(No Model.)

T. CRANEY.

ELECTROLYTIC APPARATUS.

No. 487,996. Patented Dec. 13, 1892.

Fig. 1.

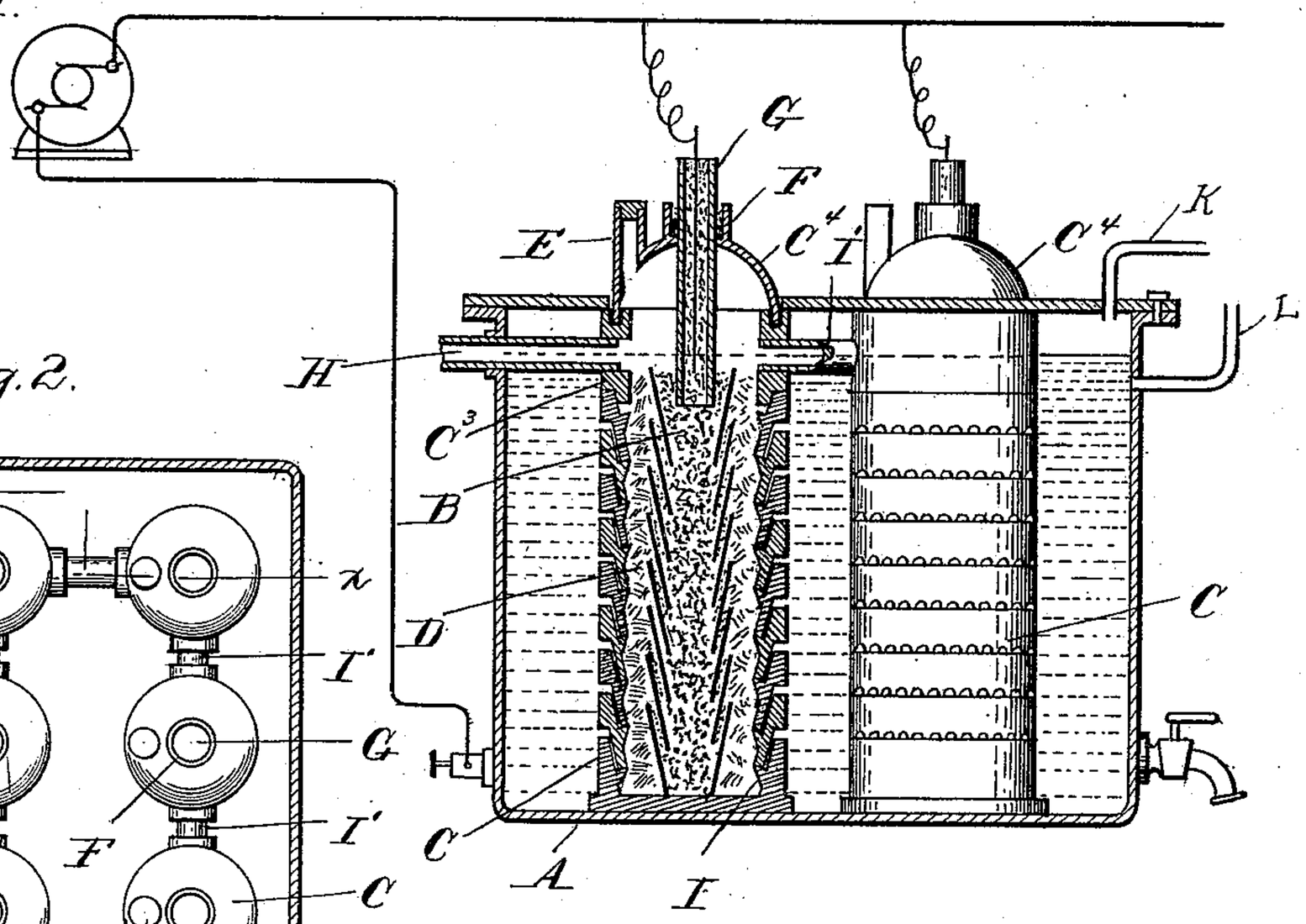


Fig. 2.

Fig. 4.

