by A. M. Smith, the author of this paper, who erected a 40-ton per day cyanide leaching plant and during the years 1911 to 1914 inclusive, treated that portion of the impounded tailings which still remained. The quantity was 21,294 tons, average value $2.48 per ton; total extraction $1.94 per ton; total costs (including plant and royalty) $29,185.31 which equals $1.331 per ton; total net dividends paid, $13,066.82; net profit per ton, $0.6149. The tailings were exceedingly easy to cyanide. A five-day leach was given in vats 20 feet in diameter and five feet deep. Tests proved that a higher extraction could have been obtained by increased time of contact, but a greater profit was made by putting through more tonnage in shorter time.

The following inferences are drawn;
The original ore, including the concentrate, could have been treated with ease by cyanidation in a simple cyanide annex to the original mill.

The increased net profit per ton treated would have amounted to about $2.50 per ton of ore, due to saving the cost of concentration and marketing of concentrate. Also, there would be less labor than was necessary in the Smith leaching operation.

By means of a modern fine-grinding all-cyanide mill, costs can be reduced still more, and a high extraction be obtained. The ore is uniform in character, and is more readily subject to cyanidation than most of the sulphide, unoxidized ores now being treated by that method.

MINING

Attached herewith is a copy of the paper read before the American Institute of Mining Engineers, by Ellsworth Daggett, Salt Lake Mining Engineer, in the year 1907. It is entitled "The Extraordinary Faulting of the Berlin Mine, Nevada", This thoughtful and careful work by a former pioneer in the study of movements of rock masses in mines is of great value, both in respect to the Berlin vein, and as a matter of general knowledge in dynamic geology. At the same time, coming as it did in a past period when mine faults were thought to be much greater obstacles than they are in this day, its effect on the Berlin mine was bad. Mining operators and investors were prejudiced at the beginning of their investigations by the very title of Mr. Daggett's paper, and were universally convinced, by the time they had finished reading it, that the district had been so badly disturbed it would be well to leave it alone, and look elsewhere, A number of unusually favorable features were not mentioned in the paper; some for the reason that it was not a report upon the mine, but was only a discussion of the faulting, a various good features were not mentioned because they were more or less unknown to the mining fraternity of that day.

The mine cannot be examined underground, and this has prevented engineers from giving it much attention in recent years. It is filled with water to the 100-foot level. The shaft, drifts and stopes were all timbered with rough, round pinon pine, which is subject to rapid decay. While it should be a comparatively easy task to unwater the mine, it is doubtfull if the old drifts could then be entered. The writer went into some of the upper drifts above water level in 1912, and found them in unsafe condition, caved in places, due to the rotting away of the timbering.

Another unfortunate fact is that a number of years ago a cloudburst flood came down the canyon northeast of the incline and flowed into an old stope which had broken through to the surface. To what extent it may have filled up a portion of the mine with debris, or whether it found its way into the

shaft is not yet known.

There are numerous stories afloat of rich ore left in the bottom of the shaft at the time Stokes shut down the mine following his discovery of dishonesty on the part of a manager. Such tales cannot be given too much attention. It is hardly probable that there is ore in the bottom of the shaft, due to the geological structure. There may be much ore yet undeveloped, but it will be found elsewhere in the mine, as described later on.

Little may be accomplished by entering the mine workings except to substantiate the maps and geological findings of Daggett which we have no valid reason to doubt, excepting, perhaps, in some matters of theory alone. All of the known ore-bodies of any importance were taken out. What remains to be done is to explore the unknown adjacent territory into which is is probable the ore extends. If drilling such areas discloses substantial ore extensions, then the shaft should be pumped outand be put in good condition, and one of the old drifts be cleaned out and retimbered to approach the new ore in the most direct and economical manner.

As a mining venture it may be recommended on a number of points. First of these is the unusual uniformity of the vein in width, structure and value. It is not simply one, or more, payshoots on a quartz vein. The entire vein, wherever opened up and mined out to the lines where terminated by "breaks" and faults, was composed of unoxidized sulphide ore of good milling grade, ranging in value from $10. to $50. per ton, with occasional spots of higher value. In many gold mines the tenor of the ore is erratic, with many barren areas of vein material, but this is not the case here. Wherever the vein existed there were good values in gold and silver, which is highly in its favor.

