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REPORT No 255

~~of the~~

~~ORE DRESSING AND METALLURGICAL LABORATORIES~~

Experimental tests on the ore of the Argonaut Mine, Argonaut, Ontario

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Shipment: One shipment consisting of two samples, total weight 150-lbs, was received at the laboratories August 31, 1926, from Argonaut Consolidated Mines Ltd., 307 Dominion Express Building, Montreal.

Characteristics and analysis : The samples were of a gold-copper ore in which, according to the company's engineer, the gold and copper bear no definite relation to each other. The copper is present as chalcopyrite and the gangue is tentatively classed as semi-basic volcanic. Considerable magnetite is present. Analysis of the two samples was as follows:

No. 1	Copper	0.80 %
No. 2	Copper	1.35 %

Purpose of experimental tests: The flow sheet of the Argonaut mill is as follows: Grinding in a ball mill followed by a classifier in closed circuit with a tube mill and one set of amalgamation plates. The overflow from the classifier is passed to another set of amalgamation plates, the tailing from which is floated. Ore from two levels in the mine is at pbesent milled. Recently the flotation results on the ore represented by sample No. 1 were unsatisfactory. The recoveries were poor, and the froth in the cell was watery and of a greyish colour. Ore as represented by sample No. 2 behaved normally.

The purpose of these tests is to ascertain if possible the reasons for the difference in behaviour of the two samples, and to apply corrective measures to sample No. 1

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Experimental tests - Lot No. 1

Test No.	Product	Weight %	Analysis Cu %	Percent values	Remarks
1	Concentrate	6.0	12.24	94.0	Ore ground -100 mesh
	Tailing	94.0	0.05	6.0	Froth fair
2	Concentrate	4.4	16.52	92.7	Ore ground 18% +200 mesh
	Tailing	95.6	0.06	7.3	Bluish-grey froth
3	Concentrate	7.2	10.56	93.0	Bluish-grey froth
	Tailing +200	17.8	0.07	1.5	
	-200	75.0	0.06	5.5	
4	Concentrate	4.5	16.84	96.3	Froth bright colour
	Tailing +200	15.9	0.03	0.6	
	-200	79.6	0.03	3.1	
5	Concentrate	4.3	16.52	88.2	Ore ground 15% +200 mesh.
	Table conc.	6.5	0.23	1.8	Bluish-grey froth. Table
	" midd.	2.7	0.09	0.2	concentrate high in
	" tail.	61.5	0.08	6.1	magnetite
	Slimes	25.0	0.12	3.7	
7	Concentrate	6.6	10.46	90.8	Froth bluish-grey
	Tailing +200	8.4	0.12	1.3	
	-200	85.0	0.07	7.9	
8	Concentrate	5.0	14.66	96.3	Froth superior to test 7
	Tailing +200	7.4	0.03	0.3	Colour bright
	-200	87.6	0.03	3.4	
9	Concentrate	4.7	19.08	93.1	Head sample high, 0.96% Cu
	Tailing +200	9.6	0.07	0.7	Froth good, colour bright
	-200	85.7	0.07	6.2	
10	Concentrate	4.8	14.08	94.7	Froth good, colour bright
	Tailing +200	7.0	0.04	0.4	Pulp alkaline
	-200	88.2	0.04	4.9	
11	Concentrate	6.1	12.32	95.2	Froth good, colour bright
	Tailing +200	7.5	0.04	0.4	Pulp alkaline
	-200	86.4	0.04	4.4	
12	Concentrate	7.7	10.50	95.8	Conditions good
	Tailing +200	6.1	0.04	0.2	
	-200	86.2	0.04	4.0	
13	Concentrate	9.5	7.46	90.4	Froth bluish grey
	Tailing +200	6.3	0.15	0.9	
	-200	84.2	0.08	6.7	

6 Test for soluble salts:

Iron ferrous	0.0025 grams/litre
CaO	0.0113 "
Solution alkaline	
MgO	0.0086 "
SO_3	0.0103 "

Reagents used:

Test No.	Reagent	Amount lb/ton	Added to
1	Soda ash	3.0	Ball mill
	Coal tar 40 / Coal tar creosote 60	0.35	" "
	Pine oil Flot. brand	0.04	Cell
2	Lime	4.0	Ball mill
	Xanthate	0.2	Cell
	Pine oil No. 5	0.04	"
3	Lime	3.0	Ball mill
	Xanthate	0.2	Cell
	Pine oil No. 5	0.04	"
	Copper sulphate-	0.5	"
4	Soda ash	3.00	Ball mill
	Xanthate	0.2	Cell
	Pine oil No. 5	0.04	"

