

Duplicate 566/37 23/7/37

REPORT ON TREATMENT OF GOLD ORE RECEIVED FROM H. A. RAYNER

FROM THE NEW GOLDEN GATE MINE, MATHINNA.

1937

No 5.

The ore, consisting of quartz with arsenopyrite as the predominating sulphide and containing also a proportion of oxidised ore, was stated to have been obtained from a surface tunnel and 150 ft. level cross-cut.

The sample assayed:

TABLE 1.

Gold	34.6 dwts. per ton.
Silver	14.9 " " "
Arsenic	3.65%
Iron	5.03%
Sulphide Sulphur	12.43%
Sulphate Sulphur	0.09%

BATTERY AMALGAMATION.

The ore, after sampling, was crushed and amalgamated at the State Battery situated at Lefroy with the following results:

Screen used: 225 per sq. in.

TABLE 2.

	Dwts./ton.		Extraction.	
	Heads.	Tails.	Dwts./ton.	%
<u>Gold</u>	34.6	13.7	20.9	60.4
<u>Silver</u>	14.8	6.1	8.7	58.8

No increase in extraction was obtained by Laboratory amalgamation, grinding to -100 Mesh.

EXAMINATION OF BATTERY TAILINGS.

TABLE 3. Screening Analysis.

Size	Weight per cent.	Assay value Gold, dwts/ton.	Percent. Distribution of Gold
+44	15.9	17.5	20.3
+60	17.0	17.2	21.3
+85	17.2	14.6	18.3
+120	9.6	12.8	9.0
+150	7.1	12.4	6.45
+200	7.9	11.7	6.75
-200	25.3	9.7	17.9

Microscopic examination showed attached sulphide and quartz in all sizes up to +200 mesh with a lessening of same from 120 mesh and finer.

A concentrate was obtained from the tailing, and after decomposing the sulphide by chemical means was examined for gold particle size. The largest particle observed was 320 microns (48 mesh) and the smallest 14 microns. Thirty percent of the particles observed were 40 microns (325 mesh) and smaller.

From the examination and the fact that the gold was not recoverable by amalgamation it was evident that any successful method of treatment would require fine grinding.

TREATMENT OF BATTERY TAILINGS.

Gravity Concentration. Owing to attached sulphide and gangue particles and -200 mesh sulphide it was not anticipated that a satisfactory concentration would be made. This was confirmed by a test which showed a distribution of 48.7% of the gold in a concentrate assaying 85.6 dwts. gold per ton.

Cyanidation.

A. - Roasted. Four lots were roasted with protective alkalinity - (CaO) Pulp ratio and Cyanide solution in all tests 2:1 and 0.1% respectively. Agitated for 24 hours. Results given in Table 4.

TABLE 4.

Cyanide Test No.	Assay Value Gold dwts./ton. Heads (calc)	Gold Tails	KCN Consumption lbs./ton.	CaO	Extraction of Gold dwts./ton.	
3.	14.1	10.1	0.22	5.4	4.0	
4.	14.1	11.3	0.22	6.5	2.8	
6.	14.1	12.2	0.27	---	1.9	
6B.	12.2	7.0	0.46	8.0	5.2	(Tailing fm. No. 6 re-ground to 96.5% -200 mesh)
<u>B. - Unroasted.</u>						
1.	13.7	8.3	1.25	5.3	5.4	
2.	13.7	6.7	1.61	6.4	7.0	(Ground to 91.7% -200 mesh)
7.	13.7	5.1	1.20	7.0	8.6	(Ground to 96.5% -200 mesh)

Amalgamation.

Three tests were made; two roasted, one of which was finely ground and the latter unroasted and finely ground to observe effect of various treatments.

No. 1. Roasted, but with no further grinding.
Heads: Gold 14.1 dwts./ton. Tails: Gold 6.5 dwts./ton.
Extraction: 7.6 dwts./ton.

No. 2. Roasted and ground to 89.5% -200 mesh.
Heads: Gold 14.1 dwts./ton. Tails: Gold 2.1 dwts./ton.
Extraction: Gold 12 dwts./ton.

