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DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

CANADA

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Ottawa, September 24, 1946.

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2107.

Some Laboratory Experiments on the Recovery of Gold from a High Grade Ore from the Property of the Gogita Mining Syndicate at Boston Creek, Ontario, with the Purpose of Outlining Profitable Operation at a Small Tonnage.

Note:
This report relates essentially to the samples as received. It shall not, nor any correspondence connected therewith, be used in part or in full as publicity or advertising matter for the sale of shares in any promotion.

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BUREAU OF MINES
DIVISION OF METALLIC MINERALS
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ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Shipment:

On July 9, 1946, a shipment of ore from the above-mentioned property was received under instructions from Mr. Peter Tagliamonti, Boston Creek, Ontario. The shipment consisted of four bags of ore, tagged Nos. 1, 2, 3 and 4 respectively, of a total weight of 198 pounds.

Under the interpretation of Mr. Tagliamonti's letters of April 23 and July 1, 1946, the contents of each bag were prepared individually for assaying and the four bags of ore were then combined for ore testing purposes.

Location of Property:

The property of the Gogita Mining Syndicate Limited from which the samples originated is in Boston township in the Boston Creek district of northern Ontario.

Sampling and Assaying:

The contents of each bag were crushed individually to approximately 20 mesh and a sample cut out for assay for gold and silver.

The remaining portions of the ore from the four bags were then thoroughly mixed and a head sample cut out for assaying and analysis. The total weight of the ore was passed through a 20-mesh screen and bagged for investigative purposes.

The assay results on the individual samples and the analysis of the combined head sample were as follows:

Sample No. 1 - Weight 50 lb. -	Gold,	0.77	oz./ton
	Silver,	0.11	"
Sample No. 2 - " 52 " -	Gold,	0.445	"
	Silver,	0.080	"
Sample No. 3 - " 48 " -	Gold,	1.28	"
	Silver,	0.18	"
Sample No. 4 - " 48 " -	Gold,	0.75	"
	Silver,	0.13	"

Combined Head Sample:

Gold,	0.795 oz./ton
Silver,	0.15 "
Copper,	Nil.
Zinc,	"
Lead,	"
Iron,	7.31 per cent
Sulphur,	3.30 "
Insoluble,	50.82 "

Purpose of Investigation:

Mr. Tagliamonti, in his letters, intimated that his intentions were to start operations on the basis of 10 tons per day. In the test work and recommendations, this small-scale operation, with its high cost per ton milled and high

(Purpose of Investigation, cont'd) -

cost per ounce of gold recovered, had to be borne in mind. Cyanidation of the ore or its products, with its expensive plant equipment, could hardly be considered. More emphasis has been placed on processes involving cheaper plant expenditure, lower cost of operation and less operating experience, balanced against a satisfactory recovery. It is indefinite also whether the operation is to be on a 10 ton per 8 hour day basis or on a 24 hour day basis.

Screen Analysis of Head Sample:

A screen analysis of the head sample showed the values, association and distribution of the gold in the various mesh sizes to be as follows:

Mesh Size	Weight, per cent	Assays Ozs./ton: Au	Assays Per Cent: Fe	Assays Per Cent: S	Distribution, per cent: Au	Distribution, per cent: Fe	Distribution, per cent: S
+48	18.64	0.86	7.95	4.05	19.3	20.1	21.9
+65	17.14	1.00	7.90	4.59	20.6	18.3	22.9
+100	11.14	1.00	8.18	4.94	13.4	12.4	16.0
+150	10.59	0.94	7.84	4.42	12.0	11.2	13.6
+200	7.45	0.90	7.84	4.08	8.1	8.0	8.8
-200	35.04	0.65	6.27	1.64	26.6	30.0	16.8
Total	100.00	0.83	7.36	3.44	100.0	100.0	100.0

Some 65 per cent of the gold occurs in the sizes above 150 mesh, with lower assays and distribution below that mesh. The need of fine grinding, as measured by present day fine grinding practice, is not indicated. While later test work showed that approximately 65 per cent of the gold is "free milling," the screen analysis shows that its distribution follows closely also to the distribution of the iron and sulphur (pyrite) in the sample.

