O T T A W A November 25th, 1940.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 931.

Report on Cast Iron Brake Drum for
Universal Carrier.

BUREAU OF MINES
DIVISION OF METALLIC MINERALS
—
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CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Origin of Material and Purpose of Investigation:

In a letter (No. 175) from the office of the D.C.I.A.(G), Department of National Defence, Ottawa, Ontario, dated November 20th, 1940, an examination of a brake drum was requested. This is part No. 3614 for the Universal Carrier.

Hardness:

Hardness tests indicated a Brinell number of 230 - 240.

Microstructure:

Figure 1.

25X (Unetched).

Figure 1 shows the dendrite pattern as outlined by the graphite flakes. Note that the flakes are arranged in rows and layers which form planes of weakness through the iron.

Figure 2.

100X (Nital etch).

(Continued on next page)

(Microstructure, cont'd) -

Figure 2 shows the shape of the individual graphite flakes. The matrix is seen to consist almost entirely of pearlite. Steadite formations are normal for automotive grey iron.

Figure 3.

400X (Nital Etch).

Figure 3 shows that the pearlite is fine grained. Sulphide inclusions are normal for automotive grey iron.

(Continued on next page)

(Microstructure, cont'd) -

Figure 4.

1000X (Nital etch).

Figure 4 shows that the carbide laminations in the pearlite are curly or wavy, and so thin as to be resolved only at 1000X. This is a characteristics of high strength grey irons.

Chemical Analysis:

		Per cent
Carbon	-	3.13
Silicon	-	1.75
Manganese	-	0.95
Sulphur	-	0.104
Phosphorus	-	0.165
Nickel	-	0.37
Chromium	-	0.47
Molybdenum	-	0.31
Vanadium	-	Nil.

DISCUSSION:

Grey iron consists of a steel-like matrix in which are embedded graphite flakes. Graphite flakes act as voids in reducing the strength of the matrix. Therefore in making high strength grey iron, two properties of the

(Discussion, cont'd) -

metal must be brought under control:

1. Graphite flakes should be short and curly. Dendrite patterns must be avoided (rows and layers).
2. Matrix must consist of fine-grained pearlite. Steadite and sulphide inclusions must be held to a minimum.

The brake drum iron examined in this report appears to have a satisfactory matrix. However, its strength is limited by a dendritic graphite pattern. This can be corrected by adding graphitizing agents either in the ladle or in the charge. Graphitizing agents are:

Carbon,
Silicon,
Zirconium,
Nickel,
Calcium-Silicon.

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