No. 608,300. Patented Aug. 2, 1898.

J. G. A. RHODIN.

ELECTROLYTIC APPARATUS.

(Application filed Aug. 11, 1897.)

(No Model.)

Fig. 3.

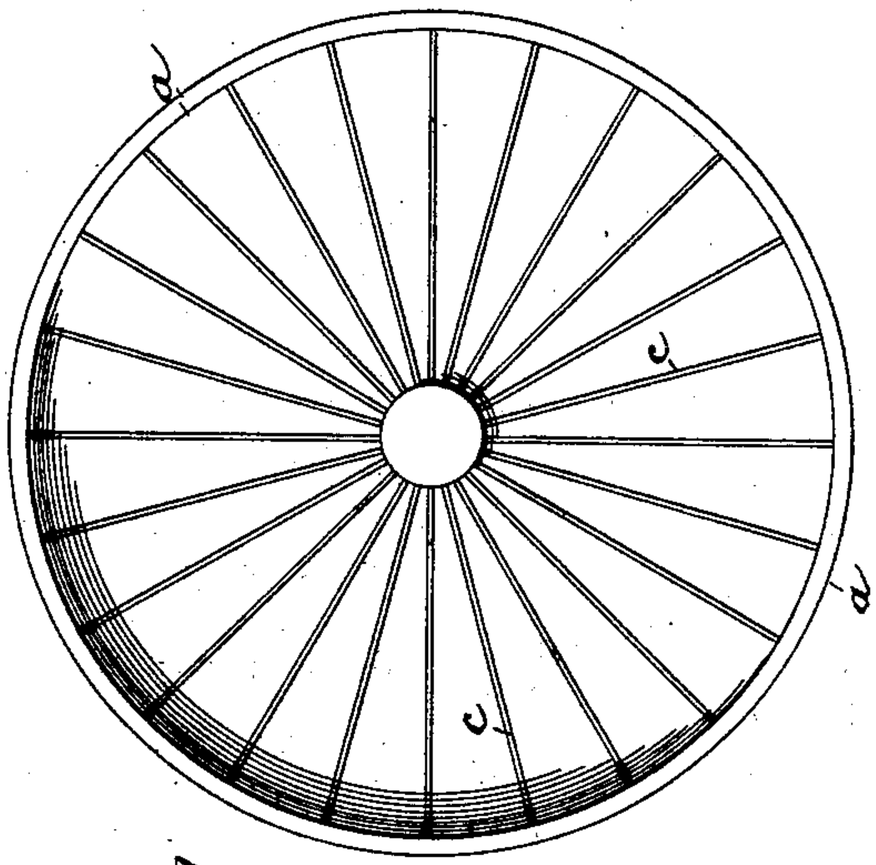


Fig. 1.