Test No	Reagent	Amount lb/ton	Added to
5	Lime	3.00	Ball mill
	Coal tar creosote	0.30	"
	Cresylic acid	0.08	"
	Pine oil No. 5	0.04	Cell
7	Lime	3.0	Ball mill
	Barretts No. 4	0.34	"
	Pine oil No. 5	0.04	Cell
8	Soda ash	3.00	Ball mill
	Barretts No. 4	0.34	"
	Pine oil No. 5	0.04	Cell
9	Lime	2.00	Ball mill
	Coal tar creosote	0.25	"
	Cresylic acid	0.08	"
	Pine oil No. 5	0.04	Cell
10	Soda ash	2.00	Ball mill
	Coal tar creosote	0.25	"
	Cresylic acid	0.08	"
	Pine oil No. 5	0.04	Cell
11	Lime	1.00	Ball mill
	Coal tar creosote	0.20	"
	Cresylic acid	0.08	"
	Pine oil No. 5	0.04	Cell
12	Soda ash	1.00	Ball mill
	Coal tar creosote	0.20	"
	Cresylic acid	0.08	"
	Pine oil No. 5	0.04	Cell
13	Lime	6.00	Ball mill
	Coal tar creosote	0.20	"
	Cresylic acid	0.08	"
	Pine oil No. 5	0.04	Cell

Lot No. 2:

Test No	Product	Weight %	Analysis Cu %	Percent values	Remarks
1	Concentrate	8.2	16.32	95.4	Ore ground -100 mesh
	Tailing	91.8	0.07	4.6	Froth good
2	Concentrate	6.0	21.30	95.8	Ore ground +150 mesh
	Tailing	94.0	0.06	4.2	Froth good
3	Concentrate	7.6	17.50	95.3	Ore ground 18% +200 mesh
	Table conc.	6.9	0.25	1.2	Froth good. Table
	Table midd.	3.3	0.10	0.2	concentrate high in
	Table tail.	48.9	0.06	2.1	magnetite
	Table slime	33.3	0.05	1.2	
5	Concentrate	7.6	17.38	96.5	Conditions good
	Tailing +200	7.6	0.06	0.4	
	-200	84.8	0.05	3.1	
4	Soluble salts :				
	Iron ferrous		0.0015	grams/litre	
	CaO		0.0137	"	
	Solution alkaline				
	MgO		0.0149	"	
	SO_3		0.0103	"	

Reagents used:

Test No	Reagent	Amount lb/ton	Added to
1	Soda ash	3.0	Ball mill
	Water gas tar	0.37	"
	Pine oil No. 5	0.04	Cell
2	Lime	4.00	Ball mill
	Xanthate	0.20	Cell
	Pine oil No. 5	0.04	"
3	Lime	3.00	Ball mill
	Coal tar creosote	0.28	"
	Cresylic acid	0.08	"
	Pine oil No.5	0.04	Cell

Test No	Reagent	Amount lb/ton	Added to
5	Lime	1.0	Ball mill
	Coal tar creosote	0.20	"
	Cresylic acid	0.08	"
	Pine oil No. 5	0.04	Cell

SUMMARY:

Reagents:- (1) Lime - The bluish grey froth mentioned by Mr. Thomas, the company's engineer, was more pronounced in the tests where three or more lbs per ton was used. Using one and two lbs./ton the froth was golden in colour and fairly consistent. In test no. 13 where six lbs/ton lime was used the bluish-grey colour was very pronounced. I would suggest that the company control this reagent, if ir is in use, so that not more than 1.5 lbs/ton be used.

(2) Soda ash - No mention has been made of the use of this reagent in the mill. It might be used in quantities up to 1.5 lbs/ton with good results, providing it does not upset the operation of the classifier. We have often experienved that soda ash used in the flotation of chalcopyrite will produce a brighter and better froth than lime. In the presence of pyrite its action is not as selective as that of lime, but this point need not be considered in this case. If the ore should be slightly oxidized, not perceptible under the microscope, soda ash will give better results than lime.

(3) Oils - Various oils were tried along with Xanthate. Coal tar creosote 0.2 lb/ton added to the ball mill with 0.08 lb/ton cresylic was satisfactory. This should approach that used at Argonaut where the coal tar creosote contains a high percentage of cresylic acid. Pine oil No. 5 was used as a frother, added in the flotation cells. Mr. Thomas' report did not state where the oils were added. I would suggest that the coal tar creosote be added to the tube mill which will allow of time contact. If it should interfere with the amalgamation, Xanthate in solution might be added at the end of the second set of plates, the pine oil could also be added here.

Microscopic examination: Both lots were examined under the microscope and no difference could be detected.

Soluble salts: A Test for soluble salts was made on each sample. The solutions from each test were alkaline using phenol pthaline as indicator. Lot No. 1, in spite of the fact that analysis showed it to contain less lime and magnesia that lot no. 2, gave indications of

being the more alkaline of the two. The sodium was not determined. This latter element may account for the paradox.

CONCLUSIONS: From this distance, and the information at hand, it is difficult to say just what the trouble is. I would suggest that a ten day run be undertaken using - lime 1.0 lb/ton added to tube mill, coal tar creosote 0.2 lb/ton added to tube mill, pine oil added at end of last amalgamation plates. Should no improvement be noted, try the same quantity of soda ash added to the tube mill.