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O T T A W A December 2nd, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1547.

Examination of Two Piston Rings for Ranger 6-440C5 Engine.

(Copy No. 6.)

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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Source of Material and Object of Investigation:

On November 29th, 1943, A/C A. L. Johnson, for Chief of Air Staff, Department of National Defence for Air, Ottawa, Ontario, submitted (via F/O N. S. Spence) two piston rings for examination. These rings, marked Pedrick 9910B and Hastings 9909H respectively, were designed for use in the Ranger 6-440C5 engine. It was requested (accompanying letter, File No. 935AR-2-5(AMAE DAI)) that comparative tests be carried out to determine which ring was of better metallurgical quality.

Hardness Tests:

Hardness determinations carried out by the Rockwell method gave the following results:

Sample	Rockwell	Brinell (converted)
Pedrick No. 9910B	93 ('B' scale)*	200
Hastings No. 9909H	25 ('C' scale)*	255

* Average of 13 readings.

Microscopic Examination:

Specimens were taken from each of the rings, mounted in bakelite, polished, and examined under the microscope in the unetched condition. Figures 1 and 2 are photomicrographs at X100 magnification and show the unetched structure of the Pedrick and Hastings piston rings respectively. The graphite is in the form of clusters in both irons; however, it will be noted that the graphite in the Pedrick iron is coarser than in the iron of the Hastings. The materials were next etched in a solution of 4 per cent picric acid in alcohol and re-examined. Figures 3 and 4 are photomicrographs, at X1000 magnification, showing the picral-etched structure of the iron of the Pedrick and Hastings piston rings respectively. The pearlite in both irons is quite fine. However, it will be noted that pearlite in the Pedrick ring is slightly spheroidized.

Remarks:

Hardness tests carried out on these materials showed that the Hastings piston ring was considerably harder than the Pedrick ring. The larger graphite particles found in the latter ring would indicate that this iron would not have as good wear-resistance qualities as the Hastings ring, especially if the cylinder walls of the motor were hardened by a process such as nitriding, etc. It is thought, however, that the Pedrick ring,

(Remarks, cont'd) -

although softer, would probably give satisfactory service in a cast iron cylinder, such as is used in the automotive industry.

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Figure 1.

X100, unetched.

STRUCTURE OF PEDRICK PISTON RING NO. 9910B.

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Figure 2.

X100, unetched.

STRUCTURE OF HASTINGS PISTON RING NO. 9909H.

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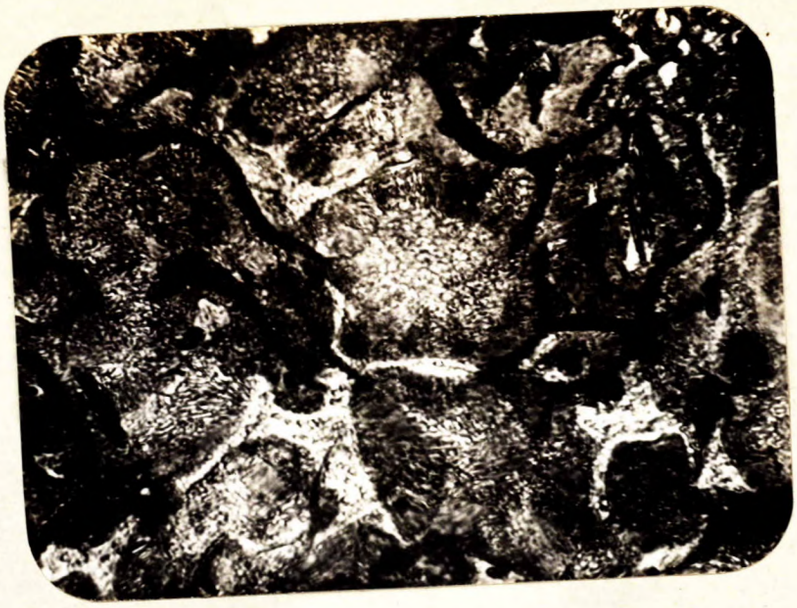
Figure 3.



X1000, etched in 4 per cent picric acid.

STRUCTURE OF PEDRICK PISTON RING NO. 9910B.

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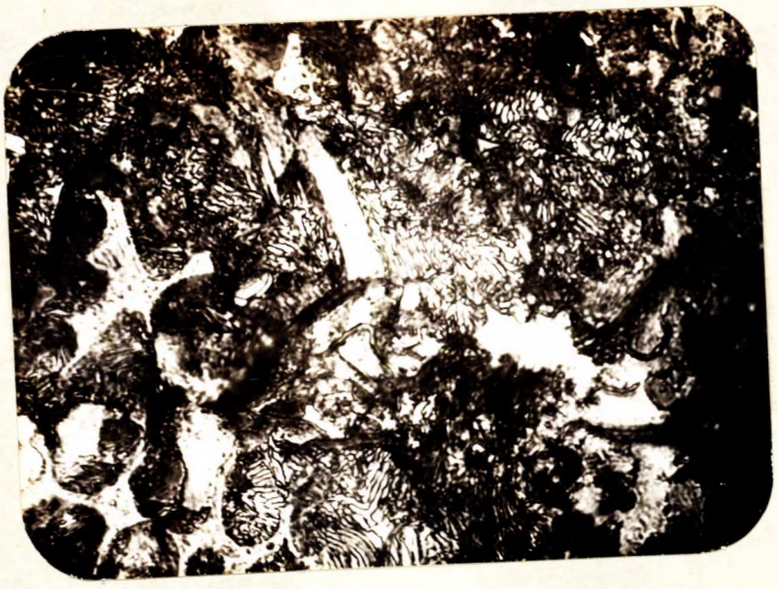
Figure 4.



X1000, etched in 4 per cent picric acid.

STRUCTURE OF HASTINGS PISTON RING NO. 9909H.

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