UNITED STATES PATENT OFFICE

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MEANS FOR PRODUCING MERCURY ELECTROLYTICALLY FROM ACID SOLUTIONS

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2 Claims. (Cl. 284—350)

1. The invention relates to means for producing metallic mercury electrolytically from an acid electrolyte and a general object of the invention is to provide a new and improved method and means by which the electrolytic reduction of metallic mercury from an acid solution containing mercury salts may be efficiently carried to completion.

Another object of the invention is to provide a novel method of this character which includes the steps of collecting the metallic mercury produced by electrolysis in a mercury pool as the cathode of the electrolytic cell and maintaining the size of such pool constant by withdrawing mercury therefrom as fast as it is produced electrolytically.

Another object of the invention is to provide a novel means for producing metallic mercury electrolytically which includes an electrolytic cell having as its cathode a pool of mercury arranged to be maintained constant by the continuous withdrawal therefrom of mercury in an amount equal to that produced electrolytically.

Other objects and advantages will become apparent in the following description and from the accompanying drawing in which the single figure shows an electrolytic cell according to the invention.

While the invention is susceptible of various modifications and alternative constructions, we have shown in the drawings and will herein describe in detail, the preferred embodiment, but it is to be understood that we do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Heresofore the electrolytic recovery of mercury from an acid solution has been impractical because the action of the acid in the electrolyte on the metallic mercury produced electrolytically reverses the electrolytic action by returning the metallic mercury to its original salts.

The present invention overcomes this difficulty by utilizing as the cathode of the electrolytic cell a mercury pool having a surface area maintained constant by the removal of mercury from the cell as fast as it is produced electrolytically. The invention may be used to recover mercury from acid solutions or from materials from which the mercury may be taken into acid solution. An example of the use of the present invention is given in our copending application Serial No. 468,396, filed December 9, 1942, covering a Process of purifying metallic mercury.

2. Referring to the drawing, the numeral 10 indicates the container of an electrolytic cell. This container is preferably of glass, ceramic material or the like which is inert to the action of mercury or the electrolyte. The container has a top opening and its bottom wall 11 slopes or tapers inwardly and downwardly to communicate with an outlet defined by a neck or stem 12. A suitable distance above the bottom wall an anode 13 is suitably suspended as in this instance by anode leads 14 extending through and suitably sealed to the walls of the container. The anode preferably is a flat perforate member or plate of platinum and is suspended to extend transversely of the container. One or more cathode leads 15 extend through and are suitably sealed to the wall of the container in the lower portion thereof; this lower portion being occupied when the apparatus is in use by a pool 16 of metallic mercury which is in electrical contact with the cathode lead and hence forms the cathode of the cell.

Means is provided for removing mercury from the cell as fast as it is produced electrolytically. In the present instance this means comprises a conduit 17 connected with the bottom outlet and having a return or reverse bend 18 therein which determines the height of the surface level of the cathode pool in the container. The return bend has an upwardly opening vent 19 to prevent the formation of a siphon.

It will be evident that this arrangement will be effective automatically and continuously to remove from the container that mercury which is plated out on the surface of the cathode pool. The quantity of mercury removed will be almost precisely equal to the quantity of mercury electrolytically produced whereby the surface area of mercury in the cathode pool will be maintained constant.

The effective surface area of the cathode pool is determined as an approximate balance between two opposing factors. On the one hand, the surface area should be large to provide an efficient and effective cathode area. On the other hand, the surface area should be small to minimize the reaction between the metallic mercury and the free acid in the electrolyte. For any given set of conditions, these opposing factors may be empirically balanced depending on the concentration of mercury in the electrolyte, the acid concentration of the solution and the current density. It has been determined that when these factors are fairly balanced the electrolytic reaction can be
carried to completion or to substantial completion.

In carrying out the process an acid electrolyte derived, for example, from the leachings from mercury ores, from acid solutions of mercury salts or waste, or from mercury residues and the like, is placed in the container. The acid of these solutions will under most circumstances be nitric acid in view of the insolubility of most mercury salts of other acids. The most effective surface area of the cathode pool having already been determined for the particular type of solution to be electrolyzed, the cell is energized.

The electrolytic cell may be and preferably is equipped with cooling means of suitable form such as a water jacket 20. Where the electrolyte is cooled, the surface area of the cathode pool and the current density employed may be increased to hasten the speed of the electrolytic reaction.

We claim as our invention:

1. An electrolytic cell for producing metallic mercury from an acid electrolyte containing a mercury salt having, in combination, a cylindrical container for said electrolyte, the bottom wall of said container sloping inwardly and downwardly and having a central outlet, a liquid cooling jacket about said container, a stationary anode consisting of a flat perforate member suspended transversely in said container and having leads extending through and sealed in the side wall of said container in the lower portion thereof, a cathode in the lower portion of said container below said anode and comprised of a static pool of metallic mercury, a conduit connected at one end to said outlet and having a reverse bend located above said outlet for maintaining constant the level of said cathode pool within the container, and an air vent opening upwardly from the top of said reverse bend in said conduit, said conduit affording a passage for the continuous removal of mercury from said pool as mercury is electrolytically deposited thereon.

2. An electrolytic cell for producing metallic mercury from an acid electrolyte containing a mercury salt having, in combination, a container for said electrolyte, the bottom wall of said container sloping inwardly and downwardly and having a central outlet, a liquid cooling jacket about said container, an anode suspended transversely in said container in the lower portion thereof, a cathode in the lower portion of said container below said anode and comprised of a static pool of metallic mercury, and a conduit connected at one end to said outlet and having a reverse bend located above said outlet for maintaining constant the level of said cathode pool within the container, said conduit affording a passage for the continuous removal of mercury from said pool as mercury is electrolytically deposited thereon.

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