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R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1280.

(M. & S. No. 9/B)

Investigation of a Broken Universal Carrier Track Link.

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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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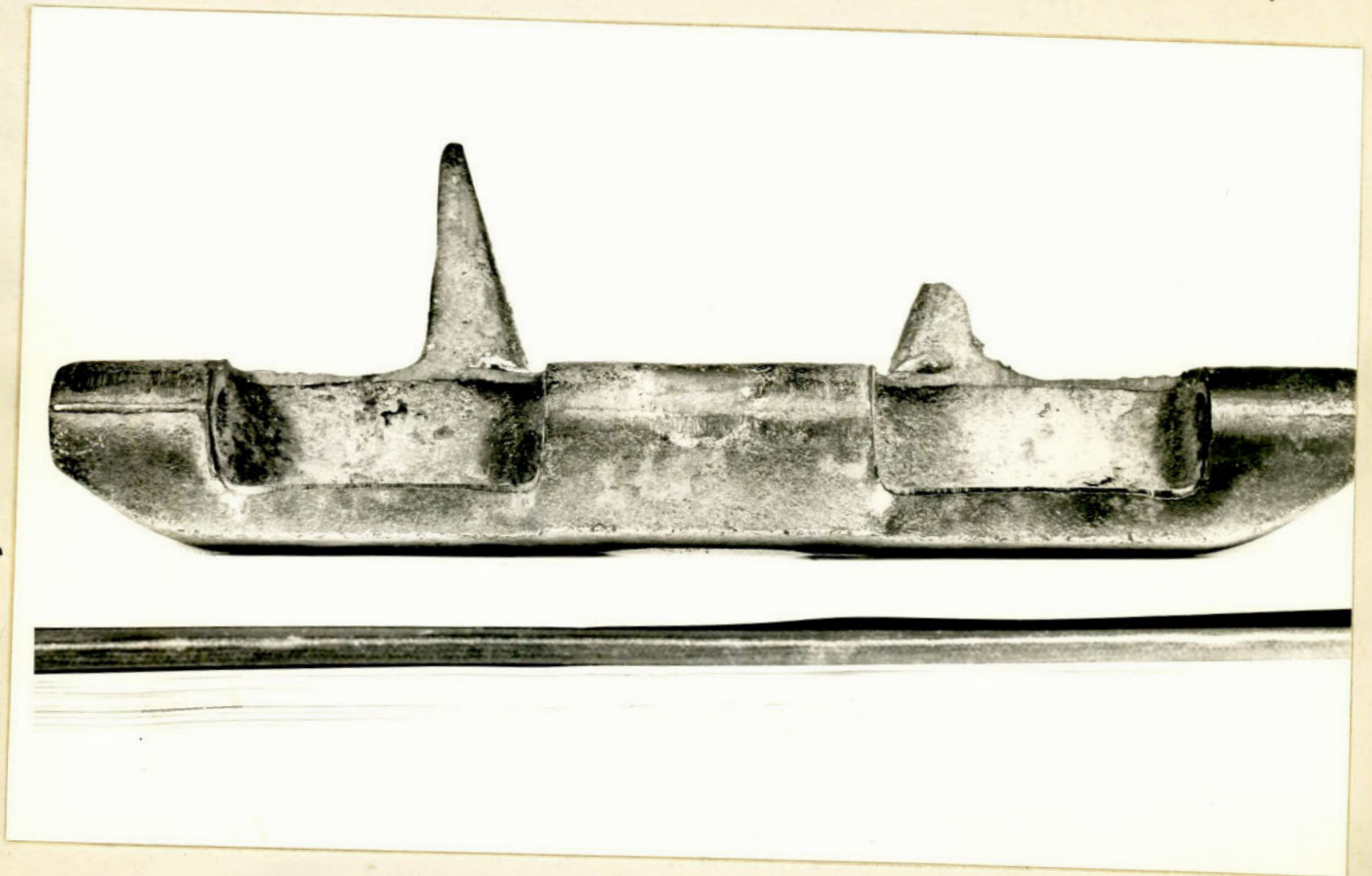
Origin of Material and Object of Investigation:

On July 31st, 1942, a track link, having a broken lug, was received through the Department of Munitions and Supply. This link came from the "Green" side of an experimental track which was first used on June 26th, 1942 and broke on July 20th, 1942. The mileage covered before the link broke was 434.

(Origin of Material and Object of Investigation, cont'd.) -

It was decided to make a thorough metallurgical examination to determine the cause of failure. Figure I shows the link as received.

Figure I



Chemical Analysis:

	<u>As Found</u>	<u>Ford # 7.</u>
Carbon	1.14	1.35 - 1.55
Silicon	1.00	0.90 - 1.10
Manganese	0.42	0.40 - 0.60
Sulphur	0.048	0.08 Max.
Phosphorus	0.057	0.10 Max.
Copper	0.12	
Nickel	trace	
Chromium	trace	

Hammer Test:

A link is considered to have sufficient ductility and toughness when the eye-holes will withstand the blows of a hammer until they are two-thirds of their original diameter. This link was subjected to test on two eye-holes and in both cases failure resulted. Figure II shows the cracking of the eye-hole wall.

Figure II.



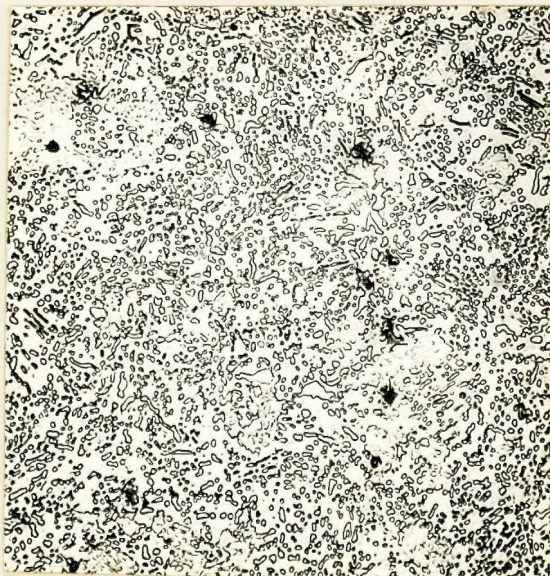
Hardness Tests:

The hardness obtained on the Brinell machine was 229.

Microscopic Examination:

A microspecimen was cut from the link and examined in the unetched and nital-etched condition. An examination in the unetched state revealed that the steel contained a fair number of inclusions. Figure III taken off the etched sample at x 500 magnification shows the spheroidized carbides in a ferrite groundmass.

Figure III.



Discussion:

From the chemical analysis it appears that the steel is closely similar to Ford No.7.

The hammer test indicates low impact strength and this is the most probable reason for failure of the lug occurring.

The polished microspecimen indicates that the steel was fairly dirty. The spheroidized structure is the most desirable state for a casting of this analysis. It must be pointed out, however, that a low impact material was obtained with this type of steel even though the most satisfactory heat treatment was given. It would appear that Ford No. 7 steel is not as satisfactory as Ford No. 4 steel for the Universal Carrier link.

Conclusions:

- (1) The material is similar to Ford No. 7 steel.
- (2) The casting has a low impact strength as shown by the hammer-test failure.
- (3) The steel contained a fair number of inclusions.
- (4) The heat treatment was suitable for this type of steel.
- (5) Ford No. 7 steel does not appear as satisfactory as Ford No. 4 for the Universal Carrier link.

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