

Dec. 8, 1931.

C. VAN DERAU
CHROMIUM PLATED ARTICLE

1,835,679

Filed Jan. 5, 1929

Fig. 1.

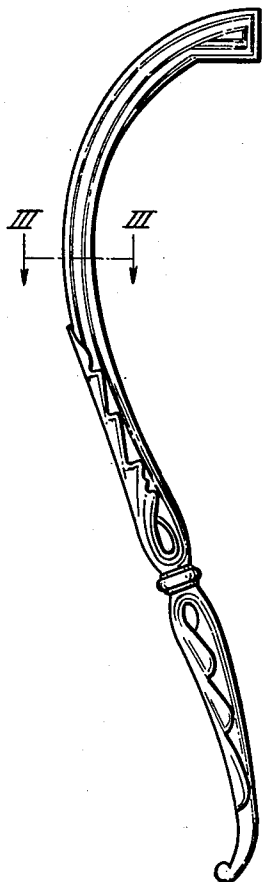


Fig. 2.

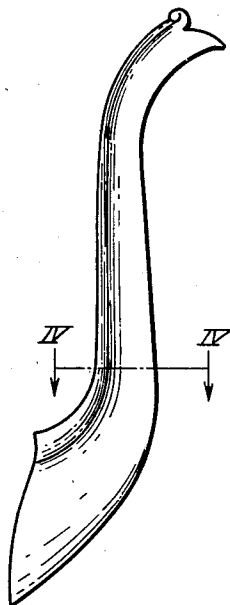


Fig. 3.

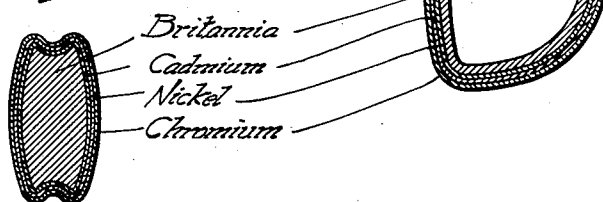
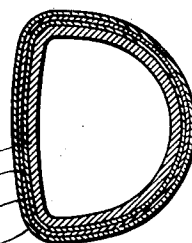


Fig. 4.



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CLARENCE VAN DERAU, OF MANSFIELD, OHIO, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

CHROMIUM PLATED ARTICLE

Application filed January 5, 1929. Serial No. 330,505.

My invention relates to chromium-plated articles and more particularly to articles of this type having a foundation metal which may be easily cast into any desired form.

5 An object of my invention is to provide a chromium-plated article having a foundation metal comprising lead or tin, or an alloy containing these metals, and a small amount of another metal, such as antimony, in such proportions that the alloy may be cast into
10 solid or tubular form.

Another object of my invention is to provide an article of manufacture having a foundation metal formed of an alloy, containing
15 lead, tin and antimony, upon which is plated successive layers of cadmium, nickel and chromium.

A further object of my invention is to provide a method of plating a foundation metal, containing a soft metal or alloy, with a protective layer of chromium, which comprises
20 polishing the foundation metal, coating it with a metal that has a temperature coefficient of expansion similar to the foundation metal, electrodepositing a layer of nickel on
25 the coated foundation metal to provide a lustrous surface, and finally depositing an outer layer of chromium.

In plating comparatively soft metals with
30 chromium, such as copper or brass, it is customary to polish the foundation metal and to coat it with a layer of nickel before the chromium plating is applied. It has been found necessary to provide this intermediate
35 coating to prevent the chromic acid, which is now universally utilized as an ingredient in chromium-plating solutions, from reacting with and etching the foundation metal. When the base metal is made of iron or cop-
40 per, or an alloy of either of these metals, such as steel or brass, this method is satisfactory and produces good results. Articles of manufacture, such as reflectors, made according to the above method, are described in the
45 copending application of John Corbit, Serial

No. 76,119, filed and assigned to the Westinghouse Electric & Manufacturing Company.

In applying this method to a foundation metal composed of alloys containing either lead or tin, or both of these metals in combination with a small percentage of other
50 metals, such as copper or antimony, it was found that the nickel would not adhere to the foundation metal during the subsequent chromium-plating operation.

In the bath utilized in the electrodeposition of chromium, which is maintained at a temperature of approximately 135° F. during the plating process, there is a considerable evolution of gas which is caused principally by the decomposition of water. Nickel has a linear temperature coefficient of expansion much less than that of tin or lead, or an alloy containing these two metals, and it is believed that the scaling of the nickel
65 coating during the chromium-plating process is caused by the foundation metal expanding, under the influence of heat, to a greater extent than the nickel coating. Undoubtedly, the evolution of gas also has the tendency
70 to prevent an even deposition of chromium.

I have made the discovery that chromium can be successfully plated upon foundation metals containing lead, tin or alloys of such metals, with a small percentage of antimony or copper, by first electrodepositing a layer of cadmium on the foundation metal before
75 applying the layer of nickel.

