Fele

FILE COPY

O T T A W A April 4, 1946.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2026.

Concentration of Hematite-Taconites
from the "Attikamagen" Deposit,
New Quebec-Labrador District.

===========

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. 13.)

BUREAU OF MINES
DIVISION OF METALLIC MINERALS

ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

O T T A W A April 4, 1946.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2026.

Concentration of Hematite-Taconites
from the "Attikamagen" Deposit,
New Quebec-Labrador District.

==============

Background of the Investigation:

In May, 1945, a request was received from Dr. J. A. Retty, Chief Geologist, Labrador Mining and Exploration Co. Ltd., Montreal, Quebec, to undertake concentration tests on samples of a siliceous iron ore from a showing known as the "Attikamagen Deposit". This deposit is located some 135 miles northwest of Grand Falls, on the Hamilton river, New Quebec-Labrador district, and is stated to contain very large ore reserves of a grade approximating 40 per cent iron and 38 per cent silica.

A 173-pound sample was then received, on June 5, 1945, and an investigation was instituted to determine the relation

(Background of the Investigation, cont'd) -

of the minerals one to the other, and to carry out a program of concentration tests with the object of producing a product of commercial grade. This problem resolved itself into the finding of a method of separating the iron minerals from the siliceous part of the ore.

An analysis made of the shipment showed the following:

		Per cent
Total iron (Fe)	-	47.81
Silica (SiO_2)	-	26.46
Sulphur (S)	-	0.05
Phosphorus (P)	-	0.035
Manganese (Mn)	-	0.15
Alumina (Al_2O_3)	-	0.94
Lime (CaO)	-	0.69
Magnesia (MgO)	-	Trace.
Titanium (Ti)	-	None detected.

Results of Investigation:

The conclusions to be drawn from a study of the lithological characteristics of the ore, and from the relation of the metallic minerals one to the other as observed by microscopic examination of polished surfaces, coincide with the results of the ore dressing investigation.

No satisfactory method is known today that will produce a product low enough in silica to be commercial. Due to the intimate association of the siliceous minerals with the predominating iron mineral, hematite, no decisive separation is obtainable.

CHARACTERISTICS OF THE ORE:

Samples of the ore as received were sent to the Geological Survey, Ottawa,* for petrographic examination. Nine thin sections were prepared there and studied.

* Geological Survey Division, Bureau of Geology and Topography, Mines and Geology Branch, Department of Mines and Resources, Ottawa, Canada.

(Characteristics of the Ore, cont'd) -

Lithological Character.

(By Dr. T. L. Tanton, Geological Survey.)

The material is of dense, hard, massive, finely-granular, reddish grey rock. In some specimens parallel streaks or bands, less than ¼ inch wide, of darker colour, alternate with bands, of similar widths, of lighter colour. In some specimens, roughly spherical masses, averaging ¼ inch in diameter, of paler rock are scattered through the dark-reddish grey rock in polka-dot pattern; when tested with acid they were found to contain calcite. The magnetic properties of specimens vary: some, a cubic inch in volume, can be picked up with a magnet; others are not attracted. The only mineral that can be identified by the naked eye is glaucophane that occurs as prisms, up to 2 mm. long, singly and in divergent clusters, irregularly disseminated.

Under the microscope the rock shows the granule texture and composition of taconite. This rock, as typically developed on the Mesabi and Gunflint iron ranges, is an iron-stone that consists essentially of granules or globular segregations, commonly 1 mm. or less in diameter, of an iron mineral in a matrix of chalcedony. A qualifying descriptive term designating the most abundant mineral in the granules commonly accompanies the name taconite.[1]

In the specimens the distinctive oval and spherical granules, averaging about 0.4 mm. in diameter, consist chiefly of microscopically fine-grained hematite. The rock is thus identified as a <u>hematite taconite</u>. In the granules and also in the interstitial chalcedony there are, in several specimens, relatively coarsely crystalline grains, singly and in aggregates,

---

(1) See Gill, J. E. Origin of Gunflint Iron-bearing Formation. Econ. Geol., Vol. 22, p. 692, footnote 5 (1927).

(Characteristics of the Ore, cont'd) -

of magnetite. In the immediate vicinity of the hematite segregations, the chalcedony or jasper is commonly stained red with exceedingly fine-grained hematite dust; the chalcedony marginal to the magnetite, in zones up to 0.4 mm. wide, is clear and colourless.

The opaque, metallic minerals are hematite and magnetite. They make up, in different specimens, from 30 to 55 per cent of the volume of the rock. They are intimately associated with one another and microscopically intergrown with the chalcedony and other non-metallic constituents of the rock and they were the subject of special study under the reflecting microscope.

The non-metallic constituents of the rock are: chalcedony and jasper, siderite, calcite, glaucophane, and a mineral tentatively identified by E. Poitevin as stilpnomelanite.

Chalcedony, in different specimens, makes up from 20 to 55 per cent of the volume of the rock. It occurs as granules and as the interstitial filling around granules; it also occurs as the filling in spongy and lace-work patterns within hematite granules and as contraction crack fillings in them.

