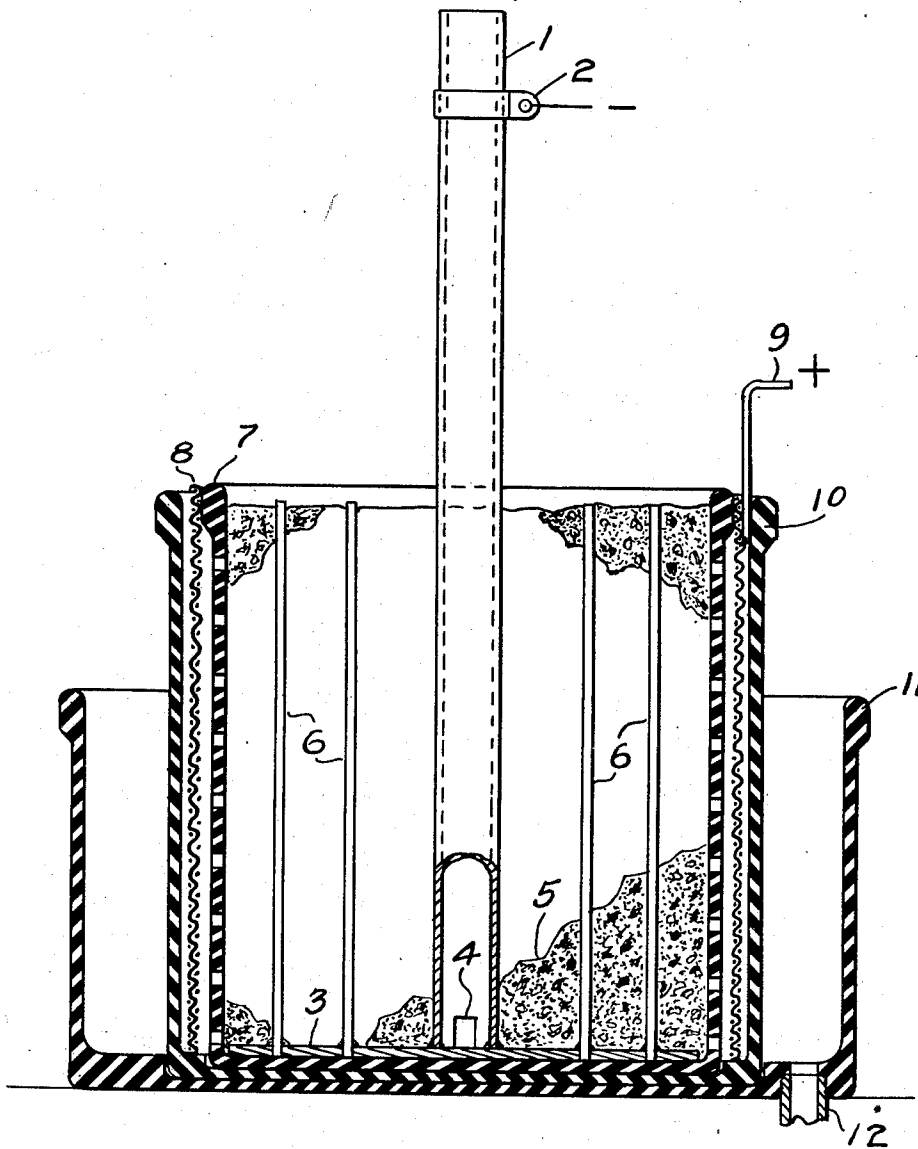


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ELECTROLYTIC CELL FOR THE DEPOSITION OF GOLD
AND/OR SILVER FROM SOLUTIONS
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ELECTROLYTIC CELL FOR THE DEPOSITION
OF GOLD AND/OR SILVER FROM SOLUTIONSJohn Benjamin Zadra, Reno, Nev., assignor to the
United States of America as represented by the
Secretary of the Interior

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1 Claim. (Cl. 204—272)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

1 The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon in accordance with the provisions of the act of April 30, 1928 (ch. 460, 45 Stat. L. 467).

This invention relates to electrolytic cells and more particularly to an electrolytic cell for the deposition of precious metals from their solutions. Still more particularly, this invention relates to an electrolytic cell for the stripping of gold or silver from solutions thereof by electrodeposition upon charred excelsior or other suitable form of carbon.

