

Ottawa, Ont.

May 18, 1925

REPORT
of the
ORE DRESSING AND METALLURGICAL LABORATORIES

Report No. ²²⁵....

Experimental tests on sweepings from the
Canada Bronze Co.

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Shipments: A shipment of 400 pounds of the sweepings was received
February 7, 1925

Characteristics of the sweepings: The material consisted of sweepings remaining
after casting, and was composed of gates, spills,
etc. from the castings, as well as pieces of coal, and considerable
sand from the moulds, all varying in size from 2 inches to a very
fine material, 100 mesh, and analysed approximately Cu 30% Pb 10%
Sn 3.5% Zn 7.0%

Sampling and Analysis: Owing to the nature of the material it was almost
impossible to obtain a satisfactory head sample. The
copper in the head sample will be calculated from the products of the
various tests.

Purpose of experimental work: The purpose of these tests was to raise the
metallic content of this material, particularly
the copper, by grinding and gravity concentration, to such a point
to permit of its being re-melted and re-cast. Formerly the material
was shipped to a U.S. smelter, but high freight rates made it advisable
to find a simple and cheap method of treatment on the company's premises.
The copper predominating, it was the element that the company was

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most desirous of recovering, and they will be satisfied if this element alone be determined by analysis. If possible, the company would like to be able to utilize a Wilfley table, already in their possession.

Experimental Tests:

Test No. 2: Grinding, screening, and tabling.

A sample of 20 pounds was cut from 300 pounds of the sweepings and crushed in rolls, screened on a 4 mesh screen. The +4 mesh product was a good grade of metallics. From the -4 mesh, a sample of 3887 gms was cut with a Jones sampler. This was crushed once in the rolls and screened on 48 mesh. The +48 mesh product was ground wet in a ball mill and again screened on 48 mesh. The +48 mesh product was a good grade of metallics and was not further treated. The -48 mesh from the rolls was tabled on a small Wilfley table, re-running the middlings to make a concentrate and tailing. The -48 mesh from the ball mill was treated similarly and the slimes from both tabling operations were combined.

Results: 1. Sampling, grinding, and screening

Oversize from 20-lbs crushed to 4 mesh	329.5 gms
Sample cut from -4 mesh	3887.0 "
+48 mesh after passing once through rolls	1913.0 "
-48 " " " " " "	1974.0 "

2. Concentration

Product	Weight gms	%	Analysis Cu. %	Content Cu	% of Cu values
+48 mesh from ball mill	565.0	16.5	74.05	1214.8	58.6
Table conc. -48m from ball mill	228.0	6.6	52.02	343.3	16.6
" " -48m from rolls	351.2	10.2	23.04	235.0	11.3
Table tails -48m from ball mill	408.7	11.9	6.14	73.1	3.5
" " -48m from rolls	1242.5	36.2	3.12	112.9	5.5
Slimes from both tablings	635.5	18.6	5.01	93.2	4.5

Head sample from products, omitting the +4 mesh - 20.72% Cu

Total feed 3887 gms

Products recovered 3431 "

Loss in slimes 456 "

% loss original feed - 11.7

% value in the concentrates - 86.5

Summary: The slime loss indicated the tendency of this material to slime when treated this way. The concentrate on 48 mesh screen after grinding in ball mill is very good. That produced from tabling the -48 mesh from the rolls was the poorest of the three. The table of concentrates is shown below.

Product	gms	%	Cu%	Cu gms	% of values
+48 mesh from ball mill	565.0	49.4	74.05	3658.1	67.7
Table conc. -48m from ball mill	228.0	19.9	52.02	1025.2	19.2
" " -48m from rolls	351.2	30.7	23.04	707.3	13.1

Average copper in concentrates 54.0%

Test No. 4: Grinding in ball mill, screening on 35 mesh, and tabling the -35 mesh.

A sample of 15-lbs was cut from 180-lbs of the sweepings. This was screened on 4 mesh. The oversize was passed once through rolls and again screened on 4 mesh. From the -4 mesh a sample of 1562 gms was cut and this was ground wet in a ball mill for 15 minutes and screened on 35 mesh. The oversize was re-ground for a further 15 minutes and again screened on 35 mesh. The oversize from this was a good metallic product. The -35 mesh product was tabled on a Wilfley table, re-running the middlings and making a final concentrate, middling and tailing. The slimes from the screenings were kept separate from those of the table.

