No. 631,468. Patented Aug. 22, 1899.

C. KELLNER.

METHOD OF AND APPARATUS FOR PRODUCING ALKALI SALTS.

(Application filed Oct. 23, 1897.)

(No Model.)

Fig. 1.

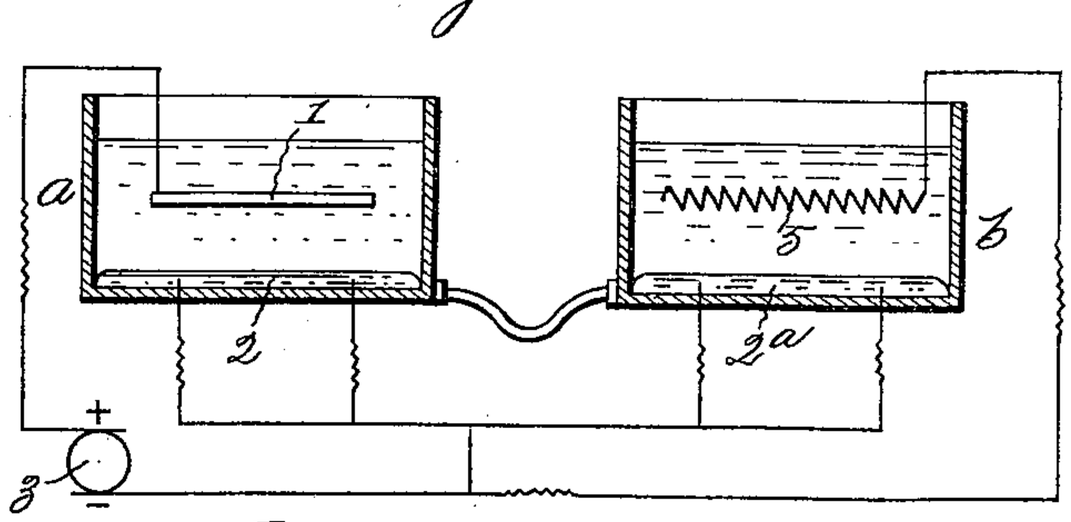


Fig. 2.

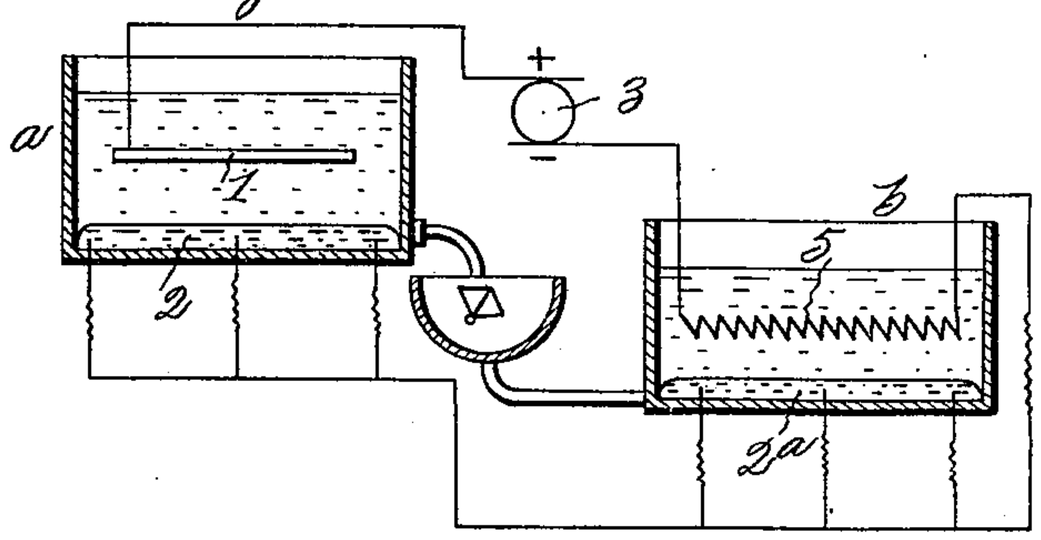


Fig. 3.