Microscopic Examination:

Eight polished sections, two from each sample, were prepared and examined under a reflecting microscope for the

(Microscopic Examination, cont'd) -

purpose of determining the character of the ore. Since the microscopic examination showed all four samples to have similar characteristics they will not be described separately.

Gangue -

In the polished sections gangue material is a mixture of glassy quartz, dark greenish grey rock, and abundant, coarse to fine, pinkish white carbonate (calcite). A qualitative microchemical test for iron was applied to the last-named constituent and gave a very weak positive reaction.

Metallic Minerals -

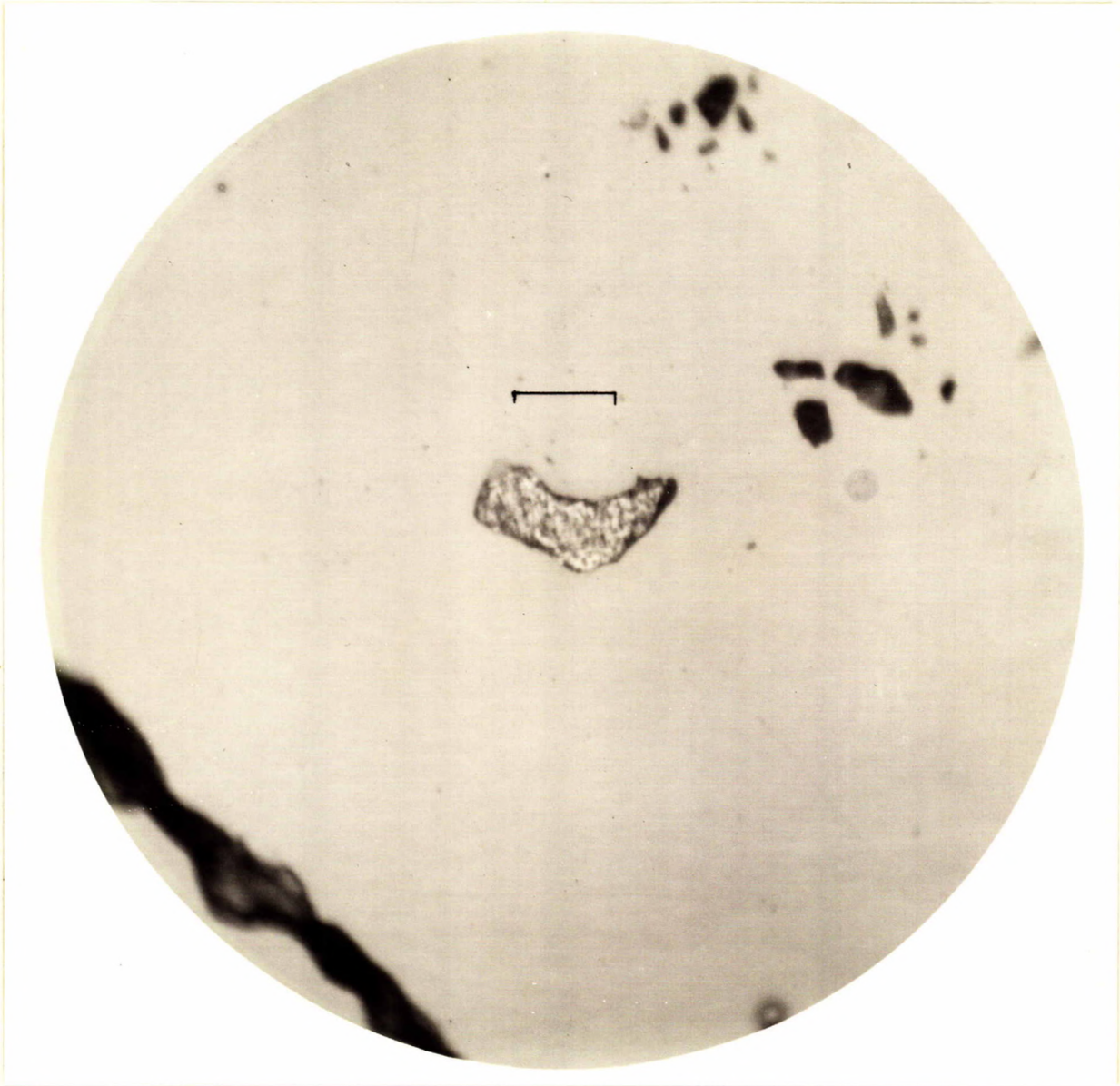
Metallization is moderately stoong and is represented by pyrite, magnetite and ilmenite, chalcopyrite, and gold. Pyrite preponderates over all the others and is the only abundant metallic mineral visible in the eight polished surfaces. It occurs as coarse to fine crystals and grains disseminated unevenly through gangue. The two greatest dimensions of the largest crystal observed measure about 2 x 1.5 mm. The other crystals range from that size down to only a few microns in diameter but the coraser sizes predominate. Small amounts of magnetite and ilmenite are present as occasional to rare tiny grains in gangue and pyrite, and a negligible quantity of chalcopyrite is visible in the same manner.

