M. M. MERRITT.

METHOD OF SOLDERING ALUMINUM.

APPLICATION FILED OCT. 13, 1919.

1,387,426. Patented Aug. 9, 1921.

Fig. 1.

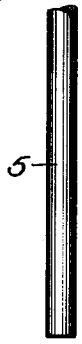


Fig. 2.

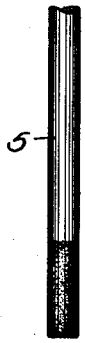


Fig. 3.



Fig. 4.

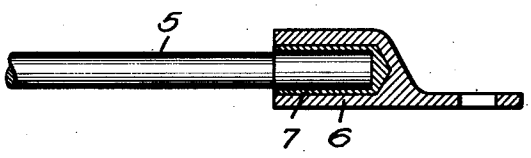
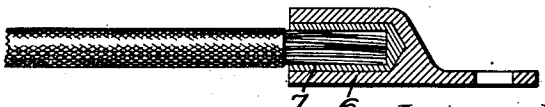


Fig. 5.



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UNITED STATES PATENT OFFICE.

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METHOD OF SOLDERING ALUMINUM.

1,387,426. Specification of Letters Patent. Patented Aug. 9, 1921.

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To all whom it may concern:

Be it known that I, MATTHEW M. MERRITT, a citizen of the United States, and a resident of South Middletown, county of Essex, Commonwealth of Massachusetts, have invented an Improvement in Methods of Soldering Aluminum, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention pertains to improvements in methods of soldering aluminum and of preparing aluminum for the soldering operation. It is among the purposes of the invention to provide a simple, inexpensive and satisfactory method of soldering aluminum articles to one another or of soldering aluminum articles to copper or other suitable metallic articles.

In the drawings, wherein I have elected to show diagrammatically the results of various steps in practising one illustrative operation in accordance with my improved methods:

Figures 1, 2 and 3 are side elevations of the end of an aluminum wire at various stages of preparation for soldering;

Fig. 4 is a view, partly in section, showing the wire soldered into a copper electric terminal of usual construction; and

Fig. 5 is a view, partly in section, showing a wire made up of several strands of aluminum soldered into a copper electric terminal of the usual construction.

One of the broader aspects of my invention is the coating of an aluminum object or a portion thereof with copper or other metal which can be readily soldered. It is difficult to coat aluminum with copper in such a way to provide a close union of the metals because of the tendency of the aluminum to become immediately oxidized on the surface after any usual cleaning operation.

I have found that, by first dipping the aluminum object in nitric acid, a film of copper may be readily deposited electrolytically on the surface of the aluminum object. This film of copper is, however, relatively non-adherent and when applied to a flexible object such as a wire, any sharp bending thereof will rupture the copper.

I have further found that a film of copper may be deposited on an aluminum object where the surface of the object is first treated with stannous chlorid. Where stannous chlorid is used as a preliminary treatment, the adherence between the copper and the aluminum is also relatively weak so that a sharp bend in the wire will rupture the copper.

Where the surface of the aluminum object is initially treated with a mixture or combination of stannous chlorid and muriatic acid, the adherence of the copper to the aluminum is better than where nitric acid or stannous chlorid alone are used as a preliminary treatment, as above described. The best results are obtained by initially treating the surface of the aluminum object by dipping or otherwise treating it with a mixture or combination of stannous chlorid, muriatic acid and nitric acid.

A mixture of stannous chlorid and nitric acid gives satisfactory results, but without the great adherence provided by the mixture of the three agents described in the preceding paragraph.

In soldering terminals to aluminum wire or for other uses where flexibility is not necessary, any one of the before-described treatments followed by electro-deposition of copper or other metal readily soldered gives satisfactory results, especially if the copper deposit surrounds the entire portion to be soldered so that any weakness which may exist in the adherence of the copper to the aluminum is minimized. Where, however, the entire wire or other object is coppered, the treatment by stannous chlorid and muriatic acid, or equivalents thereof, or treatment by stannous chlorid, muriatic acid and nitric acid, or equivalents thereof, should preferably be adopted.

In the drawings, Figure 1 shows an untreated piece of aluminum wire 5; Fig. 2 represents the same wire after being dipped in the combination of the three chemicals above mentioned; Fig. 3 represents the wire after electro-deposition and Fig. 4 shows the wire soldered into a terminal 6 by ordinary solder 7.

While I have shown and described my improved method as applied to soldering an aluminum wire to a copper terminal, it will be readily understood that the method is of use in any connection where aluminum is to be soldered. It will also be understood that, while I have described a preferred method of practising my invention, the same may

be greatly varied within the scope of the following claims.

Claims:

1. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with a solution containing muriatic acid and then electrolytically depositing copper thereon.

2. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with a solution containing nitric acid and then electrolytically depositing copper thereon.

3. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with a solution containing stannous chlorid and then electrolytically depositing copper thereon.

4. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with a solution containing muriatic acid and stannous chlorid and then electrolytically depositiing copper thereon.

5. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with a solution containing muriatic acid, nitric acid and stannous chlorid and then electrolytically depositing copper thereon.

6. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with a metal-bearing solution and subsequently electrolytically depositing copper thereon.

7. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with an acid having the capacity rapidly to attack the aluminum surface and with a metal-bearing solution, and subsequently electrolytically depositing copper thereon.

8. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with an acid having the capacity rapidly to attack the aluminum surface, and subsequently electrolytically depositing copper thereon.

9. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with an acid having the capacity rapidly to attack the aluminum surface, and subsequently electrolytically depositing a readily solderable metal thereon.

10. The method of preparing aluminum for a soldering operation which comprises initially treating the surface of the aluminum with a metal-bearing solution and subsequently electrolytically depositing a readily solderable metal thereon.

In testimony whereof, I have signed my name to this specification.

MATTHEW M. MERRITT