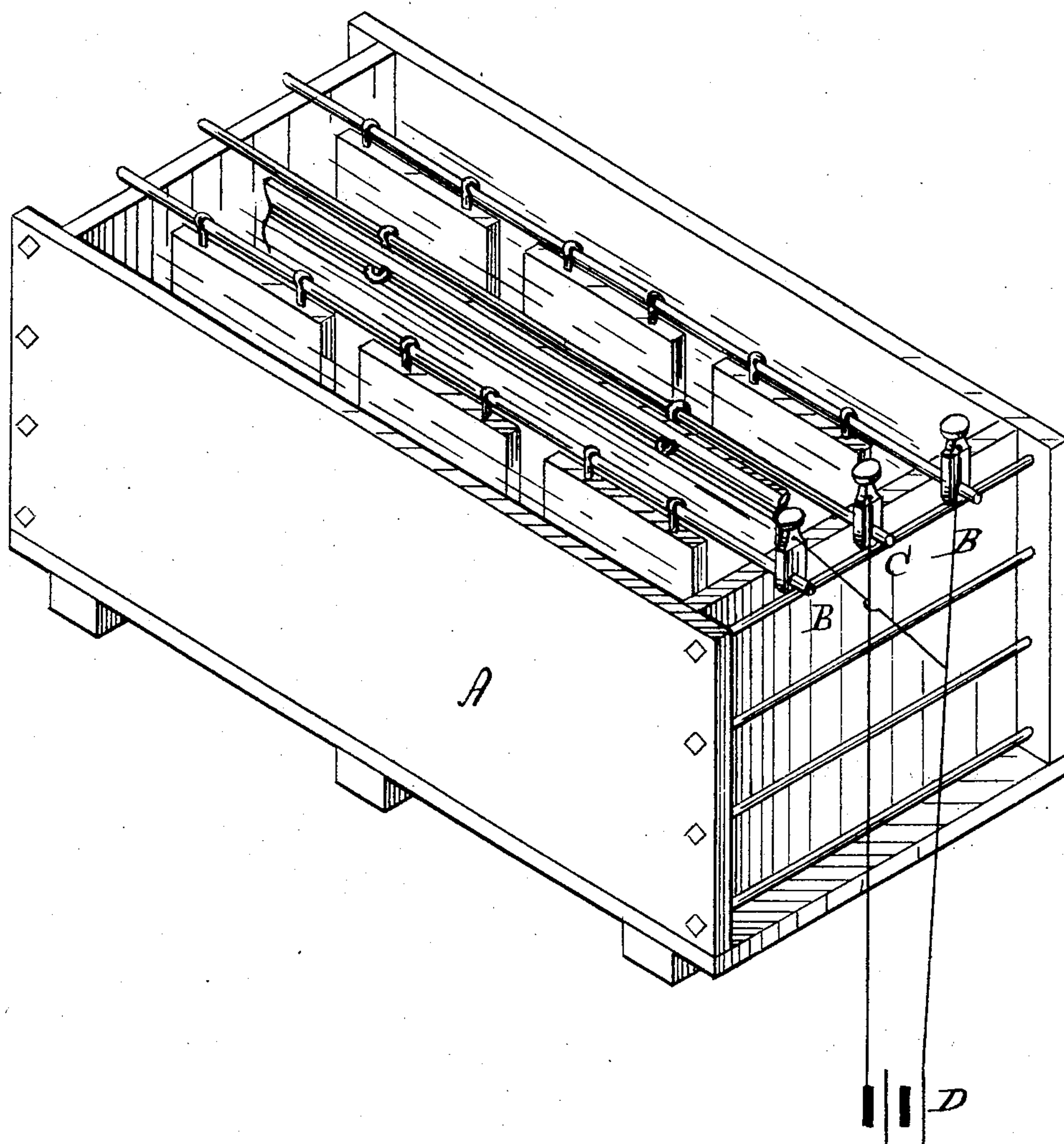


No. 786,221.

PATENTED MAR. 28, 1905.

E. D. KENDALL.  
PROCESS OF ELECTRODEPOSITING METALS.  
APPLICATION FILED OCT. 28, 1903.



Witnesses:

Wm. G. Andrew  
Lucy B. Mayer

Inventor:

Edward D. Kendall



## UNITED STATES PATENT OFFICE.

EDWARD D. KENDALL, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-THIRD TO EDWARD N. DICKERSON, OF STOVALL, NORTH CAROLINA.

