(No Model.)

# T. CRANEY.

## ELECTROLYTIC APPARATUS.

No. 482,724. Patented Sept. 20, 1892.

Fig. 2.

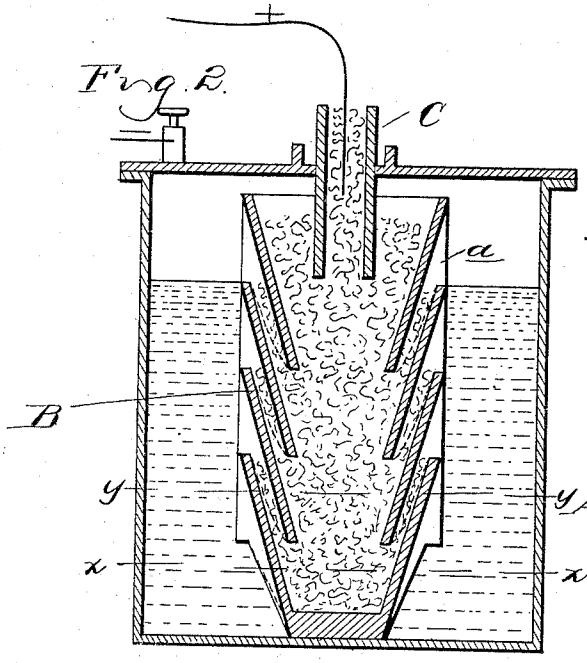



Fig. 1.

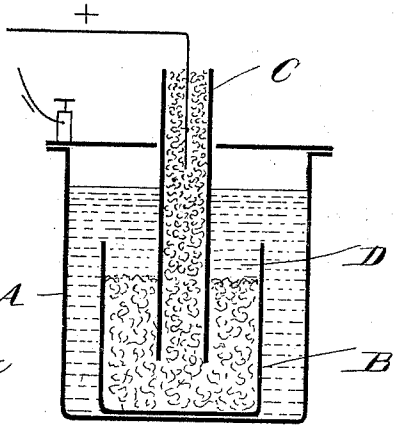



Fig. 3

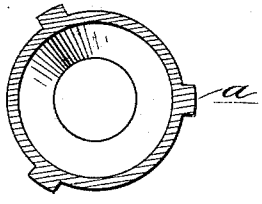



Fig. 4.

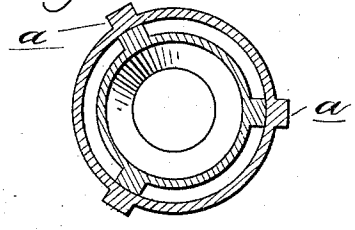



Fig 5

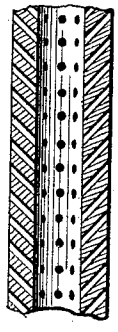
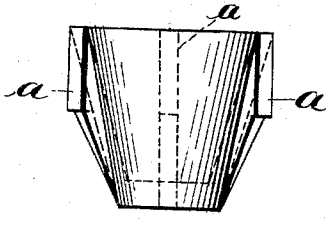


Fig. 6.

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# UNITED STATES PATENT OFFICE.

THOMAS CRANEY, OF BAY CITY, MICHIGAN.

## ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 482,724, dated September 20, 1892.

Application filed January 2, 1892. Serial No. 416,764. (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, and refers more specifically to the construction of the anode. The process of electrolysis has been applied heretofore for the decomposition of solutions of metallic salts; but none of the attempts have been of practical success as far as the commercial exploitation of the process on a large scale is concerned. The reason for this is mainly due to the fact that the permanency of the anodes and cathodes could not be maintained for any reasonable length of time. In electrolyzing metallic salts—such as chloride of sodium—it is especially difficult to prevent the anode from disintegration, as it is exposed to the destructive action of the chlorine. The one material which has been found to have suitable conducting qualities and to be practically indestructible is carbon, and the way it has been employed is in the form of a solid body or pencil made either of carbon or powdered carbon held together by a binding material carbonized by baking. While such solid carbon bodies or pencils are sufficiently-good conductors, they are not permanent enough to make their use in a commercial plant a success, as they soon disintegrate either by the mechanical action of the current or the chemical action of the acid radicals, such as chlorine gas, the chlorates, or other products formed by electrolysis of chloride of sodium, and which act upon the impurities in the carbon.

