W. THUM.

ELECTROLYTIC APPARATUS.

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969,921. Patented Sept. 13, 1910.

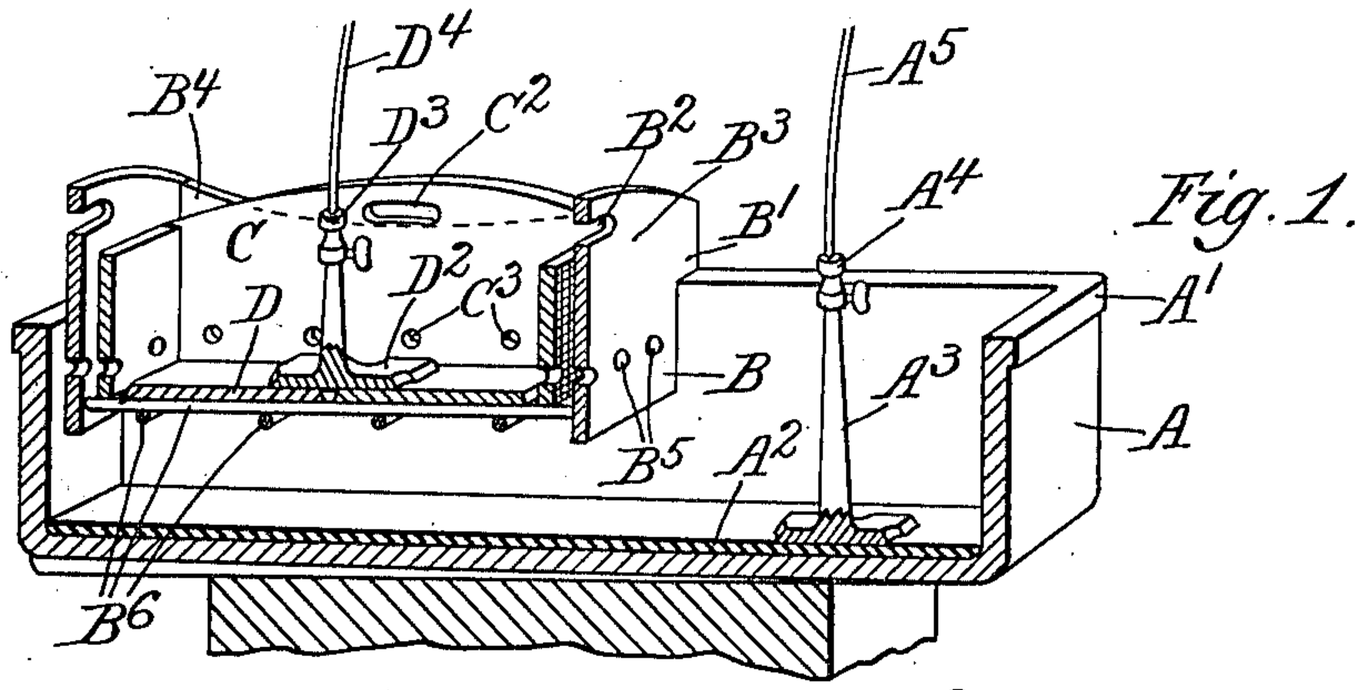

Fig. 1.

