DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

CANADA

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Ottawa, January 31, 1947.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2173.

Thickness and Hardness of Chromium Plate on an Extractor Forging for 4" Mark XVI* Naval Gun.

(Copy No. 7.)

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Bureau of Mines

DEPARTMENT
OF
MINES AND RESOURCES

Mineral Dressing and
Metallurgy Division

Physical Metallurgy
Research Laboratories

Mines and Geology Branch

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Background:

A verbal request was received on or about December 23, 1946, from Commander G. Taylor, Chief Inspector of Naval Ordnance, Department of National Defence (Naval Service), Ottawa, Ontario, for information regarding the resistance to abrasion of chromium-plated areas on the ends of an extractor forging for a 4" Mark XVI* naval gun. A sample plated forging was submitted.

Experimental:

In order to obtain some indication as to the resistance to abrasion, a number of thickness and hardness measurements were made on the plated extractor.

The thickness measurements were made with the Aminco-Brenner Magne-Gage at the points indicated in Figure 1. The values obtained are given in Table I.

TABLE I.

Point No. (See Figure 1.)	Thickness of Chromium (inches)
1	0.00250
2	0.00150
3	0.00185
4	0.00137
5	0.00120
6	0.0 (Plating was removed from these areas before the sample reached these Laboratories.)
7	0.00165
8	0.00130
9	0.00165

Points 7, 8 and 9 correspond to points 1, 2 and 3 respectively.

The hardness measurements were made partly by the Vickers Test and partly by the Rockwell Test. The points tested are shown on Figure 2. The values obtained are given in Table II.

TABLE II. - Hardness Measurements.

Point No. (See Figure 2.)	Vickers Test (10-kg. load)	Rockwell "C" Test (150-kg. load)
1) On		30
2) plated		30
3) surface.	715	(Rockwell equivalent = 61)
4)	502	(" " = 49½)
5) On	286	(" " = 28)
6) unplated		26
7) steel		21
8) surface.		22

Discussion:

It will be noted that the maximum thickness of the chromium film was 0.00250 inch, which is extremely thin. This film is very hard when the load on it is small but when a large load is used the film is ruptured and the hardness obtained is that of the steel underneath.

Conclusions:

On the basis of the above data it is concluded that a film of chromium of the thickness used in this work would be useful in resisting comparatively mild abrasion. However, it would be almost useless in resisting abrasion which is accompanied by heavy impact. It is understood that the extractor is subjected to considerable impact in service.

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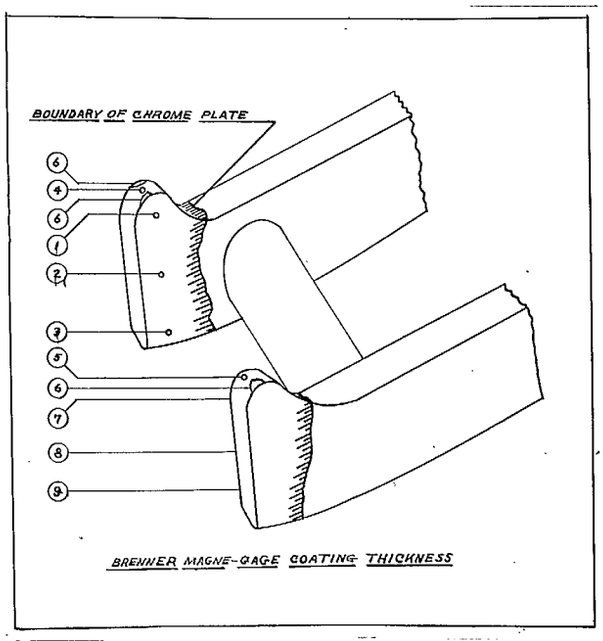
(Figures 1 and 2 follow,
on Page 4.)

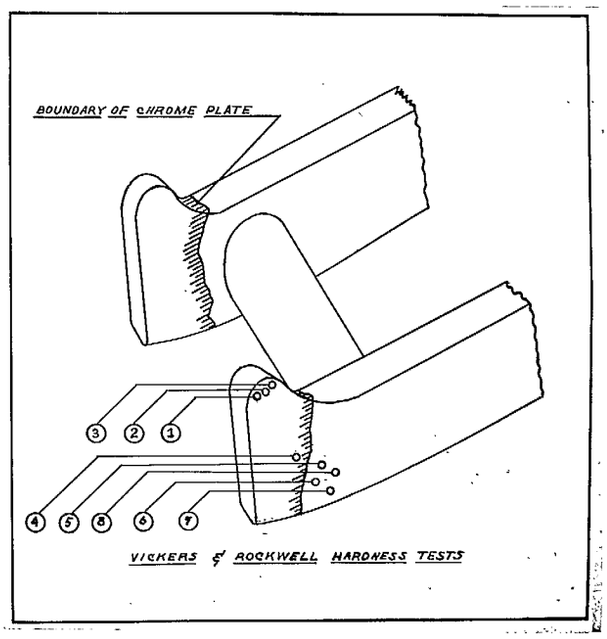
Figure 1.



DRAWING OF PART OF THE EXTRACTOR, SHOWING POINTS WHERE THICKNESS MEASUREMENTS WERE MADE.

Note: Points 7, 8 and 9 correspond to points 1, 2 and 3 respectively.

Figure 2.



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