Carbonate minerals, siderite and calcite, in different specimens, make up from 3 to 30 per cent of the volume of the rock. They occur as individual crystals commonly 2 mm. in diameter and in crystalline aggregates irregularly distributed and locally concentrated in bands less than ¼ inch wide through the chalcedony, jasper and hematite. The siderite is untwinned, and locally it is stained brown due, possibly, to a development of a small amount of goethite. Calcite occurs in twinned crystalline aggregates as a prominent constituent and the interstitial material around hematite granules in nodular masses averaging ¼ inch in diameter.

(Characteristics of the Ore, cont'd) -

Glaucophane, in different specimens, makes up from 1 to 10 per cent of the volume of the rock. It occurs in stout prisms singly and in divergent clusters with heterogeneous orientation, transgressing the granules of hematite and chalcedony. Where the crystals are in contact with calcite they show tattered corrosion boundaries. Well defined crystalline growths of magnetite occur locally in glaucophane crystals where the latter have penetrated hematite granules. See Figure 1.

Stilpnomelanite is a minor constituent of the rock, absent in the majority of specimens examined; in one, however, it makes up approximately 3 per cent of the volume. It occurs as a felt of brown crystals, up to 0.02 mm. in length of micaceous habit, concentrated in granules up to 0.4 mm. in diameter and it occurs also disseminated in scales through chalcedony that forms the interstitial material around hematite granules.

No detrital grains were observed in the specimens. There is no pore space in the rock.

Metallic Mineralization.

(By W. E. White.*)

Metallic mineralization is moderately strong in the polished sections examined and consists solely of hematite and magnetite. These two minerals together occupy approximately one-half of the area of the six polished sections.

Hematite, the more abundant mineral, is unevenly disseminated through gangue as tiny particles which are frequently bunched together forming small, more or less rounded, cloud-like patches or granules, which average roughly 500

---

* Mineralogist, Metallic Minerals Division, Bureau of Mines, Mines and Geology Branch, Department of Mines and Resources, Ottawa.

(Characteristics of the Ore, cont'd) -

microns (-28 +35 Tyler mesh) in diameter. This ore mineral is very intimately associated with gangue material which, in many places, appears to have attacked and replaced the iron oxide. The effect of such replacement is shown in the polished sections as ragged-lacy patterns. The largest grain of hematite observed in the sections measures about 125 microns (-100 +150 Tyler mesh) but much finer sizes predominate and range down to the limits of the microscope (about 1 micron) in size. Under crossed nicols some areas of gangue, which appear to be almost, if not entirely, free from metallics, show deep red internal reflections probably due to highly dispersed sub-microscopic hematite dust.

Magnetite is common as comparatively coarse subhedral and euhedral crystals, which average about 74 microns (200 Tyler mesh) in size and which, on the whole, are scattered rather evenly throughout the hematite-gangue matrix in the six polished surfaces. In contrast to hematite it contains no inclusions of gangue, and in all six sections only a few grains occur which are intimately intergrown with the red iron oxide.

The photomicrographs, Figures 2 and 3, show the characteristics of the ore in an average field of the microscope at different magnifications.

Six polished sections were prepared from the products of test work. Five of these were of samples of flotation concentrates and one was from a magnetic concentrate.

The flotation concentrates consisted essentially of particles of hematite, and magnetite, ranging from approximately 100 microns (about 150 Tyler mesh) down to only a few microns in size. Hematite is the more abundant of the two minerals and whereas the magnetite grains are almost entirely free of gangue, practically every particle of hematite contains numerous tiny inclusions of it (see Figure 4). In fact it is

