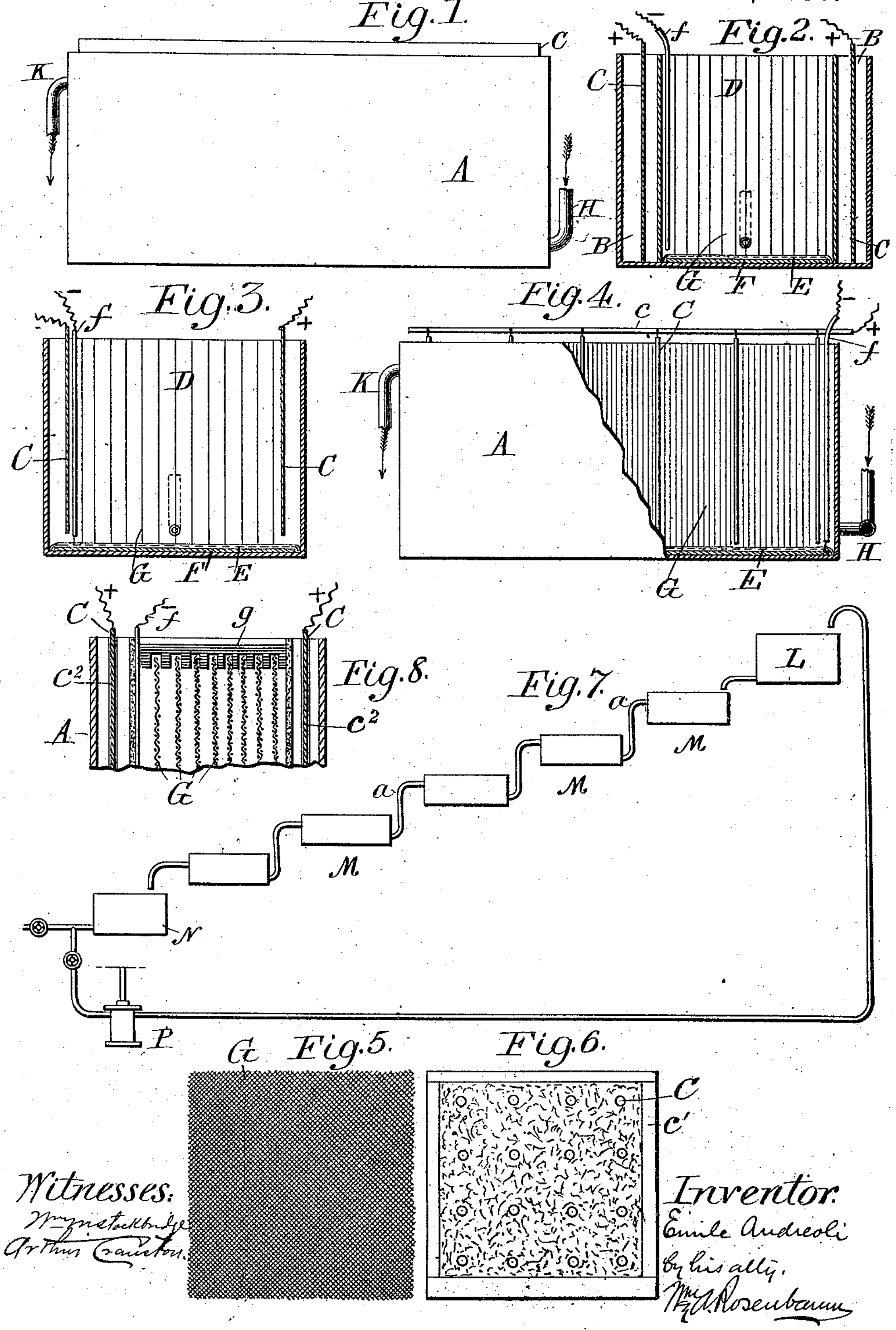
(No Model.)

E. ANDREOLI.

APPARATUS FOR ELECTRODEPOSITION OF GOLD OR SILVER.

No. 568,724. Patented Oct. 6, 1896.



