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REPORT
of the
ORE DRESSING AND METALLURGICAL LABORATORIES.

Report No. 209

Gold ore from Mine Centre, Ontario.

by C. S. Parsons

Shipment: A shipment of 200 pounds of gold ore was received on January 4th. 1924, from Mr. J. S. Hillyer, 4 Chester Terrace, Duluth, Minn. U.S.A.

Location of deposit: The property from which this sample was taken is situated near the Seine river, Mine Centre, Rainy River district, Ontario.

Characteristics of sample: The sample is a clean free milling gold quartz ore.

Sampling and analysis: The entire 200 pound sample was crushed to 8 mesh, and cut in a Jones sampler to 100 pounds, which was further reduced to 14 mesh. The sample for assay was obtained from this 14 mesh material by careful graded reduction.

Assay of sample .. .. Gold .. 2.22 ozs. per ton

Purpose of shipment: Information as to the best method of treatment of the ore was desired, for the design of a mill to recover the gold.

Scope of Experimental work: The ore was found to be a free milling gold quartz containing a small amount of iron pyrite. There were five possible methods of treatment, namely: Amalgamation; amalgamation followed by concentration; amalgamation followed by concentration and cyaniding; amalgamation followed by cyaniding; and the simple method

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of straight cyaniding. In order to obtain data for judging and comparing the merits of each method, tests were conducted using each of the above flow sheets.

EXPERIMENTAL WORK

Test No. 1

Amalgamation: The ore was crushed to 35 mesh and amalgamated

Procedure: 1000 grams of ore was agitated with 100 grams of mercury in a pulp of 1:1 for 2 hours

Recovery:

Assay of heads	2.22	ozs per ton
Assay of amalgamation tlg.	0.52	" " "
Recovery by amalgamation	76.4 %	

Test No. 2

Amalgamation followed by table concentration: The amalgamation tailing from test no. 1 was tabled:

Product	Weight grams	Weight %	Assays oz./ton	Recoveries
Table concentrate	30.4	3.06	6.76	39.20
Table tailing	963.4	96.94	0.33	60.80
Heads	993.8		0.52	

Recapitulation:

Recovery by amalgamation	76.4%
Recovery in table concentrate	9.25%
Total recovery	85.65%
Loss in tailing ..	14.35%

Test No. 3

Amalgamation, table concentration, and cyaniding: The table tailing from test no. 2 was cyanided, the tailing first being recrushed to pass 100 mesh. A cyanide solution of 0.25% KCN; the time of treatment 24 hours; and 10 pounds per ton of lime was used.

Assay of table tailing before cyaniding	0.33	oz./ton
Assay after cyaniding	0.02	" "
Extraction by cyaniding	94.0 %	

Recapitulation:

Recovery by amalgamation	76.4 %
Recovery in table concentrate	9.25%
Extraction by cyaniding	13.5 %
Total extraction by combined methods	99.15%

Test No. 4

Amalgamation followed by cyanidation of amalgamation tailing: A new

sample was crushed to 35 mesh and amalgamated as in test no. 1

Assay of heads before amalgamation	2.22 ozs./ton
Assay of amalgamation tailing ..	0.56 " "
Recovery of gold by amalgamation	74.7 %

The amalgamation tailing was recrushed to pass 100 mesh and cyanided. The strength of solution used was 0.25% KCN; 10 pounds of lime per ton was used.

Assay of amalgamation tailing before cyaniding	0.56 oz./ton
Assay of cyanide tailing	0.02 " "
Extraction by cyaniding	96.5 %

Recapitulation:

Recovery of gold by amalgamation	74.7 %
Extraction by cyaniding ..	24.4 %
Total recovery by combined methods	99.1 %

Test No. 5

Cyaniding: A sample of ore was crushed to 100 mesh and cyanided directly. A solution strength of 0.25% KCN was used; 10 pounds per ton of lime was added; time of treatment 24 hours.

Assay of heads before cyaniding	2.22 ozs./ton
Assay of tailing after cyaniding	0.02 " "
Extraction by cyaniding ..	99.1 %

SUMMARY: A good recovery of the gold is obtained on this grade of ore by amalgamation and concentration, but the tailing is too high grade to be discarded. A tailing assaying 0.33 oz. per ton gold is equivalent to $6.60 ore. Therefore cyaniding must be used as an adjunct to amalgamation and concentration. That there is no advantage in concentration when the table tailing has to be cyanided is very evident, because the same total extraction is obtained by omitting the concentration step, as in test no. 4

The choice of procedure lies between the method used in test no. 4 and that used in test no. 5, namely amalgamation and cyaniding, and straight cyaniding. Both methods give the same extraction. The first cost of plant would be slightly higher for the flow sheet using amalgamation, and more labour would be required in operating the mill. The cyanide consumption in either case should not be high, as the ore is a remarkably clean ore. The small scale tests give a higher consumption of cyanide in test no. 5. This would be expected, but against this there would be an almost equivalent loss in waste of solution in the amalgamation and cyaniding flow sheet

It would seem that straight cyaniding of the ore would be the better practice to follow, but final decision should only be made after careful consideration of conditions at the mine. It may be found more advantageous to amalgamate before cyaniding.