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O T T A W A June 22, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1894.

Corrosion Resistance of Identity Discs
and Chains Issued to the U.S. Army.

(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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Background:

A letter dated May 14, 1945, File DIRD(P)-105-7, from Wing Commander P. W. Webb, Director of Inter-Service Research and Development (Clothing and Equipment), Department of National Defence, 299 Bank Street, Ottawa, Ontario, requested that corrosion tests be given to several identity discs and accompanying chains, the former being of monel metal and the latter of stainless steel.

TESTS PERFORMED

I. - Corrosion Resistance of Discs and Chains.

(a) Two assemblies, each consisting of a disc and short chain hanging from a larger chain, were tested for corrosion resistance in the 20 per cent salt spray cabinet at 95° F. In both cases the chains hung vertically. One disc (No. 2) was stamped and the other (No. 1) was not.

Results:

After 17 hours:

No. 1 - Six beads corroded. Little or no visible corrosion on disc.

No. 2 - Seven beads corroded. Some corrosion visible on disc.

After 3 days:

No. 1 - About 1/4 of chain corroded. Slight corrosion on the monel.

No. 2 - About 1/5 of chain corroded. Corrosion of disc more advanced than on previous inspection.

After 6 days:

Nos. 1 and 2 - About 8 beads uncorroded on each chain.

After 7 days:

No. 2 chain broke and was removed from test (see Figure 1).

After 11 days:

No. 1 chain still unbroken. Figure 2 shows the condition of the assembly at that time.

(b) One chain was suspended horizontally in the 20 per cent salt spray test at 95° F. At the end of 4 days the chain was removed and it was found that approximately 30 per cent of the beads were corroded (see Figure 3). The corroded beads were separated from the uncorroded ones and each kind was analysed for chromium.

(Tests Performed, cont'd) -

Results:

		Chromium, per cent
Uncorroded beads	-	16.95
Corroded beads	-	17.13

(c) A sheet of polished 18-8 chromium nickel steel was placed in the 20 per cent salt spray test for 8 days at 95° F.

Result:

No corrosion was observed.

(d) One assembly, consisting of one chain and one disc, was hung in the Weather-Ometer where it was exposed to light (resembling sunlight) produced by an electric arc and a temperature of 130° F. For three minutes out of every twenty the assembly was exposed to a spray of ordinary tap water. This test lasted for 15 days.

Result:

No corrosion was observed.

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II. - Analysis of Chain.

One of the chains was analysed. The results are compared with the specification composition (Investigation No. 1840) as follows:

Constituent	Specification Composition, per cent	Found on Analysis, per cent
Carbon	0.06 to 0.15	0.08
Manganese	0.20 to 0.60	0.34
Silicon	0.75 (max.)	0.36
Nickel	0.50 (min.)	Trace.
Chromium	17.0 (min.)	16.90
Copper	1.50 (max.)	0.09

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III. - Analysis of Disc.

One disc was analysed. The results are compared with the specification composition as follows:

Constituent	Specification Composition, per cent	Found on Analysis, per cent
Nickel	63 to 70	65.79
Iron	2.5 (max.)	1.32
Manganese	2.0 (max.)	1.00
Copper	Remainder.	31.53
Aluminium, carbon, silicon and sulphur	Small amounts.	Not determined.

Conclusions:

CHAINS.

1. The chains investigated in this work were more resistant to the corrosive action of 20 per cent salt spray than the chains mentioned in the report of Investigation No. 1840 (April 17, 1945).

2. The chains investigated in this work were not entirely resistant to the corrosive action of 20 per cent salt spray.

3. The chain analysed in this work fulfilled the specification requirements except that it was slightly too low in chromium and considerably too low in nickel.

4. The corrosion of the chain investigated in this work did not appear to be due to a deficiency of chromium.

5. Steel containing 18 per cent chromium and 8 per cent nickel is entirely resistant to the corrosive action of 20 per cent salt spray under the conditions of this test.