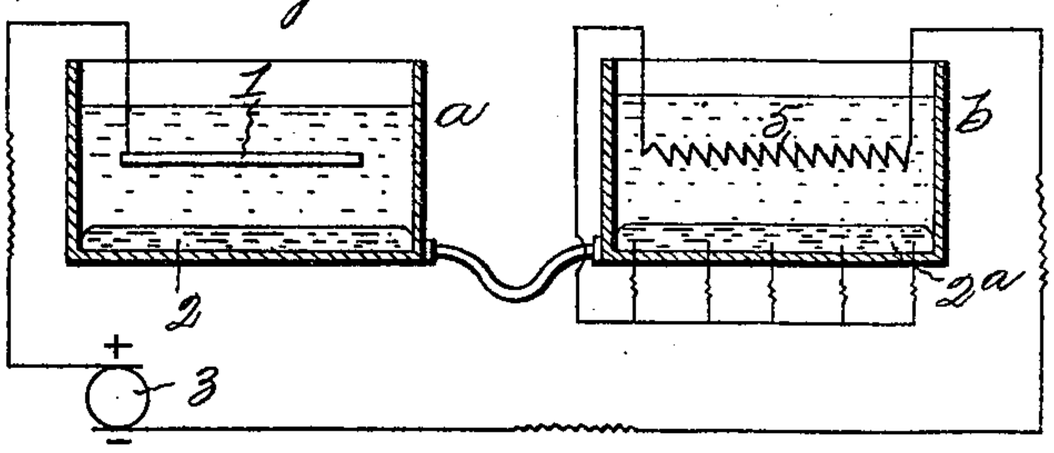
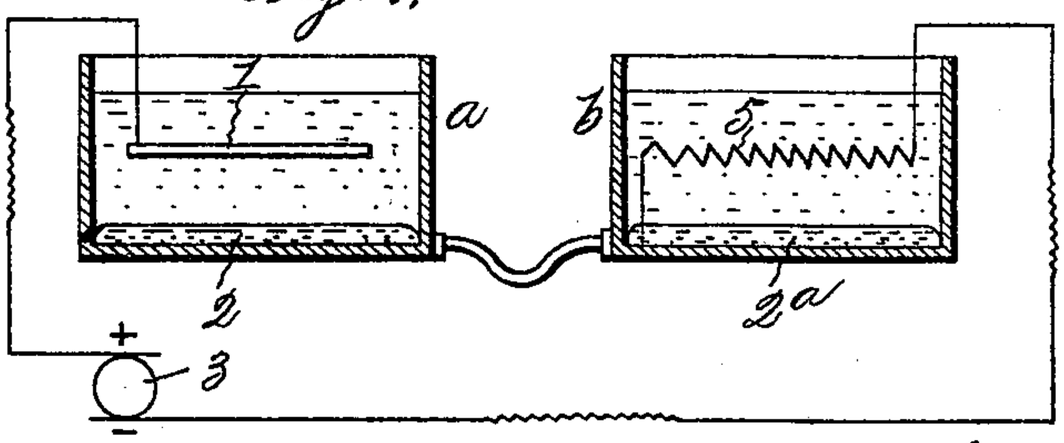


Fig. 4.



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CARL KELLNER, OF VIENNA, AUSTRIA-HUNGARY.

METHOD OF AND APPARATUS FOR PRODUCING ALKALI SALTS.

SPECIFICATION forming part of Letters Patent No. 631,468, dated August 22, 1899.

Application filed October 23, 1897. Serial No. 656,196. (No model.)

To all whom it may concern:

Be it known that I, CARL KELLNER, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Methods of and Apparatus for the Production of Alkali Salts; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electrolytic apparatus, and more particularly to the economic arrangement and connection of cells, so as to give as large an output as possible for a given current. It is a well-known fact that in electrolytic-decomposing apparatus provided with a mercury cathode there is sometimes considerable difficulty in eliminating from the amalgams formed by the cathions an equal number of cathions in the same unit of time in which the aforesaid cathions are set free from the electrolyte by the action of the current. To avoid this inconvenience, recourse has been had to several different manipulations—such as, for instance, first, separation of the amalgam by means of the difference of specific gravity; second, separation by centrifugal apparatus in which the lighter amalgam remains in contact with the dissolving fluid in the interior of the centrifugal drum, (in a manner analogous to the separation of cream from milk in a centrifugal separator,) while the heavier mercury goes to the periphery; third, by stirring with boiling water; fourth, by treating with steam, and, fifth, by so connecting the amalgam in the main circuit that the mercury is working in the decomposing-cell as an anode and in the oxidizing-cell as a cathode of the decomposing-current furnished by the machine. All these manipulations have proved inappropriate for this purpose. I have succeeded in finding a system of electrical connection by means of which the amalgam can be freed from the cathion as rapidly as it becomes enriched therewith and without resorting to special manipulations, which are apt to incommode the practical working, and without recourse to bipolar electrical connection, which will oxidize the mercury.

Referring to the drawings, in which like letters and numerals of reference refer to like parts throughout the several views, Figure 1 shows a system of connections for a pair of decomposing and oxidizing cells having a mercury electrode common to both and in which the decomposing-cell is connected with the generator and the oxidizing-cell is short-circuited and included as a shunt in the return-line to the generator. Fig. 2 is a system similar to Fig. 1, but having the mercury connection mechanically broken between the two cells. Fig. 3 is a view similar to Fig. 1, showing a system in which the current flows from the decomposing to the oxidizing cell and thence through the return-circuit to the generator, the oxidizing-cell being short-circuited and shunted in the main circuit. Fig. 4 is a view similar to Fig. 3, the oxidizing-cell being short-circuited through the liquid and included in the return-circuit. In these last three figures the secondary cathode forms also a part of the main metallic circuit.