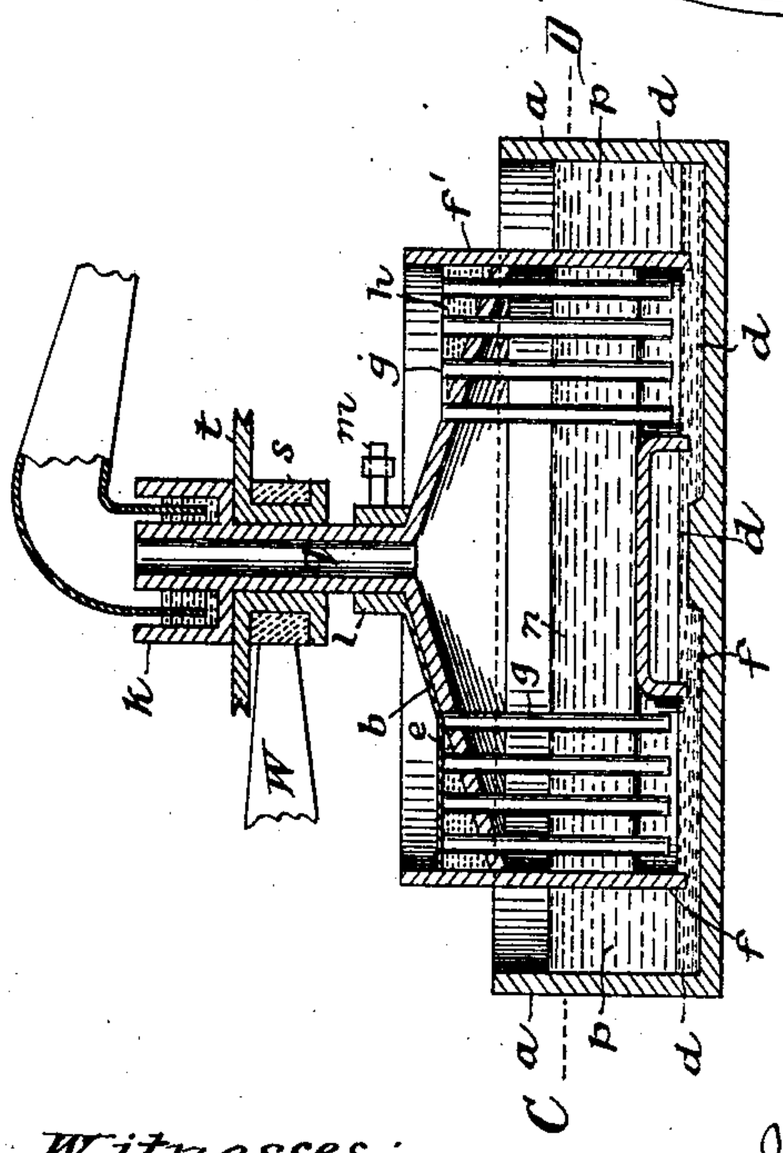
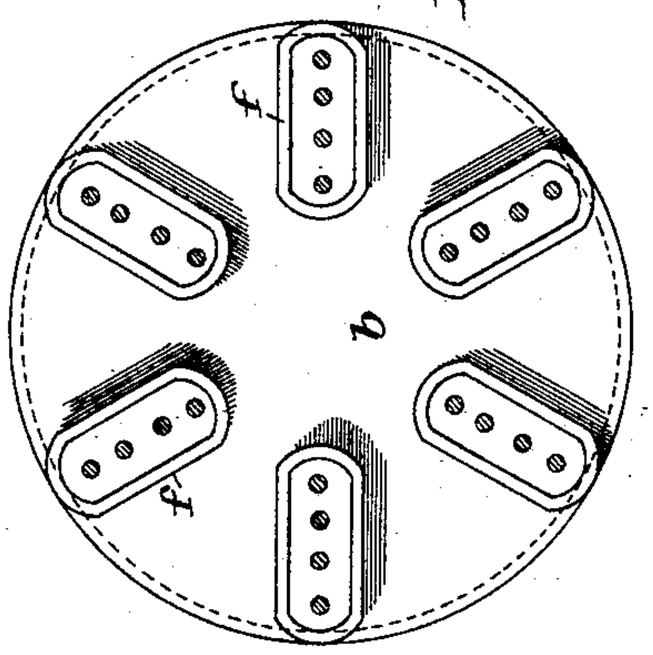


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN GUSTAF ADOLF RHODIN, OF ECCLES, ENGLAND.

ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 608,300, dated August 2, 1898.

Application filed August 11, 1897. Serial No. 647,914. (No model.) Patented in England September 29, 1896, No. 21,509.

To all whom it may concern:

Be it known that I, JOHN GUSTAF ADOLF RHODIN, a subject of the King of Sweden and Norway, and a resident of 104 Gilda Brook road, Eccles, near Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Electrolytic Apparatus, (for which I have obtained a patent in Great Britain, numbered 21,509, bearing date September 29, 1896,) of which the following is a specification.

My invention relates to an improved electrolyzer or apparatus for use in electrolysis; and my object is to construct a cheap, simple, and efficient form of apparatus.

In constructing my improved apparatus I employ a cylindrical or other suitably-shaped vessel, of earthenware or other suitable material, with a flat base and open top. On the inside of the bottom I form radial or other ribs or projections. Inside and concentric with this vessel I fit a second vessel, of earthenware or other suitable material, in the bottom of which are formed a series of tubes or hollow projections, in which are fitted a corresponding series of carbon rods, all in metallic contact with the positive pole of a dynamo or other source of electricity. The tubes on the bottom of the second vessel project into a layer of mercury covering the bottom of the first vessel and in metallic contact with the negative pole of a dynamo or other source of electricity. A quantity of water or other suitable liquid is placed on the mercury in the first vessel, and in the interior of the second vessel is placed a suitable electrolyte, such as a solution of chlorid of sodium or nitrate of sodium, &c. The second vessel is closed by a cover which is fastened to it and may be provided with an outlet pipe or passage, through which gases liberated during the electrolysis might escape. The second vessel is fitted and provided with means whereby it may be rotated.