No. 3. Tailings ground to 96.5% -200 mesh.
Heads: Gold 13.7 dwts./ton. Tails: Gold 1.5 dwts./ton.
Extraction: Gold 12.2 dwts./ton.

Flotation.

1.0 lb./ton Soda Carb. to Ball Mill
Reagents: Pot. Ethyl Xanthate. Aerofloat 31.
 0.2 lb./ton 0.16 lb./ton

Conditioned for 5 minutes in each case. Flotation time 6 minutes.

TABLE 5.

Products . % Weight .	G O L D .	
	Assay Value Dwts./ton	% Distribution .
Concentrate 10.1	126.7 (calc)	93.4
Tailings 89.9	1.0	6.6

pH value after flotation: 10.5

TABLE 6.

Battery Amalgamation and Flotation Concentrate
Calculated to Original Ore.

	Gold, dwts./ton	% Distribution
Heads	34.6	100
Extraction by Battery Amalgamation .	20.9	60.4
Extraction, Flotation Concentrate .	12.7	36.8
Tailings	1.0	2.8

Extraction by amalgamation and flotation: 97.2%.

Extraction by battery amalgamation, fine grinding of
 tailings and amalgamation: 33.1 dwts./ton or 95.3%.

Re-sample of original ore: Head assay Gold 32.6 dwts./ton.
 Silver 11.0 " "

Treatment of ore by direct flotation after wet fine grinding
 and treatment of Flotation Tailings.

Standard

Conditions: Soda Carb. 1.0 lb./ton to mill
 Pot. Ethyl Xanthate 0.2 lb./ton. Conditioned 5 minutes
 Aerofloat 31 0.16 lb./ton. " " "
 Pine Oil pH value after flotation 8 - 8.5
 Flotation time: 6 minutes.

Variation of two tests. No. 11 additional grinding.

No. 10. 96.5% -200 mesh
 No. 11. 98.7% -200 "

TABLE 7. follows.

TABLE 7.

Test No. .		% Weight	Gold Assay Value dwts./ton	% Distribution
10.	Concentrate	12.0	249.6(calc)	91.9
"	Tailings	88.0	3.0	8.1
11.	Concentrate	10.86	275.5(calc)	91.8
"	Tailings	89.14	3.0	8.2

Amalgamation of flotation tailings resulted in the following gold distribution:

	Test No.	
	10	11
Flotation Concentrate	91.9%	91.8%
Amalgamation of flotation Tailings	5.4%	5.4%
Tailings	2.7%	2.8%

Cyanidation of Flotation Tails.

A sample of combined tailings of tests Nos. 10 & 11 were cyanided with a consumption of 0.61 lb./ton KCN and 9.2 lbs./ton CaO with the following result:

Heads: 3.0dwts./gold/ton.

Tails: 0.5dwts. gold/ton.

thus showing an indicated extraction by direct flotation and cyanidation of flotation tailings of 32.1dwts./ton, or 98.4%.

DISCUSSION OF RESULTS.

Fourty per cent. of the gold in this ore is intimately associated with Arsenopyrite, and satisfactory extraction could not be obtained after fine grinding or fine grinding and roasting by Cyanidation. Amalgamation tests of finely ground tailings (96.5% -200 mesh) roasted and unroasted giving residues of 2.1 and 1.5 dwts. of gold per ton are of interest, but would require the operation of a pilot plant to assess the practicability of this method and if satisfactory could be utilised for the complete ore. The choice of method of treatment would be amalgamation and retention of tailings for future treatment. This may be justified if capital expenditure is at present a major consideration.

An alternative choice of treatment would be fine grinding and flotation, in which case amalgamation could be incorporated either after flotation or during fine grinding or both. The flotation concentrate could be sold as such or the gold extracted.

Cyanidation of the flotation concentrate does not show a great deal of promise from these tests with tailings, but further testing would be desirable; fine grinding of same and amalgamation is worthy of attention.

As amalgamation of flotation tailings gave a residue of only 1 dwt. of gold per ton, it would be a preferable method of treatment to cyanidation owing to lower operating and capital costs, particularly as only an additional 0.5 dwt./ton of gold would be anticipated.

GOVERNMENT CHEMIST & ASSAYER.