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O T T A W A

August 15th, 1941.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1069.

Examination of a Section of a Broken Liner.

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BUREAU OF MINES  
DIVISION OF METALLIC MINERALS  
—  
ORE DRESSING AND  
METALLURGICAL LABORATORIES



CANADA  
DEPARTMENT  
OF  
MINES AND RESOURCES  
MINES AND GEOLOGY BRANCH

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Origin of Problem:

On August 4th, 1941, a section of a broken liner was submitted for examination, accompanied by a letter, dated August 4th, 1941, from Mr. J. A. Critchley, Plant Manager, Sorel Steel Foundries Limited, Sorel, Quebec.

Information was given in the accompanying letter that the liner broke while it was being peened in their plant. It was also stated that they believed the silicon content was too high and it was requested that an examination be made to establish cause of failure.

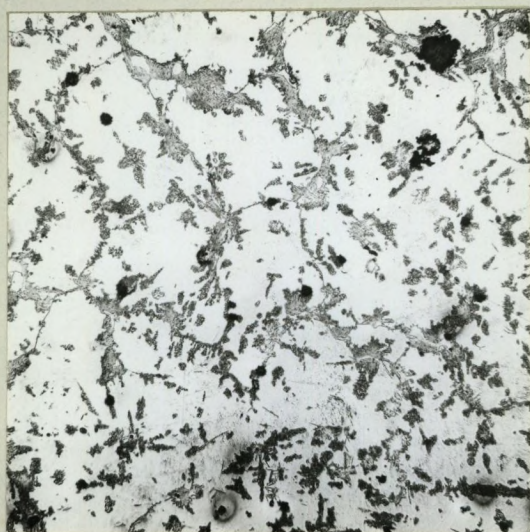
Chemical Analysis:

	<u>Per cent</u>
Carbon	- 1.26
Manganese	- 12.30
Silicon	- 0.88
Phosphorus	- 0.050
Sulphur	- 0.016

Hardness:

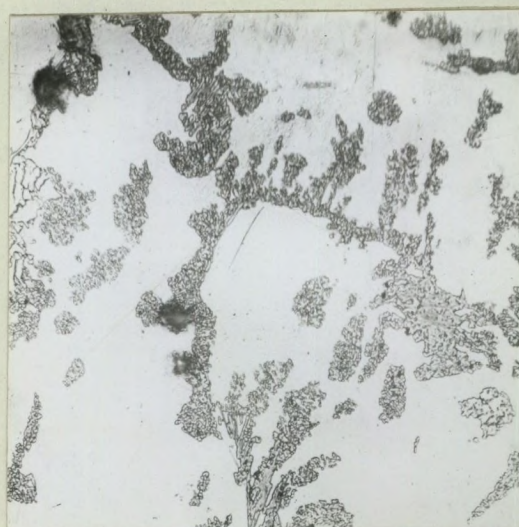
The Brinell hardness on the section as received was 269.

Figure 1.



X100, nital etch.  
Steel as Received.  
B.H.N. 269.

Figure 2.



X1000, nital etch.  
Steel as Received.  
B.H.N. 269.

Since Figures 1 and 2 showed the presence of large amounts of carbide out of solution, it was decided to heat-treat another piece of the sample. The specimen (2" x 2") was held at 1900° F. for 45 minutes and then quenched in water. Figure 3 shows the resulting austenitic structure, free from undissolved carbides.

(Figure 3 appears on next page)

Figure 3.



X100, nital etch.

After Heat Treatment.

B.H.N. 173.

DISCUSSION:

"No appreciable effect on physical properties can be found from variations in silicon between 0.30 and 1.00 per cent." A. S. M. Handbook 1939, P. 568.

The brittleness of the metal was due to the presence of large amounts of carbides out of solution (Figures 1 and 2).

It is quite obvious that in the heat treatment of the specimen received:

- (1) The carbides were not in solution before quenching.
- (2) Quenching was not drastic enough.

A regular heat treatment is all that is required to give this metal the usual properties of austenitic manganese steel.

Coarse grain size indicates that pouring temperature might be lowered. This would improve the physical properties.

HHF:GB.

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