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INVESTIGATION
OF
GRAIN SIZE OF TIN
from
FEDERATION MINE, ZEEHAN

31-047

Investigation of Grain-Size of Tin
from Federation Mine, Zeehan
by
L. A. Clarke 2/4/31

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INVESTIGATION OF GRAIN SIZE OF TINFROMFEDERATION MINE, ZEEHANLG ClarkMethod of Testing

The ore was crushed down in a small jaw-crusher to about $\frac{1}{2}$ " and then to size through a Braun disc-crusher. After crushing to the size required to free the largest tin grains, as determined by preliminary tests which are given below, the ore was sized and each size vanned separately to find the proportion of free tin in each grain size. After the free tin was removed the tailings from each size were recrushed through 150 mesh and vanned again. The object of this was to determine whether any of the coarser sizes could be rejected without further treatment. Considerable difficulty was met in screening the finer sizes as the ore was clayey and for that reason sizing was stopped at 150 mesh on the Reilly Section ore.

The concentrates after vanning were cleaned with a magnet which removed a small proportion of magnetic mineral. They were then digested to endeavour to remove the titaniferous iron. This was in a very resistant form and even after crushing the sample very fine and digesting for four hours very little was dissolved, although the concentrates obviously contained a big proportion of these minerals. Accordingly a number of assays had to be made which it had been hoped to avoid. Owing to the high proportion of heavy mineral it was decided not to attempt to clean the concentrates owing to the chance of losing tin in the vanning. By assaying the concentrates, as was found

The second parcel was crushed through 30 mesh instead of 40 mesh as before. The crushing to avoid sliming was very carefully done.

Sizing Test

-30 + 40 mesh	33.6%
+ 60 "	12.4%
+ 80 "	9.7%
+100 "	4.0%
+150 "	10.9%
-150 "	29.2%

Free Mineral Test

	% Concentrates	Assay Value Sn.	% Metallic Tin in Size
-30+ 40 mesh	2.18	44.5 %	0.97%
+ 60 "	4.45	-	-
+ 80 "	8.2	13.5%	1.1%
+100 "	11.5	-	-
+150 "	7.35	16.5%	1.21%
-150 "	3.9	22%	0.86%
<u>after regrinding through 150 mesh</u>			
+ 40 "	2.1	6.0%	0.12%
+ 80 "	6.3	1.0%	0.06%
+150 "	14.1	0.5%	0.07%

These results show the tin to be well distributed throughout the various sizes but that almost all the tin is freed from gangue by crushing through 40 mesh.

Owing to the above results I would suggest that

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laboratory, which was very carefully done, and therefore a relatively big area of strakes should be provided. The details of rearranging the mill will, of course, have to be decided by the staff on the mine. A set of laboratory screens should be obtained and used for controlling the work in the mill.

Black face

The ore from the black face contained two different species of gangue. One was chiefly quartz and moderately hard and the other a rock consisting of decomposed feldspar and tourmaline which was soft. Preliminary tests indicated that no free tin would be obtained on +30 mesh ore. A parcel was then crushed as before and screened, with the following results.

Sizing test

-30 + 40 mesh	21.4%
+ 60 "	20.5%
+ 80 "	7.9%
+100 "	6.7%
+150 "	5.4%
+200 "	5.6%
-200 "	32.4%

The two different gangue materials account for the sizing result.

Each size was vanned and the tailings were recrushed as before through 150 mesh and revanned. The concentrates were treated as before.

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Free Mineral Tests

% Concentrates

Assay Value

% Metallic Tin

	% Concentrates	Assay Value	% Metallic Tin
-30 + 40 mesh	0.47		
+ 60 "	0.88		
+ 80 "	1.16		
+100 "	5.1	.36%	
+150 "	6.26		
+200 "	8.29		
-200 "	4.5		

Tails recrushed through 150 mesh

% Concentrates
after recrushing
through 150 mesh

+ 40 mesh	1.14		
+ 60 "	0.95		
+ 80 "	1.42		
+100 "	4.2	...	2.6%
+150 "	0.8		
+200 "	3.8	crushed through 200 mesh	

Done by different vanner.

The concentrates contained a little magnetic mineral. Again the tin is distributed throughout the ore and the coarser sizing will need recrushing.

The layout of your new mill should be reconsidered in the light of these results. Generally it would appear that the ore should be crushed through -30 mesh in the Marcy Mill followed by classification tabling and recrushing of the coarse tails, preferably in some form of tube mill. The same principle as given for the small mill of concentrating as soon as tin is freed from gangue, should be followed in the layout. Special thought must be given to the slime department as a large proportion of the softer ore will be slimed.

The following flowsheet shows the proposed mill in outline.

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FREE MINERAL TESTS.

		% Concentrates	Assay Value	% Metallic Tin
-30	+ 40 mesh	X 0.47	64	0.30
	+ 60 "	X 0.88		
	+ 80 "	X 1.16	64	0.74
	+100 "	5.1	36%	1.83
	+150 "	6.26	31%	1.94
	+200 "	8.29	26%	2.15
	-200 "	4.5	20%	0.9

Tails recrushed through 150 mesh

% Concentrates, after recrushing through 150 mesh.

+ 40 mesh	X 1.14	- 51	0.58
+ 60 "	X 0.95		
+ 80 "	X 1.42	60	0.85
+100 "	4.2	2.6%	0.11
+150 "	0.8	2.0	0.02
+200 "	3.8 crushed through 200 mesh	3.0	0.11

X Done by different vanner.