The decomposing-cell of a continuously-operating electrolytic apparatus is indicated by *a* and the oxidizing-cell by *b*. It will be understood that I can use a number of pairs of such cells and connect them either in series or in parallel to obtain the best results and conform to the exigencies of the particular plant and the local conditions; but for the purpose of the present description I have shown only two cells in each figure, one a decomposing and the other an oxidizing cell. The anode 1 of the decomposing-cell is connected to the positive terminal of any suitable source of electricity 3, and indicated in the drawings by a generator. The cathode 2 of the same cell is connected to the negative terminal of the generator by direct connections, as shown in Figs. 1 and 2, and indirectly through the amalgam anode 2^a of the oxidizing-cell *b*, forming an uninterrupted metallic circuit, as shown in Figs. 3 and 4, while at the same time the anode 2^a and the cathode 5 of the oxidizing-cell *b* in all the figures are short-circuited. This short circuit is made by external connections in Figs. 1, 2, and 3, and by the internal connection, as in Fig. 4. Thus it is seen that the short circuit of the oxidizing-cell forms a shunt that is included in the main circuit, or rather in the return-line of the main circuit, and the secondary

current set up in the oxidizing-chamber by the action of the amalgam on the solvent is in a direction opposite to the main current.

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

1. An electrolytic apparatus comprising a decomposing-cell having electrodes, a source of electric supply connected therewith, an oxidizing-cell having electrodes and a short circuit for the latter electrodes forming part of the supply-circuit, substantially as described.

2. An electrolytic apparatus comprising a decomposing-cell having electrodes, a source of electric supply connected therewith, an oxidizing-cell having electrodes and a short-circuit connection for the latter electrodes within the cell forming part of the supply-circuit, substantially as described.

3. An electrolytic apparatus comprising a decomposing-cell having electrodes, the anode of which is connected to the positive terminal of a supply-circuit, an oxidizing-cell having electrodes, metallic connections between the cathode of the decomposing-cell and the anode of the oxidizing-cell and the latter anode connected to the negative terminal of the supply-circuit, and a short circuit for the electrodes of the oxidizing-cell forming part of the supply-circuit, substantially as described.

4. In an electrolytic apparatus comprising a decomposing-cell provided with a suitable anode and a mercury cathode and an oxidizing-cell provided with an amalgam anode and suitable cathode, a source of electric supply, a metallic connection between the electrodes of the oxidizing-cell, a metallic connection from the anode and cathode of the decomposing-cell to the source of electric supply, the metallic connection between the cathode of the electrolytic cell and the negative pole of the source of electricity serving as a portion of the metallic conductor between the electrodes of the oxidizing-cell, substantially as described.

5. An electrolytic apparatus comprising a decomposing-cell provided with an anode and a mercury cathode, a source of electric supply, connections therewith, and an oxidizing-cell provided with an amalgam anode and a suitable cathode, and a metallic connection between the latter electrodes and the negative pole of the source of electric supply, the cathode of the oxidizing-cell forming part of the circuit of the decomposing-cell, substantially as set forth.

6. In an electrolytic apparatus comprising a decomposing-cell, an anode and cathode therefor, a source of electric supply and connections therewith, and an oxidizing-cell separate from the decomposing-cell, a mercury connection between the cathode of the decomposing-cell and anode of the oxidizing-cell and a short circuit for the electrode of the oxidizing-cell forming part of the supply-circuit, substantially as described.

7. In an electrolytic apparatus comprising two cells, an anode in one and a cathode in the other, a bipolar electrode lying in both cells, a source of electric supply for the first cell and connected therewith, and a short circuit for the electrodes of the second cell forming a part of the circuit connections of the first cell, for the purpose set forth.

8. An electrolytic apparatus comprising a decomposing-cell having electrodes, the anode of which is connected to the positive terminal of a supply-circuit, an oxidizing-cell having electrodes, metallic connections between the cathode of the decomposing-cell and the cathode of the oxidizing-cell, the latter cathode connected to the negative pole of the supply-circuit, a short circuit for the electrodes of the oxidizing-cell forming part of the supply-circuit, and electrical connections between the anode of the oxidizing-cell and the positive pole of the source of electricity, substantially as described.

9. A method of producing alkali salts, which consists in electrolyzing a solution of a suitable substance in a cell having a mercury cathode forming an amalgam, transferring said amalgam to a second cell connected with the first cell and decomposing the amalgam by means of a suitable solvent, while passing therethrough the electrolyzing-current and the secondary current produced by metallically connecting the electrodes of said second cell, substantially as set forth.

10. A method of producing alkali salts, which consists in electrolyzing a solution of a suitable substance in a cell having a mercury cathode thereby forming an amalgam, transferring and decomposing said amalgam in a second cell having electrodes in series with those in the first cell, by means of a suitable solvent while passing therethrough the electrolyzing-current and the secondary current produced by metallically connecting the electrodes of the second cell, substantially as set forth.

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

CARL KELLNER.

Witnesses:
ALVIS ZWICKER,
HUGO RÖDERFF.