(Characteristics of the Ore, cont'd) -

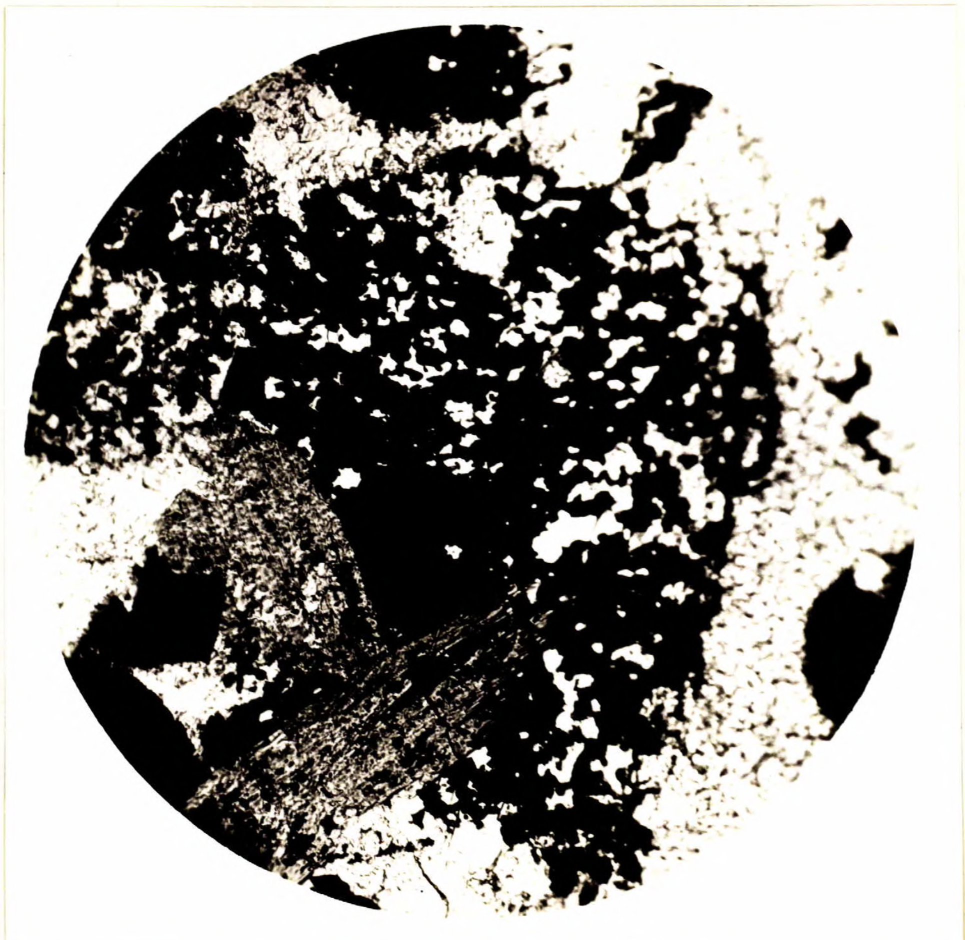
probably truer to describe almost one-half of them as fragments of gangue enclosing finely divided hematite. Rare, small particles of gangue apparently free of metallics, and a few tiny grams of pyrite and chalcopyrite, are also visible in the polished surfaces.

The section prepared from the samples of magnetic concentrate is similar to those made from the flotation concentrates, except that magnetite grains are more abundant in it.

(Figures 1 to 4 follow,)
(on Pages 8 to 11.)

(Characteristics of the Ore, cont'd) -

Figure 1.



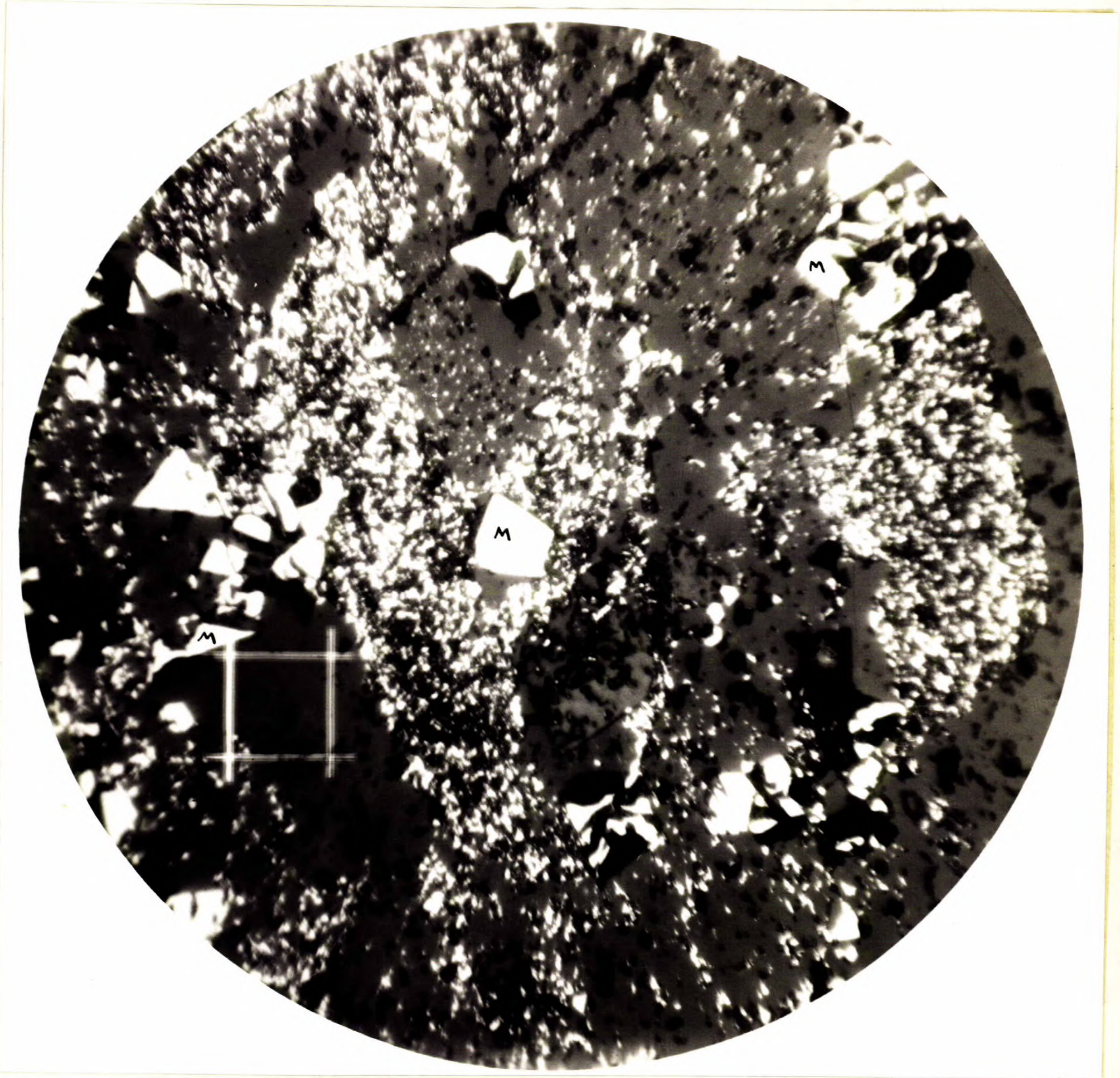
Thin section of taconite, showing octahedra of magnetite (black) replacing glaucophane prisms (light grey) that transgress a granule of hematite (black) in a carbonate matrix (white).

