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G. J. ATKINS.

ELECTRODE OF ELECTROLYTIC APPARATUS.

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Fig. 1.

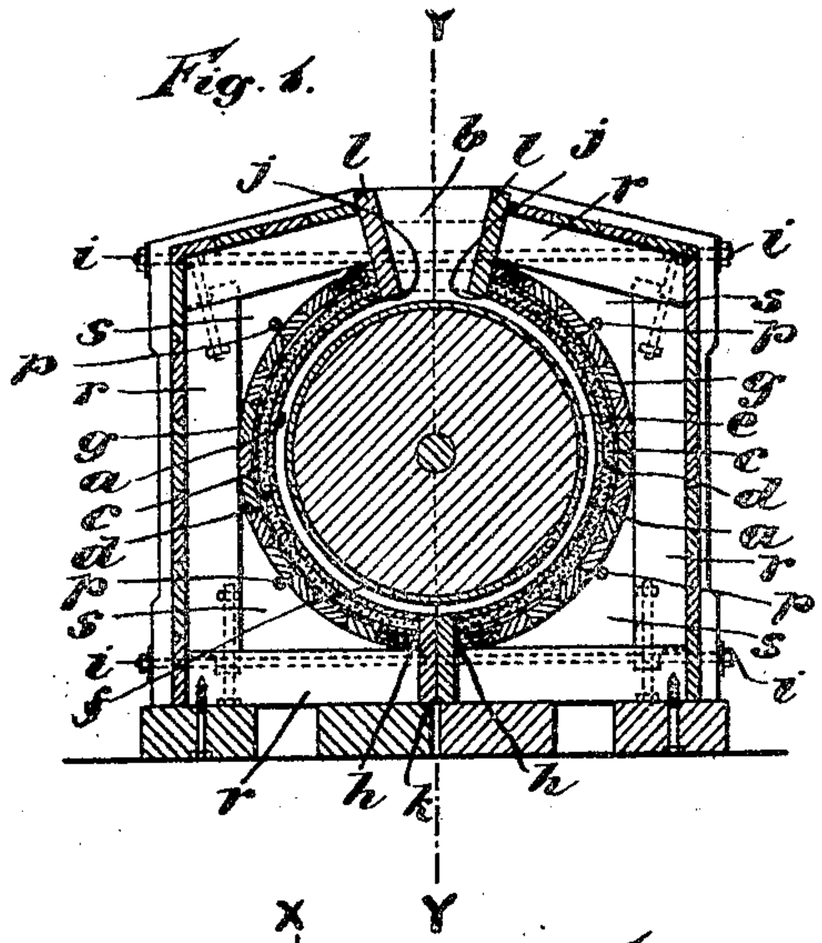
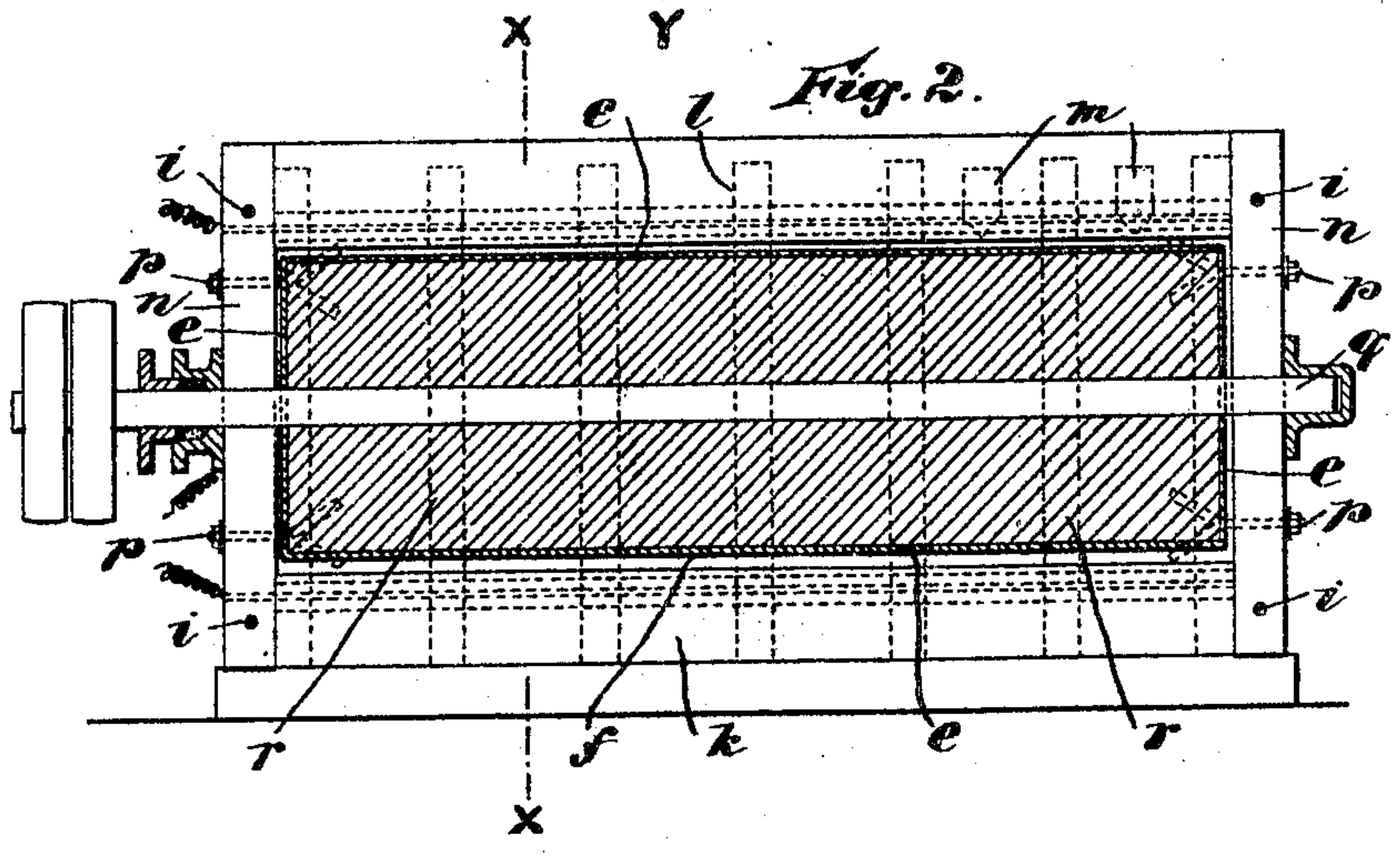