Three tiny irregular particles of native gold were observed in the sections. The largest is approximately 60 microns (-200 +280 Tyler mesh) in size and all occur in apparently dense pyrite. (See Figure 1.)

(Figure 1 follows,
on Page 5.)

(Microscopic Examination, cont'd) -

Figure 1.



Photomicrograph of polished surface, showing a tiny knee-shaped particle of gold (white, rough pitted surface) in dense pyrite (light grey, smooth surface). Pits and fractures are black.

This is the smallest of the three grains of native gold observed; the black line is 10 microns in length.

Oil immersion. X1500.

Conclusions from Test Results:

From the test work involving amalgamation, it is established that approximately 65 per cent of the gold in the ore is "free milling" and amenable to amalgamation, providing an inexpensive means of recovering nearly two-thirds of the gold. This method also provides a method of quick payment for the gold produced.

Flotation of the tailings from amalgamation, as in Tests Nos. 3 and 5, gave a good overall recovery of the gold. A small flotation unit incorporating the cleaning of the rougher concentrate, as in Test No. 5, should be employed. It is suggested that the cleaner concentrate from the flotation operation, involving 8.7 per cent of the weight of the ore and assaying 2.7 ounces gold per ton ($94.50 per ton gold at $35.00), could be shipped to a smelter or treated at one of the mills in Kirkland Lake. The cleaner tailings could be stored for future disposal.

Flotation of the ore directly, as in Tests Nos. 6 and 7, gave much the same overall recovery as did the tests in which flotation was preceded by amalgamation. As in Test No. 7, a cleaner concentrate assaying 12.2 ounces gold per ton ($427.00 per ton at $35.00) was obtained from 6.1 per cent of the ore weight. This high-grade product is decidedly a smelting proposition and the cleaner tailings could be stored or shipped to one of the Kirkland Lake mills for treatment.

Milling operations following the above tests incorporating flotation would require a moderate plant expenditure for the flotation equipment.

In Tests Nos. 8 and 9, where amalgamation was followed by blanket concentration in Test No. 8 and by table concentration in Test No. 9, the overall recovery was not so high as in the preceding tests but cost of operation and

(Conclusions from Test Results, cont'd) -

plant expenditure would be reduced to a minimum.

In the tests the blanket operation and the tabling were only carried out in single stage, but a series of blankets with the concentrate cleaned on a separate blanket would undoubtedly raise the grade of concentrate and probably the extraction. This would apply to the tabling operation also.