(X200. Ordinary light.)

2026

(Characteristics of the Ore, cont'd) -

Figure 2.



Shows an average field in polished section prepared from sample of Attikamagen iron ore, with a 200-mesh Tyler screen opening superimposed at 200X.

Magnetite (M) - comparatively coarse, white crystals.

Hematite - more abundant, fine, white grains.

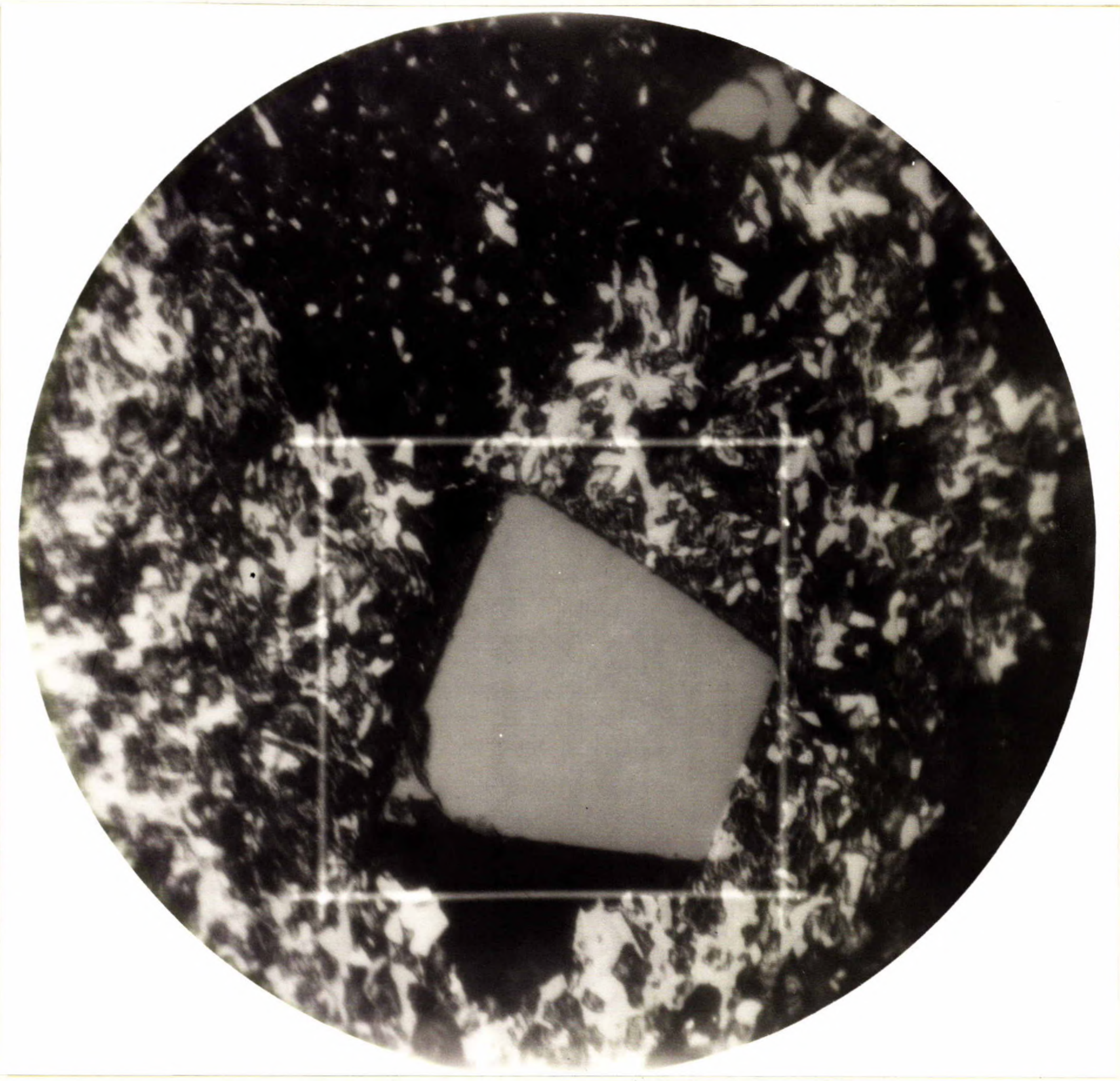
Gangue - Grey.

