(No Model.)

2 Sheets—Sheet 1

J. BOELSTERLI.

PROCESS OF AND APPARATUS FOR ELECTROLYZING FUSED SALTS.

No. 589,523. Patented Sept. 7, 1897.

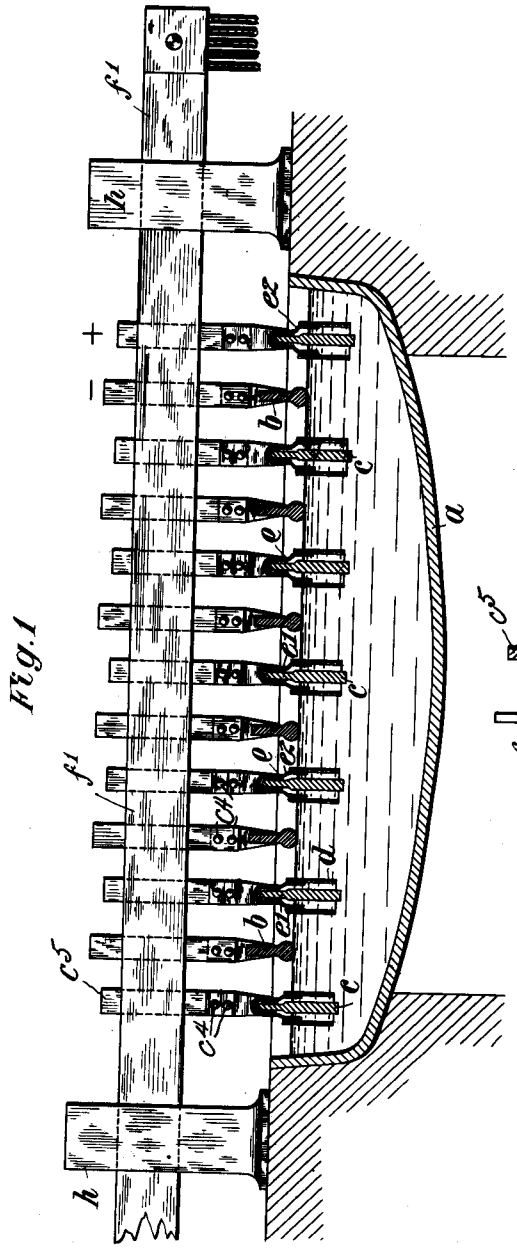


Fig. 1

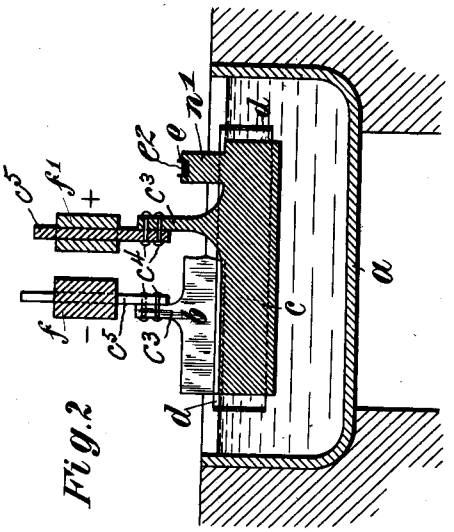


Fig. 2

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

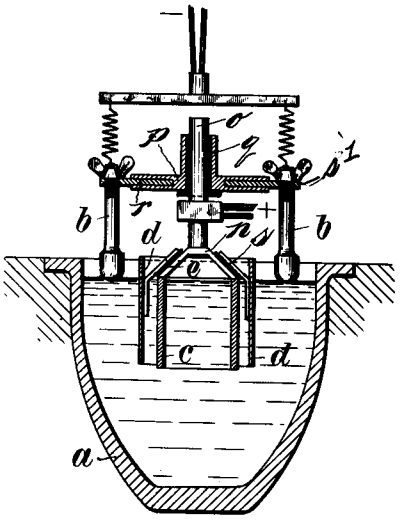


Fig. 6

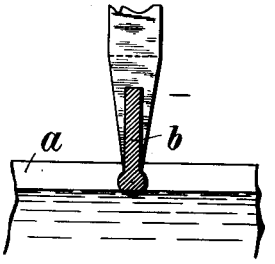


Fig. 4

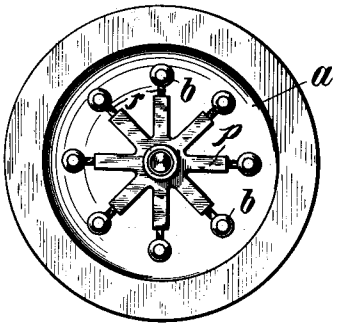


Fig. 5

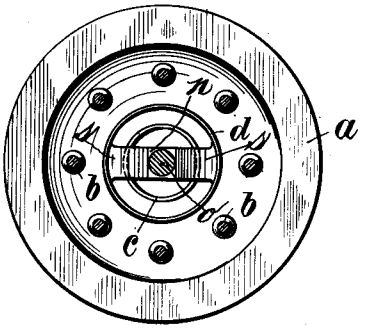
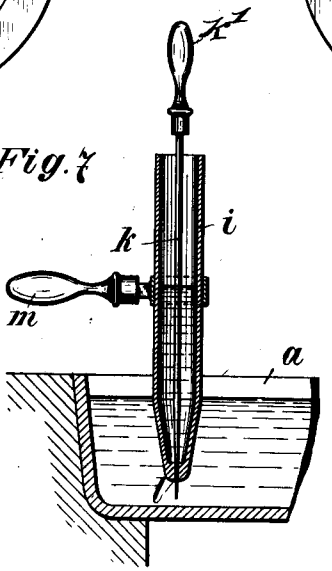


Fig. 7



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UNITED STATES PATENT OFFICE.

JOHANN BOELSTERLI, OF NEUHAUSEN, SWITZERLAND.

PROCESS OF AND APPARATUS FOR ELECTROLYZING FUSED SALTS.

SPECIFICATION forming part of Letters Patent No. 589,523, dated September 7, 1897.

Application filed October 27, 1896. Serial No. 610,175. (No model.)

To all whom it may concern:

Be it known that I, JOHANN BOELSTERLI, a citizen of the Republic of Switzerland, and a resident of Neuhausen, in the Republic of Switzerland, have invented certain new and useful Improvements in Processes of and Apparatus for Electrolyzing Fused Salts, of which the following is a specification.

My invention relates to an electrolytic process and apparatus, and particularly to that class employing molten electrolytes from which are obtained directly the metals, more especially metals of the alkalies; and the object of my invention is to produce in connection with my improved process a simple and cheaply-constructed apparatus that will give a good yield for a given current.

Referring to the drawings, in which similar letters of reference indicate like parts, Figure 1 is a longitudinal section showing an alternate arrrangement of cathodes and anodes. Fig. 2 is a cross-section of the same, the cathode being partly broken away. Fig. 3, partly in section, is a form in which the cathodes are grouped around the anode. Fig. 4 is a plan of the same. Fig. 5 is a similar view, partly in section. Fig. 6 is a cathode in section, showing its position relatively to the surface of the electrolyte. Fig. 7 is a cross-section of a collector and separator for the metal formed at the cathodes.

A cast or wrought iron vessel *a* is placed over a suitable hearth and contains the caustic alkali that forms the electrolyte when melted by the fire on the hearth.

The cathodes *b* are preferably of metal and have rounded or pointed ends that dip just below the surface of the electrolyte, Fig. 6. This form of end for the cathodes acts as a gatherer or assembler of the large globules of metal that float on the surface of the electrolyte during the electrolytic action, and when they come in contact with these rounded or pointed ends they hang to them and can then be easily skimmed from the electrolyte.

