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O T T A W A August 24th, 1944.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1704.

Examination of Striker Springs for 25-Pdr. Gun.

(Copy No. 10.)

Bureau of Mines
Division of Metallic
Minerals
-
Physical Metallurgy
Research Laboratories

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
Mines and Geology Branch

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Origin of Material and Object of Investigation:

On July 20th, 1944, Mr. R. O. McGee, for the Controller-General of the Inspection Board of United Kingdom and Canada, Ottawa, Ontario, submitted two striker springs for the 25-pdr. gun. Analysis Requisition No. O.T. 4261 (Reference No. 28/4/5) requested that a complete metallurgical investigation be carried out.

Chemical Analysis:

One half of each spring was softened by immersing in neutral salt at 1500° F. for three minutes and cooling in lime. Drillings were then obtained for chemical analysis.

	Spring No. 1	Spring No. 2
	- Per Cent -	
Carbon -	0.88	0.71
Manganese -	0.47	-
Silicon -	0.16	-
Phosphorus -	0.015	-
Sulphur -	0.018	-

Hardness:

Hardness readings were taken on the face of transverse sections cut from each of the springs. The Vickers hardness machine with a 30-kilogram load was used.

SPRING NO. 1		SPRING NO. 2	
V.P.N.	Equivalent Rockwell 'C'	V.P.N.	Equivalent Rockwell 'C'
514	49	502	48

Grain Size:

The McQuaid-Ehn grain size was:

Spring No.		Grain Size
1	-	4-5
2	-	5-6

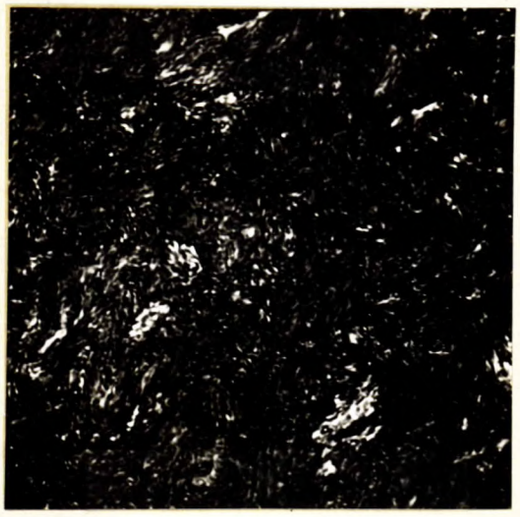
Microscopic Examination:

Transverse specimens were cut from the springs. These were polished and examined under the microscope. In the unetched condition they were found to be quite clean. They were then etched in 2 per cent nital. Figures 1 and 2 (at X1000) illustrate the tempered martensitic structures of

(Microscopic Examination, cont'd) -

both springs. Figure 3 (X250) is taken at the surface of a specimen after it has been held in neutral salt for three minutes and immersed in lime. A very small amount of partial decarburization is present. The structure at the top of Figure 3 is that of the hardened steel specimen holding the piece. The lighter etching areas are from the annealed spring. Note additional ferrite at the edge of the sample.

Figure 1.



X1000, nital etch.
SPRING NO. 1.
Tempered martensite.

Figure 2.

X1000, nital etch.
SPRING NO. 2.
Tempered martensite.

(Microscopic Examination, cont'd) -

Figure 3.

X250, nital etch.

ANNEALED SPECIMEN.
Note slight partial decarburization
at the surface.

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Discussion:

Two different types of carbon steel are represented by the two springs examined. They have both been heat-treated to approximately the same hardness, the maximum that should be

(Discussion, cont'd) -

allowed in this material. These springs could have been either oil-quenched and drawn or water-quenched and drawn. A very slight partial decarburization exists. It is desirable, from the point of view of resistance to alternating stresses, not to have any decarburization. It is thought, however, that this slight amount is probably unavoidable in production.

Conclusions:

1. Two different steels have been used for the springs; namely, SAE 1070 and SAE 1085.

2. The hardness of the springs is 502 to 514 V.P.N.

3. The grain size is 4-5 and 5-6 McQuaid-Ehn.

4. A slight partial decarburization is present at the surface.

5. Tempered martensite structures were obtained for both springs.

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SLG:GHB.