

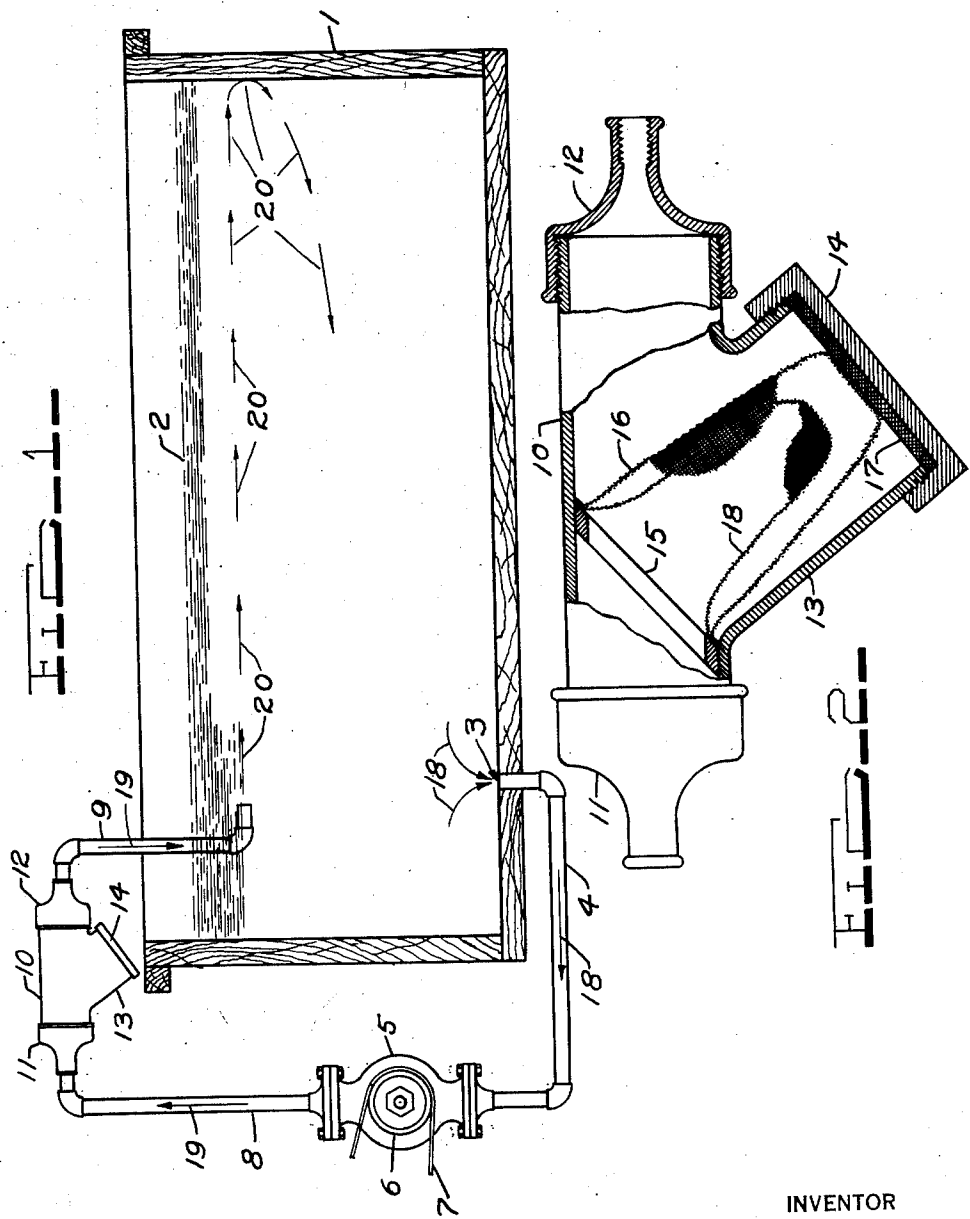
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J. M. GAUSS

ELECTROPLATING APPARATUS

Filed July 4, 1923



INVENTOR
JULIUS M. GAUSS
BY *R. M. Ramsey*
ATTORNEY

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UNITED STATES PATENT OFFICE.

JULIUS M. GAUSS, OF SOUTH BEND, INDIANA, ASSIGNOR TO THE STUDEBAKER CORPORATION, OF SOUTH BEND, INDIANA, A CORPORATION OF NEW JERSEY.

ELECTROPLATING APPARATUS.

