G. KOLSKY.

PROCESS OF OXIDIZING OR REDUCING CHEMICAL SUBSTANCES BY WAY OF ELECTROLYSIS.

APPLICATION FILED NOV. 3, 1911.

1,039,415.

Patented Sept. 24, 1912.

Fig. 1.

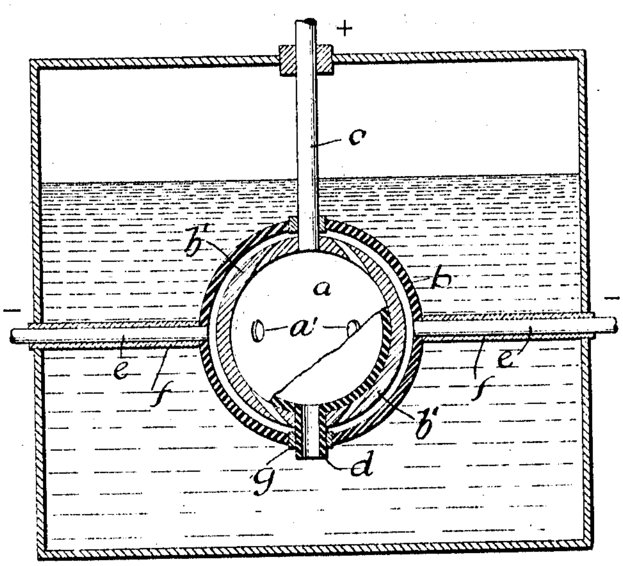
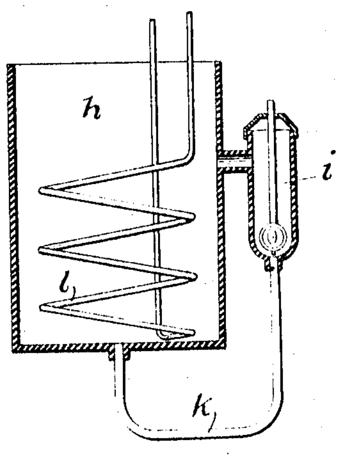


Fig. 2.



Witnesses:

Inventor

By Attorney

UNITED STATES PATENT OFFICE.

GEORGE KOLSKY, OF NEW YORK, N. Y.

PROCESS OF OXIDIZING OR REDUCING CHEMICAL SUBSTANCES BY WAY OF ELECTROLYSIS.

1,039,415. Specification of Letters Patent. Patented Sept. 24, 1912.

Application filed November 3, 1911. Serial No. 658,375.

To all whom it may concern:

Be it known that I, GEORGE KOLSKY, of Switzerland, residing at New York, State of New York, have invented an Improvement in the Process of Oxidizing or Reducing Chemical Substances by Way of Electrolysis; and I do hereby declare that the following is a full and exact description thereof.

This invention more especially relates to the electrolytic production of hypochlorites, chlorates, perchlorates and persulfates. I have found that such electrochemical reactions may be greatly facilitated by placing either the cathode into the interior of the anode or the anode into the interior of the cathode and by rapidly rotating the inner electrode. For instance I have treated a solution of potassium chlorid with the apparatus which I shall describe hereafter. I found that with a certain current intensity, the tension was reduced to 3 volts, by using my improved apparatus with the anode rotating, whereas under the same conditions, but with the anode at rest, a tension of about 6 volts was needed. Furthermore the output was considerably increased, and finally in spite of lower voltage a far greater current intensity could be used than with the same apparatus, and with the anode at rest, so that a certain quantity of chlorate could be produced in far shorter time than with the anode at rest.

The mechanical apparatus which, in the light of my present knowledge, I think best adapted to carry out my invention, is illustrated in the accompanying drawing, which I will now describe.

Figure 1 is a vertical central section of an electrolytic apparatus for transforming alkali chlorids into alkali chlorates, with the electrodes formed according to my invention. Fig. 2 is a modification comprising means for cooling the solution treated.

Reference being had to Fig. 1, *a* is the anode having the form of a hollow sphere with a number of lateral perforations *a'* and one opening at the bottom, similar to what is called "the Witt stirrer." This hollow sphere is surrounded by a second hollow sphere *b* forming the cathode. The outer sphere is also perforated, the perforations having the form of oblong openings *b'*. The anode is mounted on the shaft *c* which freely passes through the cathode. The lower end of the anode terminates by a socket *d* which is also freely movable in the outer shell *b*. In order to allow of removing the cathode it is composed of two hemispheres. The current is supplied to the anode by the shaft *c*, and to the cathode by the rods *e*, of which two or more may be provided. These rods penetrate the outer shell *b*, and may be covered with china or glass tubes *f*, to prevent loss of current and to insulate them against the walls of the containing vessel. Another purpose of the rods *e* is to support the cathode and to hold it in a closed condition. The anode may be made of any material which is suitable for the especial purpose, for instance of platinum, oxidized iron, lead peroxid or the like. On the other hand it may be constituted by a nonconductor of electricity, for instance of earthen-ware, hard rubber or the like, and this nonconductor may be intertwined or equipped with platinum wires or another suitable conductor. For the purpose of guiding the anode an insulating bearing *g* may be provided either in the upper or in the lower opening of the cathode shell, or in both of them. The socket *d* is then preferably provided with a collar projecting into a corresponding groove in the bearing. By this means a more perfect joint between the electrodes is attained, so that no solution can be sucked up out through the socket *d*. The shaft *c* may also be guided by a bearing arranged in the cover of the containing vessel. Let it be understood that the vessel is only generally indicated, its true dimensions being far greater than as shown in the drawing.

The efficiency of this apparatus, comprising electrode, agitator and pump, is very great. The contents of the vessel seem to be converted into dust, although the current continues to flow in undiminished strength showing that the interval between the electrodes is wholly filled up with solution. Owing to the spherical form of both electrodes, the current density on the latter is absolutely uniform, so that the electrochemical action at every point of the active electrode is controlled by the same conditions and the process may be confined to one single desired reaction.

Instead of rotating the inner electrode I may effect the circulation of the liquid by another means, for instance by a propeller

provided in the socket *d*, the electrodes themselves being fixed.

Under certain conditions, for instance, when the electrolyte is to be strongly cooled, it may be preferable to arrange the system of electrodes in a separate vessel which is combined with another larger vessel in such a manner that a circulation of the liquid through both vessels may be produced. This arrangement is illustrated by Fig. 2 in which *h* indicates the greater and *i* the smaller vessel containing the electrodes. Both vessels are connected at the bottom by a pipe *k* and communicate near the top by a wider tube. The liquid in the vessel *h* is for instance cooled by the coil *l*. A plurality of smaller vessels *i* may be connected with the vessel *h*, each being provided with electrodes.

I claim:—

1. In an electrolytic apparatus the arrangement of two spherical, perforated electrodes, one of them surrounding the other.

2. In an electrolytic apparatus, the combination of a spherical, perforated electrode surrounding another likewise spherical and perforated electrode, and means for rapidly rotating the said inner electrode.

3. In an electrolytic apparatus, the combination of a containing vessel, another smaller vessel connected therewith, electrodes in the said smaller vessel, and means for rapidly rotating one of the said electrodes.

4. In an electrolytic apparatus the combination of an outer, spherical, perforated electrode, an inner, likewise spherical and perforated electrode, a socket extending from the bottom of the second electrode and freely penetrating the first electrode, and means for rotating the second electrode.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE KOLSKY.

Witnesses:
GEO. C. HEINICKE,
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