6. Bright light, comparatively high temperature and ordinary tap water do not produce deterioration of the chains.

(Conclusions, cont'd) -

DISCS

7. The unstamped disc investigated in this work was approximately as resistant to the corrosive action of 20 per cent salt spray as the ones mentioned in the Report of Investigation No. 1840.

8. The stamped disc was less resistant to the corrosive action of 20 per cent salt spray than the unstamped one.

9. The disc analysed in this work fulfilled the specification requirements with regard to content of nickel, iron, manganese and copper.

10. Bright light, comparatively high temperature and ordinary tap water do not produce deterioration of the discs.

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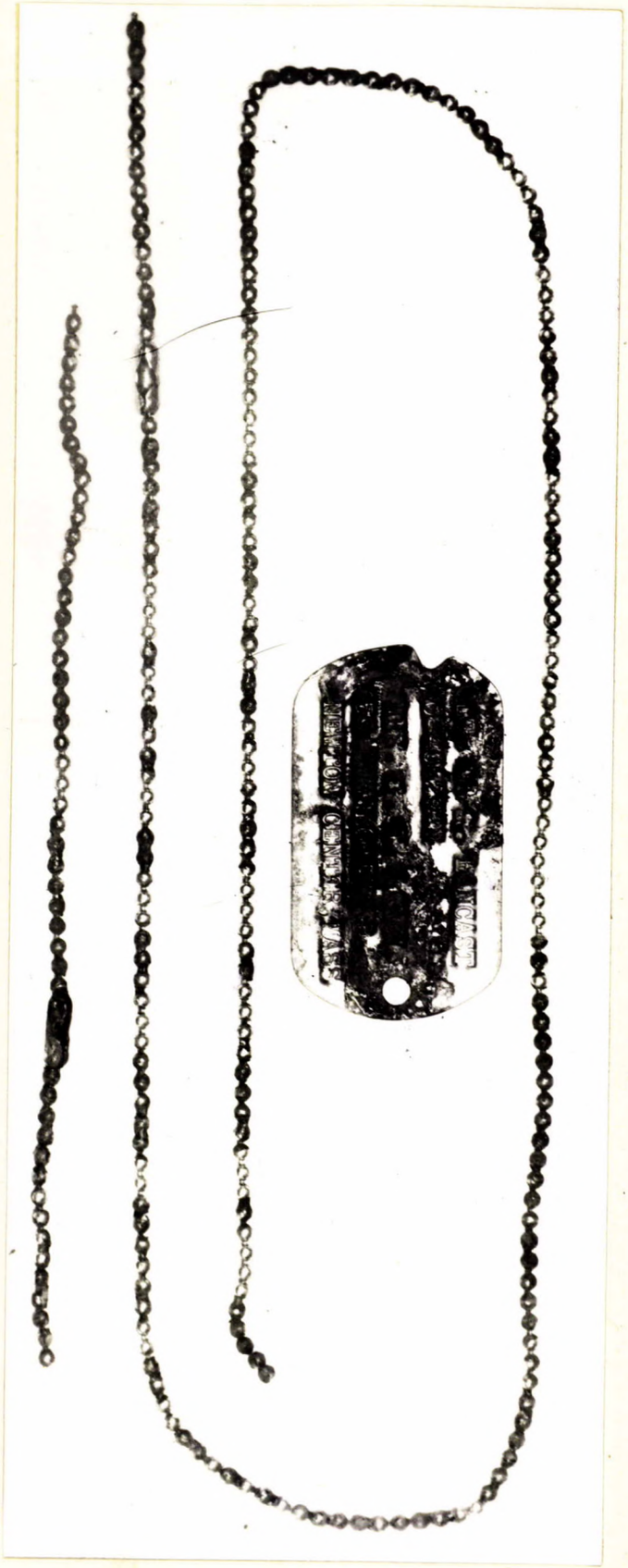
Figure 1.

