C. S. Parsons

O T T A W A March 27, 1946.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2021.

Investigation of Procedures for Improving the Recoveries of Molybdenite and Bismuth at the Mill of the Molybdenite Corporation of Canada, Limited, La Corne, Quebec.

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.

(Copy No. 8.)

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

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Shipment:

A sack containing 21 pounds of ground ore was received on January 20, 1946, from the Molybdenite Corporation of Canada, Limited, La Corne, Quebec, per G. Shartner, Resident Manager. This material was from the mill operated at La Corne by the company, and consisted of solids from the grinding circuit classifier overflow.

Purpose of Tests:

The tests reported herein were made in order to determine the effect of different reagent combinations, in flotation, when using the new flowsheet. Also included are screen tests made on the table products from a gravity concentration test on flotation bismuth concentrate from pilot plant experiments with the new flowsheet. These screen tests were made in order to find out whether a part of the molybdenite reporting with the flotation bismuth concentrate could be removed by screening.

Chemical Analysis:

Upon standard chemical analysis of this material the following results were obtained:

MoS_2 - 0.71 per cent
Bismuth - 0.04 "

Summary of Results:

The indications are that several new reagent combinations give promise for improvement in the recovery of bismuth and molybdenite at the Ca Corne mill.

By screening the concentrate and middling product from table concentration of flotation bismuth concentrate a good separation of the MoS_2 and Bi was obtained with a 100-mesh screen.

Experimental Tests:

I. - Flotation Tests.

A series of six flotation tests was planned. The first in the series was made with the kerosene-pine oil combination of reagents that is now in use at the mill. Test No. 1, then, will serve as a standard of comparison. The other tests, made with different reagent combinations, should be compared with Test No. 1 in order to show the improvements under the changed conditions.

The reader who is familiar with mill operation will realize at once that the products from these tests do not compare, in either grade or recovery, with the mill products. No attempt was made to imitate mill results; rather, accent was placed on a careful control of conditions, so that one test could be compared with another, to show the merits and defects of each set of reagents. These tests should not be considered as conclusive in themselves. They do, however, point the way to procedures that are worth a trial under operating conditions.

The time of conditioning, the addition of reagents, and the other controlling factors, were the same in each test throughout the series, in so far as this was possible. The only variable, then, was the reagent combination.

(Continued on next page)

(Flotation Tests, cont'd)-

TABLE I. - Flotation Reagents Used.

Reagent	Test No. 1	Test No. 2	Test No. 3	Test No. 4	Test No. 5	Test No. 6
		- (Lb./ton) -				
Kerosene	0.76	0.76	0.76	0.60	0.66	0.60
Fuel oil						0.16
Pine oil	0.062	0.062	0.062	0.062	0.031	0.062
Amyl xanthate				0.28		
Dresinate XXX					0.093	
$CuSO_4$				0.23		
Soda ash		0.65		0.46		
Water glass			0.46			
pH	9.0	10.4	9.6	10.0	9.0	9.0

TABLE II. - Flotation Results.

Test No.	FEED Wt., gm.	FEED MoS_2, per cent	FEED Bi, per cent	CONCENTRATE Wt., gm.	CONCENTRATE MoS_2, per cent	CONCENTRATE Bi, per cent	TAILING Wt., gm.	TAILING MoS_2, per cent	TAILING Bi,* per cent	RECOVERIES, per cent MoS_2	RECOVERIES, per cent Bi
1	1500	0.71	0.04	45.0	13.57	0.42	1449.0	0.25	0.028	66	32
2	1500	0.71	0.04	33.3	17.82	0.64	1438.2	0.15	0.026	79	36
3	1500	0.71	0.04	27.7	22.14	0.46	1479.7	0.15	0.031	79	24
4	1500	0.71	0.04	53.0	11.45	0.58	1454.5	0.12	0.019	83	54
5	1500	0.71	0.04	53.3	12.78	0.45	1443.6	0.10	0.024	86	42
6	1420	0.71	0.04	38.2	16.66	0.51	1367.0	0.05	0.027	93	34

* Calculated.

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II. - Screen Tests.

A sample from the flotation bismuth concentrate resulting from pilot plant experiments with the La Corne flowsheet was selected for table concentration. The results of this test have been reported in Report of Investigation No. 1932, of these Laboratories, dated October 15, 1945.

The following table gives the results of analyses of the screen products from the table concentrate and table middlings:

(Continued on next page)

(Screen Tests, cont'd) -

TABLE III. - Screen Analysis Results.

Mesh Size	TABLE CONCENTRATE Weight, per cent	Assays, per cent MoS_2	Bi	Cu	TABLE MIDDLING Weight, per cent	Assays, per cent MoS_2	Bi	Cu
+ 65	4.8	37.52	0.10	Trace	16.0	18.27	0.05	0.09
+100	9.8	20.47	0.69	0.75	16.7	8.86	0.11	0.18
+150	13.9	8.24	4.70	3.05	15.5	7.64	2.79	2.25
+200	15.7	6.05	12.50	5.35	12.9	7.03	9.32	4.60
-200	55.8	5.86	41.71	6.39	38.9	16.46	24.59	6.20

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CONCLUSIONS AND RECOMMENDATIONS:

An examination of the tests reported in Table II will show:

Test No. 1. - The kerosene-pine oil combination of reagents does not make as high recoveries nor as clean concentrate as do the other combinations.

Test No. 2. - The use of soda ash as an alkalinity regulator improves both the grade and the recovery of bismuth and molybdenite.

Test No. 3. - Water glass is a strong gangue depressant, and, as shown by this test, it makes possible the recovery of a clean molybdenite concentrate. Use of this reagent is recommended, not in primary flotation, but in flotation after heat treatment, where it is desirable to make a high-grade molybdenite product, low in bismuth and gangue minerals.

Test No. 4. - A high recovery of the metallics is

(Conclusions and Recommendations, cont'd) -

indicated with the amyl xanthate-kerosene-$CuSO_4$ combination. These reagents should be regarded with suspicion until they prove themselves; soluble reagents such as the xanthates are more difficult to drive off in heat treatment than are the insoluble reagents such as kerosene. The combination in Test No. 4 is worth investigating, however, and if these reagents are eliminated so as to depress the bismuth after heat treatment, they may be of advantage to the operation.

Test No. 5. - Dresinate XXX, as a substitute for a part of the pine oil, brings improved recovery with the kerosene-pine oil combination.

Test No. 6. - Fuel oil, used as a collector, makes a good recovery of molybdenite and bismuth. It may be found that this reagent floats a large amount of mica with the molybdenite.

The results from the screen test on the table product show than an 80-mesh or a 100-mesh screen screen would divide this product into a fine portion, of high enough grade for the bismuth concentrate, and a coarse portion that would be returned to the ball mill.

It is recommended that such a screen should be attached to the table launders, in order to effect this screening operation in an inexpensive manner. Also, it is suggested that the reagent combinations described in the flotation tests should be given a trial in the mill. In this manner the worth of the improved results could be

(Summary and Conclusions, cont'd) -

balanced against the increased costs, to learn whether the change in reagents is justified.

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