

# UNITED STATES PATENT OFFICE.

HENRY J. ALTMAN, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO MAX H. FISCHER, OF SAME PLACE.

## ELECTRODEPOSITION OF ALLOY.

SPECIFICATION forming part of Letters Patent No. 543,824, dated July 30, 1895.

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*To all whom it may concern:*

Be it known that I, HENRY J. ALTMAN, of the city, county, and State of New York, have invented certain new and useful Improve-

ments in Electrodeposition of Alloys of Platinum; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to use the same.

My invention relates to the plating by electrodeposition of articles of metal or other suitable material with an alloy composed of platinum and one or more other suitable metals. For this alloy I may employ with platinum any known metal or metals having a specific gravity between 2.6 and 9 at 0° centigrade, under the ordinary atmospheric pressure, except manganese, antimony, and chromium, which are not suitable for use in my invention herein described.

In general terms, my invention comprises a process for electroplating articles of metal or other suitable material with an alloy of platinum and one or more other suitable metals of the class above defined, which process consists in forming a suitable bath or solution containing a chloride of platinum and the sulphate of the other metal or metals desired in the alloy to be electrodeposited, immersing in the bath as a cathode the article to be plated and an anode composed of an alloy of the metals to be electrodeposited, and then passing an electric current through the bath, thereby electrolyzing the same.

It also comprises the improved electroplating solution herein described and the articles plated with the specified alloys.

For convenience I will describe my invention with special reference to the electrodeposition of alloys of platinum and nickel, it being understood that my invention is also applicable to alloys composed of platinum and any one or more suitable metals of the class above defined.

The object of my invention, so far as it relates to the employment of alloys of platinum and nickel, is to produce upon the articles to be plated a brilliant coating, almost resembling in color that of silver, but less liable to tarnish or corrode, and therefore better

adapted for commercial uses than any known alloy.

My invention, considered only with reference to the employment of alloys of platinum and nickel, comprises, in general terms, a process for electroplating articles of metal or other suitable material with such alloys, which process consists in forming a suitable bath or solution containing a chloride of platinum and the sulphate of nickel, immersing in the bath as a cathode the article to be plated, and an anode composed of an alloy of platinum and nickel, and then passing an electric current through the bath, thereby electrolyzing the same. This specific form of my invention further comprises the improved electroplating solution herein described, composed of salts of platinum and nickel with the other herein specified ingredients, and the articles plated with an alloy of platinum and nickel.

The salt of nickel which I preferably employ is its sulphate, but the chloride and the nitrate may also be employed in my process. I preferably employ a chloride of platinum, usually the tetrachloride.

In carrying on my said improved process of electroplating, I preferably form an electrolytic bath of the following ingredients, in suitable proportions, to wit: The sulphate of nickel and ammonium, platinum tetrachloride, chloride of sodium, caustic soda, and ethylamine or a material having equivalent properties. In place of the caustic soda any other suitable alkaline material may be used—such as caustic potash, sodium potash, &c. In place of ethylamine any other suitable organic base containing nitrogen may be employed—such, for example, as methylamine among the amines, or pyridine among the vegetable-alkaloids. The ethylamine or other organic base is used primarily to neutralize the excess of hydrochloric acid in the commercial salts of platinum. The alkaline material is also used to neutralize the acids in the bath and serves the further purpose of increasing the conductive power of the bath.

The proportions of the above ingredients will vary according to the proportion of platinum desired in the plating. A very small proportion (say one per cent.) of platinum in



the alloy will protect the articles plated with the alloy from the oxidation of the atmosphere. A larger proportion of platinum is necessary to prevent tarnishing and corrosion from other causes. To produce the best results in my said improved process, the proportion of platinum should not exceed one part platinum to three parts nickel. Within the limits specified as to the proportion of platinum to be employed my process operates successfully. Taking the case where it is desired that the plating shall contain one per cent. platinum, I preferably mingle the said ingredients in the bath in about the following proportions, to wit: sulphate of nickel and ammonium, twelve ounces; tetrachloride of platinum, one-fourth of an ounce; chloride of sodium, one-half of an ounce; caustic soda, one-sixth of an ounce; ethylamine, one and one-fourth ounces. These ingredients I preferably first dissolve separately, as follows: The salts of nickel and ammonium in seven pints of water, the chloride of platinum in half a pint of water, and the caustic soda also in half a pint of water. The solution of caustic soda is then added to the platinum chloride solution, and to the resulting mixture I add the ethylamine or equivalent material. The mixture thus obtained is then added to the nickel solution, and last the chloride of sodium is put in. The resulting bath is then introduced into any suitable electroplating apparatus. I preferably employ an anode composed of an alloy of platinum and nickel mingled in approximately the same proportions as are desired in the alloy to be electro-deposited. If desired, however, an anode of any other suitable material, as of platinum or carbon, may be employed. In this latter case the bath is replenished from time to time by the addition of suitable quantities of the metal salts. The article to be plated serves as the cathode. When the current is caused to flow, the metals are deposited on the cathode as an alloy of the desired composition. When a larger percentage of platinum is desired in the bath, the proportion of the platinum chloride in the bath is suitably increased. As the proportion of the platinum chloride to the nickel salt increases in the bath the other ingredients in the bath should be increased in somewhat the same proportions. The exact proportions, however, will depend upon conditions which need not be set forth here, being familiar to those acquainted with the art.

