Feb. 5, 1929. 1,701,346

E. THOMSON

ELECTROLYTIC APPARATUS AND METHOD OF OPERATION

Filed March 25, 1926 2 Sheets-Sheet 1

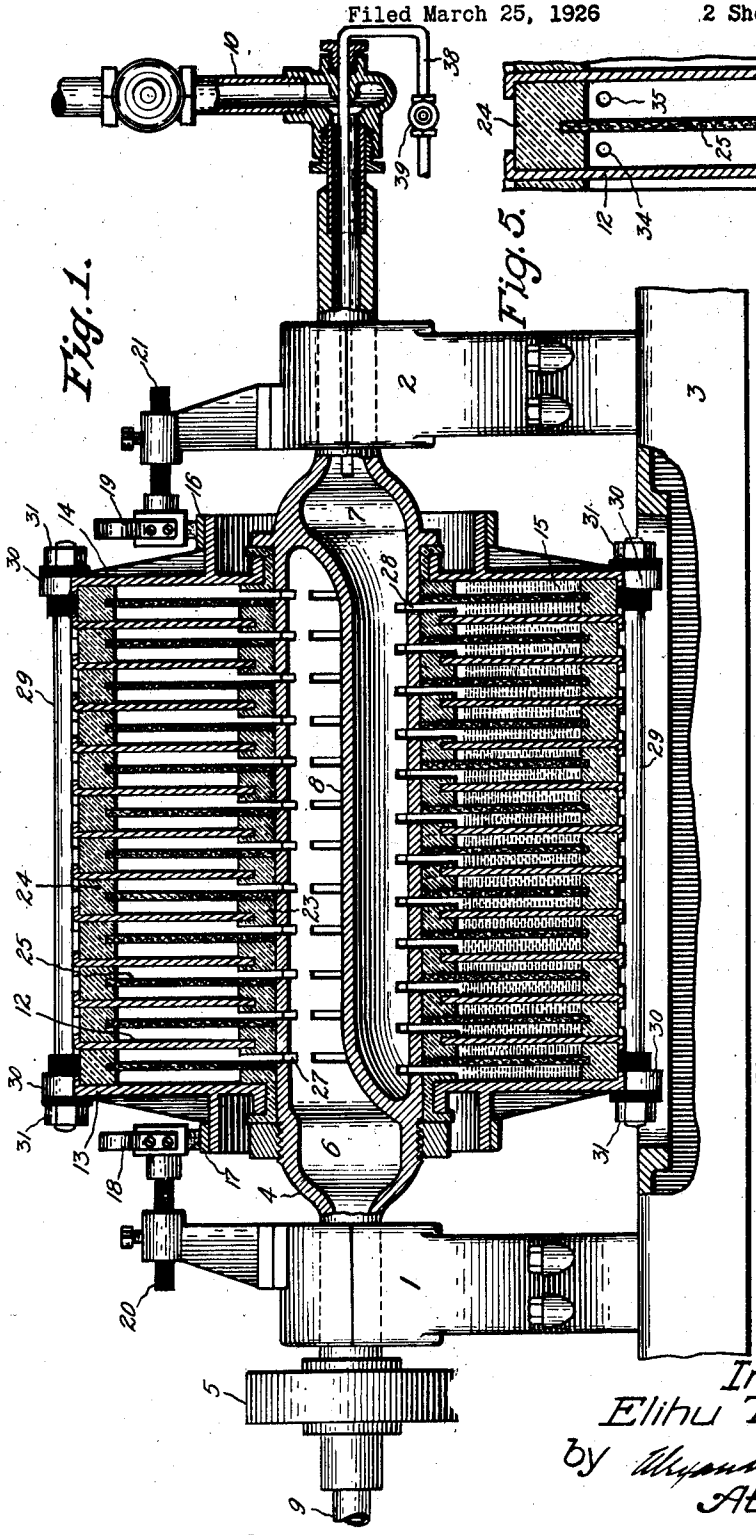


Fig. 1.

Fig. 5.

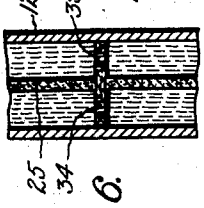


Fig. 6.

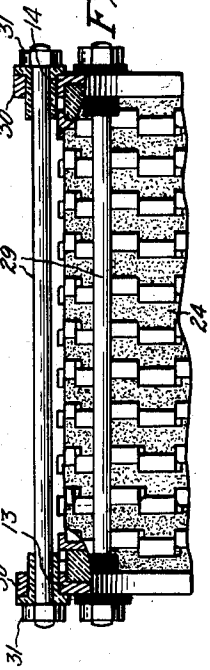


Fig. 4.