The vein is old geologically, and probably of late Tertiary origin. It was formed in a deep and uniform fissure by quartz and mineral deposition from ascending solutions. It is beautifully banded, with alternating mottled white, greenish and gray layers. The whole vein is frozen solidly to the dark gray andesite walls, for there was no movement or disturbance alnng the the walls, other than the slow and gradual opening of the fissure during the time it was filled.

The subsequent faulting was also slow and uniform. There were no violent stresses resulting in crushed makses of rock; there are no shear-zones, and no breccia. The faults are in the main clean, sharp planes, well defined, and marked by several inches of clay gouge, due to attrition under pressure.

The faults are normal, and regular in habit. This fact enabled the mine foremen, uninformed in geology, to readily

locate segment after segment of the ore-bodies. It is true that they did not always approach and extract the ore by the best mining methods. Too often the ore was handled too many times before reaching the surface. During the Farnum and Trenaman lease some ore was transferred four times by hand before it arrived at the mill.

The ore segments were large. An inspection of Mr. Daggett's maps shows that they were roughly square or rectangular, and contained on an average of 4000 tons of ore each.

The mining was not difficult, for the ore was easily kept separate from the waste in mining. The light-colored quartz was easily kept separate from the dark andesite. The ground hell fairly well, and in general was amply supported by a few pinon-pine stulls.

DEVELOPMENT POSSIBILITIES

Knowledge of the ground, and a study of the Daggett plans indicate that only a very limited amount of constructive development work was done on the northern extension of the vein. Onthe north side, six large segments of the vein which were stoped out, and certainly produced not less than 20,000 tons of ore, terminate abruptly by faults along the north edge.

At one point the vein was recovered north of the surface outcrop, but the result was unsatisfactory, for at that point it had been faulted into a number of smaller blocks, not too small, however, for they were mined out. Sometime later a drift was driven northerly from the No. 8 level a distance of about 500 feet. This drift was 50 feet vertically below the lower edge of one of the largest segments that had been stoped out. Failing to find ore by this drift and one short cross-cut, no further work was done on the north side. It is quite probable that the end of this drift is beneath another segment of the vein. The short black line marked "C" on Fig. 1 is undoubtedly not a portion of the Berlin vein, although marked as such, for the vein where found always contained values.

There is good ground for assuming that additional segments of the vein lie to the north. It seems that these might be located by diamond drilling, at moderate expense. The dense, dark-colored andesite will drill and core well, and the light-colored hard quartz be easily detected when drilled into.

In the past, engineers have been frightened away by the story of the faults. Today, a mine without faults in the rock mass is so rare as to be a curiosity. At the Berlin mine it is really a great advantage to know so much about the faulting,

because it simplifies the work of investigation.

During the past and present year the Combined Metals mine at Pioche, Nevada, has developed over a million tons of new ore, in a series of faulted blocks, or segments, on the C-M vein. In addition to this, the potential ore bodies, not yet fully developed, have been vastly increased by following out a geological plan in the mining. The fault system is similar to that at the Berlin mine. Diamond-drilling is being done from underground stations, and both diamond- and churn-drilling from the surface. In one place where the vein was terminated by a fault, it was recovered again at a point 200 feet vertically below on the fault plane. In most of the places there, however, the movement was much less, and quite comparable with the Berlin mine situation. This is told merely as an instance to show that rock-faulting is not the fearsome obstacle that it was 25 years ago. All over the world reserves of various types of ore have been increased in recent years by study of geological conditions.

A sketch is herewith attached showing tentative positions for diamond-drill holes. Two or three holes, located in correct places, will determine if extensions of the Berlin vein exist. After locating the ore, the shaft may be pumped out and re-conditioned to be the main working shaft, as formerly. It is deep enough for all purposes, and much money can be saved by using it. A proposed new vertical shaft, located to the north of the present incline, has been advised by some engineers in years gone by. Such a proposal has but little to recommend it, for little could be gained for the great expense of construction. The present shaft can be equipped to hoist in excess of 200 tons per day without difficulty, and this might suffice for all needs.