Pits - black.

-

(Characteristics of the Ore, cont'd) -

Figure 3.



Central part of field shown in Figure 2, at higher magnification to show better the relationship of the ore minerals. A 200-mesh Tyler screen opening is superimposed. The magnification is 900X.

Hematite - light grey, fine, irregular grains.

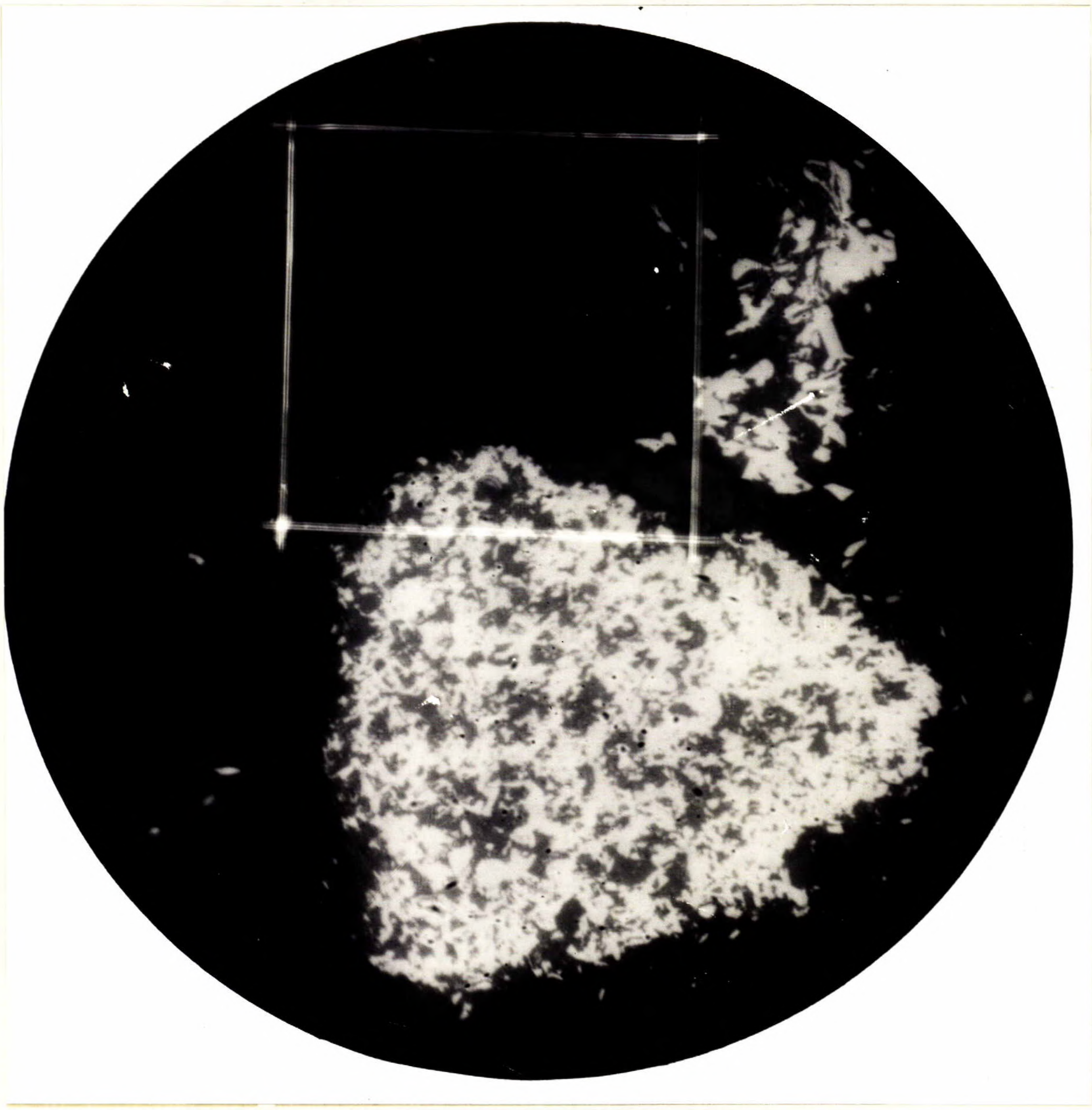
Magnetite - medium grey, coarser crystals.

Gangue - dark grey to black.

-

(Characteristics of the Ore, cont'd) -

Figure 4.



Photomicrograph of a polished section of flotation concentrate from Lake Attikamagen iron ore, showing grains of hematite (white) highly impregnated with finely divided gangue (grey). Pits and bakelite are dark grey to black. The magnification is 800X. A 200-mesh Tyler screen opening is superimposed.

DETAILS OF INVESTIGATIVE TESTS:

Screen Analysis.

To determine the distribution of the iron minerals in progressively finer particles of ore, a sample was crushed to pass a 14-mesh screen, and an analysis was made of screened products. It is to be noted that in most of the following tests, the analyses of "feeds" are calculated from the weights and assays of the various products. This accounts for slight variations from test to test.

Test No. 1. - Results of Screen Analysis.