I do not limit myself to any special proportions of the ingredients of the bath, as any proportions of the same which may be found suitable may be employed.

I do not limit myself to any particular proportions of the metals in the alloy to be electrodeposited, as such proportions may be varied according to the purpose for which the plating is required without departing from the essential nature of my invention.

In the process herein described, the plati-

num of the anode is probably dissolved by the chlorine iron.

I preferably employ a strong smooth current of electricity of suitable voltage and volume. The voltage of the current is preferably between two and five volts.

By the herein described process, a regular effective non-oxidizing deposit is obtained, and the plating is homogeneous—that is to say, the plating consists throughout of a perfect intermixture of the metals constituting the alloy, instead of a succession of layers having different compositions.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. As an improvement in the art of electroplating with alloys of platinum, the herein described process, which consists in forming a suitable bath containing a chloride of platinum and the sulphate of the other metal or metals desired in the alloy to be electro-deposited, (which may be any suitable known metal or metals having a specific gravity between 2.6 and 9 at 0° centigrade under the ordinary atmospheric pressure,) immersing in the bath as a cathode the article to be plated and an anode composed of an alloy of the metals to be electro-deposited, and finally passing an electric current through the bath, substantially as described.

2. As an improvement in the art of electroplating, with alloys of platinum, the herein described process which consists in forming a suitable electrolytic bath or solution, containing a chloride of platinum and the sulphate of the other metal or metals desired in the alloy to be electro-deposited, (which may be any known metal or metals having a specific gravity between 2.6 and 9 at 0° centigrade under the ordinary atmospheric pressure,) a suitable ingredient used for conductive purposes, the chloride of sodium, a suitable alkaline material and a suitable organic base containing nitrogen, then immersing in the bath as a cathode the article to be plated and an anode composed of an alloy of the metals to be electro-deposited; and finally passing an electric current through the bath, substantially as described.

3. As an improvement in the art of electroplating with alloys of platinum, the herein described process which consists in forming a suitable electrolytic bath or solution containing a chloride of platinum and the sulphate of nickel, immersing in the bath as a cathode the article to be plated, and an anode composed of an alloy of platinum and nickel, and then passing an electric current through the bath, substantially as described.

4. As an improvement in the art of electroplating with alloys of platinum, the herein described process which consists in forming a suitable electrolytic bath or solution of the tetrachloride of platinum, the sulphate of nickel and ammonium, the chloride of sodium, a suitable alkaline material and a suit-



able organic base containing nitrogen, then immersing in the bath as a cathode the article to be plated, and an anode composed of an alloy of platinum and nickel, and finally passing an electric current through the bath, substantially as described.

5. As an improvement in the art of electroplating with alloys of platinum, the herein described process which consists in forming a suitable electrolytic bath or solution consisting of the tetrachloride of platinum, the sulphate of nickel and ammonium, the chloride of sodium, caustic soda and ethylamine, then immersing in the bath as a cathode the article to be plated, and an anode composed of an alloy of platinum and nickel in approximately the proportions desired for the

plating to be electro-deposited, and finally passing an electric current through the bath, substantially as described.

6. As a new composition of matter, the improved electro-plating solution herein described composed of salts of nickel and ammonium, dissolved in water, chloride of platinum and caustic soda, chloride of sodium and ethylamine, substantially as set forth.

7. As a new article of manufacture, an article of metal or other suitable material plated with an alloy of platinum and nickel, substantially as shown and described.

HENRY J. ALTMAN.

Witnesses:

GILBERT H. CRAWFORD,  
L. FICHER.