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ARRANGEMENT IN ELECTROLYTIC TANKS WITH DIAPHRAGM CELLS.

APPLICATION FILED SEPT. 10, 1920.

1,426,071. Patented Aug. 15, 1922.

Fig. 1.

Fig. 2.

Fig. 3.

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By

Attorneys
To all whom it may concern:

Be it known that I, Gustaf Haglund, a subject of the King of Sweden, and a resident of Christiania, Kingdom of Norway, have invented certain new and useful Improvements in the Arrangement in Electrolytic Tanks with Diaphragm Cells, of which the following is a specification.

This invention relates to electrolytic tanks with diaphragm cells and the object of the invention is the provision of means whereby the liquid may be removed from the diaphragm cells without intermixing with the liquid outside the diaphragm cells and whereby ready and convenient removal of the diaphragm cells may be effected. The invention also embodies means whereby the comparative levels of the liquids within and without the diaphragm cells may be regulated by a controlled removal of the liquid from the diaphragm cells without contact or mixing with the liquid outside the diaphragm cells.

In electrolytic processes which are carried out in diaphragm cells, liquids or solutions having a different composition in the anode and in the cathode compartment are generally employed, and the object of the diaphragm is to prevent the mixing of these solutions.

It occasions no difficulty to arrange inlet and outlet for the liquid outside the diaphragm cells, as this may be accomplished by means of an overflow or tubes passing through the wall of the electrolytic tank itself.

With regard to the solution inside the diaphragm cells the problem is, however, a different one, and it has occasioned a great difficulty to arrange inlet and outlet for the solution in a satisfactory manner. Besides obtaining an even circulation of liquid through the cells, care must also be taken that the arrangement does not prevent inspecting and changing the anodes and cathodes as well as the diaphragm cells themselves.

The present invention has proved to satisfy all these requirements. In the drawings forming part of this application I have illustrated a suitable form of the invention. The electrolytic tank chosen for illustrative purposes is one suitable for use in the deposition of metallic nickel from a neutral nickel sulphate solution on cathodes placed outside the diaphragm cells, with insoluble anodes such as for instance lead anodes inside the cells in an acid nickel sulphate solution.

The addition of solution to the anode compartment is supposed to take place through the diaphragm itself. It is however obvious that the addition may just as well be effected by means of a tube or a hose leading over the edge of the electrolytic tank directly into the diaphragm cell.

Fig. 1 is a section through an electrolytic tank with diaphragm cell inserted. Fig. 2 is a plan of the said tank. Fig. 3 shows the arrangement of the outlet tube in detail.

The electrolytic tank a, having a suitable lining m is provided with ledges c, c, for the support of diaphragm cells b, b. Each diaphragm cell is constructed of the usual diaphragm material mounted on a wooden framework d. At a suitable distance from the top of each cell a tube e is mounted and extends through the framework d and terminates in a hollow nipple f. Opposite this nipple there is a passageway g through the side of the tank, suitably lined and faced by the flanged pipe l. The construction of the nipple f and of the passageway g is such that when the nipple is pressed into the passageway the joint between them is water-tight. This joint is normally maintained and is brought about by wedging action of a block h.

On the outside of the passageway g there is provided a hollow nipple i, of similar characteristics as the nipple f, and mounted to form a water-tight joint with the passageway. To the nipple i is attached a curved tube j. The electrolytic tank is provided with a conduit k located beneath the passageway g and in line with the said curved tube. The arrangement is such that the tube j with its nipple i, can be rotated about the passageway g. The tube e, nipple f, passageway g, nipple i and tube j, therefore, constitute a complete channel leading from the interior of the diaphragm cell to the exterior of the electrolytic tank.
The relative levels of the liquid inside the diaphragm cell and the liquid in the electrolytic tank can be regulated in the following manner:

It will be apparent that the level of the liquid in the diaphragm cell is determined by the position of the outlet end of the tube $j$. Assuming a constant level of liquid in the electrolytic tank, the tube $j$ is turned until its outlet end is at the desired level of the liquid in the diaphragm cell and this level is thus maintained. The liquid from the diaphragm cell flowing through the tube $j$ discharges into the conduit $k$ and is removed without contact or mixture with the liquid in the electrolytic tank.

