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January 6th, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1571.

Examination of Two Aluminium Bronze Test Bars.

(Copy No. 4.)

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Origin of Problem:

In a letter (File 935UI-1-5) dated December 13th, 1943, A/C A. L. Johnson, for Chief of Air Staff, Department of National Defence for Air, Ottawa, Ontario, requested the examination of two sand cast aluminium bronze test bars.

It was reported that the specimens had been heat treated at 1600° F. for 30 minutes, quenched in water, and reheated at 900° F. for 30 minutes. The hardness was stated to be Rockwell 'B' 104.

It was requested that the samples be tested to determine whether the material conforms to the SAE Specification No. 68 - Grade B, issued in January, 1943.

Chemical Analysis:

	<u>Examined</u> <u>Sample</u> - Per cent -	<u>S.A.E. Specification</u> <u>No. 68 - Grade B</u>
Copper	- 87.80	86.00 - 89.00
Aluminium	- 10.49	10.00 - 11.50
Iron	- 1.44	1.00 - 2.00
Tin	- 0.19	0.20 max.
Silicon	- 0.06	Total impurities: 0.50 max.
Manganese	- Trace.	-
Zinc	- n.d.	-
Lead	- n.d.	-

n.d. = None detected.

Mechanical Properties:

Tensile Tests -

The specimens were tested "as received", without machining. The following results were obtained:

	<u>Specimen</u> <u>No. 1</u>	<u>Specimen</u> <u>No. 2</u>
Yield strength, p.s.i.	- --	--
Ultimate tensile strength, p.s.i.	- 46,500	46,100
Elongation, per cent	- 0.0	0.5

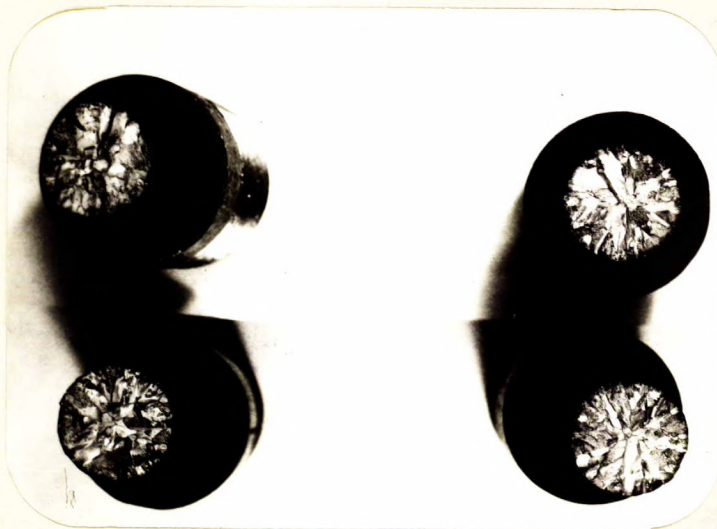
The specimens broke with practically no elongation, showing extreme brittleness.

Figure 1 shows the coarse crystalline structure of the fractures of the specimens.

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(Mechanical Properties, cont'd) -

Figure 1.



(Approximately actual size).

Hardness Tests -

Rockwell 'B' 106-108.

Metallographic Examination:

Figure 2 shows the macrostructure of the cross-section of the samples, revealing very coarse, dendritic radial crystals.

Figure 2.



(FeCl₃ etch).

Approximately actual size.

CONCLUSIONS:

The chemical analysis of the examined samples conforms to the composition given in S.A.E. Specification No. 68 - Grade B.

The uncommon brittleness and the very coarse crystalline structure of the material are due to considerable overheating of the metal.

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