

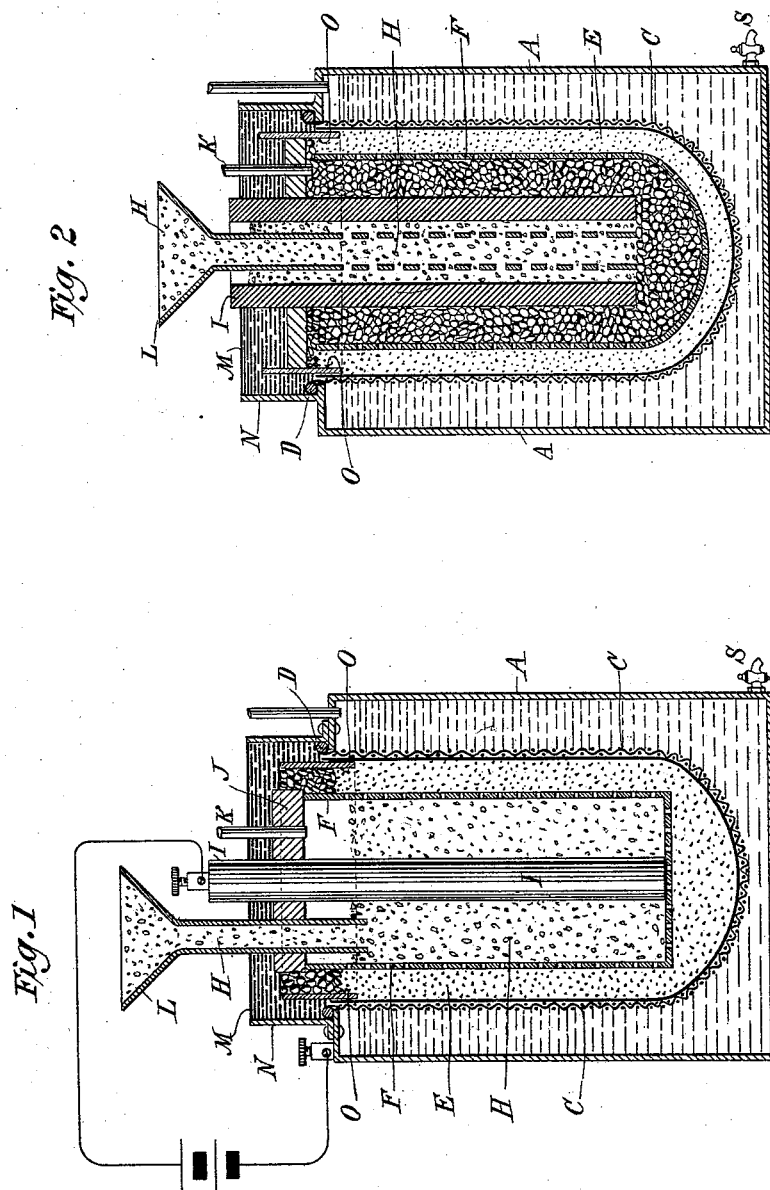
(No Model.)

I. L. ROBERTS.

METHOD OF ELECTROLYTIC DECOMPOSITION OF SALTS.

No. 522,616.

Patented July 10, 1894.



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UNITED STATES PATENT OFFICE.

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METHOD OF ELECTROLYTIC DECOMPOSITION OF SALTS.

SPECIFICATION forming part of Letters Patent No. 522,616, dated July 10, 1894.

Original application filed September 27, 1892, Serial No. 447,076. Divided and this application filed September 4, 1893. Serial No. 484,705. (No model.)

To all whom it may concern:

Be it known that I, ISAIAH L. ROBERTS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Methods of Electrolytic Decomposition of Salts, of which the following is a specification, reference being had to the drawings accompanying and forming a part
10 of the same.

In a number of patents granted to me I have shown and described apparatus for the electrolytic decomposition of metallic salts in which the cathode and anode chambers or
15 compartments are separated by a diaphragm composed of an amorphous substance, or a material in such a fine state of subdivision as to constitute a practically amorphous partition between the electrodes, impervious to
20 the transfusion of the liquids or solutions under all ordinary circumstances, but of such nature as to permit of what is now known as electrolytic transfusion, which is the passage of a portion of the liquid through the diaphragm in the direction and during the flow
25 of the electric current, and the electrolytic transfer of the radicals or bases.

My present invention consists in a novel method of decomposing metallic salts by
30 means of apparatus of this character, which I have found productive of greatly improved results. Heretofore I have placed the solution either with or without crystals of the salt to be decomposed in the cathode chamber or compartment, but I have now found
35 that I obtain much better results by supplying the salt crystals to the anode compartment and around or in the immediate vicinity of the anode, and maintaining the supply
40 of crystals constantly up to the water level, whereby no impoverishment of the solution in any part can occur.

