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O T T A W A July 11th, 1940.

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ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 864.

Concentration Tests on a Sample of Manganese Ore from the Magdalen Islands, Quebec.

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Concentration Tests on a Sample of Manganese Ore from the Manganese Islands, Quebec.

Shipment:

One bag of manganese ore, weighing 150 pounds, was received on May 30th, 1940. The sample was submitted by R. F. Hardy, 45 Richmond Street West, Toronto, Ontario.

Location of Property:

The property is located on the Magdalen Islands Group, in the Gulf of St. Lawrence.

Character of the Ore:

Six polished sections were prepared and examined microscopically for the purpose of determining the mode of occurrence of the manganese.

Gangue -

The rock is composed of quartz grains and a cementing material which appears to be largely dolomitic in character, but which also contains the manganese oxide or oxides. The quartz grains are small and are angular to sub-angular in shape, indicating that they have suffered little abrasion by water. The rock is apparently a sandstone.

Distribution of the Manganese -

Manganese oxide, probably largely pyrolusite, although some hausmannite(?) (Mn_3O_4) may be present, occurs as part of the cementing material interstitial to the quartz grains. It is commonly finely divided and only rarely does it form the complete matrix for the quartz grains. In some places, as in Figure 1, the manganese oxide is penetrated along crystallographic directions by gangue which has replaced the pyrolusite; in other places, as in Figure 2, what appear to be tiny remnants of pyrolusite occur in the carbonate filling of the interstices.

It is estimated that only a small percentage

of the manganese oxide is essentially free from intimate contamination by gangue and that it is largely as shown in the figures. It seems, therefore, that it would be difficult to grind sufficiently fine to effect a substantial degree of freeing of the manganese and if this were indeed accomplished, trouble would probably develop through excess sliming.

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(NOTE: Figures 1 and 2 are placed at the end of this report.)

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Sampling and Assaying:

The sample was assayed and reported as follows:

Manganese	-	29.84 per cent
Iron	-	2.12 "
Silica	-	39.60 "
Sulphur	-	0.03 "
Phosphorus	-	0.05 "
Insoluble	-	45.40 "

Experimental Tests:

Small-scale flotation and table concentration tests were conducted on samples of the ore to determine the grade of concentrate that could be produced. The microscopic examination indicates that, owing to the fine size of the manganese oxide minerals as well as their intimate association with the cementing material

between the quartz grains, it will be difficult, if indeed at all possible, to make a concentrate of marketable grade.

The tests are described in detail as follows:

Test No. 1. - Flotation.

A sample of the ore at minus 14 mesh was given a 5-minute grind with 1.0 pound per ton of soda ash and 1.0 pound per ton of sodium silicate. The pulp had a pH value of 8.0.

A concentrate was then floated with the following reagents:

Copper sulphate	-	1.0 lb./ton
Reagent No. 708	-	0.15 "
B-23 Frother	-	1.0 "

Reagent No. 708 and the frother were added in successive small amounts.

A voluminous froth was produced which was at first black and later took on a greyish colour. The products were assayed for manganese and acid insoluble. The concentrate was also assayed for iron.

Summary of Results:

Product	Weight, per cent	Assays - Per cent			Distribution, per cent	
		Mn	Fe	Insol.	Mn	Insol.
Flotation conc.	45.72	38.94	1.83	30.9	60.0	30.2
Flotation tailing	54.28	21.84	-	60.3	40.0	69.8
Feed (cal)	100.00	29.66	-	46.8	100.0	100.0

The grade of concentrate is low owing to the large amount of insoluble matter that cannot be freed by grinding.

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Test No. 2. - Table Concentration.

A sample of the ore at minus 14 mesh was screened on 35, 48, 65 and 100 mesh screens. The oversize retained on each of these screens and the fractions finer than 100 mesh were fed to a small table in the above order. The concentrate, middling and tailing were bulk sampled and assayed.

Summary of Results:

Product	Weight, per cent	Assays - Per cent			Distribution, per cent	
		Mn	Fe	Insol.	Mn	Insol.
Table conc.	44.1	26.78	1.58	50.40	44.0	46.3
Table middling	26.0	22.88	-	58.58	22.2	31.7
Table tailing	29.9	30.38	-	35.25	33.8	22.0
Feed (cal.)	100.0	26.84	-	48.00	100.0	100.0

The ore does not appear to be amenable to table concentration. From the results of this test it is evident that no separation of manganese minerals from gangue minerals is effected and at the same time the loss of fine manganese in the table tailing is high. A screen test showed the table tailing to be 97 per cent finer than 100 mesh while practically all of the coarser material came off in the concentrate and middling.

Conclusions:

Owing to the extreme fineness of the manganese minerals and their intimate association

with the cementing material, as shown in the accompanying photomicrographs, it appears to be impossible to concentrate this ore and produce a concentrate containing 50 per cent manganese. Flotation comes nearer to a solution of the problem than gravity concentration but is still inadequate owing to the nature of the ore.

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Figure 1.

Photomicrograph of polished section
of manganese-bearing rock from the Magdalen Islands.

The quartz grains (light grey) and interstitial material are well shown. Pyrolusite is white, and is seen to be penetrated along crystallographic directions by gangue.

Magnification - X 120. A 200-mesh opening is shown.

Figure 2.

Photomicrograph of polished section of manganese-bearing rock from the Magdalen Islands, showing finely divided pyrolusite (white) in the matrix material interstitial to the quartz grains. From evidence throughout the polished sections it seems probable that the pyrolusite has been infiltrated and deposited along with some of the carbonate forming the matrix, but that some of the gangue has succeeded the deposition of the pyrolusite and has replaced to greater or lesser degree. The scattered small grains of pyrolusite shown here would therefore represent remnants left by such replacement.

Magnification - X 120. A 200-mesh opening is shown.

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