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Fig. 2.

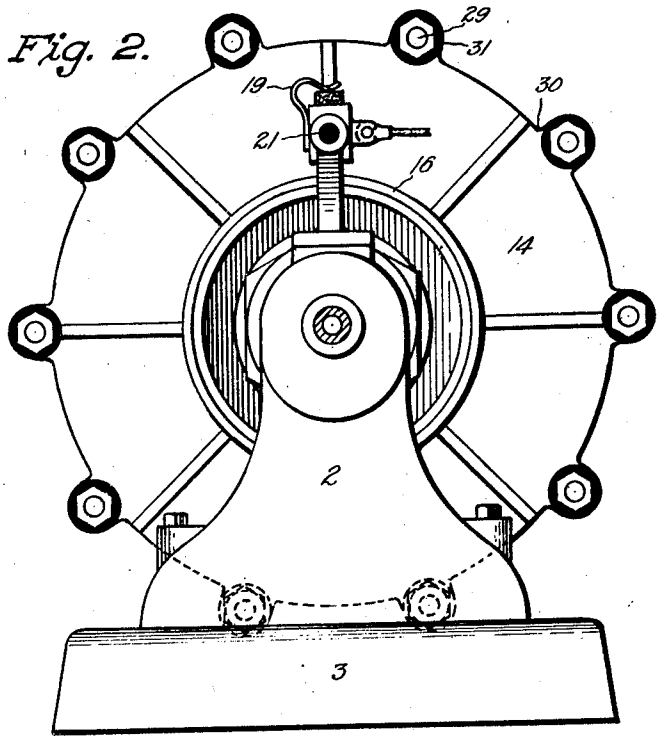


Fig. 7.

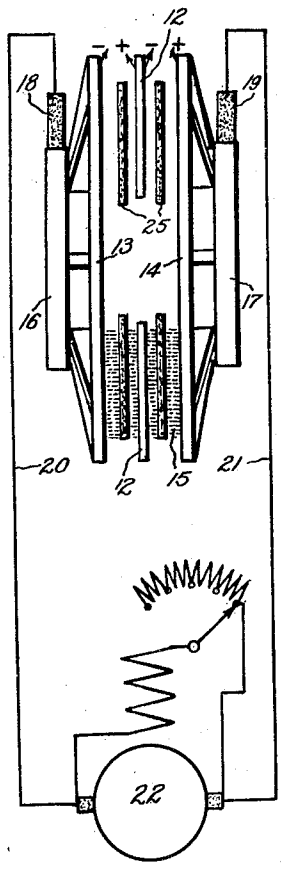
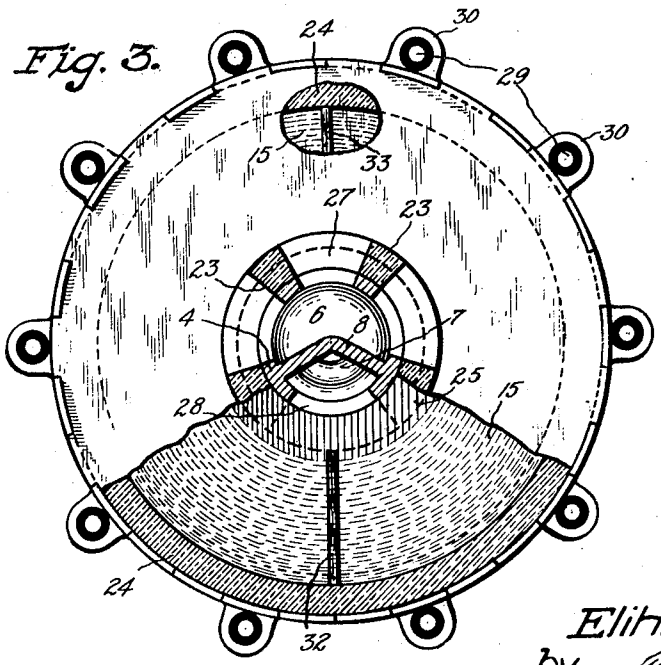


Fig. 3.



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Patented Feb. 5, 1929. 1,701,346

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF SWAMPSCOTT, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTROLYTIC APPARATUS AND METHOD OF OPERATION.

Application filed March 25, 1926. Serial No. 97,376.

The present invention relates to the construction of electrolytic apparatus and in particular to apparatus used for the electrolytic production of oxygen and hydrogen from water.

In apparatus of this type a limitation is imposed by the slowness with which gas bubbles separate from the electrodes and ascend through the electrolyte. When it is attempted to increase the current density in order to speed up the production of gas, then the collection of gas bubbles at the electrodes unduly increases the electric resistance of the device.

