T. GRISWOLD, JR.

ELECTROLYTIC CELL.

APPLICATION FILED JUNE 15, 1911.

1,070,454.

Patented Aug. 19, 1913.

2 SHEETS—SHEET 1.

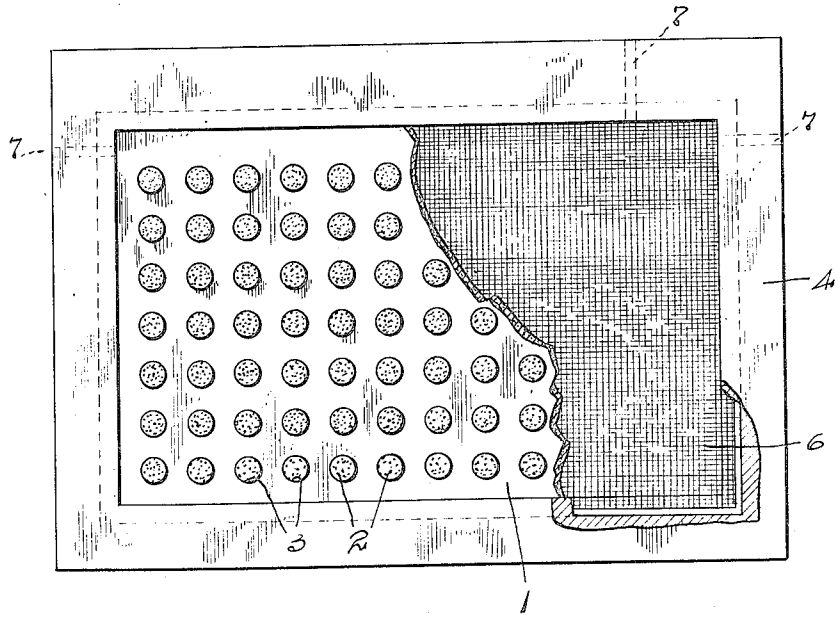

Fig. 1

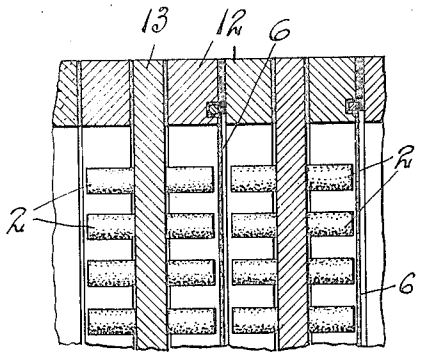

Fig. 5

Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

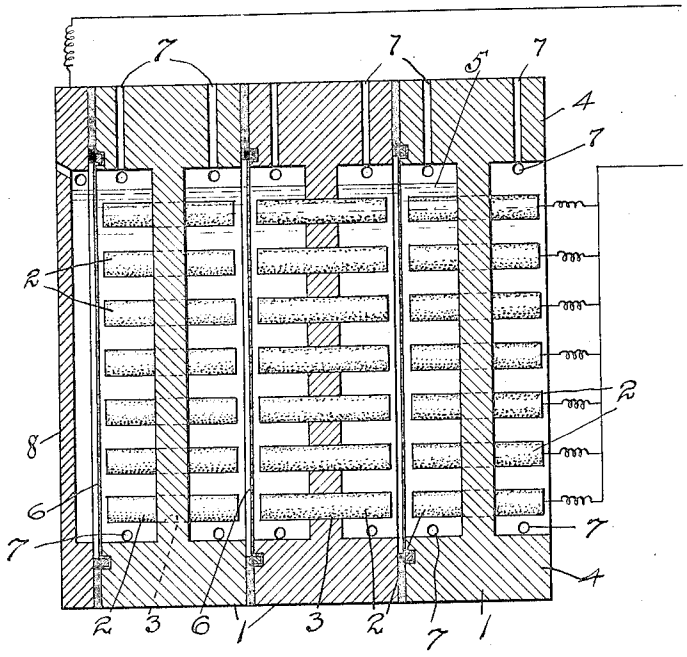


Fig. 3.

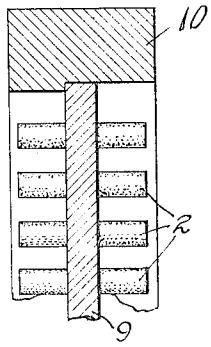
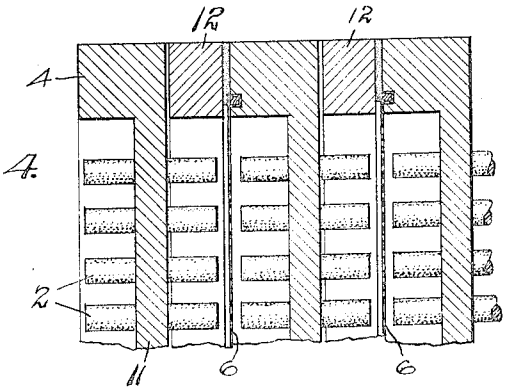


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTROLYTIC CELL.