Fig. 2.



Witnesses.

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ELECTRODE OF ELECTROLYTIC APPARATUS.

No. 798,314. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed November 22, 1904. Serial No. 233,852.

To all whom it may concern:

Be it known that I, GEORGE JONES ATKINS, a subject of the King of Great Britain, residing at Tottenham, in the county of Middlesex, England, have invented new and useful Improvements in or Connected with the Poles or Electrodes of Electrolytic Apparatus and the Like, of which the following is a specification.

This invention relates to improvements in or connected with the electrodes of electrolytic apparatus of the kind in which a trough-like vessel of wood or other suitable material is lined with carbon which forms the anode-electrode, the internal surface of such carbon lining having a semicylindrical form and in which a cylindrical cathode-electrode is placed concentrically with the semicylindrical surface of the anode and is caused to rotate in the electrolyte contained therein. This rotating cathode is generally only immersed in the electrolyte to the extent of about half its diameter or less, and the output of any given apparatus is much less than if the cathode were wholly immersed in the electrolyte; but I have also found in practical working that in some cases the rotating cathode is liable to become oxidized by the alternate action upon its surface of the electrolyte and atmospheric air, which oxidation it is desirable to obviate.

The chief objects of the present invention are, first, to provide means whereby the efficiency of apparatus having such electrodes can be very materially increased, and, secondly, to provide special means for preventing atmospheric oxidation on that portion of the cathode of such apparatus which is exposed to the air. This incomplete immersion of the cathode and its oxidation may be prevented by simply making the trough-like vessel deep enough to contain sufficient electrolyte to cover the cathode completely; but that method is objectionable because it involves the presence of a comparatively large quantity of electrolyte which is not acted upon effectively by the electrode surfaces.

In order to effect the complete immersion of the cathode in the electrolyte and yet secure effective action of the electrode surfaces upon the electrolyte, I extend the carbon anode up beyond the heretofore-used semicylindrical anode, so as to form an almost completely cylindrical anode concentric with the outer cylindrical surface of the cathode and separated from it preferably by a narrow space only. This arrangement may be carried out in a variety of ways, one of which I have shown by way of example in the accompanying drawings, in which—

Figure 1 is a transverse section taken on the line X X of Fig. 2 of an electrolytic apparatus of the kind hereinbefore referred to constructed in accordance with my present invention; and Fig. 2. is a longitudinal sectional elevation of same, taken on the line Y Y of Fig. 1.

In the drawings, *a* represents the carbon anode, which is of almost completely cylindrical form except as to a longitudinal opening *b* at the top.

c represents conducting-plates which lead the electric current to the anode *a*.

d is a layer of conducting water-tight material interposed between the conducting-plate *c* and the anode *a* and which may be employed or not, according to circumstances, as will be hereinafter explained.

e is the revolving cathode. *f* is the space between the anode *a* and the cathode *e* containing the electrolyte to be treated, and *g* is the trough-like vessel containing the above-mentioned parts.