In accordance with my invention this difficulty is overcome by providing an apparatus wherein the electrolyte is subjected to centrifugal force to promote the separation of gas bubbles from the electrodes.

My improved apparatus comprises a plurality of cells of annular form arranged around an axis of a hollow shaft having two compartments communicating with the electrolytic cells by a plurality of ducts so arranged that hydrogen is delivered to one compartment of the hollow shaft and oxygen to the other compartment of the shaft.

Fig. 1 shows in side elevation and partly in section, my improved apparatus as a whole; Figs. 2 and 3 are end elevations, the latter being partly in section to show the interior structure; Fig. 4 is a fragmental view of one portion of the periphery of the apparatus which shows the arrangement of the electrode plates in the construction; Figs. 5 and 6 are detail views illustrating the structure of the electrolytic cells; and Fig. 7 in a diagrammatic way illustrates the electric connections and the path of the current through the cells.

As shown in Fig. 1, an electric apparatus is rotatably mounted upon the pedestals 1 and 2 which is supported upon a base 3. Rotation is secured by a pulley wheel 5. The hollow shaft 4 contains the compartments 6 and 7 which are separated from each other by the wall 8, and which serve for the collection of the gases produced at the opposite electrodes. The gases are carried away from the compartments through the hollow shaft by the conduits 9, 10, which communicate with the rotating shaft through stuffing boxes. Annular cells are arranged around the hollow shaft as indicated in Fig. 1, the cells being separated by the plates 12. These plates, together with the end plates 13, 14, all consisting of nickel or iron, serve as electrodes for carrying out the electrolysis of the electrolyte 15 which, during rotation of the apparatus is forced to the periphery of the apparatus. As shown in Figs. 1 and 7, the end plates 13, 14 acting as terminal electrodes are connected by the slip rings 16, 17 through the intermediary of the electric brushes 18 and 19 to the conductors 20, 21 which lead to a direct current generator 22 or other suitable source of electric power.

The electrode plates 12 are mounted in rings 23, 24, consisting of suitable insulating material, such as vulcanized rubber for example, the plates being spaced transversely with respect to the shaft so as to provide a series of annular chambers. As shown in Fig. 1 the bent over ends of the plates 12 are turned to the right and the left to secure the insulating rings 24 in proper relation to the electrode plates. Each of the cells are divided intermediate the electrodes by a porous septum 25 consisting of asbestos cloth, fibre, or other suitable material. Openings 27, 28 are provided through the insulating rings 23 whereby the alternate halves of the cells communicate with the respective chambers 6, 7 so that the gases produced at the opposite electrodes for example, oxygen and hydrogen, are separately collected. This cell structure is held together by the longitudinal rods 29 which pass through holes in the ears 30 and the insulated nuts 31.

As shown in Figs. 3, 5 and 6 one or more transverse partitions 32, 33 are provided whereby the electrolyte during the beginning of revolution is caught up and set into motion. Openings 34, 35, are provided as shown in Figs. 5 and 6 to permit the level of the electrolyte to be equalized. Water may be supplied to the electrolyte to make up for decomposition and losses by a pipe 38 provided with a valve 39 and communicating with the hollow shaft through a stuffing box.

During revolution the electrolyte (an aqueous alkaline solution, for example) is thrown outwardly against the periphery, forcing the gases toward the centre, the difference in inertia between the container and the electrolyte assisting in stripping the gas bubbles from the electrodes. The current passes transversely across the stack of cells as shown diagrammatically in Fig. 7 for two cells. The apparatus permits of operation

at high current density without deleterious frothing or heating.

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

1. An electrolytic apparatus comprising the combination of a rotatable receptacle having a hollow shaft, means for providing therein a plurality of annular electrolytic cells arranged in stacked relation at right angles to the axis of rotation of said receptacle, permeable partitions sub-dividing said cells and means comprising said shaft for separately collecting gases from the positive and negative halves of said cells.

2. An electrolytic apparatus comprising a rotatable receptacle having a hollow shaft, a plurality of electrodes therein arranged substantially at right angles to the axis of rotation of said receptacle and means comprising separate portions of said hollow shaft for carrying away during rotation gases evolved at opposite electrodes during the electrolysis of an electrolyte in said apparatus.

3. An electrolytic apparatus comprising a rotatable receptacle having a hollow shaft, a partition subdividing said shaft into separate chambers, a plurality of electrolytic cells spaced about said shaft, means for subdividing said cells, conduits communicating from corresponding portions of said cells and said chambers to separately collect said gases there generated and mean for carrying away said gases during rotation.

In witness whereof, I have hereunto set my hand this 22nd day of March, 1926.

ELIHU THOMSON.