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ANODE FOR USE BY ELECTROLYSIS OF ALKALINE SALT SOLUTIONS.

APPLICATION FILED MAR. 6, 1911.

1,041,261. Patented Oct. 15, 1912.

Fig. 1.

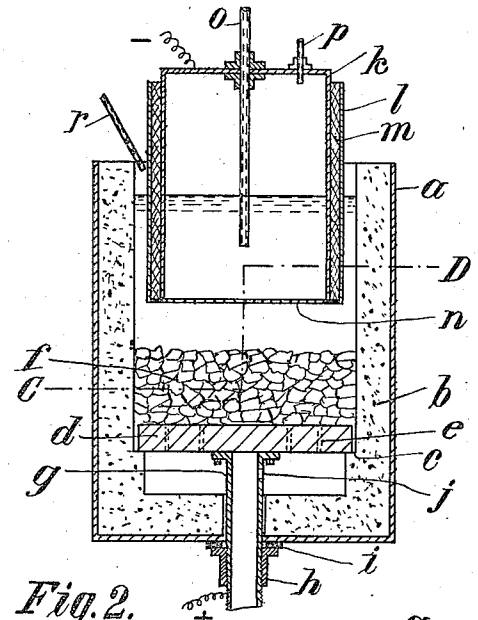
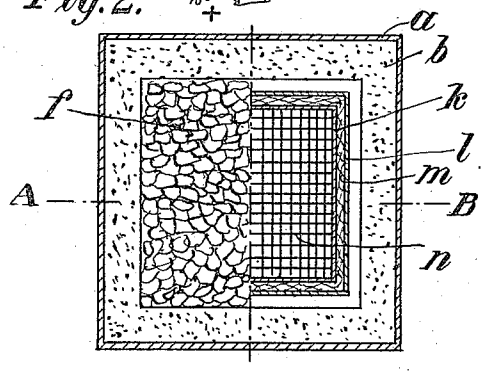


Fig. 2.



WITNESSES:

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ANODE FOR USE BY ELECTROLYSIS OF ALKALINE-SALT SOLUTIONS.

1,041,261. Specification of Letters Patent. Patented Oct. 15, 1912.

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To all whom it may concern:

Be it known that I, AXEL THEODOR KONSTANTIN ESTELLE, a subject of the King of Sweden, residing at 47 Norrtullsgatan, Stockholm, in the Kingdom of Sweden, have invented new and useful Improvements in Anodes for Use by Electrolysis of Alkaline-Salt Solutions, of which the following is a specification.

My present invention relates to apparatus for the electrolytical decomposition of alkaline salts soluble in water, and in which the anode consists of a heavy metal, preferably iron, capable of forming with the anion a compound soluble in water, the solution of which compound has a specific gravity greater than that of the electrolyte. In such apparatus the electrodes are, as is known, arranged so that the anode, by which the heavier solution is formed, is placed beneath the cathode, for the purpose of rendering more difficult the mixture or diffusion of the solutions formed during the electrolysis. If it be, for example, the electrolytic decomposition of a solution of common salt by using an anode of iron, the chlorin liberated by the decomposition combines with the iron to form ferrous chlorid, $Fe Cl_2$, which is soluble in water and thus can be separated as a solution. The iron anode, however, is corroded and gradually consumed, and may be replaced by another, each replacement causing an interruption of the process. By the use of my invention such interruptions are done away with, or at least very seldom occur, so that the electrolytic decomposition takes place continuously, and moreover other advantages are gained.

My invention consists in that the anode is made in two independent parts, one of which is a solid part readily connected with the source of current, said part essentially acting as a support, and also as a conductor for the current. The other part is composed of pieces or lumps of suitable size loosely resting on the solid support in a layer of suitable thickness.

The conducting capacity of the metal being considerably greater than that of the electrolyte, the consequence will be that only the upper free surfaces of the pieces are considerably affected or corroded, while the solid support is only corroded to a slight degree by the current. As the loose pieces are consumed others are introduced without interruption of the process. The use of an anode in the form of a layer of pieces or lumps also has the advantage that narrow passages are formed between the pieces, said passages being successively filled up with the heavier product of decomposition formed at the anode, which product when using iron as anode and a common salt solution as electrolyte, consists of ferrous chlorid. This ferrous chlorid solution will, at the place where it is formed, be saturated or nearly saturated, and consequently sinks down through the interstices of the layer of lumps of iron to the bottom of the vessel, thereby displacing the electrolyte. If in this state new electrolyte is introduced between the anode and the cathode, the anode liquid filling the narrow passages between the iron pieces is retained in said passages, so that it does not take part in the whirling movement, or circulation, caused by the introduction of the electrolyte. Owing to this, the anode and cathode liquids may easily be drawn off separately and continuously and in the same proportion as new electrolyte is introduced into the apparatus.