I have found it convenient to construct the apparatus in two parts, each of which corresponds approximately to one of the semicylindrical or segmental trough-like chambers of the known apparatus above referred to. These two approximately semicylindrical or segmental parts are placed in juxtaposition on their sides, as shown in Fig. 1, and held together, by means of bolts *i* or otherwise, so as to joint them liquid-tight at their lower edges *h*. The upper adjacent edges *j* of the two parts are so arranged that a more or less continuous opening *b* is left from end to end for the escape of the hydrogen and other gases generated during the electrolytic action. The metallic conductors *c* are connected in any suitable manner with the dynamo or other source of electricity. The lower edges *h* of the two parts may be jointed together direct and the joint made water-tight by means of a suitable cement—such as one made with carbon mixed with mineral oil, for example, or other water-repellent substance—or there may be interposed between the said edges *h* an abutment of wood or other suitable material *k*, against which the edges *h* are jointed with such cement, the parts being in either case pressed together by the lower screw-bolts *i*. The upper ends of the two segments of carbon *a*, forming the anode, are supported (so that they cannot fall in onto the cathode) by means of abutment-pieces *l*,

secured to the framework of the trough-like vessel, and in some cases cross-bars—such as those shown by dotted lines at *m*, for example—may be placed at intervals across the opening *b* for the same purpose. The ends of the more or less completely cylindrical anode *a* must be connected water-tight to the ends *n* of the trough-like vessel, and this may be effected by making the joints with cement, such as that above described, and drawing the surfaces together by means of the screw-bolts *p*.

The revolving cathode *e* may be made as usual or in any suitable way. Its metallic axis *q* must of course be passed through a stuffing-box in the end *n* of the trough-like vessel to prevent the escape past it of the electrolyte, and the electrical connection with the cathode may be effected through the said axis by means of sleeves, brushes, springs, or otherwise, as may be convenient.

It will be understood that the trough-like vessels containing the anodes *a*, conductors *c*, and when such are employed the interposed layers of conducting water-tight material *d* may be constructed in any suitable way. In the example shown in the drawings they are composed of narrow battens *g*, secured to strong frames *r* and segmental bracket-pieces *s*, placed at intervals along the length of the vessel, and of end pieces *n*, secured to the battens *g* by bolts *p*. It will be obvious that when it is required to place the cathode *e* in the anode or to remove it therefrom the two parts of the apparatus must be separated by withdrawing the bolts *i*. It will also be understood that the layer of conductive water-tight material *d* between the anode *a* and the conductor *c* may be employed or not, according to circumstances; but I generally prefer to employ it, partly to effect a more complete electric connection between the opposing surfaces of the conductor and anode than can be effected by the direct contact of the comparatively smooth surface of the sheet-metal conductor with the rough surface of the back of the anode, partly to allow of the unequal expansion and contraction of the metal conductor and the carbon anode, and partly to prevent any electrolyte that may percolate through the carbon anode reaching and attacking the said conductor. The said conductive water-tight material is composed of finely-divided carbon or other suitable conductive material combined with a suitable water-resisting material, preferably a non-oxidizable oil; but in order to prevent as much as possible the passage of electrolyte through the carbon or through the cement joints by which the slabs or bricks of carbon composing the anode are joined together I prefer to saturate the said carbon and jointing cement with oil or other suitable water-resisting material, whereby the said carbon and jointing cement are made more or less impermeable to the electrolyte.

By the invention above described the cathode *e*, being almost completely surrounded and inclosed by the anode, can be completely immersed in the electrolyte and atmospheric oxidation thereof be thereby avoided, an equality of resistance through all parts of the electrolyte is maintained, the thickness of the electrolyte being practically equal at all points of the circumference of the rotating cathode, the area of the poles or electrodes in action is largely increased as compared with that obtainable in the semicylindrical arrangement of anode heretofore in use, and therefore the electrolytic effect or output produceable on a given floor-space is proportionally increased. The gases produced by the electrolytic action may, if desired, be readily recovered through any suitable arrangement of duct placed over the opening or openings *b*.

The above description of the invention relates to its application to an apparatus in which the anode is stationary and of trough-like shape and the cathode rotating and of cylindrical shape; but it is obvious the invention is equally applicable to apparatus in which the cathode is stationary and of trough-like shape and the anode rotating and of cylindrical shape.

I claim—

In an electrolytic apparatus of the kind in which a trough-like vessel is lined with carbon which forms the anode, the improved anode which consists of cylindrical segments of carbon *a*, cylindrical segments of sheet-metal conductors *c* and cylindrical segments of conducting water-tight material *d*, separate trough-like vessels *g* supporting said segments, frames *r*, *s*, supporting said vessels, and screw-bolts *i* holding the parts together, the said segments forming a hollow cylindrical anode the two parts of which can be separated from one another to enable the cylindrical cathode to be placed in or removed from the same, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE JONES ATKINS.

Witnesses:
R. WESTACOTT,
STEPHEN EDWARD GUNYON.