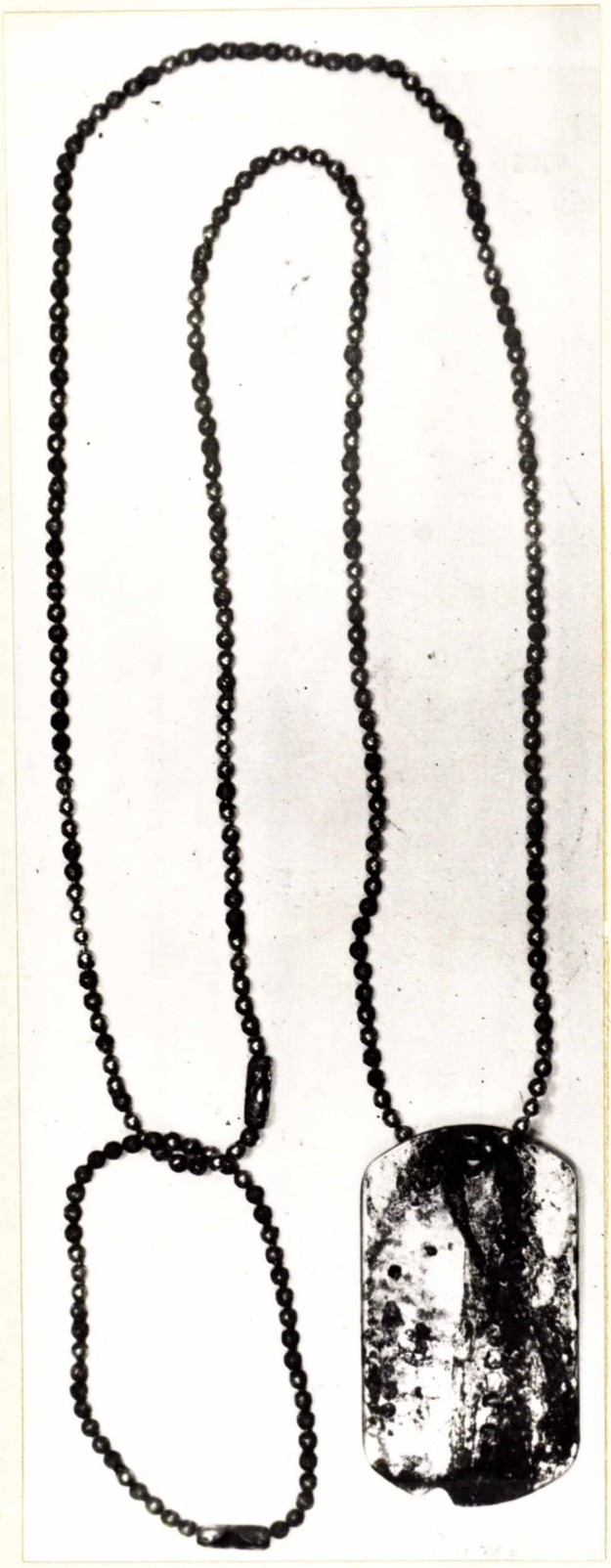


NO. 2 CHAIN AND ACCOMPANYING SHORT CHAIN AND DISC, AFTER 7 DAYS IN THE 20 PER CENT SALT SPRAY TEST AT 95° F.

(Magnification: slightly greater than 1).

Note that the chains are broken. Most of the dark material on the disc was corrosion product from the chains. However, some corrosion product from the monel was present also.

Figure 2.



NO. 1 CHAIN AND ACCOMPANYING SHORT CHAIN AND DISC, AFTER ELEVEN DAYS IN THE 20 PER CENT SALT SPRAY TEST AT 95° F.

(Magnification: slightly greater than 1).

Figure 3.

CHAIN AFTER 4 DAYS IN THE 20 PER CENT SALT SPRAY TEST AT 95° F. (SUSPENDED HORIZONTALLY).

(Magnification: approximately 1).

Note that some of the beads were corroded and some were not.

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