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December 29th, 1941.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1141.

An Examination of Two Towing
Hooks.

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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 and Nature of Investigation:

Analysis Requisitions Nos. M.T.139 and M.T.140, issued on December 22nd, 1941, by Mr. R. Boult, for the Inspection Board of the United Kingdom and Canada, Ottawa, requested that tests be taken on submitted towing hook castings to cover ultimate strength, elongation, reduction in area, and bending.

The two steel castings submitted were identified as follows:

Sample No. 6 - Sub-contractor - Canadian Steel Forgings.
 " " 7 - " - Dominion Forgings.

Test pieces were cut from the base of the castings.

Physical Tests:

	<u>No. 6</u>	<u>No. 6</u>	<u>No. 6</u>	<u>No. 7</u>
Tensile, p.s.i. -	83,000	78,500	71,680	122,000
Yield, p.s.i. [⊕] -	49,600	48,700	54,300	77,500
Elongation, per cent in 1½ inches -	9.3	10.0	7.5	14.0
Reduction in area, per cent -	12.0	16.3	--	18.0
REMARKS	Broke at shrinkage cavity.	Broke at internal chill.	Broke at internal chill.	Broke at flaw.
Bend test	Broke at shrinkage cavity.			70 per cent bend.
Brinell hardness	170			163

[⊕] Yield by dividers method.

The use of internal chills has been mentioned in a previous report on towing hooks issued by this Department. [⊕] Since X-ray inspection has come into use as a tool for measuring internal soundness, soft wire coils have been used in the mould to chill the metal and reduce shrinkage. Figure 1 shows that these wires are not always bonded to

[⊕] Investigation No. 1038, "Report on Towing Hooks for Military Vehicles." (June 27th, 1941)

the metal of the casting.

Figure 1.



↑ ↑ ↑ ↑ ↑ ↑
E F D C B A

(Approximately to size).

NOTE:

- | | | |
|---|---|--------------------------------|
| A |) | |
| B |) | - Test bar fractures of No. 6. |
| C |) | |
| D | - | " " fracture " No. 7. |
| E | - | Bend test fracture of No. 6. |
| F | - | " " " " No. 7. |
-

Sectioning for Shrinkage:

At the request of Mr. R. L. Martin, Deputy Inspector of Motor Transport, the hooks were sectioned at and around the area which is under greatest stress in service. No gross cavities were discovered in either casting.

Conclusions:

The physical tests are not truly representative of the quality of the metal, since the fractures occurred at internal chills, shrinkage, etc.

Regular X-ray inspection should be used to detect occurrence of shrinkage defects.

The shrinkage and internal chills appear to be confined mainly to the base of the casting.

A proof test would afford much more satisfactory indication of the quality of the casting than is obtained by test pieces cut out of the base.

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