REPORT COVERING PRELIMINARY TEST WORK

ON

ORE FROM THE SILVER PEAK SHAFT

LOOKOUT CLAIM

PIOCHE, NEVADA

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By

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The following tests were run on ore from the Silver Peak Mine which is situated on the Lookout claim about one mile southeast of the Town of Pioche, Nevada.

These tests are necessarily preliminary in scope, their purpose being to function as a guide to the type of work necessary for the determination of type and amount of both machinery and reagents required for the profitable treatment of this ore.

They did show enough definite characteristics to indicate the type of flowsheet necessary for the treatment of this material.

Most of the test work was done on ore previously mined from the 80 foot level of the Peak shaft and stored on the surface. The values are contained in a vuggy quartz very low in Lead Carbonate, i.e. 2% and less. Some tests were run on the vein material in the new adit where the vein intersects a fault and several water courses close to the surface. These values were too erratic and low grade for good testing procedure. However, this material did show the same trends as manifested by the ore from the main shaft.

Cyanide Tests

The first plan of attack was to determine whether this ore would respond to cyanidation at all and if so, what particle size would be required.

The first three tests were run in the following manner: The ore was separated into three sizes and placed in a solution containing four lbs. KCN per ton of solution at a one to one dilution for a period of 48 hours. The residue was filtered, washed and dried. Au figured at $35.00/oz, Ag at $91.00/oz.

Test No. 1

-3 mesh + 6 mesh

Product	Au oz/ton	Ag. oz/ton	Gross value Au + Ag $/Ton
Heads	0.01	12.0	11.27
Tails	Tr.	9.1	8.28
Recovery	100.0%	24.1%	$ 2.99

Cyanide Consumption - 2 lbs. per ton of ore.

Test No. 2

-6 mesh + 65 mesh

Product	Au oz/ton	Ag. oz/ton	Gross value Au + Ag $/Ton
Heads	0.02	10.5	10.26
Tails	0.005	6.3	5.91
Recovery	75.0%	40.0%	$ 5.35

Cyanide Consumption 2.9 lbs. per ton of ore.

Test No. 3

Minus 65 Mesh

Product	Au oz/ton	Ag. oz/ton	Gross value Au + Ag $/Ton
Heads	0.04	19.7	19.33
Tails	0.02	13.3	12.80
Recovery	50.0%	32.5%	$ 6.53

Cyanide Consumption 3.8 lbs. per ton of ore.

The next series of tests were run on a product which had been crushed and pulverized to 100% minus 65 mesh and then separated into sand and slime fractions at the 100 mesh size. Comparison of behavior with moderately strong solution, strong solution and solution containing lime was investigated along with effect of contact time.

Sand Fraction (-65 plus 100 mesh)

Test No. 4

Leached 24 hours at 1 - 1 Dilution in solution containing 2 lbs. Na CN per ton of solution. Then the solution was filtered and the residue re-pulped with fresh solution of the same strength and leached 6 days more. Cyanide consumption after 24 hrs. was 1.5 lbs. per ton of ore. No figure available after 6 days because the solution evaporated to dryness.

Results

Heads	0.02	6.80	$ 6.89
Tails	0.005	3.44	3.31
Recovery	75.0%	49.5%	$ 3.58 or 52.0%

Test No. 5

Procedure of preceding test repeated except that 20 lbs lime per ton of ore was mixed in the original solution to see whether or not the presence of lime would slow up the consumption of cyanide and materially benefit extraction of values. Cyanide consumption after 24 hours was 0.7 of a pound per ton of ore thereby showing some improvement in the consumption of cyanide.

Results.

Heads	0.02	6.80	6.89
Tails	0.005	1.92	1.91
Recovery	75.0%	71.8%	$ 4.98 or 72.2%

The excessive protective alkalinity maintained here showed definite beneficial effects metallurgically.

Test No. 6

Procedure of the two preceding tests were followed with a solution containing 10 lbs. Na CN and 20 lbs. CaO per ton of ore. Leaching was done in a covered vessel to prevent evaporation.