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To all whom it may concern:

Be it known that I, JULIUS M. GAUSS, a citizen of the United States of America, and resident of South Bend, in the county of St. Joseph and State of Indiana, have invented certain new and useful Improvements in Electroplating Apparatus, of which the following is a specification.

This invention relates to electro-plating and deals particularly with such a process in which a tank or other receptacle is provided for holding the electro-plating solution in which the work is done.

It has for its object to provide an apparatus for the thorough and continual agitation of the electro-plating solution, thereby insuring a complete uniformity of mixture of the different materials incorporated therein; the continual straining of the solution to remove any foreign matter therein detrimental to the quality of the work to be done; the depositing of a finer and tougher metal on the work to be plated; the shortening of the time required to complete a given depth of plating; to prevent localized heating of the mixture; and to provide a particularly suitable type of strainer especially adaptable for such service.

The tanks used in electro-plating are generally left open so that the work may readily be introduced into and removed from the solution and consequently are subject to the entrance of dust and dirt from various sources. Any foreign matter which may cling to the articles to be plated is usually freed from the articles because of the electro-chemical action going on during the plating process and is either mixed with the solution or is precipitated to the bottom of the tank. Foreign matter is also often present in the slats used in such processes. Such foreign matter in the electro-plating solution is detrimental to the quality of the work done and results in blemishes, discoloration or pinholes in the deposit of plating metal. It is therefore desirable to filter the solution in order to remove any foreign matter that may be present.

In localities where it is necessary to use hard water to replenish the electro-plating solution, it is found that the lime and magnesia in the water has a detrimental effect on the cyanide in the solution. As a fresh supply of water has to be added frequently it is very desirable to filter the solution so

that the foreign substances found therein will be removed.

In such a process it is also desirable to agitate the liquid in order that the plating metal deposited on the work will be taken from the anode instead of the salts in the solution. In copper plating for instance, it has been found that if the mixture is not agitated a relatively large amount of copper salts must be frequently added while the copper anode is very slowly decreased in size. This is a result of the following actions. The water is decomposed by the electric current into its two elements, hydrogen and oxygen. The oxygen collects around the copper anode and because of its nascent state shows a marked tendency for uniting with the metal to form an oxide of the same covering the surface of the anode. This oxide is soluble in the solution only during the passing of an electric current there-through. During this period it can replace two atoms of hydrogen contained in the solution, forming a cyanide of the metal on the anode. When the solution is not agitated the oxide builds up around the anode to such an extent that it retards the passage of electricity and the oxygen formed finds its way to the surface of the tank thus being lost. The cyanide in solution is then decomposed, its metallic element being deposited on the cathode faster than it is replaced by the anode and gradually the solution loses its cyanide content. This naturally causes a loss in the strength of the solution and retards the rate of deposit of the plating metal on the work, and also causes the solution surrounding the cathode to become polarized and heated. I have found that by sufficiently agitating the liquid the oxide tending to form on the anode is rapidly washed off and the chemical actions of the solution are speeded up with a result that the cathode does not become polarized, and does not heat up, the cyanide content of the solution is not decreased and the texture of the metal deposited on the work is finer and tougher resulting in a more desirable product.

There are now on the market some devices used for the agitation of electro-plating solutions but as far as I am aware these methods comprise an apparatus which absorbs and picks up lubricating oil from the pumping apparatus. This oil naturally

finds its way into the electro-plating solution and I have found that it comes in contact with the work being plated and either wholly prevents plating on the surface, or where it comes in contact with the surface causes blemished and unsatisfactory plating. Such oil is not removed by a filtering process as it rises to the top of the tank and is not drawn off with the solution being filtered.

One of the objects of my invention is to agitate the solution by a device preferably not susceptible to the carrying of oil. I do this by using a liquid pump, which in its preferred form does not need to be lubricated internally, for continually drawing off part of the solution, filtering the solution drawn off, and returning it to the tank in such a manner that it causes the entire solution to be agitated.

In the accompanying drawings which show a preferred form of my invention.

Fig. 1 is a sectional view of an electro-plating tank with my present invention in connection therewith and

Fig. 2 is a partially sectioned view of the filter used in connection therewith.

1 is a tank of any suitable material filled to a point near the top with an electro-plating solution 2. An opening 3 is provided in the bottom and a pipe 4 leads from this opening to a centrifugal pump 5 having a pulley 6 over which a belt 7, driven by any suitable means, passes to cause rotation of the same. A pipe 8 leads from the pump 5 to a filter and thence by the pipe 9 down into the electro-plating solution 2 where it discharges a short distance beneath the surface in a horizontal direction.