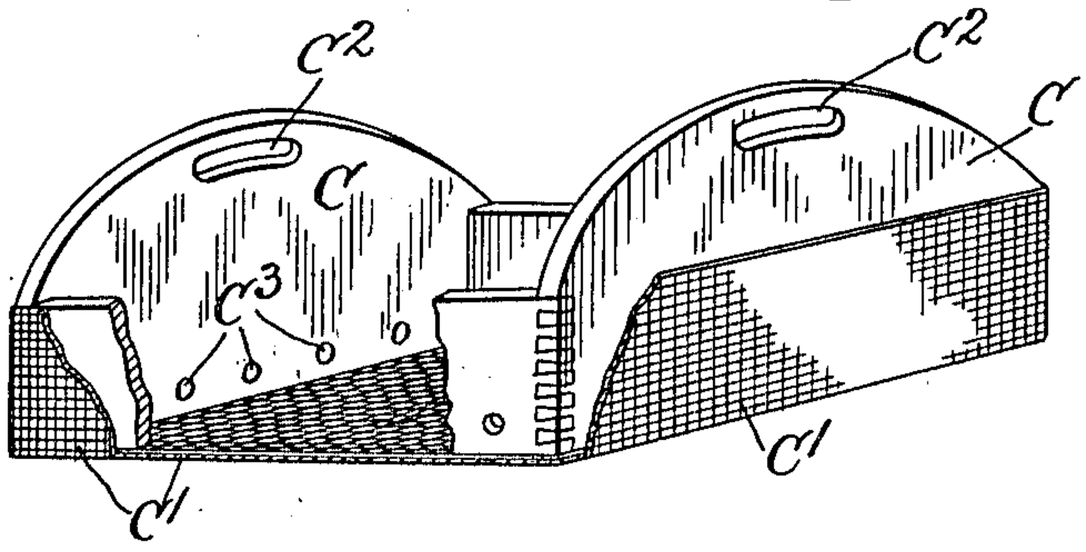

Fig. 2.

Fig. 3.

Fig. 4.

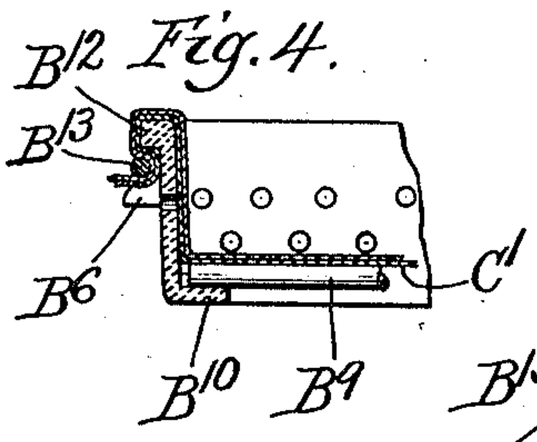

Fig. 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

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ELECTROLYTIC APPARATUS.

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To all whom it may concern:

Be it known that I, WILLIAM THUM, a citizen of the United States, residing at Hammond, in the county of Lake and State of Indiana, have invented a certain new and useful Improvement in Electrolytic Apparatus, of which the following is a specification.

My invention relates to an electrolytic apparatus for the saving of gold, silver and the like, more particularly for the electrolytic refining and separation of metals which are deposited in the form of crystals, flakes or trees, such as the parting of gold and silver and the electrodeposition and refining of bismuth, and the like.

It is illustrated in the accompanying drawings, wherein—

Figure 1 is a section through the apparatus; Fig. 2, a detail, Fig. 3, a modification, Fig. 4, a detail of a modification. Fig. 5 is a detail.

Like parts are indicated by like characters in all the drawings.

A is a tank of any desired shape with an inclined bottom adapted to hold the electrolytic liquid and is provided with a projecting rim A^1 about the top thereof and the cathode lining A^2 in the bottom which is in connection with the cathode terminal A^3 and through the binding post A^4 and wire A^5 with the negative terminal of any suitable source of electric current. The anode cell B is supported in the tank A by means of the projecting ledges B^1 which engage the walls thereof and is provided with the handle slot B^2 in the end wall B^3. The side walls B^4 together with the end walls B^3 are provided with the perforations B^5 therethrough. The bottom of the cell consists of a grid made up of the bars B^6. The anode basket C which is located within the anode cell and rests upon the grid B^6, is provided with the canvas bottom C^1, the handle holes C^2 and the perforations C^3 at its sides and ends. The anode plate D is situated within the basket C and rests upon the spacing bars D^1 which rest in turn upon the canvas bottom of the basket, and carries the anode terminal D^2 which is in circuit through the binding post D^3 and wire D^4 with the positive terminal of the electric generator.

