

O T T A W A

March 9th, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1174.

Examination of Piece of Manganese Steel Cone.

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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 Request:

On March 3rd, 1942, Mr. W. S. White, of the Sorel Steel Foundries Limited, Sorel, Quebec, submitted a sample piece of manganese steel taken from a cone. Chemical analysis and microscopic examination were requested.

Macro-Examination:

The piece received was roughly 3" x 2 $\frac{3}{4}$ " x 1 $\frac{1}{2}$ " in size. It had been cut from the casting by burning.

Chemical Analysis:

The chemical analysis is compared with A.S.T.M. Spec. A 128-33 as follows:

	<u>Sorel casting, per cent</u>	<u>A.S.T.M. Specification A 128-33, per cent</u>
Carbon	1.21	1.0-1.4
Manganese	10.55	10.0 min.
Silicon	0.87	---
Phosphorus	0.095	0.10 max.
Sulphur	0.005	0.05 max.

Physical Tests:

The metal was found to be slightly magnetic. It had a Vickers pyramid hardness number of 219.

Microscopic Examination:

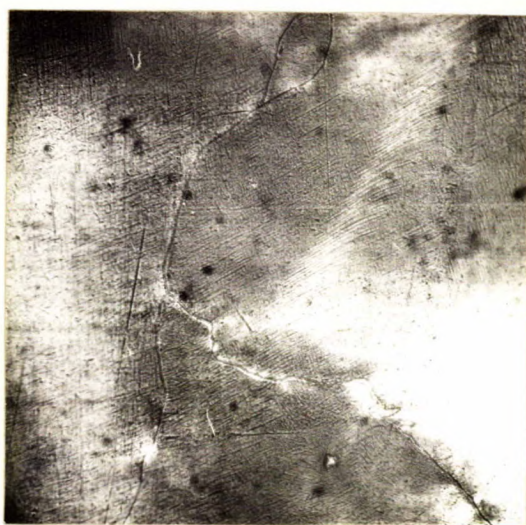
This metal was examined both after the conventional picral etch and after a 15-minute etch in boiling alkaline sodium picrate. This latter etch was used to show up any free carbide. The results of these treatments are shown in Figures 1 and 2. The metal would appear to have a normal austenitic structure, free from carbides.

Figure 1.



X100, picral etch.

Figure 2.



X100, alkaline sodium picrate etch.



Discussion of Results:

The burning method, used in obtaining the sample, is not the best, as the metal could easily be heated to a high enough temperature to cause the austenite to start decomposing. That this has happened is shown in both the magnetic properties and the hardness. A normal hardness for manganese steel is 180. The decomposition has not progressed far enough, however, to affect the microstructure, which is purely austenitic.

Chemical analysis and microscopic examination would indicate that the steel was properly made and heat-treated.

Conclusion:

The steel is within the proper chemical specifications. Heat treatment practice was good.

Recommendations:

It is recommended that future samples of this steel should be obtained by means of a cutting wheel. If this is not practicable, the pieces cut out by torch should be at least 6 inches along cut dimensions.

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