When it is desired to remove a diaphragm cell from the electrolytic tank, the supply of liquid to the diaphragm cell having been cut off, the tube $j$ is first turned to its lower position so that all of the liquid in the diaphragm cell above the level of the tube $e$ is exhausted therefrom. The tube $j$ is then turned to its upper position to prevent the discharge of liquid from the electrolytic tank when the cell is removed. The wedge $h$ is then taken out and the diaphragm cell removed without any intermixture of the two liquids. The replacing of the diaphragm cell will be readily understood.

In the particular embodiment chosen for illustrative purposes, i., a, an electrolytic tank for the deposition of metallic nickel, the tube $e$, nipple $f$, lining $i$, nipple $t$ and tube $j$ are preferably made of antimony-lead which has a sufficient hardness and is not attacked by the solutions. The lining of the electrolytic tank $m$ is preferably of lead.

It is, however, obvious that in each case that material will be chosen which is most suitable for the solutions used in the electrolysis. The collecting of the liquid flowing from the cells may of course be carried out by other means than the conduit shown in the drawing. It will further be understood that when the diaphragm cell is to be removed the nipple $t$ and tube $j$ may be replaced by a stopper.

The anodes and cathodes placed in the diaphragm cells and the tank have not been shown in the drawing, as the present invention only relates to the above described arrangement, which is entirely independent of the character of the anodes and cathodes.

The above specific illustration of my invention has been given for clearness of understanding only, and no undue limitation should be deduced therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination with an electrolytic tank and a diaphragm cell arranged therein of a tube, one end of which is situated in the diaphragm cell, the other end being pressed against the walls of an opening in a wall of an electrolytic tank to form a tight connection therewith.

2. The combination with an electrolytic tank and a diaphragm cell arranged therein of a tube, one end of which is situated in the diaphragm cell, the other end being pressed against the walls of an opening in a wall of the electrolytic tank to form a tight connection therewith, and wedging means for effecting such connection.

3. The combination with an electrolytic tank and a diaphragm cell arranged therein of a tube, one end of which is situated in the diaphragm cell, the other end having a conical end-piece fitting into and being pressed against the walls of an opening in a wall of the electrolytic tank to form a tight connection therewith.

4. The combination with an electrolytic tank and a diaphragm cell arranged therein of a tube, one end of which is situated in the diaphragm cell, the other end having a conical end-piece fitting into and being pressed against the walls of an opening in a wall of the electrolytic tank to form a tight connection therewith, and wedging means for effecting such connection.

5. The combination with an electrolytic tank and a diaphragm cell arranged therein of a tube, one end of which is situated in the diaphragm cell, the other end having a conical end-piece fitting into and being pressed against the walls of an opening in a wall of the electrolytic tank to form a tight connection therewith, and a nipple having an adjustable tight connection with the walls of said opening and being provided with a tube whereby the level of the liquid in the cell may be regulated by raising and lowering the tube.

6. The combination with an electrolytic tank and a diaphragm cell arranged therein of a tube, one end of which is situated in the diaphragm cell, the other end being pressed against the walls of an opening in a wall of the electrolytic tank to form a tight connection therewith, wedging means for effecting such connection, a nipple having an adjustable tight connection with the walls of said opening and being provided with a tube whereby the level of the liquid in the cell may be regulated by raising and lowering the tube.

7. The combination with an electrolytic tank and a diaphragm cell arranged therein of means affording a complete channel from the interior of the diaphragm cell through a wall of the electrolytic tank to the exterior of said tank, said means including a means whereby the outlet of the channel may be raised and lowered with respect to the level of the liquid in the cell.
8. The combination with an electrolytic tank and a diaphragm cell arranged therein and detachable therefrom, of means affording a complete channel leading from the interior of the diaphragm cell to the exterior of the electrolytic tank, said means including means whereby the channel may be interrupted when the electrolytic tank is removed, and including means whereby the outlet of the channel may be adjusted with respect to the level of the liquid in the cell.

Signed at Christiania, Norway, this 5th day of August 1920.

GUSTAF HAGLUND.