The concentrates contained a little magnetic mineral. Again the tin is distributed throughout the ore and the coarser sizing will need recrushing.

The layout of your new mill should be reconsidered in the light of these results. Generally it would appear that the ore should be crushed through -30 mesh in the Marcy Mill followed by classification tabling and recrushing of the coarse tails, preferably in some form of tube mill. The same principle as given for the small mill of concentrating as soon as tin is freed from gangue, should be followed in the layout. Special thought must be given to the slime department as a large proportion of the softer ore will be slimed.

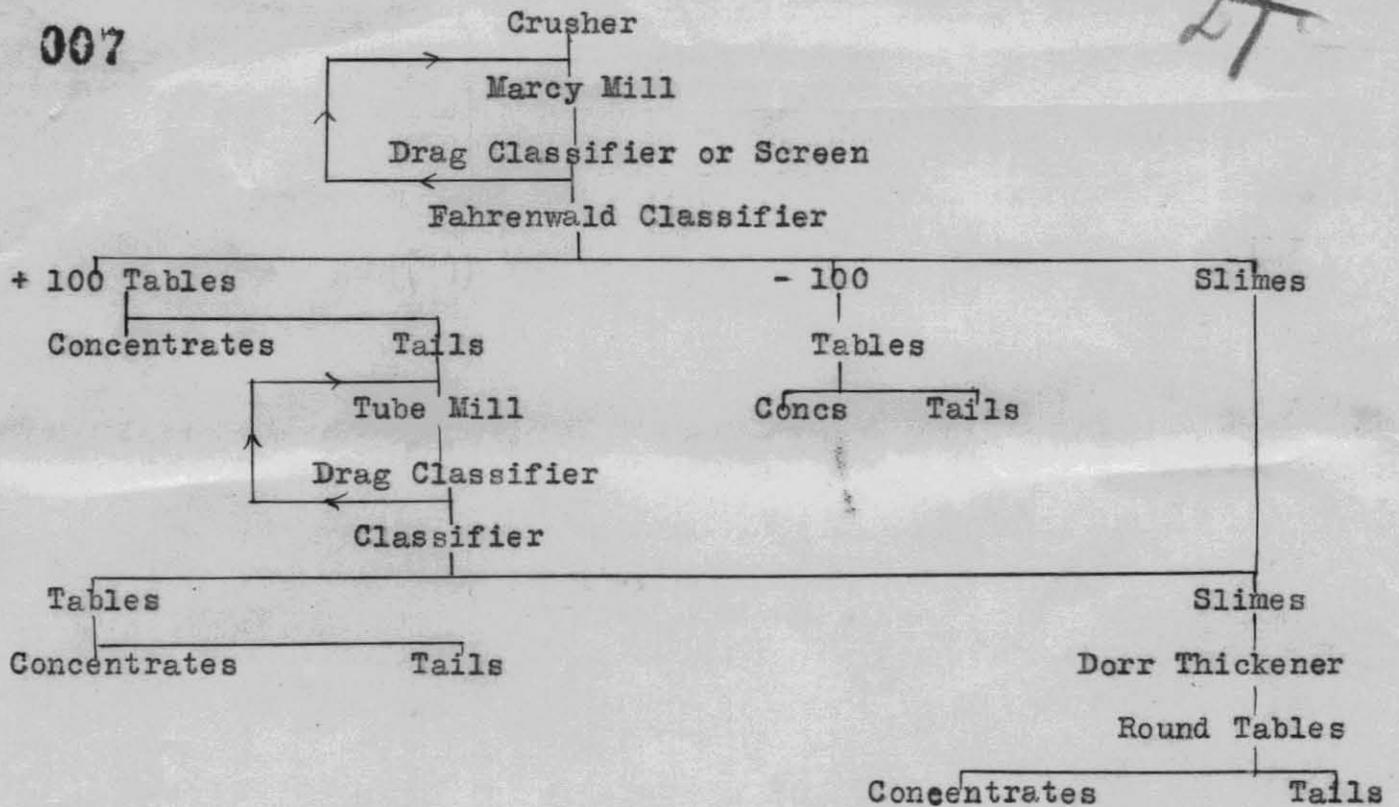
The following flowsheet shows the proposed mill in outline:-

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Both the flow sheets given are only intended to indicate my views generally and do not deal with the details of the layout such as handling of middlings etc.

The results given show that, if regrinding is done on all material + 100 mesh as would appear advisable, regrinding capacity for about 60% of the total feed would have to be provided in the second tube mill. Further, the number of tables needed in different parts of the mill is indicated. Allowing 1 ton per hour for tables treating + 100 mesh material and $\frac{3}{4}$ ton per hour for tables treating - 100 mesh pulp, apart from the slime, the number of tables in each section for any output required can be calculated from the sizing test.

Also it would appear that a slime department handling about 30% of that material handled will be necessary. The replacement of strakes by multiple deck round tables is a possible variation in the slime department.

The flow sheets given above indicate my ideas in outline. I feel that the layout of the new mill requires more consideration than is intended to be given in this report and I should be pleased to discuss this and other matters arising from this report on a visit I am making to Zeehan shortly, the date of which I will advise you.

Sir Percy G. Clark