File.

FILE COPY

O T T A W A March 28th, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1614.

Examination of a Snowmobile Bogie Lower Spring Anchor Pin.

(Copy No. 10.)

Bureau of Mines
Division of Metallic
Minerals.

Ore Dressing
and Metallurgical
Laboratories

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
Mines and Geology Branch

O T T A W A March 28th, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1614.

Examination of a Snowmobile Bogie Lower Spring Anchor Pin.

Origin of Material and Object of Investigation:

On March 16th, 1944, the Army Engineering Design Branch of the Department of Munitions and Supply, Ottawa, Ontario, submitted one snowmobile bogie lower spring anchor pin (of recent production) for metallurgical examination. Requisition No. 636 (A.E.D.B. Lot No. 528, Report 107 "D", Test 10) requested the following information:

(1) Composition,
(2) Rockwell hardness,
(3) Depth of case.

It was reported that the pin was made of pack-hardened SAE 1020 steel.

Chemical Analysis:

Analysis of drillings taken from the core of the pin is shown in Table I.

Table I.

	As Found	Specification SAE 1020	Specification SAE 1112
		- Per cent -	
Carbon	0.13	0.18-0.23	0.08-0.13
Manganese	0.72	0.30-0.50	0.60-0.90
Phosphorus	0.073	0.040 max.	0.09-0.13
Sulphur	0.196	0.050 max.	0.16-0.23

Rockwell Hardness:

The core hardness, as determined by Rockwell readings on a transverse section, is 19-21 Rockwell "C". The surface hardness is 82-83 Rockwell "A".

Microscopic Examination:

Microspic examination of a longitudinal section showed the microstructure to be low-carbon martensite and ferrite. The metal contained numerous sulphide and silicate-sulphide inclusions elongated into stringers in the direction of rolling. This microstructure is shown in Figure 2, a photomicrograph at 250 diameters. Examination at the surface of the section revealed a higher-carbon case 0.010 to 0.013 inch in depth. This cased structure is shown in Figure 3 (a photomicrograph at 100 diameters).

Discussion:

The snowmobile lower bogie spring anchor pin, shown in Figure 1, was made by pack-hardening and quenching bar stock of a chemical composition corresponding to SAE 1112 free-machining steel (see Table I). This is not in agreement with the reported information that the specification requires pack-hardened SAE 1020 steel.

(Discussion, cont'd) -

The surface and core hardnesses, also the microstructure, suggest that the pin has been properly heat treated, and the depth of case indicates some degree of efficacy in the pack-hardening operation. However, the case on a pin of this composition, because of its high sulphur content, will not have wear resistance properties equal to those of pack-hardened SAE 1020 steel.

Since the manner in which the pin is stressed during service is not known, its behaviour in service cannot be determined. However, it is not made according to specification, and the full wear resistance normally expected of a cased pin cannot be realized.

Conclusions:

1. The bogie lower spring anchor pin is made from pack-hardened SAE 1112 steel.

2. The core hardness is 19-21 Rockwell "C". The surface hardness is 82-83 Rockwell "A".

3. The case is 0.010 - 0.013 inch in depth.

4. The chemical composition does not agree with reported specifications. The wear resistance of the case can be improved considerably by the use of the proper SAE 1020 steel specified.

oooooooooooo
oooooo
oo

IHM:MC.

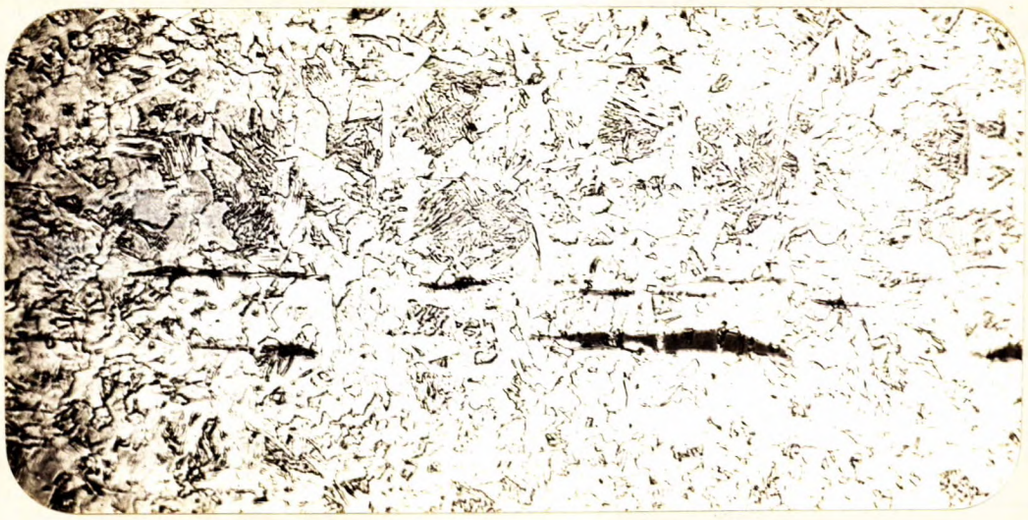
Figure 1.

SNOWMOBILE BOGIE LOWER SPRING ANCHOR PIN.

(Approximately 1/3 actual size).

—

Figure 2.



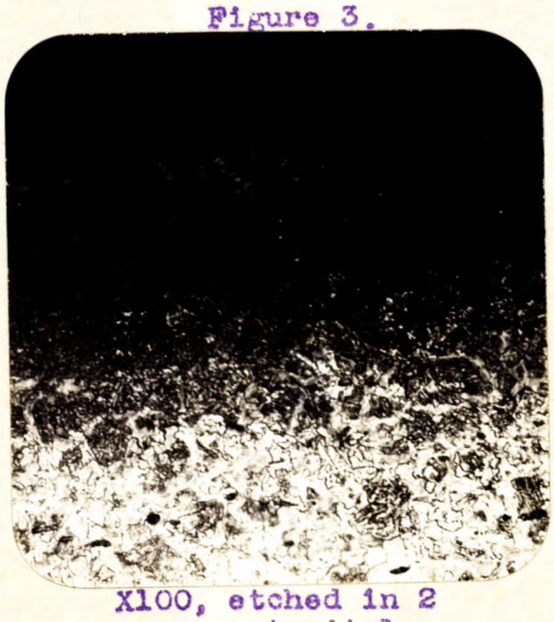
X250, etched in 2 per cent nital.

CORE STRUCTURE.

The white areas are ferrite; grey areas are low carbon martensite. The dark fibres are sulphide and silicate-sulphide inclusions, elongated in the direction of rolling.

—

Figure 3.



X100, etched in 2 per cent nital.

CARBON CASE.

IHM:MC.