(No Model.)

I. L. ROBERTS.

ELECTROLYTIC APPARATUS.

No. 522,615. Patented July 10, 1894.

Fig. 1

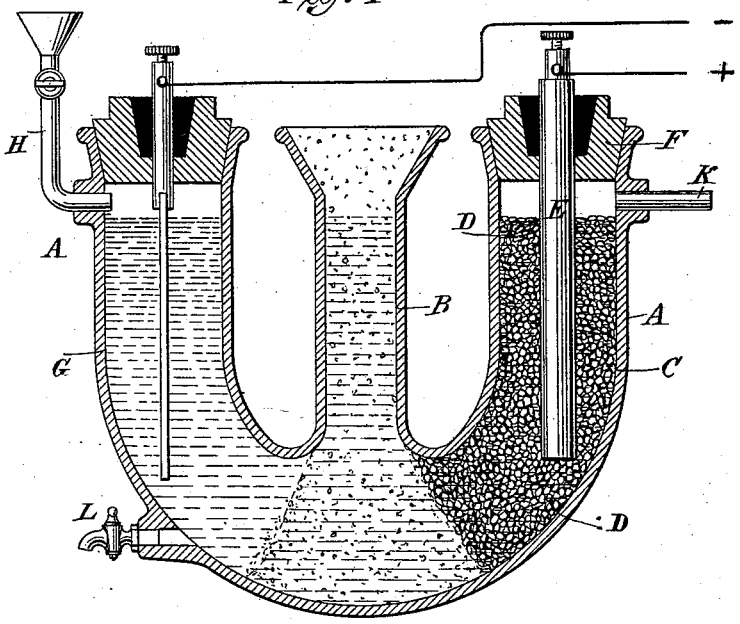


Fig. 2

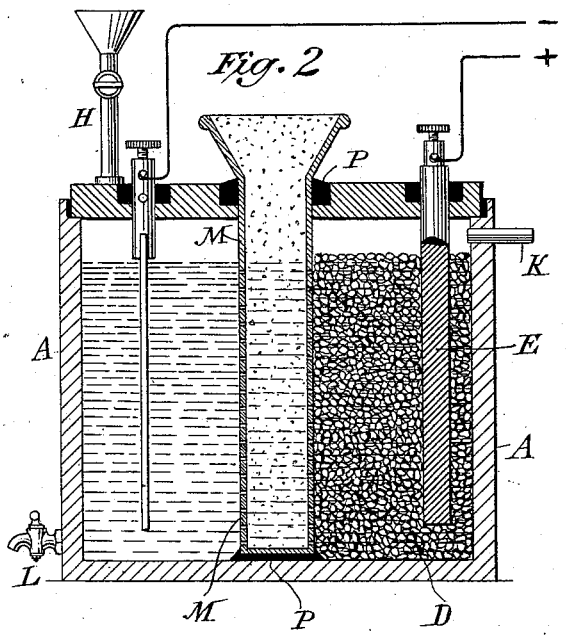
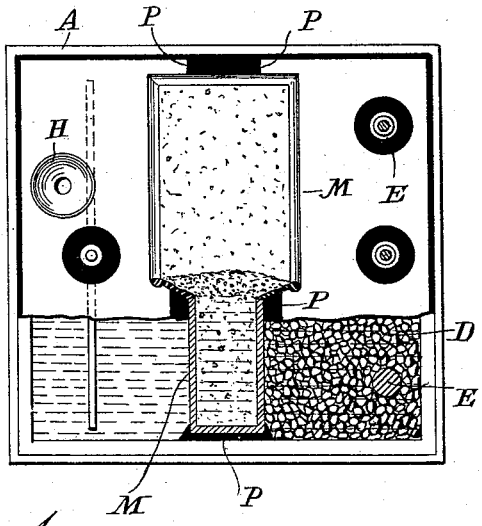


Fig. 3



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UNITED STATES PATENT OFFICE.

ISAIAH L. ROBERTS, OF BROOKLYN, NEW YORK.

ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 522,615, dated July 10, 1894.

Application filed August 19, 1893. Serial No. 483,550. (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 Electrolytic Apparatus, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

My invention is an improvement in electrolytic apparatus more especially designed for the decomposition of the alkaline chlorides and pertaining to the same general class of devices which I have described in numerous patents and which contain as one of the elements a diaphragm or partition of such character as to be practically impervious to fluids under ordinary conditions, but at the same time permitting electrolysis to go on through it.

