

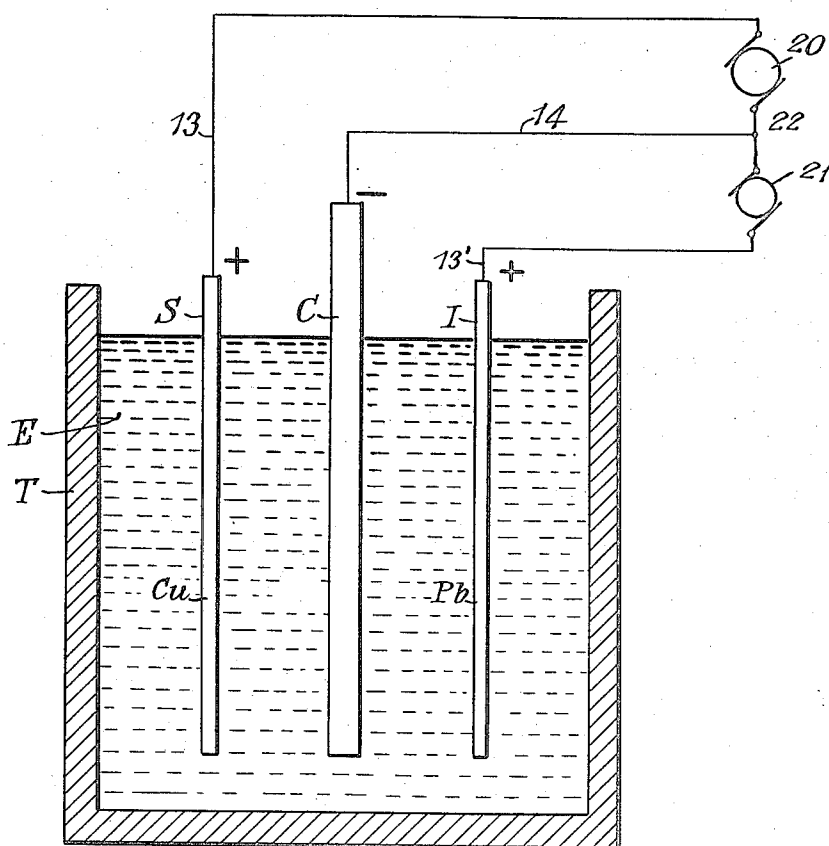
Aug. 14, 1923.

1,465,034

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PROCESS FOR THE ELECTROLYTIC DEPOSITION OF COPPER

Filed Nov. 3, 1921



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PROCESS FOR THE ELECTROLYTIC DEPOSITION OF COPPER.

Application filed November 3, 1921. Serial No. 512,626.

To all whom it may concern:

Be it known that I, FRANK LINDEN ANTISELL, a citizen of the United States, and a resident of Perth Amboy, county of Middlesex, State of New Jersey, have invented certain new and useful Improvements in Processes for the Electrolytic Deposition of Copper, of which the following is a specification.

My invention consists in an improved process for the electro-deposition of copper from cupriferous electrolytes.

By virtue of my improved process I obtain copper the purity of which is superior to that heretofore obtained by the usual manufacturing processes and also having physical characteristics which render it more advantageous for use in the arts.

In the ordinary commercial processes of electro-refining and electro-depositing copper, four factors have hitherto been considered essential for obtaining a satisfactory deposit. These are (a) the composition of the electrolyte, (b) the current density at the electrodes and (d) the temperature of the solution. It has hitherto also been universally understood that the addition to the electrolyte of a small quantity of various salts or chemical reagents, such as tannic acid, glue, molasses, etc., had a beneficial influence upon the structural characteristics of the deposited copper and tended to make the same more uniform in quality. This understanding, however, is not unreservedly correct, because, while small quantities of such additional agents in the electrolyte tend to produce a smooth deposit, a very slight increase in the quantity of the same, more than is absolutely necessary, results in a decidedly inferior, brittle deposit.

I have discovered that very dense ductile deposits of copper may be continuously produced by making use of a novel and beneficial expedient, which results in what I will hereinafter term the "conditioning" of the electrolyte. This novel step is a radical departure from the prior art and consists in the simultaneous employment of two kinds of anodes, one of which may be defined as a soluble anode and the other an insoluble anode.

The soluble anode is preferably constituted of the impure copper as ordinarily used in copper refineries and the insoluble anode is preferably constituted of lead or any other suitable material not attacked

either by the electrolyte or by the products of the electrolysis.

An apparatus suitable for carrying out my invention is illustrated diagrammatically in the accompanying drawings in which the figure is a side elevation through a depositing tank showing the installation of the electrodes and the means of supplying current to the soluble and insoluble anode.

I have obtained good results, when the current passing between said insoluble anode and the cathode was from 2% to 10% of the total current. The said insoluble anode may be used continuously in conjunction with the soluble anode, but the insoluble anode may also be operated intermittently, provided that the proper percentage of total current is maintained.