Figures 1 and 2 of the accompanying drawings illustrate in central vertical section modified forms of decomposition cells by means
45 of which I carry out my improved process of electro-decomposition.

Referring to Fig. 1, A is a tank or vessel, preferably of a metal such as iron, in order
50 that it may serve as the cathode.

C is a bag composed generally of wire net-

ting and cloth or asbestos fabric which is secured to a metal ring D that rests on the edges of an opening in the cover of the tank and supports the bag C and its contents in
55 the tank.

E is the diaphragm or partition of silica, powdered anthracite coal or similar material contained between the two supporting walls formed by the bag C and a perforated or porous jar F, which may be ordinary unglazed
60 porcelain.

H is a mass of the crystals of the salt to be decomposed, and I is an anode of conducting charcoal.

J is a block of wood or preferably an unglazed terra-cotta tile soaked in hot paraffin to fill the pores. This tile contains three holes, one for the passage of the anode I, another for a gas vent, as K, and a third for a
70 long tube L through which a supply of salt crystals is introduced into the anode compartment.

N is an annular collar riveted to or cast on the top of tank C, and M is a luting or seal
75 of wax or a proper material that closes the tank.

O is a ring of glass, hard rubber, glazed tile or the like, that is used to more effectively insulate the material of the diaphragm E from
80 the tank A.

To construct and operate the above described apparatus and to carry out the process to be described, I construct a tank as above and suspend a net of insulated wire or
85 twine on the ring D. I then put a canvas bag in such net which may be lined with asbestos paper. I also knead to a stiff dough an amorphous powder made from anthracite coal, silica, or any substance which will be
90 unacted upon by either the radical liberated or its base, using a solution of the base intended to be transferred for making the dough. For instance, if caustic soda is
95 intended to be produced a solution of it in water is used. When the dough is made I pack in the bottom of the bag the amount necessary for the thickness of the partition. I prefer
at least two or three inches of wall although
100 more or less may be used, but the thicker the wall or diaphragm the purer and richer can the solution of the base be made. When the

thickness desired is attained in the bottom I set in the center the porous cup or tile F. Then I pack around it the aforesaid dough until the space between it and the outer wall is filled. I prefer to carry it above the ring D a little way so as to allow for any shrinkage that might take place. When this is done the tubes and anode are sealed in, as described above. When the wax is cool I fill the space around the anode in the cup or tile through the long tube L, with the salt crystals and water desired for decomposition, say chloride of sodium or potash and pour in enough water to come above the lower end of the wide tube and seal it; then I fill the outer compartment with water through an inlet R. I prefer to use a weak solution of the base on starting to lower the resistance of the water. I now connect the positive pole of the source of electricity to the anode and the negative pole to the tank or cathode. The action of the current is to send the base of any salt, as sodium, potassium, iron or copper toward the cathode and liberate the acid radical on the anode. If such radical is a gas it will escape through the tube K. If it is a liquid it can be drawn off by a siphon or pumped out when desired. The liquid bases, such as caustic alkalis may be drawn off at a cock S. The process can thus be made continuous by adding crystals on the anode side of the diaphragm and drawing off the base on the cathode side.

The specific form of anode and arrangement of the anode chamber may be much varied. In Fig. 2, for instance, I have shown a cylindrical anode I, of conducting charcoal. The feed tube L extends down through the anode and is perforated as shown. The space around the anode is filled in with coarse par-

ticles of a conducting charcoal or what I have found to be the equivalent thereof, to wit; carbonized anthracite coal. In this case the mass of broken charcoal really constitutes the anode, while the cylinder or rod I serves merely as a connector.

Heretofore in apparatus for decomposing salts, crystals of the latter have been placed around the anode for variously expressed purposes, but no provision has been made for maintaining a supply of such crystals that will keep around or in contact with the anode a mass of the same substantially up to or above the water level, nor, so far as I am aware, has the desirability of any such provision been recognized. I find it, however, to be of great importance to do this, in order to prevent any tendency toward the impoverishment of the solution at any part and the resultant liberation of oxygen from the water, which is very destructive of the anode.

I do not claim herein the apparatus employed or illustrated as the means of carrying out my invention, as this forms the subject of an application filed by me September 27, 1892, Serial No. 447,076, of which this application is a division.

What I claim is—

The improvement herein described in methods of decomposing metallic salts by electrolysis, which consists in maintaining by continuous feed the supply of crystals in the anode compartment and in contact with the anode, up to the level of the solution in said compartment.

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