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APPARATUS FOR ELECTRODEPOSITION OF GOLD OR SILVER.

SPECIFICATION forming part of Letters Patent No. 568,724, dated October 6, 1896.

Application filed July 10, 1895. Serial No. 555,502. (No model.) Patented in Belgium April 1, 1895, No. 114,959, and in England June 18, 1895, No. 11,752.

To all whom it may concern:

Be it known that I, EMILE ANDREOLI, a citizen of France, residing at Somerleyton Road, S. W., London, in the county of Surrey, England, have invented certain new and useful Improvements in the Electrodeposition of Gold or Silver, (patented in Great Britain June 18, 1895, No. 11,752, and in Belgium April 1, 1895, No. 114,959,) of which the following is a full, clear, and exact description.

In the usual electrodeposition of gold or silver each anode or row of anodes is opposite and near to a cathode, either in a single electrolyte or in two liquids separated by porous cells, and the metal is only deposited on the side of the cathode which faces the anode.

According to this invention I use two anodes only in presence of numerous cathodes and deposit gold and silver from their solution in less time and on a much larger surface of cathodes, although in smaller tanks, than by the ordinary process.

I will take as an illustration the treatment of cyanid of gold and potassium cyanid solution; but my process is applicable to other gold and silver solutions.

In carrying out this invention I may use a tank without compartments or a tank divided in three compartments by porous diaphragms. When there are three compartments in the tank, the central one contains the gold solution, say a cyanid of gold and potassium solution, and is the negative compartment between two positive compartments. The electrolyte in the positive compartments may be varied. I prefer, however, to use a caustic potash or soda solution, or a cyanid-of-gold solution similar to the one electrolyzed in the negative compartment. I may use iron anodes, but I preferably use peroxidized lead as a positive plate, and to the best of my knowledge such peroxidized-lead anodes have never been employed in a cyanid solution. At the bottom of the central compartment is a thin layer of mercury, in which a copper or other metal plate connected with the negative pole of the generator of electricity is immersed. In this mercurial cathode I dip the lower edges of as many perforated plates or gauzes or pieces of wire network of amalgamated copper or other suitable metal as the width of the central compartment allows me to put one against the other, making good contact with the mercury, in which they stand up and work as a cathode. Thus these amalgamated plates present the largest surface possible of mercurial cathodes to the gold solution, which rises from the bottom of the tank and passes through their interstices as through a filter which retains the gold. When a sufficient quantity of gold has been absorbed by the amalgamated cathodes, the plates are cleaned up and the mercury is retorted in the ordinary way. The gold solution enters the tank at the bottom by means of a pipe or several pipes conveniently disposed over the mercury cathode and escapes through outlets in the upper part of the compartment after it has yielded its gold to the mercury layer and to the amalgamated perforated plates, gauzes, wire network, and the like.

When I have several tanks, the gold solution runs from one central compartment to a second, &c., through suitable pipes. The diaphragms are preferably made of porous asbestos or kieselguhr porcelain, mounted on suitable frames made of paraffined wood or slate or similar material and fixed in grooves cut at the bottom and on the walls of the tank, where they make water-tight compartments. The advantage in employing asbestos or kieselguhr porcelain or their equivalent is that it does not allow the diffusion of the cyanid, and that this material is not attacked by alkalies or by cyanid of potassium. When such porcelain cannot be procured, the compartments are formed by finely-woven tissues stretched on frames, and in such a case the same gold solution circulates in the three compartments, or, still better, the electrodeposition of gold takes place in a tank without compartments, as hereinafter described and illustrated.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the tank. Fig. 2 is a cross-section thereof. Fig. 3 is a cross-section of a tank without compartments. Fig. 4 is a side elevation with the wall broken away and showing the plates or electrodes disposed crosswise therein. Fig. 5 illustrates a wire network electrode. Fig. 6 illustrates a peroxidized-lead anode. Fig. 7 shows an arrangement of several tanks in a circulating system; and Fig. 8 is a cross-section of the up-

per part of the tank, showing the construction in detail.

A is the tank.

B B are the positive compartments, containing a caustic potash or cyanid of gold and potassium solution.

