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REPORT
of the
ORE DRESSING AND METALLURGICAL LABORATORIES.

Report No. 208

The Concentration of Garnetiferous Gneiss from Barry's Bay, Ontario.

Shipment: Three lots of garnetiferous gneiss were received at the Ore Dressing and Metallurgical Laboratories, as follows:

Lot No. 1	received	December 5, 1923 -	gross weight 40 pounds
Lot No. 2	"	December 13 1923 -	" " 591 "
Lot No. 3	"	January 4, 1924 -	" " 3000 "

The shipments were submitted by the Bancroft Mines Syndicate Ltd., 18 Toronto Street, Toronto, Ont., from the company's property in the vicinity of Barry's Bay, Ont.

Purpose of Experimental Tests: The company had decided to erect a new concentrator to replace the one recently destroyed by fire. Business connections had been built up for the disposal of their product and in order to retain these it was necessary to lose no time in commencing operations. The old method of concentration, which consisted of crushing to 6 mesh, sizing, and tabling, did not produce a product high enough in garnet content to meet the demands of the trade. The Company requested the assistance of the Department in determining a method of concentration that would produce a concentrate suitable for the trade they had already built up.

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Conditions governing the method of concentration to be applied: The methods to be applied to the concentration of the garnet rock of these particular deposits were governed by the following conditions:

The trade required a crude product of 90% garnet content consisting of 6 mesh material with very little fines. The manufacturers desired to finish the crude product to meet their own requirements for the manufactured article.

The scarcity of an available supply of sufficient water in close proximity to the mill site for wet concentration, the advantages of operating a dry mill during the winter months, and the cost of drying wet concentration products were factors in favour of a dry concentration process, provided that a high grade product could be obtained by this means. The comparatively small tonnage to be treated, not more than 30 tons of rock per day, the high garnet content of the rock, approximately 40% garnet, the abundant supply of rock of this grade, considering the tonnage to be treated, were important factors in favour of a simple process. The tonnage to be milled was not large enough to permit of the erection of an elaborate plant to obtain extremely high recoveries of the garnet content and too large a percentage of fines was not acceptable to the trade. The high garnet content of the rock and the abundant supply of such rock permitted a waste of considerable garnet in the tailing, especially of fines that could not be disposed of. If it were found desirable and economical to improve recoveries, the addition of regrinding mills and further concentration units could be added as conditions demanded, and would depend to a large extent on the disposal of a larger proportion of fine garnet.

Characteristics of the garnet rock: The rock which contains the garnets is a gneiss, consisting of about 40% garnet mineral, and large amounts of black mica and hornblende. The garnets range in size from about 3/8" to minute crystals in the deposits being worked at present. Garnets of an inch and larger are found in certain of the deposits. The garnets are of a deep red colour and have been found to be very suitable for abrasive purposes.

Experimental Tests:

Lot No. 1 - Wet Concentration by jigging & tabling

This lot was crushed to pass a 6 mesh Tyler standard screen, and sized on 8, 10, 14, and 20 Tyler standard screens, and on 40 and 100

mesh screens. The sizes coarser than 20 mesh were jigged on a laboratory Richards pulsating jig and the finer sizes tabled on a laboratory Wilfley table.

A concentrate was produced representing 35% of the rock treated. A clean tailing was obtained. The concentrate, both jig and table, contained some black horn blende, but would average 90% garnet. The test indicated that this method of concentration could be applied successfully to the recovery of the garnet of this particular sample.

Lot No. 2 Dry Concentration on Sutton Steele & Steele Table:

This lot was crushed to 6 mesh and sized on 8, 10, 14, 20, 28, 35, 48, 65, and 100 mesh Tyler standard screens. Concentration tests were made on all the sizes with the exception of the -100 mesh, on a Sutton Steele and Steele dry table. Various adjustments were made to the table, such as the cloth used for the table top, the distribution and volume of the wind pressure, slope of the table, speed and stroke of the table, rate of feed, etc. These tests showed that a separation of the micaceous gangue could be made, but the garnet concentrate contained a large percentage of black hornblende. It was decided that dry concentration would not be successful on this class of garnet rock on account of the large amount of hornblende present, which was too close in specific gravity to the garnet to permit of a close separation by this means.

Lot No. 2 - Wet concentration on Wilfley table: The sized material of the previous tests run on the dry table was concentrated on a standard Wilfley table. No difficulty was experienced in obtaining a good separation. The garnet concentrate obtained represented 51.8% of the feed to the table. It contained an appreciable amount of black hornblende, but would contain approximately 90% garnet. The tailing was clean. The good separation depended on the close sizing and the manipulation of the table, especially on the coarser sizes. The grade of the rock treated (50% garnet) was a factor in obtaining such a good separation.

Lot No. 3 - Wet Concentration by jigging unsized material: This lot was crushed to pass a 6 mesh Tyler standard screen. An attempt was

made to concentrate the -6 mesh material without sizing in a two compartment James jig. It was found that a good concentrate and hutch were produced by the first jig, but a very poor concentrate and hutch were obtained from the second jig if a clean tailing was made. The test indicated the possibility of treating unsized material by jigging with the subsequent regrinding and jigging of a middling product from some of the compartments and the tabling of the hutch products of these compartments.

Lot No. 3 - Wet Concentration by Jigging and Tabling sized material:

The products from the previous test were dried and mixed with the remainder of the lot. The lot was then sized on 8, 10, 14, 20, 28, and 35 mesh Tyler standard screens. The sizes coarser than 20 mesh were concentrated in a two compartment James jig and the finer sizes on a standard Wilfley table. This lot was not as high grade as the previous ones and contained a larger amount of hornblende. While a good separation was made with a comparatively clean tailing, the concentrate was not as high grade as in the previous small scale tests made on the higher grade rock. The concentrate obtained represented 32% of the material treated.

Summary of Experimental Tests: The three lots submitted varied in garnet content, in the amounts of hornblende present, and consequently in their amenability to concentration.

Dry concentration was not successful. On the higher grade lot on which it was tried a satisfactory concentrate could not be obtained due to the closeness in specific gravity of the hornblende to the garnet.

Lots nos. 1 and 2 concentrated very nicely by close sizing, jigging or tabling the various sizes. Lot no. 3 being of lower grade material, the concentrates produced were not as high grade nor the tailing as clean as from the other lots by the same methods of treatment

Conclusions: The results of the test work show three simple methods of wet concentration that should be given due consideration to produce a suitable product for the trade. All three gave good results and

can be tried out at the mine in more detail and on a much larger scale to prove definitely which is the more economical:

1. Table concentration of the sized material. The success of this method will depend on very close sizing of the rock crushed to 6 mesh, and on the careful manipulation of the tables in concentrating the coarser sizes.

2. Jig and Table Concentration of the sized material. Jigs, as a general rule have been found to be more adaptable to concentration of material coarser than 20 mesh, than tables. In most cases they will give a cleaner product, have a greater capacity, do not require as closely graded material, and are easily manipulated. Tabling does better work on the finer sizes

3. Jig and table concentration of the unsized material. It may be found more economical to jig the unsized material, thus eliminating the cost of sizing. By using jigs of several compartments, a clean concentrate and hutch could be obtained from the first two compartments, a middling product and hutch middling from the remaining compartments, and a clean tailing. The middling product could be reground in wet rolls and returned to the jig circuit, and the hutch middling concentrated on tables.

R. K. Carmochan,
Engineer in charge of experimental work

W. B. Timm,
Chief, Division of Ore Dressing and Metallurgy