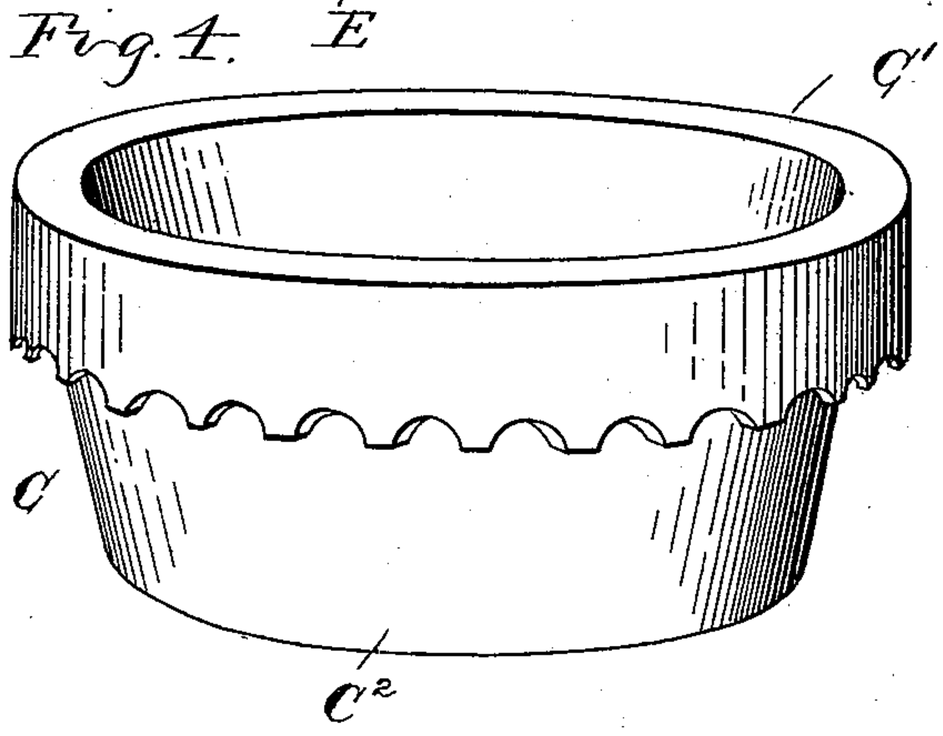
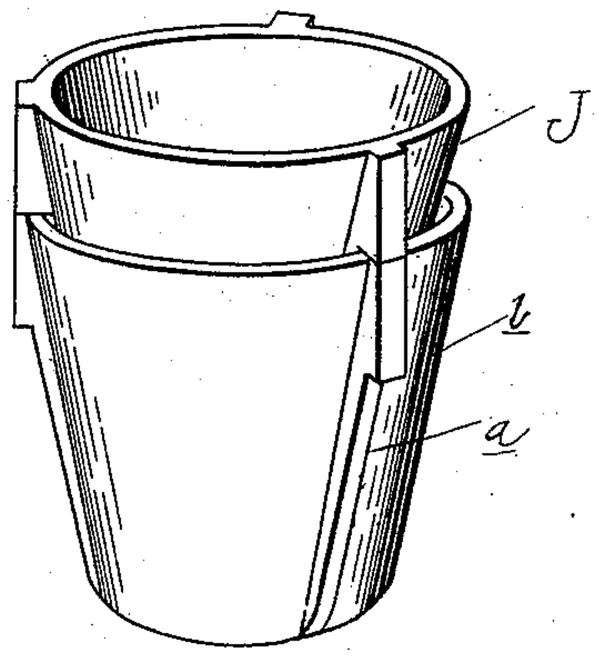


Fig. 3.



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THOMAS CRANEY, OF BAY CITY, MICHIGAN.

ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 487,996, dated December 13, 1892.

Application filed January 4, 1892. Serial No. 416,958. (No model.)

To all whom it may concern:

Be it known that I, THOMAS CRANEY, a citizen of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Electrolytic Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in electrolytic apparatus.

The principal object of my invention is to produce an apparatus adapted for the commercial production of alkalies by electrical decomposition of their salts and notably for the manufacture of caustic soda from common salt.

In the previous state of the art various constructions of apparatus have been produced and tried with indifferent success, and the main difficulty to overcome is to devise an efficient apparatus which has a high degree of permanency, without which the commercial manufacture of caustic soda from common salt cannot be successfully conducted. To insure permanency of any apparatus of this kind, it is necessary to provide for a permanent construction of anode and of electrolytic cells or diaphragms which are not disintegrated or rendered inoperative by the products of decomposition. The construction of an anode filling this requirement I have made the subject-matter of a previous application, Serial No. 416,764, filed January 2, 1892, and will refer to this matter only incidentally, the main object of the present invention being the construction of the diaphragm or cell. The purpose of a diaphragm or cell interposed between the anodes and cathodes is to separate the products of electrical decomposition in separate compartments, to prevent chemical reaction, and to facilitate their ultimate separation. The kind of cells or diaphragms which were employed heretofore are either the so-called "porous" cells, through which the electrolyte or its products of decomposition can more or less freely circulate and intermingle in the two chambers, and the so-called "non-porous" cell, which is made of a kind or construction to permit electrolytic action to take place without permitting the intermingling of the products of decomposition in the chambers. The former, while for a time very efficient, soon have their pores filled up with gas or other products of decomposition, whereby their electrical resistance becomes so great as to interfere with their continuous use, while the so-called "non-porous" cells have too high an electric resistance to render their use economical. Besides, no cell of this kind has been devised which is in any sense permanent.

The object of my invention in the construction of my electrolytic diaphragm or cup is to provide for an effective separation of the products of decomposition, combined with a high degree of permanency, and to this end I construct the cup or diaphragm sections of clay, stoneware, glass, or other like indestructible material, with interlocking joints between the sections and deflecting-flanges, and at the same time constitute a receptacle for crystals of salt, whereby I obtain an effective separation with low electrical resistance and provide for the maintenance of a saturated solution for the continued action of electrolysis.