1,070,454. Specification of Letters Patent. Patented Aug. 19, 1913.

Application filed June 15, 1911. Serial No. 633,320.

To all whom it may concern:

Be it known that I, THOMAS GRISWOLD, Jr., a citizen of the United States, and a resident of Midland, county of Midland, and State of Michigan, have invented a new and useful Improvement in Electrolytic Cells, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present improvements relate more particularly to the construction of bi-polar electrodes for use in electrolytic cells of the kind illustrated, for example, in my Patent No. 987,717, dated March 28, 1911. In the form of cell illustrated in such patent, a solid block of carbon, graphite, or other equivalent material is used as electrode.

The object of the present improvements is to provide an electrode that, while retaining all of the advantages of the patented construction, will, nevertheless, require less carbon or graphite for the construction of a cell of given output or capacity; as also to permit the use in the construction of such electrodes of carbon or graphite in forms in which it is more readily obtainable, and at a lower cost, than the large integral blocks, or plates, illustrated in the patent.

A further object is to permit the renewal of those parts of the electrodes which wear away most rapidly, with a minimum of expense and trouble.

To the accomplishment of the above and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—Figure 1 represents an elevational view of an electrode constructed in accordance with the present invention, a broken section of a diaphragm normally associated with such electrode appearing therewith; Fig. 2 is a transverse section of a series of cells built up of electrodes, such as illustrated in Fig. 1; Fig. 3 illustrates in a similar section, a modified construction of electrode; and Figs. 4 and 5 respectively illustrate yet other modified forms.

The present improved electrode may be described in a general way as being a composite one, made by inserting, or otherwise fixing, in a suitable carrying member, one, or many bi-polar carbon electrodes. This carrying member may be constructed of any suitable material adapted for the purpose for which the cell is to be used; thus wood, soap stone, slate, cement, glass, stone-ware or the like, may be used in such construction.

The bi-polar electrodes are composed of non-porous carbon blocks, rods, or pencils inserted in the aforesaid carrying members, the lengths of the projecting portions of said electrodes being properly proportioned to the space left between the contiguously disposed faces of the successive electrodes when assembled to form cells. Such electrodes may be inserted into holes in the carrying members provided for this purpose and may be secured therein with any suitable cement or lute; or the holes may be of such a size that the electrodes will fit them accurately without luting. The form, also, of the carrying members may be various, so long as they are adapted, either alone or in conjunction with other members, to form a series of successive cells such as disclosed in the patent above referred to. Thus in Figs. 1 and 2, such carrying members consist of flat plates 1 through holes 3 in which the bi-polar electrodes 2 are passed, and then cemented or otherwise secured, as above described, such plates being formed with raised annular margins of such dimensions, that when two of them with their bi-polar electrodes, are brought together face to face, they form between them a chamber or cell 5 for the reception of the electrolyte. If desired, a diaphragm 6 may be secured in position between successive electrodes by clamping it between the annular margins of the carrying members. Suitable openings 7 are also provided for the inlet and outlet of the electrolyte and for the escape of the gaseous products resulting from the electrolysis of the same, or for such other purposes as may be desired.

Direct electrical connection may be made with the individual electrodes 2 in the terminal carrying members, or plates, to form thereof the terminal anode and cathode of

the series of cells, as illustrated at the right in Fig. 2; or a plate 8 may be employed to close the terminal cell and form such anode, or cathode, as illustrated at the left in the same figure. As it is the anodes that corrode the more rapidly and thus afford occasion for the renewal or repair to which the present improved construction of electrode is particularly adapted, the arrangement of Fig. 2 in which a plate 1 with such improved electrodes constitutes the terminal anode of the series of cells, and a plate 8, the terminal cathode, is a preferred arrangement.

In the modification in the construction of the carrying member illustrated in Fig. 3, the carrying member consists of a simple flat plate 9, somewhat as before, but without the enlarged margins 4. Such plate is then secured in an annular frame 10, corresponding in a way with the enlarged margins of the previous construction. Fig. 4 shows the electrode carrying member as consisting of a plate 11 with an enlarged margin 4 on its one face only, the proper spacing of the opposite face from that of the next adjacent electrode being secured by interposing an open frame 12 of the proper dimensions and thickness. Indeed, as illustrated in Fig. 5, such frames may be employed on both sides of a flat-like member 13 for carrying the electrodes, thus simplifying the construction of the carrying members, although increasing the number of joints in the assembled series of cells.

Where rods or pencils of carbon are used for insertion in the carrying members to form the composite electrodes, it will be readily understood that such rods, being a staple article of commerce and having extensive use in other connections, may be obtained more cheaply than specially constructed blocks of carbon of suitable dimensions for use in the construction of cells, such as those in hand. Furthermore, the renewal of the corroded anodes is readily accomplished, and with much less expense for material, in the present construction, than where solid electrodes are used. It will also be seen that when the anode of the bi-polar electrodes become reduced to use, the current can be reversed through the cells and thus the ends of the electrodes, which were formerly anodes will then become cathodes and a new period of use be obtained from the cells, before renewal of electrodes becomes necessary.

