

1953

Application of Electrolytic-Polishing to Restore Obliterated Letters on Metal

Shigeo Arai

Follow this and additional works at: <https://scholarlycommons.law.northwestern.edu/jclc>

 Part of the [Criminal Law Commons](#), [Criminology Commons](#), and the [Criminology and Criminal Justice Commons](#)

Recommended Citation

Shigeo Arai, Application of Electrolytic-Polishing to Restore Obliterated Letters on Metal, 43 J. Crim. L. Criminology & Police Sci. 809 (1952-1953)

This Criminology is brought to you for free and open access by Northwestern University School of Law Scholarly Commons. It has been accepted for inclusion in Journal of Criminal Law and Criminology by an authorized editor of Northwestern University School of Law Scholarly Commons.

THE APPLICATION OF ELECTROLYTIC-POLISHING TO RESTORE OBLITERATED LETTERS ON METAL

Shigeo Arai

Shigeo Arai has since 1949 been a police technician on the staff of the Scientific Crime Detection Laboratory, National Rural Police Headquarters, Tokyo, Japan, where he is particularly interested in the application of electrical engineering to identification problems. In 1944 he completed a course in physics at Tohoku University and has devoted time to research problems related to vacuum tubes. Mr. Arai is a member of the Japanese Physical Society.—EDITOR.

The restoration of obliterated letters stamped on metal surfaces is generally accomplished by treating the area with a solution of cupric ammonium chloride and other reagents. The restored letters may not be so distinct, and the operations are troublesome. This author has therefore experimented with the application of an electrolytic-polishing method and has obtained successful restorations.

The method is applicable to various metals, and the operation can be completed in a short time (about five minutes).

METHOD

The electric circuit diagram and the apparatus for the operation are shown in Figure 1. First the obliterated area is polished with sand

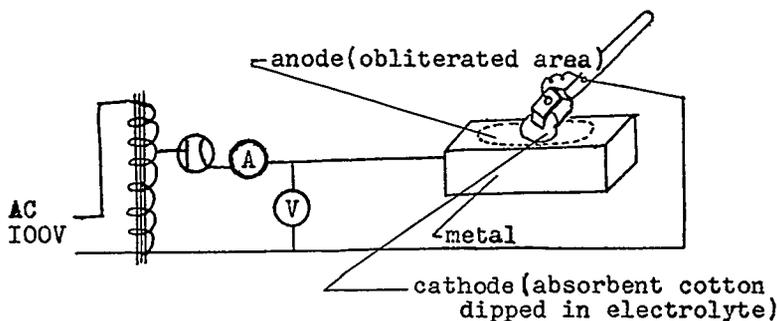


Figure 1

The Electric Circuit Diagram and the Apparatus

paper and then cleaned up with acetone. Next the area (anode) is rubbed with absorbent cotton (cathode) dipped in the electrolyte. The composition of the electrolyte is described in the following paragraph. The voltage needs to be slightly higher than a critical voltage which depends upon the property of the particular metal, for otherwise the current does not flow. If the voltage is gradually increased while rubbing the area with the cathode, the current begins to flow when the critical voltage is reached. Increasing the voltage about 0.5 volts more,



Figure 2

Letters Restored in Brass

the rubbing is continued. Generally after three minutes of treatment, the letters appear on the surface. At this point the electrolytic-polishing is stopped, and the surface is immediately cleaned by washing with water for a minute, followed by a neutralizing solution. The surface is lightly covered with machine oil and photographed. In washing and neutralizing one must be careful not to rub the area too much, lest the restored letters should be erased.

Table I shows the composition of the electrolyte, and Table II, the condition of electrolytic-polishing. It is not necessary to follow these exactly.

Table I

THE COMPOSITION OF THE ELECTROLYTE

Distilled water	500 cc
Sulphuric acid (conc.)	15 cc
Gelatine	1 gram
Cupric sulfate	1 gram

Cupric sulfate is used when the metal is a ferro-alloy and also when the letters are restored with difficulty.

Table II

THE CONDITION OF ELECTROLYTIC-POLISHING

Metal	Voltage	Approximate current density (ampere/cm ²)
Carbon steel	6.0	0.19
Brass	7.0	0.70
Copper	6.5	1.9

CONCLUSIONS

The reason why the letters are restored by this method is not exactly understood. The author believes that the following theory may be the explanation. The anode (obliterated area) is oxidized and dissolved by the electrolytic-polishing. So the growth of rust and its dissolution occur on the anode surface. The stamped parts of the metal have a permanent set. Therefore, the energy required to take one atom of metal from the surface and to oxidize it (rust it) differs at those parts where a letter has been stamped than where there was none. In this way the letters are restored.

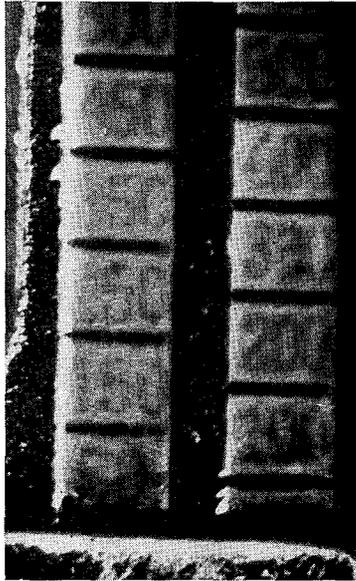


Figure 3

Numerals Restored on the Back-Sight of a Mauser Pistol

Figures 2 and 3 show examples of restored letters in experimental cases. The author had erased the letters by filing with a rasp. The photographs were made after restoration.