Mesh	Weight, per cent	Analysis, per cent		Distribution, per cent	
		Fe	Insol.	Fe	Insol.
-14 +20	16.7	47.04	30.00	16.6	17.0
-20 +28	20.3	47.88	29.72	20.5	20.4
-28 +35	16.5	47.67	29.78	16.5	16.6
-35 +48	11.5	47.77	29.42	11.6	11.5
-48 +65	8.0	48.08	28.90	8.1	7.8
-65 +100	5.5	47.35	29.62	5.5	5.5
-100+150	5.3	47.77	29.24	5.4	5.3
-150+200	1.5	49.04	26.86	1.6	1.4
-200	14.7	45.78	29.28	14.2	14.5
Feed (calc.)	100.0	47.39	29.54	100.0	100.0

It is apparent that there is no segregation of values in any of the sizes shown in the above screen analyses.

-

Magnetic Concentration.

Test No. 2.

Some specimens of the ore showed magnetic properties, while some did not. In this test an attempt was made to effect a concentration of the magnetite.

Preparation of Samples -

A representative sample of the minus 14 mesh ore was divided into eight uniform portions. These then were stage-ground in a ball mill to pass 20, 35, 48, 65, 100, 150, 200 and 325-mesh screens.

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Concentration -

These ground samples were concentrated in a "Davis Magnetic Tube". Products of each test were analysed for iron and insoluble.

Metallic iron in the concentrates resulting from abrasion in the grinding mill was removed chemically in order to obtain the true iron oxide content of the magnetic concentrates.

These were examined under a binocular microscope to determine their freedom from gangue minerals.

The coarser concentrates, from 20 to 65 mesh size, appeared to be banded with hematite and small crystals of a gangue mineral. Some particles of magnetite were attached to gangue.

The -100 to -200 mesh concentrates contained particles of gangue attached to magnetite while some grains of magnetite appeared to be quite clean.

The concentrate from the sample ground to pass 325 mesh appeared to be a fairly uniform mass of magnetite with no appreciable amount of hematite or gangue minerals attached to or in the magnetite.

Results of Test No. 2:

Minus 20 Mesh.

Products	Weight, per cent	Analyses, per cent				Distribution, per cent		
		Fe	SiO_2	Insol.	Met. Fe	Fe	SiO_2	Insol.
Feed	100.0	48.25	26.13	29.26		100.0	100.0	100.0
Mag. conc.	52.0	52.36	21.60	24.06	0.92	56.4	43.0	42.7
Non-mag. tailing	48.0	43.80	31.04	34.90		43.6	57.0	57.3

Minus 35 Mesh.

Products	Weight, per cent	Fe	SiO_2	Insol.	Met. Fe	Fe	SiO_2	Insol.
Feed	100.0	48.76	26.29	29.54		100.0	100.0	100.0
Mag. conc.	31.5	56.81	16.80	18.74	1.53	36.7	20.1	20.0
Non-mag. tailing	68.5	45.07	30.66	34.50		63.3	79.9	80.0

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Products	Weight, per cent	Analyses, per cent: Fe	SiO_2	Insol.	Met. Fe	Distribution, per cent: Fe	SiO_2	Insol.
Minus 48 Mesh.								
Feed	100.0	47.60	26.67	29.96		100.0	100.0	100.0
Mag. conc.	30.0	55.97	16.86	18.82	1.73	35.3	19.0	18.8
Non-mag. tailing	70.0	45.01	30.88	34.64		64.7	81.0	81.2
Minus 65 Mesh.								
Feed	100.0	48.38	26.47	29.47		100.0	100.0	100.0
Mag. conc.	22.6	61.14	12.04	13.36	2.04	28.6	10.3	10.2
Non-mag. tailing	77.4	44.65	30.68	34.18		71.4	89.7	89.8
Minus 100 Mesh.								
Feed	100.0	48.01	26.76	29.80		100.0	100.0	100.0
Mag. conc.	19.0	63.28	9.36	10.54	2.85	25.0	6.6	6.7
Non-mag. tailing	81.0	44.43	30.84	34.32		75.0	93.4	93.3
Minus 150 Mesh.								
Feed	100.0	47.99	26.74	29.78		100.0	100.0	100.0
Mag. conc.	16.8	66.78	4.82	5.48	3.77	23.4	3.0	3.1
Non-mag. tailing	83.2	44.19	31.16	34.68		76.6	97.0	96.9
Minus 200 Mesh.								
Feed	100.0	46.90	26.40	29.81		100.0	100.0	100.0
Mag. conc.	15.1	66.69	3.34	4.22	4.49	21.5	1.9	2.1
Non-mag. tailing	84.9	43.38	30.50	34.36		78.5	98.1	97.9
Minus 325 Mesh.								
Feed	100.0	47.07	26.76	30.24		100.0	100.0	100.0
Mag. conc.	13.7	67.69	1.78	2.54	6.02	19.7	0.9	1.2
Non-mag. tailing	86.3	43.80	30.72	34.64		80.3	99.1	98.8

From the above results it is seen that the silica content of the magnetic concentrate is reduced to approximately 10 per cent only when the grind is minus 100 mesh. At this grind, 19 per cent of the weight of ore milled is recovered as a concentrate containing 63.28 per cent iron, 9.36 per cent silica. As the fineness of grind increases, the silica content is reduced, with a corresponding loss in the recovery of iron.