It is important to use for the anode iron of suitable quality; cast iron is not quite suitable, as the same is mixed up with foreign substances, especially carbon, which makes the electrolyte impure. Scraps or chips of iron are, as is known, impure, at least on the surface, so that they should not be used without having been previously subjected to a relatively expensive washing and purifying process. A layer of rust of hammer-scale also causes considerable resistance to the current, whereby the pieces become more or less insulated from each other and from the conducting support, the consequence being that the support is affected at the beginning of the electrolysis.

I have found that the most suitable material is spongy iron, produced for instance, from magnetite from the Gellivare mines of Sweden by means of reducing gas, and consisting almost entirely of pure iron. This spongy iron is porous and may readily be crushed to pieces of suitable size. Owing to its porosity it can absorb relatively large quantities of the anode liquid, which thus is effectively prevented from mixing with the alkaline hydrate separated at the cathode.

Apparatus of the type described and embodying my invention is shown in the accompanying drawings, in which—

Figure 1 is a vertical section on the line

A—B of Fig. 2, and Fig. 2 is a horizontal section on the line C—D of Fig. 1.

The apparatus illustrated comprises a sheet iron vessel *a* lined with cement *b*. In this lining is formed a step or off-set *c* on which rests the anode plate *d*, and on this plate *d* rest the loose pieces of metal *f*. To the lower face of the plate is secured a pipe *g* passing through the bottom of the vessel where a gland *h* and packing ring *i* prevent leakage of the electrolyte. The heavy anode solution finds exit from the vessel through opening *j* in the pipe *g*.

The cathode is formed by a bell *k* of sheet metal, the lower end of which is closed by a metallic fabric *n*. The bell *k* is surrounded by a sleeve of sheet metal *l* between which and the bell *k* is placed a suitable insulating material *m*. Through the top of the bell pass two pipes, the longer one *o* extending into the electrolyte and serving as a means for drawing off the hydrate, while the other, shorter one, *p* is an exit for the hydrogen gas. The bell is suspended by any desired means, whereby it may be raised and lowered when necessary. The electrolyte is supplied through a pipe *r*. If the anode solution does not pass down with sufficient rapidity between the seat *c* and the plate *d* said plate *d* may be provided with perforations *e*.

I claim—

1. In apparatus for the electrolytic decomposition of alkaline salts soluble in water, an anode of a heavy metal capable of forming in the electrolyte with the anion a soluble salt solution heavier than the electrolyte, said anode being placed beneath the cathode and consisting of two independent parts, one of said parts forming a solid metallic support and the other of said parts consisting of a layer of pieces of the heavy metal loosely resting on said support, substantially as described.

2. In apparatus for the electrolytic decomposition of alkaline salts soluble in water, an anode of a heavy metal forming in the electrolyte with the anion a soluble salt solution heavier than the electrolyte, said anode being placed beneath the cathode and consisting of two independent parts, one of said parts forming a solid metallic support connected with the source of current and the other of said parts consisting of a layer of pieces of said heavy metal loosely resting on the solid support, said pieces being of such a size that the metallic solution easily passes through the spaces formed between them, substantially as described.

3. In apparatus for the electrolytic decomposition of alkaline salts soluble in water, a cathode, an iron anode beneath the cathode and consisting of a solid iron support connected with the source of current, and of a layer of iron pieces loosely resting on said iron support, substantially as described.

4. In apparatus for the electrolytic decomposition of alkaline salts soluble in water, a cathode, an iron anode beneath the cathode and consisting of a solid iron support connected with the source of current, and a layer of pieces of spongy iron loosely resting on said solid iron support, substantially as described.

5. In apparatus for the electrolytic decomposition of alkaline salts soluble in water, a cathode, an iron anode beneath the cathode and consisting of a solid iron support connected with the source of current and a layer of pieces of spongy iron, preferably such as is produced from magnetite by means of a reducing gas, said pieces loosely resting on the solid iron support, substantially as described.

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

AXEL THEODOR KONSTANTIN ESTELLE.

Witnesses:

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