File

DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

CANADA

Ottawa, September 28, 1946.

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2108.

Corrosion Resistance and Other Properties of Military Buttons.

(Copy No. 8.)

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DEPARTMENT
OF
MINES AND RESOURCES

Bureau of Mines

Division
of Mineral Resources

Mines and Geology Branch

O T T A W A

September 20, 1946.

R E P O R T

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Background:

A letter dated August 21, 1946, was received from Major C.A.F. Clark for T/C. J.M. Maccun, Acting Director, Interservice Research and Development (Clothing & Equipment), Dept. of National Defence, Ottawa, Canada, requesting that the usefulness of several types of military buttons be investigated according to Specification PSNL-3-1-2.

The letter (File No. DIRD (P) 105-14-5/D5) stated in part:

> "It would be appreciated if an expression of opinion could be given as to whether there would be any deleterious effects from standard dry cleaning agents and whether it would be desirable to include additional test requirements not covered in this specification."

(Continued on next page)

(Background, cont'd) -

The bottons submitted were as follows:

4 buttons of sample No. 5-318-22 which are Other Ranks quality, manufactured by Gaunt Ltd.

4 buttons of sample No. 5-318-21 which are Officers quality, manufactured by Gaunt Ltd.

8 buttons of sample No. 5-314-24 and

4 buttons of sample No. 5-273-1, both of which are Officers quality, manufactured by William Scully Ltd.

INVESTIGATION:

The usefulness of the buttons submitted was investigated under the following headings:

1. Continuity of gold plating (Par. 4.1).
2. Resistance to corrosion (Par. 4.2).
3. Attachment of shank to back (Par. 4.3).
4. Test for lacquer (Par. 4.4).
5. Resistance to dry cleaning fluid (not mentioned in the specification).

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I. Continuity Of Gold Plating.

One button of each kind was treated according to the instructions in paragraph 4.1. The lacquer was first removed from the buttons by immersing them in benzene. Each button was then immersed for a period of 15 seconds in diluted nitric acid (1 vol. concentrated nitric acid and 1 vol. water) maintained at 65° F. ±2°. In every case, there was a considerable evolution of gas from both the face and back of each button and at the same time a blue colour was imparted to the acid solution. Upon removal from the acid solution, the surfaces of buttons 5-273-1 (Navy Officers - Scully Ltd.), 5-318-21 (R.C.A.F. Officers - Gaunt Ltd.) and 5-314-24 (R.C.A.F. Officers - Scully Ltd.) were badly attacked, and in the case of button 5-318-22 (Other Ranks - Gaunt Ltd.) the button had a uniform dull finish as if the gold plate had been removed entirely.

(Investigation, cont'd) -

II. Resistance to Corrosion.

Two buttons of type No. 5-314-24 and one of each of the other kinds were exposed to the action of salt spray for 100 hours under the conditions outlined in paragraph 4.2. The results were:

After 24 hours - Sample No. 5-273-1 (Navy officer's button produced by Scully) was half covered by corrosion product.

Sample No. 5-318-21 (officer's button produced by Gaunt) had whitish material on the top surface.

Sample No. 5-318-22 (other ranks button produced by Gaunt) was tarnished.

Samples No. 5-314-24 (officer's button produced by Scully) were not greatly changed.

After 100 hours - The corrosion of the various samples is shown in Figure 1.

Sample No. 5-273-1 had considerable brass corrosion product on the surface.

Sample No. 5-318-21 was partially covered with white material and there was a slight evidence of brass corrosion product.

Sample No. 5-318-22 was rather badly tarnished.

Samples No. 5-314-24 were partially covered with white material. A very slight amount of brass corrosion product was visible.

III. Attachment of Shank to Back.

Two buttons of type No. 5-314-24 and one of each of the other kinds were tested in the tensile strength testing machine. All buttons were undamaged at 45 pounds (the minimum allowed by the specification). Later it was found that all of the buttons were undamaged at 60 pounds.

IV. Test For Lacquer.

One button of each kind was treated according to paragraph 4.4. The test buttons were placed in an oven for 15 minutes at 400° F. ±5°. At the end of this time, there was no visible evidence of lacquer peeling, but all buttons had become somewhat darker in colour. Sample 5-318-22 (other ranks' - Gaunt Ltd.) showed the greatest change in colour, then 5-273-1 (Navy officer's - Scully Ltd.), and next 5-314-24 (R.C.A.F. officer's - Scully Ltd.). 5-318-21 (R.C.A.F. officer's - Gaunt Ltd.) showed the least change in colour.

V. Resistance To Dry Cleaning Fluid.

There were not sufficient buttons to test all of the types submitted. Two buttons of No. 5-314-24 type were subjected to the following test: They were placed in the vapour of trichlorethylene (a frequently used dry cleaning solvent) for four hours. Four times during that period they were withdrawn into the air for several minutes and allowed to dry. At the end of this test the buttons had become somewhat darker in colour. Although there was no visible evidence of lacquer peeling or otherwise deteriorating, it seems evident that the surface of the brass was affected under these conditions. It is possible that the other types of button would have behaved differently.

Conclusions:

It is concluded that:

1. None of the samples conformed to the specification with regard to continuity of gold plating.

2. None of the samples conformed to the specification with regard to resistance to corrosion. The brass was not

(Conclusions, cont'd) -

greatly corroded in the case of the 5-318-21 and 5-314-24 samples. However, there was a considerable amount of white material, probably containing lacquer or deterioration product from the lacquer, on these samples.

3. All of the samples conformed to the specification with regard to attachment of the shank to the back.

4. None of the samples conformed to the specification with regard to lacquer test.

5. The one type of button tested was affected by treatment in trichlorethylene (a frequently-used dry cleaning solvent).

Note:

It is felt that the lacquer test would be more useful if a lower temperature (say 300° F.) were used.

No further tests would seem to be necessary.

RRR:MB:MC.

(Figure 1 follows,
on Page 6.)

Figure 1.

(1) (2) (3) (4) (5)

BUTTONS AFTER 100 HOURS IN THE SALT SPRAY.

1. Type 5-273-1.
2. Type 5-318-21.
3. Type 5-318-22.
4.) Type 5-314-24.
5.)

RRR:MB:MC.