The electrodes, Figs. 1 and 2, are provided with extensions c^8, that are bolted by means of bolts c^4 to rods or connections c^5, depending from cross-bars *f* and *f'*, and said connections are held in position by means of pins or any other suitable fastening devices. (Not shown.)

I provide the anodes *c*, which dip quite deeply into the electrolyte, with a sheath or envelop *d* somewhat larger than the electrode and open at top and bottom and extending above the surface of the electrolyte, which serves to conduct the oxygen formed at the anode above the surface to the open air or a suitable collector, if so desired, in which latter case the upper ends of such sheaths are closed and provided with leading-off pipes. The sheaths *d* thus confine the oxygen generated at the anodes and compel it to rise to the surface in a confined isolated space, which prevents it from bubbling up through the electrolyte and coming into contact with and reoxidizing the metal floating on the surface around the cathodes. The sheaths are made of metal, as iron, or other material, and are insulated from the anodes by an insulating substance *e*, such as asbestos, which is placed in a channel or notch at the top of a shoulder *n*, rising from the anode, the sheaths being suspended by a bracket or strap e^2, hung in the insulated recess of the shoulder *n'*.

In Figs. 3 to 5 I have shown a method of suspending the anodes around the cathode.

The anode *c* is cylindrical in form and at its upper end is connected by a shoulder *n* to its supporting-rod *o*, said rod being connected to one of the terminals of an electric generator.

The rod *o* is insulated from and holds a spider *p* by means of the non-conductive collar or sleeve *q*. The ends of the spider-arms are provided with slots to receive the rods *r*, which slide freely therein and allow the cathode to be radially adjusted, said cathodes being held in and suspended from the enlarged perforated ends of the sliding arms *r* and are rendered vertically adjustable by means of thumb-nuts screwed onto the upper threaded ends of the cathodes, which also forms a shoulder *s'*, that rests on the outer ends of the rods *r* and prevents the cathodes from dropping out of the perforation. Each suspended cathode is connected to the other terminal of an electric generator.

The guard or sheath *d*, which conducts the oxygen to the surface, surrounds and is some-

what larger than the anode, is provided with brackets *s*, insulated from the anode by a layer or facing of insulating material *e*, and rests on the shoulder *n*.

The metal collected around the cathodes is removed to one side of the bath and is run off or skimmed off and poured into a separator, Fig. 7, which is a cylindrical metal vessel *i*, having a rounded or conical bottom in which there is a central perforation *l*, closed by a pin *k*, terminating in a handle *k'* above the vessel. A second handle *m*, attached to a collar which surrounds and supports the vessel *i*, facilitates manipulation. This vessel or separator, being nearly filled with metal skimmed from the electrolyte, is allowed to stand a sufficient length of time to cause the separation by gravity of the metal from the electrolyte which was taken up with it during the skimming. The pin *k* is then removed and the electrolyte allowed to run out into a vessel *a*, after which the pin *k* is pushed back into place and the metal molded for market.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The process, which consists in electrolyzing a fused alkali-metal salt and liberating the alkali metal exclusively at the surface of the electrolyte, substantially as described.

2. The combination with an anode having a gas-conducting sheath insulated and suspended therefrom and a supporting-rod therefor, of a spider supported and insulated from said rod, whose arms support the cathodes, and means for vertically and horizontally adjusting said cathodes, substantially as set forth.

3. The combination with an anode depending from a supporting-rod and a sheath insulated from, surrounding and depending from said anode, of an insulated spider on said rod, metallic cathodes suspended from said spider-arms adapted to have surface contact with the electrolyte, and means for vertically and radially adjusting the cathodes, substantially as set forth.

In testimony whereof I hereunto sign my name, in the presence of two subscribing witnesses, this 2d day of September, 1896.

JOHANN BOELSTERLI.

Witnesses:
H. LABBART,
E. BLUM.