The object of my invention is to make a carbon anode in such a manner that neither the action of the electric current nor the disintegrating chemical action of the products of the electrolysis can break it down, and thereby destroy its permanency; and to this end it consists in incasing the carbon body in a cell or cells formed of non-porous and non-conducting material and confining the electrolytic action of the anode to a segregated portion or portions of the body. The material which forms the cell is made of stoneware, glass, or other like substance unaffected by the action of the current, as well as by the chemical action of the products of electrolysis, and the segregated portions are inclosed or contained in vertical or substantially vertical interstices formed in the walls of a cell or between the walls of two or more superimposed cells or sections. In this way the disintegration of the segregated portion of the anode will not in any way affect the permanency of the anode, all as more fully hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a diagrammatic section of an electrolytic apparatus embodying the principle of my invention. Fig. 2 is a vertical central section through the electrolytic apparatus embodying the principle of my invention in a modified form. Fig. 3 is a horizontal section on line *x x* thereof, and Fig. 4 is a similar section on line *y y*. Fig. 5 is a vertical section through a modified form of cell. Fig. 6 is a side elevation of one of the cells.

A represents a suitable electrolytic vessel or vat in which the chloride of sodium or other solution to be treated is contained.

B is a cell placed within the vessel A. It is made of a material which remains unaffected by the solution under treatment or any of the products of electrolysis thereof. C is a smaller cell of the same material projecting with its lower end into the cell B and with its upper end above the surface of the solution in the vessel A, the two cells forming the interstitial space D between their walls. The tube C and cell B are preferably filled with some finely-divided carbon packed into the same, so as to form a continuous conductor of electricity from the top above the liquid to the exposed surface in the solution. In this manner a portion of the carbon is segregated from the body and is exposed to the solution in the tank A at its upper horizontal surface in the cell B around the tube C, while the vertical surfaces are permanently protected therefrom, as well as from the products formed at the anode.

The construction of the electrolytic vessel itself forms no part of this invention, and it may be of any suitable form to permit the proper

charging and discharging of its contents and the collection of any gaseous products should any arise.

The walls of the vessel A may represent the cathode, or a separate cathode or cathodes may be used.

The terminals of the battery or generator are secured to the cathode and anode in the usual manner.

It is within the spirit of my invention to have the carbon either in finely-divided particles firmly packed into the vessel B and tube C or have it solidified by the usual process of baking it with a carbonizable binding material, or it may be formed partly of one and partly of the other—as, for instance, the mass in the tube C could be formed solid, while all or a portion of the material in the vessel B may be in a finely-divided state. In either form it will be seen that the vertical surfaces are absolutely protected, while the horizontal surface left exposed may be disintegrated to a considerable depth without affecting the permanency of the anode, and no falling away or breaking down of the anode can take place, while at the same time a free discharge is provided for any gaseous products.

For the commercial exploitation of my invention I preferably construct the anode in the form as shown in Fig. 2, in which the cell B is formed of conical sections partly inserted into each other, with interstices left between the walls of the superimposed sections. These spaces may be obtained by providing the sections of the outside with suitable ribs or projections *a*, or other suitable means may be employed for the purpose. The cell C may or may not be used. Its object is to extend the carbon anode above the surface of the solution, which object could be obtained by using enough sections in forming the cell B. The carbon is either packed in in a finely-divided state or baked solid, as before described, and the interstices between the walls of the sections are again filled in to form segregated portions of the body, with the horizontal surfaces of these portions exposed to the electrolytic action. In this construction a series of horizontal surfaces is formed on the outside of the anode in which the carbon is brought in direct contact with the solution in the vessel and which may be disintegrated to a considerable depth without affecting the permanency of the anode, the body of which is permanently protected.

Instead of building the cell B in sections it may be formed integrally in one piece, as shown in Fig. 5, in which the interstices are formed by perforations in the walls of the cell as nearly as possible in a vertical direction as required to form interstices of the required depth to form segregated portions for the carbon body.

What I claim as my invention is—

1. In an electrolytic apparatus, an anode consisting of a body of carbon arranged to expose a number of separate horizontal surfaces and a cell of non-conducting material inclosing said anode and having openings leading to said surfaces, substantially as described.

2. In an electrolytic apparatus, a carbon anode incased within an outer supporting-cell of non-conducting material, said anode consisting of a central body of pulverized carbon packed within the wall of the cell and having segregated portions contained within pockets or interstices formed in the walls of the cell and forming exposed horizontal surfaces, substantially as described.

3. In an anode for electrolytic apparatus, the combination of a cell of non-conducting material formed with open interstices in the wall thereof and a carbon body incased within said cell and provided with segregated portions contained in the interstices of the cell and forming exposed horizontal surfaces, substantially as described.

4. In an anode for electrolytic apparatus, the combination of a cell consisting of a series of superimposed sections projecting within each other and forming open interstices between such sections and a body of carbon incased within said cell and having segregated portions extending into the interstices between the sections and forming the exposed sections of the anode, 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.