Depending on conditions, a tentative figure of 0.5 sq. ft. of blanket area per ton of ore per 24 hours is allowed. The number of times per shift that the blankets are to be cleaned will vary this figure. A standard Wilfley table has a capacity of 15 to 25 tons of ore per 24 hours.

While cyanidation of the ore or its products is not recommended, due to the expensive plant required for efficient operation, Test No. 8 was made to show that the ore is not difficult to treat by this method. It can be assumed with reasonable assurance that the lower grade concentrate and cleaner tailing would also be amenable to cyanidation, so that shipment of these products to Kirkland Lake would be feasible.

The final decision on the method of operation to be adopted should be made on the basis of economics, influenced by a number of factors, the amount of capital available for plant outlay, size of the ore body, and contracts for treatment of concentrate. Any recommendations made herein are based entirely on the ore as represented by the sample received. Any change in the grade of ore or the mineral association might alter partially or entirely the method of treatment.

DETAILS OF INVESTIGATIVE TESTS:

Test No. 1.

1,000 grams of ore was ground in a jar mill to 81.8 per cent minus 200 mesh. Pulp transferred to a jar mill and amalgamated for 1 hour with 7 c.c. mercury, 0.5 gram lime, 1,000 c.c. water, and two small balls. Mercury recovered, pulp filtered. Sampled and assayed.

Results -

Head sample, Au oz./ton = 0.795
Tailings, " = 0.27
Per cent recovery of gold = 66.04

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Test No. 2.

1,000 grams of ore amalgamated as in Test No. 1. Mercury recovered and pulp treated, at 4½ to 1 dilution, on a corduroy blanket table with a slope of 2½ inches per foot. Products sent for assay.

Results -

Head sample, Au oz./ton = 0.795
Amalg. tailings, " (calc.) = 0.272
Recovery by amalgamation, per cent Au = 65.8

Product	Weight, per cent	Assay, Au, oz./ton	Distribution of gold, per cent
Blanket cone.	13.0	1.12	53.6
Blanket tailing	87.0	0.145	46.4
Totals	100.0	0.272	100.0

Further extraction on head by blanket concentration, per cent Au = 18.35

Total overall recovery, per cent Au = 84.15

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Test No. 3.

1,000 grams of ore amalgamated as in Test No. 1. Mercury recovered. Pulp filtered and repulped and transferred to a flotation cell with the following reagents:

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Reagents Added:

To Grinding - Lb./ton

Soda ash	=	0.2
Reagent No. 301	=	0.2
Reagent No. 208	=	0.2
Pot. amyl xanthate	=	0.2

To Flotation -

Pine oil	=	0.10	Condition 3 mins. Float 7 mins. pH, 8.8

Results:

Head sample, Au oz./ton	=	0.795
Amalg. tailing, " (calc.)	=	0.29
Extraction by amalgamation, per cent Au	=	63.6

Products	Weight, per cent	Assays Oz./ton: Au	Assays Per cent: Fe	Assays Per cent: S	Distribution, per cent: Au	Distribution, per cent: Fe	Distribution, per cent: S
Flot. conc.	17.8	1.44	19.31	17.74	86.2	47.2	99.0
Flot. tailing	82.2	0.05	4.67	0.043	13.8	52.8	1.0
Totals	100.0	0.29	7.27	3.19	100.0	100.0	100.0

Further extraction on heads by flotation, per cent Au = 31.37

Overall recovery, per cent Au = 94.97

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Test No. 5.

1,000 grams of ore amalgamated as in Test No. 1. Pulp transferred to flotation cell and floated with same reagent combination as in Test No. 3. Concentrate was given one stage of cleaning with 1.0 lb./ton of sodium silicate added. No other reagents.

