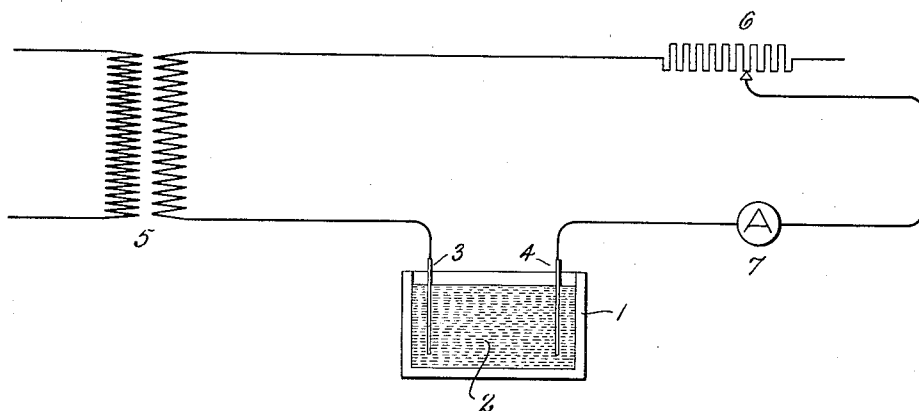


No. 811,759.

PATENTED FEB. 6, 1906.

W. C. ARSEM.  
ELECTRODEPOSITION.  
APPLICATION FILED JULY 25, 1904.



WITNESSES:

*George H. Thurston.*  
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INVENTOR:

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Att'y.

# UNITED STATES PATENT OFFICE.

WILLIAM C. ARSEM, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## ELECTRODEPOSITION.

No. 811,759.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed July 25, 1904. Serial No. 218,097.

*To all whom it may concern:*

Be it known that I, WILLIAM C. ARSEM, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Electrodeposition, of which the following is a specification.

It is customary in electrodeposition to suspend the article to be plated in a solution of the plating metal and to pass a direct current through the solution to the article. The current carries with it the metal radical of the solution, and under proper conditions an adherent coating will form on the suspended article. The quantity of metal deposited is directly proportional to the strength of the current and to the duration of its flow. If after such a deposit has been formed the current is reversed in direction, the deposit will as a rule be corroded away and returned to the solution. If copper sulfate is used as the plating solution, this complete corrosion of the copper will require approximately the same number of ampere seconds as was required in the formation of the deposit, and hence the application of an alternating current to a cell containing such a solution will cause no effective deposition, the metal deposited during one-half cycle being corroded away during the next half-cycle by the reversal of the current. There are, however, some metals which are not easily corroded by the acid radical of plating-baths, and for the electrodeposition of such metals the process herein claimed is readily applicable.

The apparatus used may consist of a cell 1, an electrolyte 2 contained therein, electrodes 3 and 4 dipping in the electrolyte, and a suitable source of alternating current, such as a step-down transformer 5. The alternating current may be regulated by a rheostat or reactance-coil 6 in series with the cell, and the current flowing may be determined by the instrument 7. The exact arrangement of the apparatus is, however, immaterial and any suitable means may be employed for subjecting the electrolyte to the alternating current. The electrolyte should be such that the negative radical liberated by the current will not readily attack the metal to be plated out.

With the arrangement described the passage of the alternating current through the cell will deposit the metal from the electro-

lyte on both electrodes 3 and 4, the deposition occurring on each electrode at every alternate half-cycle. If the metal deposited during one-half cycle is inactive when the current reverses, a permanent deposit will be formed on both electrodes 3 and 4.

The element platinum is substantially inactive as anode, and by the process above described heavy coatings of platinum may be deposited on copper, iron, and other conductors, thus overcoming the difficulties encountered in the use of direct current, such as the formation of platinum-black and the occlusion of hydrogen.

Various electrolytes may be used in depositing platinum with alternating current; but a solution of ammonium chloro-platinate in sodium citrate gives good results. The process is not limited to the use of aqueous solutions, and various fused electrolytes may likewise be employed.

While the process claimed is well adapted for the deposition of platinum, it is not limited to the deposition of this one metal, but may be used in plating with any metal which is substantially inactive as anode in the electrolyte used.

The term "alternating current" as used herein is not limited to a sinusoidal current, but includes any current which regularly and periodically reverses in direction irrespective of the wave shape of said current.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The process which consists in passing an alternating current between electrodes in an electrolyte to deposit a coherent coating of metal from said electrolyte.

2. The process which consists in passing an alternating current through a solution to deposit a coherent coating of uncombined metal from said solution.

3. The process of electroplating, consisting in passing an alternating current through an electrolyte by means of suitable electrodes, to deposit an uncombined metal in coherent form from the electrolyte, on an electrode.

4. The process of electroplating, consisting in passing an alternating current through an aqueous solution of a metal by means of suitable electrodes, to deposit on said electrodes a coherent coating of metal from said solution.

5. The process of electroplating, consisting

in passing an alternating current through an aqueous solution of platinum by means of suitable electrodes, thereby depositing platinum from the solution.

5 6. The process of electrodeposition, consisting in passing an alternating current through an electrolyte thereby depositing a metal, said electrolyte being such that the negative radical liberated by the current will  
10 not substantially corrode the deposited metal.

7. The process of electrodeposition, consisting in passing an alternating current between electrodes immersed in an electrolyte  
15 containing a metal, thereby depositing metal from the electrolyte on the electrodes, said

electrolyte being such that the negative radical liberated by the current will not substantially corrode the deposited metal.

8. The process of electrodeposition, consisting in passing an alternating current between electrodes immersed in a solution of a platinum salt, thereby depositing platinum, said solution being such that the negative radical liberated by the current will not substantially corrode the deposited metal.  
20 25

In witness whereof I have hereunto set my hand this 22d day of July, 1904.

WILLIAM C. ARSEM.

Witnesses:

BENJAMIN B. HULL,  
HELEN ORFORD.