Cyanide consumption: 24 hr. leach	0.7 lbs/Ton Ore.
6 day leach	8.2 lbs/Ton Ore.
Total NaCN Consumption	8.9 lbs/Ton Ore.

Results

Heads	0.02	6.80	6.89
Tails	0.005	3.00	2.91
Recovery	75.0%	44.2%	$3.98 or 57.8%

Evidently long contact in a strong solution tends to promote the formation of cyanicides and reduce recovery.

Test No. 7

Leaching carried on by filtration in which a solution containing 10lbs NaCN per ton of solution was used. The quantity of fresh solution used was six times the amount of ore leached. None of the filtrate was passed through the ore. Filtration time was an hour and ten minutes. Fresh water was then filtered through the pulp for another hour. Solution strength was reduced from 10 lbs. to 1.8 lbs. per ton of solution during the leaching cycle for a total consumption of 48.0 lbs. per ton of ore.

Results

Heads	0.02	6.80	$ 6.89
Tails	Tr.	0.90	0.82
Recovery	100.0%	87.0%	$ 6.07 or 88.2%

The results of this test show that a good extraction can be made by cyanidation even though the cyanide consumption here is extremely high. It is entirely possible that the same result can be obtained by using solution of moderate strength and cutting down the contact time. Tests No. 5 and 6 clearly demonstrated the effect of strong solution as compared to solution of moderate strength.

Test on Slime Fraction

Test No. 8

A bottle test was run on the minus 100 mesh fraction of this ore using a solution containing 10 lbs. per ton NaCN at a 2 to 1 dilution. The pulp was rolled in this solution for 2 hours, then filtered and washed.

Cyanide consumption was 9.2 lbs. per ton of ore.

Results

Heads	0.10	13.78	$16.04
Tails	Tr.	1.80	1.64
Recovery	100.0%	87.3%	$14.40 or 90.0%

Good recovery was obtained here with a relatively short leaching time and high cyanide consumption indicating not only complete release of values in a minus 100 mesh product but also complete release and dissemination of potential cyanicides. It is quite possible that a successful slime leach could be made with a weaker solution containing enough lime to retard formation of cyanicides.

Flotation Tests

Several preliminary flotation tests were run before a satisfactory reagent chain and test procedure was worked out. The two tests presented here give the best indication of what can be accomplished. The ore used in these tests came from the same source as that used in the cyanide tests although a different sample. The tests were conducted in 1000 gram batches. The ore was first crushed and pulverized to 95% minus 48 mesh and then ground for 20 minutes in a laboratory size ball mill at 67% solids. This operation produced a pulp of the following size:

Plus 100 mesh - 1.1%
Minus 100 plus 200 - 32.1%
Minus 200 mesh - 66.8%

Flotation Test No. 1

To Ball Mill - Z-6 (Potassium Amyl Zanthate) 1 lb./Ton.
Aerofloat #33 - 0.2 lb./Ton
Oleic-Linolic Acid - 0.2 lb./Ton
To Conditioner - Varmor F. Pine Oil 0.1 lb/Ton
Condition Time 5 minutes
Flotation Time - 1st concentrate 3 minutes at 25% solids.

Then make-up water plus 0.15 lb/Ton Cresylic acid added and a second concentrate made. Time for 2nd concentrate approximately 5 minutes at which time froth became light colored and brittle. Concentrate froth dark brown in color. Air intake opened gradually from very little at start of test to full at completion. Flotation machine used was a Wemco-Fagergren 1000 gram test cell.

Results

Product	% Wt.	Au oz/Ton	Ag oz/Ton	$Au;Ag/Ton
Heads	100.0	0.03	10.50	$10.61
Tails	93.6	0.01	3.16	2.89
1st Conc	5.2	0.24	112.16	110.47
2nd Conc	1.2	0.32	145.44	143.55
Total Rec.	6.4	55.0%	72.0%	$117.00

Transposing these results to mill performance, each 100 tons milled would produce 6.4 tons of concentrates worth $748.50.
Ratio of concentration by weight is 15.5 to 1.