(Details of Investigative Tests, cont'd) -

Flotation.

Two main methods of attack by froth flotation were investigated. The first of these consisted of attempts to float the siliceous minerals away from the iron oxides, and the other was the reverse, making the iron concentrate, leaving the insoluble as a tailing.

Methods and reagent combinations that have been more or less successful when applied to taconite ores from other iron ranges did not produce the required results on this ore. This is due to the intimate association of gangue and hematite.

Test No. 3. - Flotation of Gangue from Iron Oxides.

A method as described in U.S. Bureau of Mines Information Circular No. 3799, March 1945, was investigated after numerous other reagent combinations had been found unsuccessful. This practice is essentially to retard the flotation of hematite with lime, and then to float the siliceous minerals with anionic reagents.

A sample of the ore was ground in water to pass 100 mesh with about 80 per cent minus 200 mesh. Alkaline dispersants were added to the ball mill during the grinding period, 2.0 pounds sodium hydroxide and 1.0 pound sodium silicate per ton of ore. This produced a pH of 10.55 after discharging the pulp from the mill.

The pulp then was deslimed, and conditioned in a flotation cell with 12 pounds lime per ton of ore to a pH of 11.5.

Flotation was carried out with oleic acid, stage-fed to a quantity of 1.5 pounds per ton. Concentrates were cleaned twice with 4 pounds of lime and 0.1 pounds oleic acid per ton.

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Results of Test No. 3 -

Products	Weight, per cent	Assays, per cent		Distribution, per cent	
		Fe	Insol.	Fe	Insol.
Feed	100.0	47.55	28.91	100.0	100.0
Slimes No. 1	26.6	36.71	41.86	20.5	38.5
" No. 2	2.5	42.41	37.22	2.2	3.2
" No. 3	1.9	45.58	32.40	1.8	2.1
Combined slimes	31.0	37.73	40.92	24.5	43.8
Rougher concentrate	30.9	50.43	25.81	32.8	27.6
Cleaner concentrate	10.3	49.58	26.36	10.7	9.4
Cleaner Tailing No. 1	14.5	50.64	26.40	15.4	13.2
" " No. 2	6.1	51.69	23.68	6.7	5.0
Flotation tailing	38.1	53.17	21.64	42.7	28.6

In none of the fractions into which the feed was broken is there any indication of a separation of the siliceous minerals from the iron minerals.

Test No. 4.

As 31 per cent of the weight of feed was discarded as slimes in the preceding test, an attempt was made to reduce these losses. A reagent combination said to be less critical when slimes are present was tried.

This procedure consisted of grinding the ore to pass 80 per cent through 200 mesh, desliming, and conditioning with sodium hydroxide and sodium hexametaphosphate (Calgon).

Reagents Added: Lb./ton

To Ball Mill -

Soda ash	-	1.0
Water glass	-	0.4

pH, 8.4.

To Flotation -

Sodium hydroxide		1.4
Sodium hexametaphosphate	-	0.4
Oleic acid	-	0.8

pH, 10.5.

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Results of Test No. 4 -

Products	Weight, per cent	Assays, per cent Fe	Assays, per cent Insol.	Distribution, per cent Fe	Distribution, per cent Insol.
Feed	100.0	48.00	29.02	100.0	100.0
Slimes No. 1	25.1	39.24	38.30	20.5	33.2
" No. 2	6.1	47.05	33.80	6.0	7.1
Combined slimes	31.2	40.81	37.46	26.5	40.3
Rougher conc.	31.8	52.22	23.77	34.7	26.1
Cleaner conc.	15.4	48.10	29.50	15.5	15.7
Cleaner Tailing No.1	12.9	56.34	18.00	15.1	8.0
Cleaner Tailing No.2	3.5	55.70	19.86	4.1	2.4
Flotation tailing	37.0	50.43	26.42	38.8	33.6

These results again are unsatisfactory. There is an indication of a slight elimination of insoluble by desliming and flotation, but with low recovery of iron. The reagent combination had no material effect in reducing slime losses.

Further tests using the same reagents but without desliming the feed yielded results inferior to the above.

—

Flotation of Iron Oxides from Gangue.

Considerable success has been recorded with flotation of taconite ores from the Mesabi Range of Minnesota. One of the methods, as developed by Professor J. N. Searles of the Minnesota Institute of Technology, depends on the use of reconstructed oleic acid. Details of this reagent were supplied by W. J. Stain, Denver Equipment Co. (Canada) Ltd.

The presence of calcium and magnesium salts in solution is considered to be detrimental to oxide flotation, as soaps of these metals are formed which render concentration ineffective.

Comparative tests were made using Ottawa tap water (which has a pH of 8.3, due mainly to lime) and with de-ionized water. None of the numerous tests was successful, as examplified by the following:

(Details of Investigative Tests, cont'd) -

Test No. 5.

Reagents Added:		Lb./ton
Sodium silicate	-	1.0
Reconstructed oleic acid	-	0.35

Conditioned 5 minutes.