In the accompanying drawings, T designates an electrolytic tank of the usual construction, filled with the above described electrolyte E. C. represents a cylindrical cathode, and on one side of the cathode there is arranged a soluble electrode S and on the other side of the cathode is an insoluble electrode I. The wires 13 and 13' connect each of these anodes in circuit to the positive pole of a suitable source of electricity and the wire 14 connects the cathode C to the negative pole of the source of electricity.

The positive wire 13 from the soluble anode S leads to the positive pole of the large generator 20, while the wire 13' from the insoluble anode leads to the positive pole of the small generator 21. The negative wire 14 of the cathode is connected to a conductor 22, which connects the negative poles of the large generator 20 and the small generator 21.

It is evident that by a construction of this kind I am enabled to distribute the current between the soluble and insoluble anode in the desired manner as above set forth.

By proceeding in the manner outlined above I have also discovered when the above mentioned additional reagents are introduced into the electrolyte, that I can use larger quantities of the same than could be used heretofore without encountering the deleterious effects mentioned above.

I am aware that by the use of an insoluble auxiliary anode as outlined above, a certain proportion of the current is used up at the insoluble anode in doing what might be termed unproductive work, because the

anion set free at the insoluble anode cannot combine with the material of the same to reform the electrolyte, as does the anion set free at the soluble anode. Owing to this fact it is therefore necessary to continuously or intermittently replenish the electrolyte, which becomes poorer in copper owing to the use of an auxiliary insoluble anode. This apparent disadvantage is, however, greatly counterbalanced by the improved characteristics of my deposited metal, as outlined above, and which I attribute to the continuous "conditioning" of the electrolyte by the use of the auxiliary insoluble anode.

My improved process may be carried out in any suitable apparatus such as for instance in the ordinary electrolytic deposition tanks used in the arts, the respective surfaces of the insoluble as compared with the soluble anode or anodes being calculated in such a manner that the desired proportion of current passing between the soluble anode and the cathode and the insoluble anode and the cathode is obtained. The electrolyte for instance in the case of the electrolysis of a copper sulphate solution, may be replenished by introducing copper sulphate in a solid condition in a lead basket and hanging the same into the solution, so that the copper sulphate will dissolve at the same rate that the copper is deposited, depending upon the amount of current that is used.

I term the above mentioned additions such as tannic acid, glue, molasses, etc., beneficial additions. It is well understood as set forth above that in the prior art the beneficial result arising from these additions ceases upon the use of an excess quantity thereof. They are only beneficial in the prior art when used to a very limited extent. In the carrying out of the present invention, however, the amount used of the additions does not have to be so carefully measured, and, consequently, I have adopted the term beneficial additions in order to include all those additions used for the purpose specified.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The process of electrolyzing cupriferrous electrolytes by passing a current between a cathode and a plurality of anodes, the material of at least one of the said anodes being insoluble in the said electrolyte and not attackable by the products of electrolysis, while the other consists of cupriferrous material attackable by the said products of electrolysis.

2. The process of electrolyzing cupriferrous electrolytes by passing a current between a cathode and a plurality of anodes,

the material of at least one of the said anodes being insoluble in the said electrolyte and not attackable by the products of electrolysis, while the other consists of cupriferrous material attackable by the said products of electrolysis, the amount of current flowing between the said insoluble anode and the cathode being 2 to 10% of the total current passing between the anodes and the cathode.

3. The process of electrolyzing cupriferrous electrolytes by passing a current between a cathode and a plurality of anodes, the material of at least one of the said anodes being insoluble in the said electrolyte and not attackable by the products of electrolysis, while the other consists of cupriferrous material attackable by the said products of electrolysis, the amount of current flowing between the said insoluble anode and the cathode being 2 to 10% of the total current passing between the anodes and the cathode, the said electrolyte being kept continuously in motion during the process of electrolysis.

4. The process of electrolyzing cupriferrous electrolytes containing beneficial additions, by passing a current between a cathode and a plurality of anodes, the material of at least one of the said anodes being insoluble in the said electrolyte and the products of electrolysis, while the other consists of cupriferrous material attackable by the products of electrolysis, the quantity of the said beneficial additions being larger than could be used without the presence of the said insoluble anode.

5. The process of electrolyzing cupriferrous electrolytes containing beneficial additions, between a cathode and a plurality of anodes, the material of at least one of the said anodes being insoluble in the said electrolyte and the products of electrolysis, while the other consists of cupriferrous material attackable by the products of electrolysis, the quantity of the said beneficial additions being larger than could be used without the presence of the said insoluble anode, passing a current between the insoluble anode and the cathode of from 2 to 10% of the total current flowing between the anodes and the cathode, keeping the said electrolyte continuously in motion during the process of electrolysis and replenishing the portion of the electrolyte decomposed by the current flowing between the insoluble anode and the cathode.

Signed at borough of Manhattan, city and State of New York, this 2d day of November, 1921.

FRANK L. ANTISELL.