Referring now to Figs. 3 and 4, a modified anode cell and anode basket are here shown. The separate rigid anode cell and basket are dispensed with, and a single anode cell is used, wherein a canvas bag or basket C^1 is mounted upon and supported within this cell, thus combining both the cell and basket in one structure having but one rigid box. The anode cell is provided with the projecting lugs B^6 which have grooves B^7 in their upper side to prevent leakage, and which overlie the edge of the tank. It is also provided with handle pieces B^8 and transverse rods B^9 which form its bottom. These rest on the inwardly turned ledges B^{10}, being received at each end into a groove B^{11}. B^{12} is a bead or outward projection around the upper part of the anode cell around which the edge of the canvas or anode basket is carried. B^{13} is a wire or rubber band surrounding the anode cell beneath this bead or projection for the purpose of holding the canvas or anode basket in position. The canvas may be held, for example, by the rubber band B^{13}.

Relative to the filtering medium, filtering screen or diaphragm I have mentioned canvas C^1 as the bottom of the anode compartment, this being the simplest construction. Any other filtering medium may be used such as made from paper, asbestos, silk, linen, cotton fabric, etc., or a combination of two or all of these. Thereby I am enabled to adjust the porosity or density of the filtering medium to suit the conditions, depending on the fineness of the anode slimes to be retained by such filter. By having more than one layer of filtering mediums I am also enabled to facilitate the removal of the slimes from the compartment by lifting out one of the cloths with the slimes. It is also understood that the anode plates D can wholly or in part be substituted by the anode metal cast into granulated form, which method has some advantages, like the better diffusion of the electrolyte throughout the contents of the anode compartment and, further, of exposing a much larger surface of the metal to the action of the current, as it would be the case with a plate or slab of anode metal.

I do not, of course, desire to be strictly limited to the particular form and arrangement of parts shown, or the specific structure of the several features. Parts may be changed and varied considerably without departing from the spirit of my invention. I wish, therefore, that my drawings be regarded as more or less diagrammatic.

The use and operation of my invention are as follows:—The electrolytic fluid is contained in the tank A at such level as to be slightly above the perforations B^5 and C^3 in the anode cell and basket respectively, the anode cell being capable of movement along the tank in which it rests. When the current is supplied or turned on, the usual electrolytic action takes place with the result that certain metals are dissolved at the anode and combined with the liquid passing down through the canvas and are deposited on the bottom of the tank, whence they may be collected in any desired manner. This would be the case for instance with silver which would be deposited in the shape of loose crystals from an electrolyte containing silver nitrate and some free nitric acid or with bismuth which would be deposited in more or less coherent easily removable crystals, having the shape of trees, mushrooms and the like, from an electrolyte containing bismuth chlorid and some free hydrochloric acid. On the other hand, as an example, in the case of electrolyzing silver bullion containing gold, in connection with a nitrate of silver electrolyte, the gold remains undissolved and is collected in the shape of slimes or mud on the canvas filter cloth forming the bottom of the anode compartment and it can be recovered for treatment by lifting out the anode terminal and so much of the plate as remains, and removing the cloth or removing the slimes by means of a scraper.

It will be understood, of course, that the material to be treated could be in the shape of what I have called the anode plate or the anode contact piece, or in any other desired form.

