

*File*  
FILE COPY

O T T A W A

August 6th, 1942.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1279.

Examination of a "Broken Crusher Lug"  
Manganese Steel Casting.

=====

(Copy No. 6)

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

August 6th, 1942.

R E P O R T  
of the  
ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1279.

Examination of a "Broken Crusher Lug"  
Manganese Steel Casting.

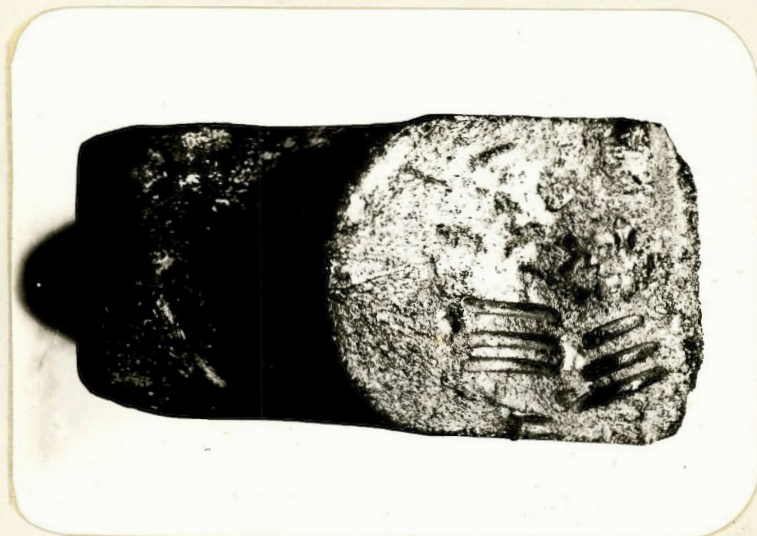
=====

Source of Material and Object of Investigation:

On July 29th, 1942, Mr. W. S. White, Superintendent, Sorel Steel Foundries Limited, Sorel, Quebec, submitted a "Broken Crusher Lug" for examination. It was desired to obtain a chemical analysis and a microscopic examination of the steel.

Macro Examination:

Figure 1.



"Broken Crusher Lug"  
Showing spring steel internal  
chill in fracture.

(Approx. 1/3 size).

Figure 1 is a photograph of the lug. The imprint of a wire chill can be seen on the surface of the fracture and also some of the wire at the edge of the fracture. Apart from this defect, the casting appeared to be free from any surface imperfections.

Chemical Analysis:

Per cent

Carbon	-	1.04
Manganese	-	12.45
Silicon	-	0.55
Phosphorus	-	0.066
Sulphur	-	0.006
Chromium	-	0.10

Microscopic Examination:

Figure 2 shows, at X100 magnification, the steel in the unetched condition. The crack shown in this photomicrograph lies between the steel wire chill and the manganese steel. The etched structure of steel wire and the manganese is shown in Figures 3 and 4, photomicrographs taken at X100

Microscopic Examination, cont'd) -

magnification. Figure 5 shows, at X100 magnification, the etched structure of the manganese steel. The grains are medium sized and are free from carbides within the grains and also along the grain boundaries.

Discussion of Results:

The composition of the steel is within the limits specified by the A.S.T.M. for austenitic manganese steel. The cleanliness of the steel, together with the chemical composition, would indicate that the steel was properly made.

The size of the austenitic grains indicates that the steel was not poured from too high a temperature. The presence of the unmelted chill in the lug would lower the impact properties of the steel.

The absence of free carbides indicates that the steel was properly heat treated.

---

Conclusions:

From the results obtained on the examination of this broken austenitic manganese steel lug, it is concluded that failure was due to the presence of a steel wire chill.

If internal chills are being used to prevent shrinkage of the metal in the lug, it is recommended that some other method be used to obtain a sound casting.

ooooooooo  
ooooo  
o

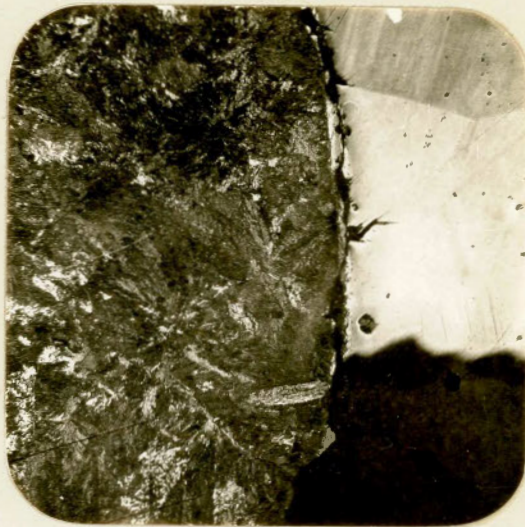
NBB:GHB.

Figure 2.



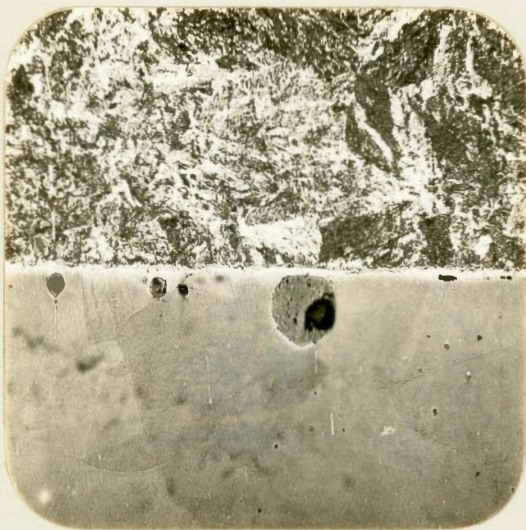
X100, unetched.

Figure 3.



X100, 2 per cent  
nital etched.

Figure 4.



X100, 2 per cent  
nital etched.

Figure 5.



X100, 2 per cent  
nital etched.