C C are the iron or peroxid-of-lead anodes.

D is the central compartment, containing the gold solution.

E is the layer of mercury, in which is immersed a copper or other metal F, connected with the negative pole of the generator of electricity by a wire *f*.

G G G are the amalgamated perforated plates, which dip in the mercurial cathode.

H is the pipe through which the solution enters.

K is the pipe through which the solution runs off.

Fig. 7 shows an installation of several tanks, and the gold solution runs from one central compartment D to a second in the next succeeding tank through suitable pipes *a*. In this figure L is the cistern containing the gold solution to be treated. M M is a series of electrolyzers through which the solution passes and yields its gold. N is the collecting-tank in case the solution has to pass again through the electrolyzers to be thoroughly exhausted. P is a pump which sends back the solution to the feeding-cistern L.

The simplest apparatus for electrodeposition of gold, and the one which I prefer, consists of tanks without partitions, and which I will illustrate as follows: In Fig. 3, A is the tank along the sides of which are suspended two peroxidized-lead anodes C C, which are perforated and do not reach the surface of the layer of mercury E, in which a plate of copper or other convenient metal is immersed and is connected with the negative pole of the generator of electricity. Proper means are adopted to prevent any contact between the anodes C C and the numerous amalgamated perforated plates, gauzes, or network, which dip in the mercury, fill up the tank, and work practically each as a mercurial cathode. There is more efficiency, conductivity, and economy in using this tank without compartments than the two others I have hereinbefore described and illustrated.

Instead of arranging lengthwise my anodes and cathodes in a tank, I may have them disposed crosswise, as in Fig. 4, and in such a case I have one perforated anode C for every group of twelve or fifteen cathodes G. The anodes are all connected outside to a bar *c*, and the cathodes dip in the layer of mercury E and are supported by the comb *g*. The advantages of this last arrangement are that I can have a very long tank without the trouble of using long peroxidized-lead plates and amalgamated plates, which it is difficult to keep apart and parallel without the risk of short-circuiting.

Fig. 6 shows a perforated anode made of lead peroxidized by one of the known means. The anodes are fixed in a slate or paraffined wood frame *c'*. The anodes slide in grooves c^2, cut in the walls of the tank, so as to be straight between the cathodes, which are kept apart from each other by means of convenient separators, so as to have their two faces in contact with the gold solution. The frame *c'* prevents contact with the cathodes, and its lower part is high enough to render impossible the contact of the anode with the layer of mercury.

I am aware that gold has been deposited on layers of mercury or amalgamated plates by aid of electricity, but to the best of my knowledge no apparatus has ever been constructed such as the one I have described, in which in presence of peroxidized-lead anodes, which are perforated, the combination of a mercurial cathode with numerous amalgamated perforated plates, or wire network, &c., secures an intimate and perfect contact of the gold solution with every particle of an enormous amalgamated surface, which fills up the compartment and acts as a cathode, thus helping in the recovery of the gold which the layer of mercury has not completely effected.

The great advantages of this process are that the rate of circulation of the gold solution can be much more rapid; that the installation of tanks is less costly, since in a few tanks more surface of active cathode is available for the deposition of gold than in the usual apparatuses for electrodeposition; that it requires less mercury; that the conductivity is at its maximum; that the perforated plates, &c., being in contact with the mercury, do not require terminals, connections, and that the slightest trouble, and without interfering with the operation, each of them can be withdrawn from the tanks and replaced by other plates for the cleaning up.

Having now described my invention, what I claim is—

In an apparatus for the electrodeposition of gold and silver from a solution, a tank provided with one or more anodes and a series of amalgamated cathodes, each cathode consisting of perforated, skeleton, or network plates and a layer of mercury in the bottom of the tank into which each of the cathodes dips, said layer of mercury being connected with the negative pole of electricity thereby constituting a common vehicle for the current from all the cathodes while at the same time maintaining the said cathodes constantly amalgamated.

In testimony whereof I subscribe my signature in presence of two witnesses.

EMILE ANDREOLI.

Witnesses:

FREDERICK J. HANBURY,

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