I wish to call attention to two important features in this construction and operation. The first of these is what relates to the means for facilitating the flow or circulation of the electrolytic fluid. The electrolyte contained in the anode cell dissolves the anode metal and therefore becomes of a higher specific gravity which fact gives it a tendency to sink through the canvas or filtering medium and to run down over the full length of the surface of the cathode lining with which the inclined bottom is covered. Thus the metal from the solution is deposited on this cathode whereupon the solution again becomes specifically lighter. The electrolyte is naturally of a less specific gravity at the lowest point of the inclined cathode lining or bottom of the tank, which gives it a tendency to rise toward the top of the bath where it flows across the surface toward the anode cell. The holes in the anode cell and the anode basket near the solution level tend to facilitate its flow so that the circulation of the liquid is obtained downwardly through the anode cell and basket, down the inclined bottom of the tank, upwardly and backwardly across the upper part of the tank toward and into the anode cell. The second particular feature which aids the operation in various ways is the employment of spacing bars between the anode plate or terminal or the material to be treated and the bottom of the anode basket or cell. Since the metal separated on the bottom of the basket is in the shape of mud or slime, the slimes would, in course of time, pack between the anode metal and the filtering bottom of the basket and cell, thus impeding the circulation of the electrolyte and causing undersirable secondary electrolytic reactions. The slimes are, therefore, allowed to rest loosely on the perforated bottom of the basket or cell so that the heavy liquids containing in solution the material to be deposited on the cathode below can freely pass through such filtering screens. The material deposited can be removed from the bottom of the tank by means of a hoe or other implement without interrupting the flow of the current.

The bottom or lining of the tank is composed of a conducting material to make contact with the conducting cathode. This cathode can be of metal or a non-metallic conductor, preferably carbon, being in that case a carbon or graphite lining plate for the bottom of the tank. In cases where my apparatus is used in connection with silver and gold bullion, so called dore bar, I prefer to apply as an electrolyte a solution of silver nitrate. In this case as above suggested, the silver will be deposited in crystals on the tank bottom and the gold slimes will be gathered in the basket or basket lining whence they will be collected for future treatment. The bottom of the tank is inclined from one to one and a half inches the total length of the tank and the cathode lining should cover the entire bottom. If a graphite plate, it may be from one fourth to one-half an inch in thickness. The bottom of the anode cell preferably has the same inclination as the bottom of the tank making anode and cathode parallel.

The spacing bars should be of glass, porcelain, hard rubber, wood or the like and are preferably of non-conducting material and of acid resisting material.

I claim:—

1. In an electrolytic apparatus, the combination of a tank having an inclined floor, with an anode cell supported in the tank above the higher part of the floor and provided with a perforated bottom and side perforations, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

2. In an electrolytic apparatus, the combination of a tank having an inclined floor with an anode cell supported in the tank

above the higher part of the floor and provided with a perforated bottom and side perforations, an anode basket within the cell provided with a filtering bottom and side perforations, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

3. In an electrolytic apparatus, the combination of a tank having an inclined floor, with an anode cell supported in the tank above the higher part of the floor and provided with a perforated bottom and side perforations, an anode basket within the cell provided with a filtering bottom and side perforations, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

4. In an electrolytic apparatus, the combination of a tank having an inclined floor, with an anode cell supported in the tank above the higher part of the floor and provided with a perforated bottom and side perforations, an anode basket within the cell provided with a filtering bottom and side perforations, spacing bars within the basket, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

5. In an electrolytic apparatus the combination of a tank having an inclined floor with an anode cell supported in the tank above the higher part of the floor and provided with a perforated bottom and side perforations, an anode basket within the cell provided with a filtering bottom and side perforations, spacing bars upon the lining, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

6. In an electrolytic apparatus the combination of a tank with an anode cell supported in the tank and provided with a perforated bottom, an anode basket within the cell provided with a filtering bottom, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

7. In an electrolytic apparatus, the combination of a tank with an anode cell supported in the tank and provided with a perforated bottom, an anode basket within the cell provided with a filtering bottom, spacing bars within the basket, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

8. In an electrolytic apparatus, the combination of a tank with an anode cell supported in the tank and provided with a perforated bottom, an anode basket within the cell provided with a filtering bottom, spacing bars upon the filtering bottom, and anode and cathode terminals connected respectively with the anode material and a cathode at the bottom of the tank.

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