My method is particularly adapted in producing a good adherent layer of chromium
80 on a foundation metal composed of an alloy containing approximately 60% to 70% lead, 29% to 39% tin and about 1% of antimony. It may also be applied with good results to a foundation metal composed of lead or tin
85 alone, or to those alloys which are known in the art as Britannia metals and which are usually composed of tin, copper and antimony, although small proportions of zinc, lead and bismuth may be present. Such al-
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loys are characterized by the fact that they may be easily cast into any desired form without shrinking, and any decorative emblems that are formed in the molds will be accurately reproduced on the molded metal.

My invention will be better understood by reference to the accompanying drawings, in which,

Figure 1 is a side elevational view of a chromium-plated handle of a percolator having a foundation metal composed of a Britannia metal.

Fig. 2 is a similar view of the spout of a percolator having a foundation metal composed of the same alloy.

Fig. 3 is a cross sectional view, on an enlarged scale, taken on the line II—II of Fig. 2, and

Fig. 4 is a similar view, taken on the line IV—IV of Fig. 2.

In practicing my invention, the foundation metal is cast in a solid or in a tubular form, as shown in the drawings. It is then polished and a layer of cadmium is applied by an electroplating process. A layer of nickel is next deposited, which provides a smooth lustrous coating upon which the outer layer of chromium is plated.

I have found that, when the cadmium is first applied to the foundation metal, a more adherent coating of chromium will be produced. The coefficients of expansion per degree Fahrenheit of lead, tin and cadmium are $.2940 \times 10^{-4}$, $.2257 \times 10^{-4}$ and $.3159 \times 10^{-4}$, respectively, while that of nickel is $.1397 \times 10^{-4}$. It will be noted that cadmium has a coefficient of expansion much more nearly like that of lead and tin than nickel. It is believed that this is the reason why cadmium will adhere to the foundation metal better than nickel. No difficulty, however, is encountered in producing an adherent layer of nickel upon the cadmium, even though their temperature coefficients of linear expansion are considerably different.

The nickel serves as a backing for the chromium and provides a smooth surface upon which it may be plated. It has almost the same color and reflectivity as chromium and is especially desirable in the event that the chromium becomes thin or worn through.

While I have described a preferred embodiment of my invention, it will be understood that various modifications may be made therein without departing from the spirit of my invention. For example, if desired, the chromium may be deposited directly on the layer of cadmium. I prefer, however, to utilize an intermediate coating of nickel.

Other modifications of my invention will be apparent to those skilled in the art and I desire, therefore, that only such limitations shall be imposed thereon as are required by the prior art and the appended claims.

I claim as my invention:

1. A chromium-plated article having a foundation metal comprising an alloy containing tin, an electrodeposited layer of cadmium on the foundation metal, an outer layer of chromium, and a layer of nickel interposed between the layer of cadmium and the layer of chromium.

2. A chromium-plated article having a foundation metal comprising an alloy containing tin and antimony, an electrodeposited layer of cadmium on the foundation metal, an outer layer of chromium, and a layer of nickel interposed between the layers of cadmium and chromium.

3. A chromium-plated article having a foundation metal comprising an alloy containing lead, tin and antimony, an electrodeposited layer of cadmium on the foundation metal, an outer layer of chromium, and a layer of nickel interposed between the layer of cadmium and the layer of chromium.

4. A chromium-plated article having a foundation metal comprising an alloy containing 60% to 70% lead, 29% to 39% tin and about 1% antimony, and successive layers of cadmium, nickel and chromium upon the foundation metal.

5. The method of producing a chromium-plated article having a foundation metal of an alloy containing tin which comprises casting the foundation metal into any desired form, electrodepositing a layer of cadmium upon the cast foundation metal and then electrodepositing a layer of chromium upon the cadmium surface.

6. The method of producing a chromium-plated article having a foundation metal of an alloy containing tin, lead and antimony which comprises casting the foundation metal into any desired form and electrodepositing successive layers of cadmium, nickel and chromium upon the cast foundation metal.

7. The method of producing a chromium-plated article which comprises casting Britannia metal in any desired form, polishing its surface and electrodepositing thereon successive layers of cadmium, nickel and chromium.

8. The method of producing a chromium-plated article which comprises casting a foundation metal composed of an alloy containing tin and antimony, plating the foundation metal with an intermediate metal having a coefficient of expansion similar to the foundation metal and then electrodepositing successive layers of nickel and chromium upon the intermediate layer of metal.

9. A chromium-plated article having a foundation metal which may be readily cast into any desired form comprising an alloy containing tin, a layer of cadmium and an outer layer of chromium.

10. A chromium-plated article having a foundation metal comprising an alloy containing tin and lead which may be readily cast into any desired form, a layer of cadmium and an outer layer of chromium.

5 11. A chromium-plated article comprising an alloy containing tin, lead and antimony which may be readily cast into any desired form, a layer of cadmium and an outer layer of chromium.

10 In testimony whereof, I have hereunto subscribed my name this 4th day of December, 1928.

CLARENCE VAN DERAU.

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