Heretofore in the apparatus which I have shown and described it has been my custom to provide diaphragms composed of insoluble substances either in a gelatinous condition or in such a fine state of subdivision as to render them impervious to fluids and yet conductors of electricity, but in the present case my object is to provide for a diaphragm composed wholly of soluble crystals of the salt to be decomposed.

In carrying out my invention I employ a vessel of which a three legged tube is a general type, that is to say it has three compartments, the central or intermediate compartment containing a mass of the crystals in a fine state of subdivision and the end compartments containing the anode and cathode respectively. Electrical communication between the electrode compartments is maintained through the body of crystals.

In the accompanying drawings Figure 1 is a central vertical section of the general form of apparatus which I use. Fig. 2 is a similar view of a modification of the same. Fig. 3 is a top plan and part sectional view of the device shown in Fig. 2.

In Fig. 1 A designates a tubular receptacle of glass or other like material having three legs or branches. Into the central branch B I run in crystals of the salts to be decomposed and which have been finely pulverized, until the said branch is completely filled. The crystals will form a pile with sloping sides at the lowest point or bend of the tube and divide the two side branches from each other. I then partially fill one of the side tubes as C with granulated gas coke, retorted anthracite coal or charcoal D, and force down into the mass a carbon rod or pencil E. The end of the branch C is then hermetically sealed as by a cover F and a coating of tar applied around the carbon rod E. The other branch G is provided with a similar cover through which a cathode of iron or other suitable conductor extends.

At the top of the cathode branch is a tube H for the introduction of the solution, and in the opposite branch is a gas vent K. Near the bottom of the vessel is a cock L by which the solution when sufficiently strong in the products of electrolysis may be drawn off.

When the apparatus has been thus constructed and arranged the two electrode branches are nearly filled with a saturated solution of the salt to be decomposed and the apparatus connected with a source of current. By the action of such current the acid radicals will be liberated on the particles of the coke or other substance constituting the anode. As electrolysis goes on, the salt in solution is gradually decomposed and the crystals forming the partition are dissolved to take its place. This wearing away of the partition is at once made good by the descent of fresh crystals from the tube B which is always kept well filled.

The same results may be secured in other ways. For example, in Figs. 2 and 3 the vessel or tank is in the form of an ordinary box and, may be made of wood coated with tar or of any other suitable material. The box is divided into two compartments by a double wall which may be composed of a jar M of porous earthenware or of glass or stone ware provided with numerous perforations or it may be formed by two tiles secured properly in position. It will generally be necessary to provide a luting P of wax or the like, along the edges and bottom of the jar to prevent leakage around it and to hold it in position. Between these walls a mass of crystals is constantly maintained to a point above the level

of the liquid in the tank. It is convenient in this device as well as in that previously described to provide a hopper or flaring opening for the receptacle containing the crystals so that a supply of crystals may be always at hand to take the place of those dissolved off from the partition.

In the case of the apparatus shown in Fig. 2 the compartment on one side of the diaphragm is filled in with granulated coke or its above described equivalent surrounding a carbon conductor which is placed as far back from the diaphragm as practicable. The other compartment contains a cathode as in the previous case and the two compartments are closed or sealed in the usual manner, due provision being made for the escape of gas from the anode compartment and the introduction of solution on the cathode side. A cock L is employed to draw off the solution when it has acquired a sufficient strength.

This plan of constructing and operating devices of this character is simple and economical. In principle of operation it differs in no essential respect from the forms of apparatus heretofore described and shown by me, but from the fact that the material composing the diaphragm is in this case soluble, suitable provision must be made for a constant supply of such material to take the place of that which is dissolved.

I do not claim broadly herein, a soluble diaphragm composed of crystals of the salt to be decomposed.

Having now described my invention, what I claim is—

1. In an electrolytic apparatus the combination with the electrodes of a soluble diaphragm interposed between the same and composed of crystals of the salt to be decomposed in a finely divided condition, and a means such as a feed tube for maintaining a supply of crystals to replace those dissolved, as set forth.

2. The combination with a tube or vessel having three branches or legs of electrodes in the side branches and a mass of salt crystals in the central branch, as and for the purpose set forth.

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