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O T T A W A May 22nd, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1652.

Metallurgical Examination of Bottom Bearing Pieces for A.R.K. Gyros.

(Copy No. 10.)

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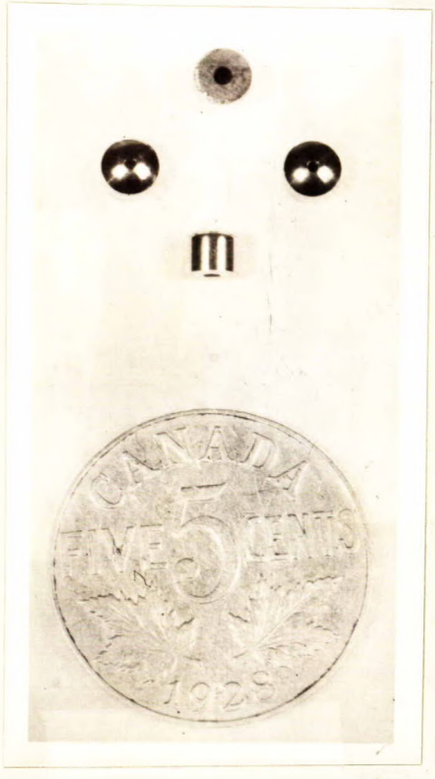
Origin of Request and Object of Investigation:

On May 5th, 1944, Mr. G. E. S. Hornby, Chief Chemist, British Admiralty Technical Mission, Ottawa, Ontario, submitted, for metallurgical examination, several bottom bearing pieces for A.R.K. Gyros. Mr. Hornby requested verbally that this examination be made to determine whether or not wear was taking place on the bearing surfaces of the parts and to determine the general suitability of the steel used. He stated that the steel from which these parts were made contained approximately 0.90 per cent carbon.

Macroscopic Examination:

Figure 1 shows several of the bearing pieces in the "as received" condition. Figures 2 and 3, at X30 magnification, show respectively a bearing surface of one of the parts and a cross-section of the bearing surface. There was no evidence of wear on any of the surfaces examined but there were signs of scoring, as shown in Figure 2.

Figure 1.



BEARING PIECES,
"AS RECEIVED".
(Approximately twice
actual size).

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Figure 2.

X30.
BEARING SURFACE OF PIECE.
Note scoring lines.

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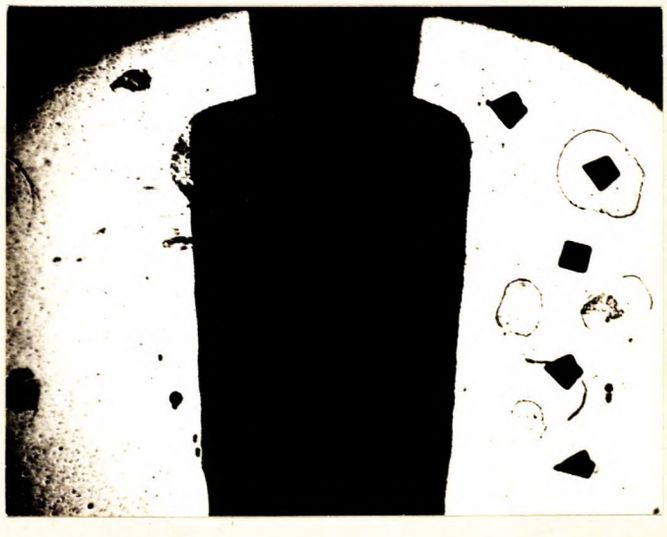
Figure 3.



X30.
CROSS-SECTION OF BEARING PIECE.
Note absence of any evidence of wear.

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Hardness Tests:

Hardness determinations were made with a Vickers hardness testing machine, using a 10-kilogram load. The average hardness determined on one piece was 772 V.H.N.

Microscopic Examination:

Two specimens were prepared for microscopic examination.

One was ground down longitudinally to cross-section, hand polished, and then etched for 7 seconds with the following reagents:

1 gm. picric acid,
5 cc. hydrochloric acid,
100 cc. ethyl alcohol.

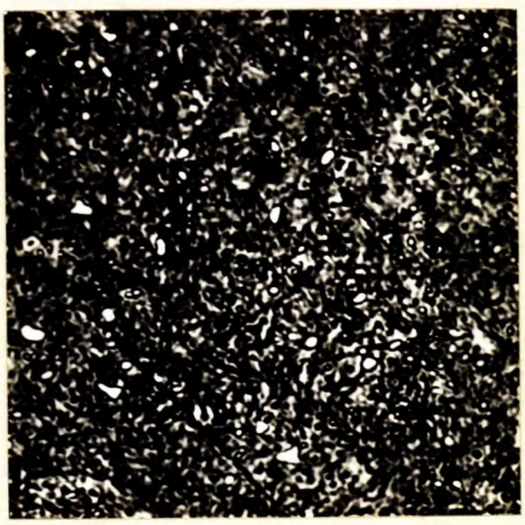
The structure revealed is shown, at a magnification of 1000 diameters, in Figure 4. Carbides are shown in an unresolvable matrix, probably martensite.

The second specimen was mounted in lucite, hand polished, and etched for 20 seconds in 4 per cent picral. This structure, shown at a magnification of 1000 diameters in Figure 5, is carbides in an unresolvable matrix, also probably martensite. Figure 6, at a magnification of 500 diameters, shows that there was no evidence of decarburization.

Figure 4.

X1000, etched in solution of picric acid and HCl in ethyl alcohol.
CARBIDES IN MATRIX OF MARTENSITE

Figure 5.



X1000, picral etch.

CARBIDES IN MARTENSITE MATRIX.

(Microscopic Examination, cont'd) -

Figure 6.

X500, picral etch.

Showing no evidence of decarburization.

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Discussion of Results; Conclusions:

The macroscopic examination showed no wear taking place on the bearing surfaces of the pieces, although there was evidence of scoring.

The hardness was normal for this type of steel.

The microscopic examination showed structures normal for this type of high-carbon steel.

No evidence of decarburization was observed, and hardening was complete to the edge of the hole.

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ELC:GHB.