Flotation Test No. 2

The reagent chain and procedure used in the following test was quite similar to that which was used by the writer at the Pioche Mines. Cons. Mill on the quartzite veins and dumps from the Meadow Valley and the Raymond and Ely Mines in 1937 and 1938.

To Ball Mill: Z-6; 1.0 lb/Ton Ore
Aerofloat #33; 0.2 lb/Ton Ore
To Flotation Machine; Crysilic Acid; 0.2 lb/Ton.
Flotation Time: 1st Conc. 3 minutes
To Conditioner: Oleic-Linolic Acid; 0.2 lb/Ton
Farmor "F" Pine Oil; 0.2 lb/Ton
Conditioning Time: 5 minutes
Flotation Time: 2nd Concentrate - 5 minutes.

Results

Product	% Wt.	Au oz/Ton	Ag oz/Ton	$Au-Ag/Ton
Heads	100.0	0.03	10.50	$10.61
Tails	84.1	0.02	3.00	3.43
1st Conc	0.7	1.32	730.00	710.50*
2nd Conc	15.2	0.02	20.2	19.08
Total Recovery	15.9%	41.2%	79.8%	$49.80 of 74.5%

Ratio of Concentration by weight - 1st Conc; 143 to 1
Ratio of Concentration by weight - 2nd Conc; 9.4 to 1
*Small Sample used up in fire assay. No lead assay available. Probably high Pb.

Transposing these results to mill performance, each 100 tons milled would yield 0.7 of a ton of concentrate having a gross value of $497.35 in gold and silver. However, in actual practice, the scavenger concentrate would be recleaned and upgraded so that the amount of finished concentrate would be greater than the 0.7 of a ton shown here and still constitute a relatively small bulk of high grade material which could easily be melted to bullion in a small crucible furnace. Also, in actual mill practice, the pulp going to the scavenger section would undergo a much longer conditioning period than shown in this test. This ore responds to flotation in much the same manner as the other quartzite ores in this district with which the writer is familiar. This long conditioning would reduce the tailing loss and result in higher overall recovery. Approximately half the values can be extracted very rapidly and the remainder very slowly.

Amalgamation

An amalgamation test was begun but not carried to proper completion due to the need for immediate use of the assay facilities of the Combined Metals Reduction Company whose test laboratory and assay facilities were kindly loaned the writer. However, according to old records, ore mined from the Peak Shaft was successfully treated in stamp mills so it is reasonable to assume that some of the values could be recovered by amalgamation. Hence the inclusion of amalgamation plates in the two possible flowsheets included in this report. This possibility could be easily checked long before the final treatment scheme is worked out.

Summary

The cyanide tests have brought out several definite characteristics of this ore. One being that ultimate good recovery is based on fine grinding. Another is that long contact time whether with strong or moderately strong solutions is very undesirable. A third is that the presence of lime definitely improves recovery while retarding abnormally high cyanide consumption. A fourth is that strong solutions are neither necessary or even desirable.

It would appear then that this type of ore could be treated by a short period of agitation followed by simultaneous washing and filtration. Care would have to be taken in the re-use of spent solutions which means that more water would be necessary for the operation of such a mill than one could normally expect.

However, if the oxidation products of Manganese, Iron and Lead increase byond that contained in the ore tested, cyanidation would be out of the question.

The flotation tests showed the possibilities of this type of treatment very well. The chief remaining problem in this scheme being to increase recovery. While flotation requires about four times as much water as ore treated, its big advantage here lies in its flexibility. One need not worry about an influx of the oxidation products of Manganese, Iron, and Lead or the sudden appearance of sulfides. In fact, the presence of more Lead Carbonate or chloride would be more than welcome.

In conclusion, the results of these tests have enabled me to draw up two possible flowsheets for the treatment of this type of ore.

Respectfully submitted,

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