In my co-pending application entitled "Process for Extracting Gold and Silver" executed on November 9, 1949, and filed in the Patent Office on or about November 15, 1949, Serial No. 127,761, there has been disclosed a complete process for the extraction of gold and silver from activated carbon loaded therewith and the electrodeposition of the precious metal values upon charred excelsior or the like. Essentially the process as therein described comprises extracting the gold with a caustic solution of sodium sulfide and electrodepositing the same upon a precoated charred excelsior cathode. Similarly, the silver is extracted from the loaded activated carbon with a sodium cyanide solution which in turn may be stripped of its silver content in a similar electrodeposition on a charred excelsior or carbon cathode. During the practice of the process described in my co-pending application, it has been found desirable to cause the solution being stripped of its precious metal content to migrate or proceed through the cell in a direction from the cathode material to the anode. Similarly, some difficulty has been observed in handling the charred excelsior employed as a cathode metal-collecting surface. By the instant invention, a simple device has been provided which permits discharging and recharging the charred excelsior with a minimum of difficulty while at the same time providing for a desirable circulation of metal-bearing solution from the vicinity of the cathode through the anode. Side reactions are thus minimized and a more complete stripping of the solution is obtainable.

Accordingly, this invention has for an object the provision of an improved electrolytic cell for stripping metal values from solutions in which they are dissolved. Another object is the provision of an electrolytic cell wherein the solution to be stripped proceeds from the general area of the cathode to the anode and thence out of the

2 cell, whereby a diaphragm becomes unnecessary and side reactions are minimized. A further object is to provide an electrolytic cell wherein a large volume of fragmentary cathode material such as charred excelsior may be introduced and withdrawn with a minimum of inconvenience.

The foregoing and other objects are accomplished in accordance with this invention which provides an electrolytic cell adapted to strip precious metals from solutions thereof wherein a centrally positioned cathode assembly into which electrolyte is introduced is surrounded by a non-conductive retaining member adapted to restrain fragmentary cathode material, and the retaining member is in turn surrounded with an anode assembly circumferentially disposed thereabout, the liquid level in the cell being controlled by a weir which in turn discharges into a launder. Thus, suitable means are provided for introducing the metal bearing solution through a central member into the cell, cooperating means are provided for restraining a discrete cathode material into electrically conducting relationship with said introducing means, circumferential perforated anode means are positioned about said cathode means and a weir device controls fluid level within the cell.

For an understanding of this invention, reference is made to the accompanying drawing wherein is shown an elevational view partly in section of an electrolytic cell constructed in accordance with this invention.

A suitable cathode assembly embodying this invention is shown in the drawing in its relation to the remaining portions of the cell, and as shown comprises, in part, a vertically mounted, electrically conductive inlet pipe 1 for introducing gold sulfide or other metal bearing solution into the cell. The pipe 1 also serves as a negative bus bar or conductor of electricity into the cell and for this purpose is provided with a negative contact 2. The pipe 1 is fastened at its lower end to a radially extended disc 3 in such fashion as to make an electrically conductive joint, as by welding. Near the lower end of the pipe 1 is an aperture 4 for permitting the solution entering through the pipe 1 to emerge therefrom into contact with a surrounding body of charred excelsior 5. In order that better electrical contact may be made between the pipe 1 and the charred excelsior 5, the disc 3 is provided with a plurality of vertically extending wire rods 6 spaced about and parallel to the pipe 1. The rods 6, the plate 3 and the pipe 1 are constructed of an electrically conductive material which is not substantially

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corroded by the solution being electrolyzed. In the case of a caustic alkaline solution of gold, these members can suitably be constructed of stainless steel, preferably the stainless steel known as "18-8" which contains about 18% chromium and about 8% nickel, the balance being substantially all iron.

In order to restrain the charred excelsior cathode material 5 in position, a retaining member is provided which is of such form as to permit the egress of solution from contact with the cathode material into contact with a circumferentially disposed anode. As shown, the retaining member may take the form of a perforated basket 7 made of hard rubber or other non-conductive material, into which nests the plate 3 and which restrains the charred excelsior mass 5. As shown the perforated basket 7 engages the plate 3 so as to space the rods 6 and the pipe 1 in their correct locations. A suitable anode 8 peripherally encircles the basket 7 and as shown, such anode may take the form of stainless steel wire mesh rolled to define an open cylinder. The mesh anode 8 is provided with a positive terminal 9 and is spaced closely adjacent to and encircling the retaining basket 7.