In the drawings, Figure 1 is a diagram section of my apparatus on line $x\,x$ in Fig. 2. Fig. 2 is a plan view thereof. Fig. 3 is a detail showing the construction of the support provided for an anode. Fig. 4 is a detail showing the construction of one of the sections of the cup.

A is a tank or vessel, preferably of iron, so as to serve as a cathode.

B are the anodes, and C are the cups surrounding the anodes and forming a receptacle for the body of salt crystals D, filled in around the anode. The cups C are composed of superimposed sections of vitrified stoneware, glass, or other like indestructible material, substantially constructed as shown in the drawings, Fig. 4, in which C′ is a cylindrical upper portion. C^2 is a reduced conical lower portion fitting into the upper portion, the construction being such that by superimposing the sections a cylindrical receptacle is formed which is closed at the lower end and open at the upper end, while the joints form passages for the electrolyte between the sections, which may be enlarged by scalloping the lower edge of the cylindrical portion C′.

Each section is provided interiorly with a deflecting-flange I. On top of each cup above the height of the solution in the tank A is an apertured ring C^3, secured by interlocking flanges, and above the same is a cover C^4, which is permanently sealed to the ring C^3. This cover is provided with a fill-opening E and with a central neck F, for the purpose of holding the upper extension G of the anode, which is also permanently sealed in the neck. All the cups are connected to each other and to an exit-pipe H by suitable connections I′, permanently sealed in the apertures provided therefor and in the ring C^3.

The construction of the anodes has been specifically described in my before-named application, and consists substantially of a hollow support of similar material as the cells C, and is composed of a vertical series of conical cup-shaped sections J, inserted into each other, with interstices formed between the walls of the sections by suitable ribs *a*, having supporting-shoulders *b*. The upper end is formed by a tubular extension G. The interior and the interstices between the cups are filled with carbon, which forms the anode B, by being connected to the positive pole of the generator.

K is a suitable pipe for conveying the solution to be electrolyzed into the tank, and L is a pipe for the escape of the hydrogen. It will be observed that by this construction the intermingling of the products of decomposition is prevented without creating a high electrical resistance and permanency of operation is assured. The chlorine gas has a large and free exit provided for it at or near the surface of the liquid, whereby it can continuously escape without producing any interior pressure liable to obstruct the free separation and escape. Suitable means are provided for drawing off the solution of caustic soda which collects in the cathode-chamber and for the escape of the hydrogen. The escape-pipe H for the chlorine gas forms at the same time an overflow for such products of decomposition incidentally forming in the process of electrolysis, and which may thus be separately collected for further use.

While I have described the construction and operation of my apparatus in connection with the electrolysis of common salt, I do not want to be limited in its use to such purpose alone, as it is equally adapted, broadly, for the electrolysis of various kinds of metallic salts.

What I claim as my invention is—

1. An electrolytic cup formed of superimposed sections of stoneware or similar material and provided with interlocking joints between the same and deflecting-flanges on the inner walls thereof, substantially as described.

2. In an electrolytic apparatus, the combination of an electrolytic cup composed of a series of superimposed sections, an inclosing top forming a chamber for the collection of the gaseous product, an anode centrally supported within the cup, and a solid body of the salt to be electrolyzed filled in between said anode and the cup, substantially as described.

3. In an electrolytic apparatus, an electrolytic cup, of stoneware or other indestructible material, built in sections, having upper cylindrical portions and lower conical portions fitting within the cylindrical portions, and deflecting-flanges formed on the inner walls thereof, substantially as described.

4. In an electrolytic apparatus, an electrolytic cup built of superimposed sections of stone or glassware partly fitting within each other, an apertured ring supported thereon, and a cover having a central aperture for the passage of the anode, substantially as described.

5. In an electrolytic apparatus, the combination of an electrolytic cup consisting of a series of superimposed sections of stoneware or like material, each section having a cylindrical upper portion, a conical lower portion, and a deflecting-flange formed on the inner wall of the section, a ring surmounting the sections and provided with an exit-pipe, and a cover sealed upon the ring and having a central opening for the anode, and a fill-opening, substantially as described.

6. In an electrolytic apparatus, the combination of an anode and an electrolytic cup inclosing said anode, forming a closed receptacle around said anode, said cup consisting of a series of superimposed sections of stoneware or like material and having interlocking joints and open interstices between the sections, an apertured ring supported thereon and having an exit-pipe, and a cover having a central aperture in which the anode is sealed, substantially as described.

7. In an electrolytic apparatus, the combination, with the outer tank for holding the electrolytic solution, of a series of anodes and a series of cups inclosing said anodes and containing a solid body of the salt to be electrolyzed, said cups extending above the surface of the solution in the tank and having communicating pipes for the exit of the gaseous products, and fill-openings, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS CRANEY.

Witnesses:
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N. L. LINDOP.