File.

FILE COPY

O T T A W A July 16th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1450.

Examination of Manganese Steel from a Crusher Cone.

(Copy No. 10.)

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 July 16th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1450.

Examination of Manganese Steel from a Crusher Cone.

Origin of Request and Object of Investigation:

On July 1st, 1943, one sample from a manganese steel crusher cone was submitted to these Laboratories for examination. In an accompanying letter, Mr. J. R. Blais, of the Sales Department of Sorel Steel Foundries Limited, Sorel, Quebec, stated that the piece was in service at the Waite-Amulet Mines and requested the chemical analysis and microscopic examination of the material.

Macroscopic Examination:

The piece appeared sound in the "as received" condition. There was a slight film of rust on the surface.

Chemical Analysis:

The chemical analysis of the material is given below in comparison with the A.S.T.M. Specification A-128-33 for austenitic manganese steel:

	Sample "As Received"	A.S.T.M. A-128-33
	-Per cent-	
Carbon -	1.03	1.0-1.4
Manganese -	10.45	10.0-14.0
Silicon -	0.40	-
Phosphorus -	0.012	0.10 max.
Sulphur -	0.037	0.05 max.

Hardness Determination:

The hardness of the material "as received" was measured on the Vickers hardness testing machine, using a 10-kilogram load. The result of this measurement was 194 V.H.N.

Microscopic Examination:

One sample was cut from the piece "as received" for microscopic examination. It was hand-polished and given a picral etch.

No free carbides were present in the steel, though some porosity was found in the sample.

The grain size of the material is fairly large, as can be recognized in Figure 1 which is a photomicrograph of the steel "as received".

Discussion of Results:

Although both the carbon and manganese are on the low side of the range of chemical analysis, they are still within the limits specified by the A.S.T.M. This condition is thus not liable to have a detrimental influence on the behaviour of the material.

The hardness of the material is that expected in this austenitic manganese steel.

The fact that no free carbides were found in the steel indicates that the temperature of quenching and the soaking period at this temperature were right. The slight amount of porosity is expected in such a type of casting.

However, the grain size of the material is definitely large. This is evidence of a high pouring temperature. It is possible to develop better properties in such a type of steel by refining the grain. This is done only by pouring the molten steel as cold as possible.

CONCLUSIONS:

1. Except for the slight amount of porosity and the large grain size, the metallurgical properties of the steel are excellent.

2. Failure has probably occurred as a result of severe service.

oooooooooo
ooooo
o

AD:GHB.

Figure 1.

X100, picral etch.

MICROSTRUCTURE OF THE AUSTENITIC MANGANESE STEEL.

AD:GHB.