In the accompanying two sheets of drawings, Figure 1 is a transverse vertical section of the improved apparatus. Fig. 2 is a sectional plan taken on the line C D, Fig. 1; and Fig. 3, a plan of the bottom of the outer vessel.

In the drawings, *a* designates the outer cylindrical or other suitably-shaped vessel, which I prefer to make of iron, and *b* is the inner concentric vessel, which I prefer to make of earthenware. The bottom of the vessel *a*, as shown in plan in Fig. 3, is provided with radial or other ribs or projections *c*, Figs. 1 and 3, and the bottom of the vessel *b*, as shown in Fig. 2, opens out into a series of hollow projections or tubes *f* of any suitable section. The top of the vessel *b* is closed by a suitably-shaped lid or cover, which may be made in one piece with the vessel, as shown in Fig. 1, or may be a separate part secured thereto. Through holes in this lid I fit a series of carbon rods or other suitably-shaped carbons or anodes of other material *g*, which fit closely into these holes and project into the above-mentioned hollow projections *f*, yet without coming in contact with a layer of mercury *d*, which seals the openings of the hollow projections when the apparatus is put together. These carbons or anodes are put in metallic contact with one another by suitable means—such as, for instance, by casting a layer of lead *h* into an annular space formed by the lid and into which the ends of the carbons or anodes project. The combined anodes might conveniently be brought into metallic contact with a ring of metal *e*, which surrounds a tube *q*, into which the lid of the vessel *b* may be suitably prolonged. The metal ring *l* may then, by means of a metallic brush *m*, be put in contact with the positive pole of a dynamo or other source of an electric current.

The above-mentioned hollow projections or tubes *f* project into a layer of mercury *d*, which seals the inner part of the vessel *b* from connection with that part of the outer vessel *a* which is not occupied by the inner vessel *b*. On the top of the mercury and filling this last-mentioned part of the vessel *a* is a layer of water or other suitable liquid *p*. The inside of the second vessel *b* is filled with a solution of an electrolyte, generally one with a metallic cation, forming the layer *n*. The second vessel *b* is further provided with means for slowly rotating it—such as, for instance, a pulley *t*, fixed round the tube *q* and provided with a collar running in a bearing *s*, supported by an arm *w* or the like, which also prevents the second vessel *b* from touching the bottom of the first vessel *a*. The tube

q may be connected with a system of gas-conducting tubes by means of a liquid seal or joint k. When the first vessel a is made of iron, which is the preferred material, the layer of mercury is made into the cathode simply by connecting the vessel a with the negative pole of the above-mentioned source of electric current.

In operation, when the electric current is flowing the second vessel b is slowly rotated, during which operation the projections f agitate the layer of mercury d, which, however, is prevented from revolving by the ribs or projections c. The amalgam formed at the bottom of the projections f is then mixed up with the main bulk of the mercury, principally by these projections sliding over the mercurial surface and by the diffusing action between the mercury and the amalgam and by the internal movement set up by the movement of the projections. The amalgam is thus brought into contact and reaction with the supernatant water or other liquid p, whereby a commercial product is formed and more or less depolarization is caused, and the mercury is enabled to dissolve more of the cation and so on in a continuous process. The anion separated out inside the vessel b may eventually be conducted through the pipe q and a system of tubes into other chemical apparatus or, if of no value, may be allowed to escape.

The apparatus as described may, as a consequence of its construction, have heat applied to it with advantage, either internally or externally, either with the object of diminishing electrical resistance or facilitating certain chemical reactions or for distilling certain chemical compounds out of the vessel b into a system of condensers.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim, and desire to secure by Letters Patent of the United States, is—

1. An apparatus for the electrolysis of solutions of salts comprising a vessel a having a corrugated or ribbed bottom and containing a mercury cathode, a rotating vessel b arranged within said vessel a, a plurality of tubular projections depending from the lower side of said vessel b, and projecting into the layer of mercury contained in the outer vessel and a series of anodes extending down into the tubular projections but without coming into contact with the layer of mercury, substantially as described.

2. In combination, the outer vessel a, having a ribbed or corrugated bottom, the rotating vessel b within the same, a plurality of tubular projections depending from the bottom of said inner receptacle and dipping into a mercury cathode, a series of anodes extending through the upper transverse wall of the vessel b with their lower ends depending into the tubular projections, and a suitable conducting substance encircling the upper ends of the anodes above the said transverse wall, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN GUSTAF ADOLF RHODIN.

Witnesses:
H. B. BARLOW,
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