Concentrate recleaned with 0.25 pound sodium silicate per ton.

Results of Test No. 5.

De-ionized Water.

Products	Weight, per cent	Assays, per cent Fe	Assays, per cent Insol.	Distribution, per cent Fe	Distribution, per cent Insol.
Feed (calculated)	100.0	47.28	29.26	100.0	100.0
Concentrate	77.1	49.14	26.68	80.2	70.3
Cleaner tailing	16.2	42.00	36.34	14.4	20.1
Flotation tailing	6.7	38.43	42.00	5.4	9.6

Ottawa Tap Water, pH 8.3. (Reagents as above.)

Products	Weight, per cent	Assays, per cent Fe	Assays, per cent Insol.	Distribution, per cent Fe	Distribution, per cent Insol.
Feed (calculated)	100.0	46.57	29.39	100.0	100.0
Concentrate	43.8	50.61	21.90	47.7	32.7
Cleaner tailing	20.1	45.57	31.82	19.6	21.7
Flotation tailing	36.1	42.21	37.14	32.7	45.6

It is interesting to note the retarding of flotation in the test in which tap water was used. Apparently the calcium salts in the water have a marked effect on flotation.

Test No. 6.

The effect of flotation in de-ionized water again was studied.

In this test the pulp was deslimed prior to flotation. The ore was stage-ground through 100 mesh to produce a minimum of fines. The sands were cut into two equal portions and floated. To one half, "A," the oleic acid reagent was stage-fed during the flotation period. To the other half, "B," the total quantity of reagent was added at once. Other flotation conditions were identical.

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Reagents to Flotation:	Lb./ton
Soda ash -	1.0
Conditioned 10 min.	pH, 8.8.
Oleic acid -	1.3
To Cleaner Cell:	
Sodium silicate -	0.5
pH, 8.3.	

Results of Test No. 6 -

Products	Weight, per cent	Assays, per cent Fe	Assays, per cent Insol.	Distribution, per cent Fe	Distribution, per cent Insol.
Feed	100.0	47.67	29.00	100.0	100.0
Slimes	40.6	45.37	32.08	38.6	44.9
Flotation feed "A"	29.7	49.17	27.07	30.6	27.7
" " "B"	29.7	49.32	26.70	30.8	27.4
Flotation of Pulp "A".					
Feed	100.0	49.17	27.07	100.0	100.0
Concentrate	9.3	53.80	14.22	10.1	4.9
Cleaner tailing	21.6	52.42	22.64	23.1	18.1
Flotation tailing	69.1	47.53	30.18	66.8	77.0
Flotation of Pulp "B".					
Feed	100.0	49.32	26.70	100.0	100.0
Concentrate	14.9	54.23	14.00	16.4	7.8
Cleaner tailing	31.9	53.04	22.34	34.4	26.7
Flotation tailing	53.2	45.70	32.88	49.2	65.5

Screen Analysis of the Slimes.

Products	Weight, per cent	Assays, per cent Fe	Assays, per cent Insol.	Distribution, per cent Fe	Distribution, per cent Insol.
Slimes	100.0	45.37	32.08	100.0	100.0
+200 mesh	1.2	65.16	18.42	1.7	0.7
-200+325	46.9	43.47	34.62	44.9	50.6
-325	51.9	46.63	30.10	53.4	48.7

Stage grinding produced more slimes than those recorded in previous tests. This probably is due to the hematite sliming more readily than the gangue minerals.

Higher recovery with no decrease in the grade of concentrate is obtained when the total quantity of collecting reagent, oleic acid, is added at once instead of in smaller, intermittent additions.

The results obtained show no great improvement and

(Details of Investigative Tests, cont'd) -

bear out conclusions to be drawn from previous tests.

Numerous other flotation reagents were tried, but the results that were obtained were equal to or poorer than those recorded above.

<u>Summary</u>:

Microscopic examinations of the ore establish the fact that the hematite and gangue are very intimately associated, and that the magnetite is gangue-free.

Magnetic concentration of the magnetite verifies this. When these magnetite particles are apparently freed from gangue by fine grinding, the insoluble content is comparatively low.

No method of flotation, however, was able to produce a hematite concentrate of satisfactory grade.

Where flotation of most non-metallic ores is practiced, it is essential that the pulp be deslimed prior to flotation. However, with this ore such practice results in a loss of from 30 to 40 per cent of the weight of feed, discarding from 25 per cent to 39 per cent of the total iron without any material benefit being derived.

Screen analyses of the feed indicate that no screened fraction can be discarded as the iron content is very uniform from 20 mesh down to 200 mesh.

No success was obtained by attempting to float the gangue minerals from the hematite, or by floating the hematite from gangue.

<u>CONCLUSIONS</u>:

As judged by today's knowledge of mineral dressing, the Attikamagen deposit must be considered a potential iron ore reserve of the future. As the art progresses, methods

(Conclusions, cont'd) -

originating both here and in other laboratories in the world will be considered and, if suited to this type of material, will be applied.

oooooooooooo
oooooooo
oo

AKA:WSJ:LB.