The anode 8 and the cathode assembly above described are placed in a concentrically surrounding weir cup 10 which serves the purpose of controlling the fluid level in the electrolytic cell while at the same time restraining the anode 8 into an equally spaced relationship to the charred excelsior 5 in the cathode assembly. The weir cup 10 is provided with cylindrical side walls and preferably a closed bottom, the whole being constructed of hard rubber or other suitable non-conductive, non-corrosive material. A launder 11 provided with an outlet 12 embraces the weir cup 10 and the whole assembly to provide a supporting base therefor. The launder 11 collects the overflow from the weir cup 10 and directs the stripped solution away from the cell through the outlet 12.

In operation, the retaining basket 7 and the cooperating cathode conducting assembly defined by the pipe 1, plate 3 and the rod 6 are filled with charred excelsior 5 which has been suitably pre-coated if necessary. Thereupon, a caustic sodium sulfide solution of gold or other metal-bearing solution is introduced through the pipe 1 and proceeds through the aperture 4 into contact with the charred excelsior 5 and the anode 8. After a sufficient quantity of solution fills the weir cup 10, it overflows into the launder 11 and passes out through the outlet 12. The contact 2 is connected with a source of negative current not shown, and the anode connection 9 is similarly connected to the positive current source. Electrolysis then proceeds and gold or other metal to be deposited is deposited largely on the charred excelsior 5. The electric current passes by way of the solution through the perforations in the basket 7 to the anode 8 and thence out of the cell through positive terminal 9. As soon as the gold or other metal content of the initial solution has been stripped therefrom, additional gold bearing solution may continuously be introduced through the pipe 1 and continuously stripped of its metal content.

Stripped solution is withdrawn from the cell through the outlet 12 and may be used for the

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solution of additional quantities of gold or the like. After the charred excelsior 5 has taken up a sufficient quantity of gold or other metal, passage of current and solution through the cell is discontinued and the retaining basket 7, together with the charred excelsior 5 and the pipe 1 is withdrawn from the cell. The plate 3 is withdrawn from the basket 7 by means of the attached pipe 1 and the loaded charred excelsior 5 discharged for working up of its gold content. Thereupon, the plate 3 and attached rods 6 and pipe 1 are reinserted in position into the basket 7 and recharged with additional charred excelsior. The basket and enclosed cathode assembly are then reinstated into the weir cup 10 inside the anode 8. The cycle can then be repeated.

It will be seen that the above-described cell provides a convenient and easily manipulated apparatus for the stripping of metals from metal-bearing solutions. As will be apparent, it is especially adapted to the stripping of gold from caustic sodium sulfide solutions thereof by depositing the gold onto charred excelsior. The charred excelsior is, of course, inexpensive and readily obtainable and the gold can merely be recovered by burning off the excelsior in the presence of a flux.

It will be apparent to one skilled in the art that various changes can be made in the invention without departing from its spirit and scope.

What is claimed is:

An electrolytic cell adapted to strip gold from sulfide solutions thereof which comprises a cathode assembly having a vertical metallic pipe adapted to deliver gold-bearing solution to the cell and to serve as a negative bus bar for delivering electric current to said cell, said pipe being axially positioned in said cell and being provided near its lower end with an aperture for permitting egress of solution from said pipe into said cell, a radially-extending metallic plate fastened to said pipe at its lower end, a plurality of upwardly extending wire rods spaced about said pipe and fastened at their lower ends to said plate for distributing electric current about said pipe, a non-conductive perforated basket enclosing the pipe, plate and rods to restrain solids while permitting fluid flow, said basket being adapted to contain charred excelsior cathode material in contact with said rods; a perforated anode surrounding said cathode assembly adapted to permit flow of solution through said anode perforations, a weir cup surrounding said anode and said cathode assembly for controlling solution level overflowing said cup, and a launder adapted to collect overflow of stripped solution from said weir cup.

JOHN BENJAMIN ZADRA.

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