O T T A W A November 1st, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1731.

Examination of a Manganese Steel Crusher Toggle Seat.

(Copy No. 10.)

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Origin of Request and Object of Investigation:

On October 19th, 1944, a request was received from the Sorel Steel Foundries Limited, Sorel, Quebec, for an investigation into the failure of a manganese steel crusher toggle seat. A piece of the toggle seat was received on October 20th.

Chemical Analysis:

The sample was found to have the following chemical analysis:

		Per Cent
Carbon	-	1.29
Manganese	-	9.76
Silicon	-	0.98
Phosphorus	-	0.109
Sulphur	-	0.005
Chromium	-	0.67

Microstructure:

Figure 1 is a photomicrograph of the sample as received. The microstructure shows carbides at grain boundaries, needle-like carbides throughout the grains, and the usual background of austenite.

Discussion:

The manganese content is below specification, and is too low for the fairly high carbon content. A sample water-quenched from 1900° F. in these Laboratories still showed some fine free carbides at the grain boundaries. This steel would not be satisfactory even if it had received the proper heat treatment.

The microstructure shows that the steel has not been properly heat-treated. The fact that attempts to duplicate this structure were unsuccessful suggests the possibility that the sample is still in the as-cast condition.

Conclusions:

1. The casting failed because it had not received the proper heat treatment. It is possible that it received no heat treatment.

2. Even if it had received the correct heat treatment the casting would not have given satisfactory service, as the manganese content is too low.

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AEM:GHB.

Figure 1.

X100, nital etch.

MICROSTRUCTURE AS RECEIVED.

Needle-like inclusions and dark masses are carbides. Background of austenite.

ALM:GHB.