Neither the specific construction of the carrying member, as has already been indicated, is material, nor is the use of any specific form of diaphragm involved as a part of the present invention. Similarly, the manner in which the cell is fed, or in which the products, resulting from the electrolysis carried on therein, are removed, constitutes no part of the invention, the arrangements for these several purposes that are illustrated being merely typical.

With regard to the material used for the carrying member, it may be remarked that certain materials will be more acceptable for use with forms than with other; thus the form of member illustrated in Figs. 1 and 2 is conveniently constructed of Portland cement or other plastic compound which may be molded into the form shown, either with the electrodes in place, or inserted afterward. The forms illustrated in Figs. 3 and 4 are well adapted to be constructed out of soap-stone or slate, where flat slabs of such material may be employed. Both in this construction and in that of Fig. 3, the carrying member may obviously be made of one material, while the enlarged margin, being separate from the plate, may be of another, different material. These enlarged margins, as they have been termed where integral with the plate, or annular frames, as they have been termed where separate from such plate, may be more simply designated as separating members, their function being to form a chamber for the electrolyte when interposed between successive carrying members, proper. By reason of the non-conducting character of the materials, specified above as adapted for use in the construction of these carrying members, it will be seen that the electrode elements are the individual carbon blocks, rods or pencils inserted in such carrying members.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. An electrolytic cell comprising two bi-polar electrodes and a separating member secured therebetween, whereby a chamber for the electrolyte is formed, said electrodes each consisting of a carrying member and electrode elements removably secured thereto.

2. An electrolytic cell comprising two bi-polar electrodes and a separating member secured therebetween, whereby a chamber for the electrolyte is formed, said electrodes each consisting of a carrying member of non-conducting material and electrode elements of conducting material secured thereto.

3. An electrolytic cell comprising two bi-polar electrodes and a separating member secured therebetween, whereby a chamber for the electrolyte is formed, said electrodes each consisting of a plate-like carrying member and electrode elements secured in

said member so as to project on both sides of the same.

4. An electrolytic cell comprising two bi-polar electrodes and a separating member secured therebetween, whereby a chamber for the electrolyte is formed, said electrodes each consisting of a plate-like carrying member and electrode elements removably secured in said member so as to project on both sides of the same.

5. An electrolytic cell comprising two bi-polar electrodes and a separating member secured therebetween, whereby a chamber for the electrolyte is formed, said electrodes each consisting of a plate-like carrying member of non-conducting material and electrode elements of conducting material removably secured in said member so as to project on both sides of the same.

6. An electrolytic cell comprising two bi-polar electrodes and a separating member secured therebetween, whereby a chamber for the electrolyte is formed, said electrodes each consisting of a plate-like carrying member of non-conducting material and carbon pencils removably secured in said member so as to project on both sides of the same.

7. A series of electrolytic cells consisting of a plurality of bi-polar electrodes and separating members alternately arranged and held together, each pair of electrodes, jointly with the interposed separating member, forming a chamber for the reception of the electrolyte and such electrodes each consisting of a carrying member and electrode elements removably secured thereto.

8. A series of electrolytic cells consisting of a plurality of bi-polar electrodes and separating members alternately arranged and held together, each pair of electrodes jointly with the interposed separating member, forming a chamber for the reception of the electrolyte and such electrodes each consisting of a carrying member of non-conducting material and electrode elements secured thereto.

9. A series of electrolytic cells consisting of a plurality of bi-polar electrodes and separating members alternately arranged and held together, each pair of electrodes, jointly with the interposed separating member, forming a chamber for the reception of the electrolyte and such electrodes each consisting of a plate-like carrying member and electrode elements secured in said member so as to project on both sides of the same.

10. A series of electrolytic cells consisting of a plurality of bi-polar electrodes and separating members alternately arranged and held together, each pair of electrodes, jointly with the interposed separating member, forming a chamber for the reception of the electrolyte and such electrodes each consisting of a plate-like carrying member and electrode elements removably secured in said member so as to project on both sides of the same.

11. A series of electrolytic cells consisting of a plurality of bi-polar electrodes and separating members alternately arranged and held together, each pair of electrodes, jointly with the interposed separating member, forming a chamber for the reception of the electrolyte and such electrodes each consisting of a plate-like carrying member of non-conducting material and electrode elements of conducting material removably secured in said member so as to project on both sides of the same.

12. A series of electrolytic cells consisting of a plurality of bi-polar electrodes and separating members alternately arranged and held together, each pair of electrodes, jointly with the interposed separating member, forming a chamber for the reception of the electrolyte and such electrodes each consisting of a plate-like carrying member of non-conducting material and carbon pencils removably secured in said member so as to project on both sides of the same.

Signed by me this 12 day of June, 1911.

THOMAS GRISWOLD, JR.

Attested by—
E. C. BARSTOW,
CLARA TURNER.