Results: 1. Sampling, grinding and screening:

Oversize from 15-lbs crushed to 4 mesh	277.7 gms
Sample cut from -4 mesh	1562.0 "

2. Concentration:

Product	Weight		Analysis Content		% of Cu values
	gms	%	Cu %	Cu	
+35 mesh screen	341.4	22.2	62.5	1387.5	69.0
Table conc. -35 mesh	360.7	23.5	22.08	518.9	25.8
Table mids. -35 "	40.0	2.6	2.38	6.2	0.3
Table tails	599.7	39.1	1.14	44.6	2.2
Slimes (1) from screening	110.7	7.2	4.52	32.5	1.6
" (2) " table	82.7	5.4	3.99	21.5	1.1

Table of concentrates

+35 mesh	341.4	48.6	62.50	3038	72.8
Table concentrates	360.7	51.4	22.08	1135	27.2

Average Cu content of concentrates 41.73%

Original feed	1562.0 gms
Products from operations	1535.2 "
Loss (Slimes from table)	26.8
% loss of original feed	- 1.7
% values in copper concentrates	- 94.8

Test No. 5: Grinding, screening, and tabling

A sample of 1869.5 grams was cut from 160-lbs. This was screened dry on 35 mesh, and the oversize re-ground 15 minutes in a ball mill and again screened. This latter operation was twice repeated. The final +35 mesh was a good grade of metallics. The -35 mesh was tabled

re-running the middlings to make a concentrate and tailing. The slimes from the screen were kept separate from those from the table.

Results:

Product	Weight gms	%	Analysis Cu %	Content Cu	% of Cu values
+35 mesh concentrate on screen	437.4	24.1	60.70	1462.9	67.3
Table concentrate -35 mesh	414.9	22.8	25.00	570.0	26.2
" tailing " "	778.4	42.8	2.19	93.7	4.3
Slimes (1) screen	55.2	3.1	5.06	15.7	0.7
" (2) table	131.0	7.2	4.58	33.0	1.5

Table of concentrates:

+ 35 mesh	437.4	51.3	60.7	3113.9	71.9
Table concentrate	414.9	48.7	25.0	1217.5	28.1

Average content of concentrates 43.31% Cu

Average head sample from products 21.75% Cu.

Original feed 1869.5 grams

Products total 1816.9 "

Loss 52.6 "

% loss of original feed - 2.8

Recovery in concentrate @ 93.5% of the copper

Test No. 6: Grinding, screening and tabling

A sample of 1795 grams was cut from 150-lbs, and crushed dry in rolls, then ground wet in a ball mill for 20 minutes and screened on 65 mesh. The oversize was again ground in a ball mill and screened. These operations were twice repeated. The oversize from the last screening was a good grade metallic product. The -65 mesh material from the screening was tabled, re-running the middlings and making a final concentrate, middling, and tailing, and slimes

Results:

Product	Weight gms	%	Analysis Cu %	Content Cu	% of Cu values
+65 mesh	360.4	21.1	74.20	1565.6	71.6
Table concentrate	185.7	10.9	37.02	403.5	18.5
" middling	25.7	1.5	12.63	18.9	0.9
" tailing	907.0	53.1	2.53	134.3	6.1
" slimes	228.0	13.4	4.78	64.1	2.9

Table of concentrates:

+65 mesh	360.4	66.0	74.20	4897	79.6
Table concentrate	185.7	34.0	37.02	1259	20.4

Head sample from products - 21.86% Cu

Original feed 1795.0 gms

Products 1706.8 "

Loss 88.2 "

% loss due to slimes - 4.9% of original feed

Recovery in concentrates - 90.1% Cu

Average Cu values in concentrate - 61.56%

Summary: In the above tests, good recoveries were made by grinding wet in a ball mill, screening out the metallics, and tabling

the undersize from the screen. The best results were obtained on material ground to -65 mesh.

Recommendations: An installation consisting of a three-foot diameter, eight-inch cylinder Hardinge ball mill, maximum capacity one ton per hour, is recommended. This could be operated in conjunction with the Wilfley table already in possession of the company. Fifteen horsepower will be sufficient to operate both the ball mill and the table.

Grinding to 65 mesh will be sufficient to free the copper, the -65 mesh material being fed to the table. The +65 mesh product can be obtained by emptying the ball mill about once per week.