Results:

Head assay, Au oz./ton	=	0.795
Amalgamation tailing, Au oz./ton (calc.)	=	0.285
Extraction, per cent Au	=	64.2

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Products	Weight, per cent	Assays Oz./ton: Au	Assays Per cent: Fe	Assays Per cent: S	Distribution, per cent: Au	Distribution, per cent: Fe	Distribution, per cent: S
Cleaner conc.	8.7	2.70	31.9	33.7	82.4	39.7	94.3
Cleaner tailing	11.3	0.09	6.07	0.93	3.5	9.8	3.3
Flot. tailing	80.0	0.05	4.40	0.09	14.1	50.5	2.4
Totals	100.0	0.285	6.98	3.11	100.0	100.0	100.0

Additional extraction on head by flotation, per cent Au = 89.5

Overall recovery, per cent Au = 93.7

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Test No. 6.

1,000 grams of ore ground to 81.8 per cent minus 200 mesh and transferred to a flotation cell with the following reagents:

Reagents Added:

To Grinding -

		Lb./ton	
Soda ash	-	0.5	
Reagent No. 301	-	0.2	
Reagent No. 208	-	0.3	
Pot. amyl xanthate	-	0.2	

To Flotation -

Pine oil	-	0.10	pH, 9.5. Condition 3 mins. Float 5 mins.

To Cleaning -

Sodium silicate	-	1.0	Float 2½ mins.

Products	Weight, per cent	Assays Oz./ton: Au	Assays Per cent: Fe	Assays Per cent: S	Distribution, per cent: Au	Distribution, per cent: Fe	Distribution, per cent: S
Cleaner conc.	5.65	13.34	45.2	50.21	89.5	34.3	85.1
Cleaner tailing	2.35	1.225	15.65	12.96	3.4	4.9	9.1
Flot. tailing	92.00	0.065	4.93	0.21	7.1	60.8	5.8
Totals	100.00	0.842	7.46	3.33	100.0	100.0	100.0

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Test No. 7.

A duplicate test to Test No. 6.

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(Details of Investigative Tests, cont'd) -

Results;

Products	Weight, per cent	Assays Oz./ton: Au	Assays Per cent: Fe	Assays Per cent: S	Distribution, per cent: Au	Distribution, per cent: Fe	Distribution, per cent: S
Cleaner conc.	6.1	12.20	43.4	48.35	93.1	35.9	92.3
Cleaner tailing	3.7	0.40	7.69	2.74	1.8	3.9	3.1
Flot. tailing	90.2	0.045	4.90	0.16	5.1	60.2	4.6
Totals	100.0	0.799	7.36	3.19	100.0	100.0	100.0

Test No. 8.

1,000 grams ore ground to 81.0 per cent minus 200 mesh and cyanided for 48 hours at 2 to 1 dilution. Pulp filtered and assayed.

Results:

Assay heads, Au oz./ton	=	0.795
Assay residue, Au oz./ton	=	0.055
Per cent extraction of gold	=	93.1
NaCN consumed, lb./ton ore	=	0.60
CaO consumed, lb./ton ore	=	2.48

Test No. 9.

1,000 grams of ore amalgamated in the usual manner.

Amalgamation tailings run over a laboratory Wilfley table with middling product re-run.

Results:

Assay of heads, Au oz./ton	=	0.795
Assay of amalg. tailing, Au oz./ton	=	0.285 (calc.)
Extraction of gold, per cent	=	64.4

Products	Weight, per cent	Assays Oz./ton: Au	Assays Per cent: Fe	Assays Per cent: S	Distribution, per cent: Au	Distribution, per cent: Fe	Distribution, per cent: S
Table conc.	5.5	3.26	39.06	35.7	63.3	39.9	61.5
Table tailing	94.5	0.11	5.54	1.3	36.7	70.1	38.5
Totals	100.0	0.285	7.38	3.19	100.0	100.0	100.0

Additional extraction on heads by tabling, per cent Au	=	22.5
Overall recovery, per cent Au	=	86.9

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