## PROCESS OF ELECTRODEPOSITING METALS.

SPECIFICATION forming part of Letters Patent No. 786,221, dated March 28, 1905.

Application filed October 28, 1903. Serial No. 178,883.

*To all whom it may concern:*

Be it known that I, EDWARD D. KENDALL, a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented a certain new and useful Improvement in Processes of Electrolytic Deposition of Metals, of which the following is a specification.

My invention relates to methods of depositing zinc on metallic and other electrically-conductive surfaces, especially on surfaces of iron or steel to protect the same from rust or corrosion, and particularly relates to electrolytic methods technically termed "cold galvanizing" in contradistinction to ordinary so-called "galvanizing" by the use of molten zinc; and my process has for its object to use and effect the deposition of zinc in required form from chemical solution which is incapable of spontaneous corrosive or chemical action on surfaces of iron or steel and from which a regulated direct electric current of low electromotive force will deposit on cathodes of iron or steel or other metal or on other electrically-conductive surfaces a firm and adhering coating of pure zinc.

My invention consists in using with an electric current derived from a voltaic battery, or an electric generator of any suitable character and with suitable electrodes an electrolyte containing zinc sulfoglycerate, which body I prepare, preferably, by first acting on anhydrous or nearly anhydrous glycerol with strong sulfuric acid, without or with the application of heat, to form sulfoglyceric acid, afterward diluting this product with a limited quantity of water, and then saturating this diluted acid with zinc, preferably by agitating the same with an excess of zinc oxid, or, better, with zinc hydroxid, finally adding more water to form a comparatively dilute solution of zinc sulfoglycerate, the essential constituent of the electrolyte to be used in my process. If a somewhat-concentrated solution of this zinc sulfoglycerate be used as electrolyte, the liquid has a high degree of electric conductivity, and an electric current of even less than one volt of electromotive force when a zinc anode is used will suffice

for the rapid deposition of zinc, while a current of considerably higher voltage, not ordinarily considered excessive, with sufficient amperage, deposits the zinc too rapidly; but when a more diluted solution of the zinc sulfoglycerate is used an electric current of increased electromotive force—say two or three volts—is preferable, unless the electric resistance of the very dilute solution be diminished by addition of any suitable salt—for example, common sodium sulfate. From such a dilute solution of zinc sulfoglycerate, under influence of a properly-adjusted electric current and with a suitable anode or anodes of zinc, the pure zinc deposited on polished cathode-surfaces has remarkable smoothness and uniformity. Of course anodes of zinc are to be preferred for use in the herein-described process; but anodes of graphite may be substituted if required for any purpose, with the disadvantage, however, that zinc is removed from the electrolyte without replacement.

Electrolysis is facilitated by heating the herein-described electrolyte; but when used cold—i. e., at ordinary temperatures—the rate of deposition and the character of the deposited zinc are satisfactory and the operation requires less supervision.

When a voltaic battery or a dynamo-electric generator is not available, an object may be covered with electrolytically-deposited zinc without departing from my invention by submerging the said object in an aqueous solution containing the zinc sulfoglycerate in a vessel within which has been placed a porous cell containing any suitable excitant for an electropositive element therein immersed and consisting of zinc or other suitable metal electrically connected with the said object.

A simple form of plant with which my process may be conducted is shown in the accompanying drawing, which is a view in perspective of an electrolytic tank containing the galvanizing solution with necessary appurtenances. A is the said tank; B B, metallic rods electrically connected with the source of an electric current, on which the anodes are suspended in the electrolyte; C, a metallic

rod having suitable electric connection, on which the articles to be galvanized are suspended, the same acting as cathodes; D, the source of an electric current.

5 What I claim as my invention, and desire to secure by Letters Patent, is—

1. The herein-described process of electrolytically depositing metallic zinc, which consists in the electrolysis of an aqueous solution  
10 containing zinc-sulfoglycerate by means of a suitable body acting as the cathode opposed to a suitable anode, both electrodes being electrically connected with the source of an electric current, substantially as described.

15 2. The herein-described process of electrolytically depositing metallic zinc in the form of a hard adherent coating or plating on sur-

faces of iron, steel or other metal, or other electrically-conductive surfaces, so electrically connected with the source of an electric  
20 current as to constitute the cathode or cathodes, the same being opposed to an anode or anodes of suitable character correspondingly electrically connected, the said electrodes being immersed in an aqueous solution contain-  
25 ing zinc sulfoglycerate, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EDWARD D. KENDALL.

Witnesses:

GEO. W. JAEKEL,  
HENRY C. GARRETSON.