The filter is composed of a body member 10, on the ends of which are threaded the reducers 11 and 12 for connection with the pipes 8 and 9. The body member 10 is formed with a branched portion 13, the end of which is closed by a cap 14. An inwardly projecting flange or ring member 15 is secured within the body portion 10 as shown in Fig. 2. A woven wire cup-shaped strainer 16, having its upper edge flanged over to bear against the ring member 15, is inserted in the branch portion 13 and is held up in place by its lower end resting on the gasket 17 between the cap 14 and the branched portion 13. A cloth bag 18 is inserted within the wire strainer 16 and its open end is turned over the outwardly flanged end of the strainer 16 and is held in position between the same and the ring 15. Both the cloth bag 18 and the wire strainer 16 are readily removable for cleaning when the cap 14 is taken off. All the electro-plating solution passing through the pump 15 is caused to pass through the bag 18 and strainer 16 and is thus free of whatever foreign matter it may be carrying.

The electro-plating solution 2 is drawn

out of the bottom of the tank at 3, as shown by the arrows 18, passes through the pipe 4, pump 5, pipe 8, filter, and pipe 9 as shown by the arrows 19 and discharges horizontally into the upper portion of the electro-plating solution 2. The force with which it is discharged from the pipe 9 is preferably such that it flows to the opposite side of the tank 1 as indicated by the arrows 20, which side acts as a baffle to turn the stream of solution back with sufficient force to cause an agitation of all the electro-plating solution 2 in the tank 1.

It is thus evident that the solution is being continually drawn off from the tank and being filtered and is discharged in such a manner that the entire solution is kept in an agitated state. Neither agitation or filtering alone will produce the desired results but both must be used in order to obtain satisfactory plating. It is also important that no oil enters the solution and the centrifugal pump such as I have illustrated which needs no internal lubrication is preferably used for such a device.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. In an electro-plating apparatus, a tank containing an electro-plating solution, means comprising a centrifugal pump for continually drawing off a portion of said solution, means for driving said pump, a filter, and discharge means leading from said filter directly to said tank and terminating in a horizontal direction below the surface of said solution in said tank, said centrifugal pump causing the solution drawn from said tank to be forced through said filter and discharged into said tank to continuously agitate the solution in said tank.

2. In an electro-plating apparatus, a tank having a bottom and side and end walls; electro-plating solution in said tank; an opening in the bottom of said tank; a pump; means for conveying said solution through said opening to said pump; means for driving said pump; a filter; means for conveying said solution from said pump to said filter; and means for conveying said solution from said filter directly into said tank and discharging the same therein: said solution being discharged into said tank in such a manner that it is caused to impinge upon an end or side wall thereof and be diverted back through the solution in said tank to cause agitation of the same.

3. In an electro-plating apparatus, a tank, electro-plating solution in said tank, a pump, a filter, and means for conveying a portion of said solution from said tank to said pump,

from said pump to said filter, and from said filter back into said tank; said filter comprising a hollow straight part having an opening at each end thereof and a hollow branching portion having an open end and a closure for the same, an inwardly projecting flange within said straight part extending around its inner wall, a wire mesh cup-shaped strainer having its upper edge turned outwardly into a peripheral flange, a cloth bag positioned within said wire mesh strainer and having its open end overlying the peripheral flange of said wire mesh strainer, said cloth bag and said strainer being held in position in said branching portion by said closure.

4. In an electro-plating apparatus in which a portion of the electro-plating solution is being continually drawn off and passed through a filter and back into the solution; said filter comprising a body member having a hollow straight portion and a hollow branched portion leading therefrom, said branched portion having an open end and a closure for the same; an inwardly projecting flange extending around the inner wall of said straight portion adjacent said branched portion; a cup-shaped self-sustain-

ing strainer positioned in said branched portion and extending into the straight portion, the open end of said strainer being provided with an outwardly extending peripheral flange; a cloth bag positioned within said strainer member and having its open end overlaying the peripheral flange of said strainer member; said peripheral flange being adapted to clamp said open end of said bag between itself and said inwardly projecting flange in said straight portion when held up in position by said closure; said strainer member and said bag being removable from said filter upon removal of said closure.

5. In an electro-plating apparatus, the combination of a tank; electro-plating solution in said tank; means for agitating said solution; and a filter for said solution comprising a body member, a strainer within said body member, a cloth bag supported at its free edge between said body member and said strainer, and a closure for said body member adapted to support said strainer.

Signed by me at South Bend, Indiana,
U. S. A. this 28th day of June, 1923.

JULIUS M. GAUSS.