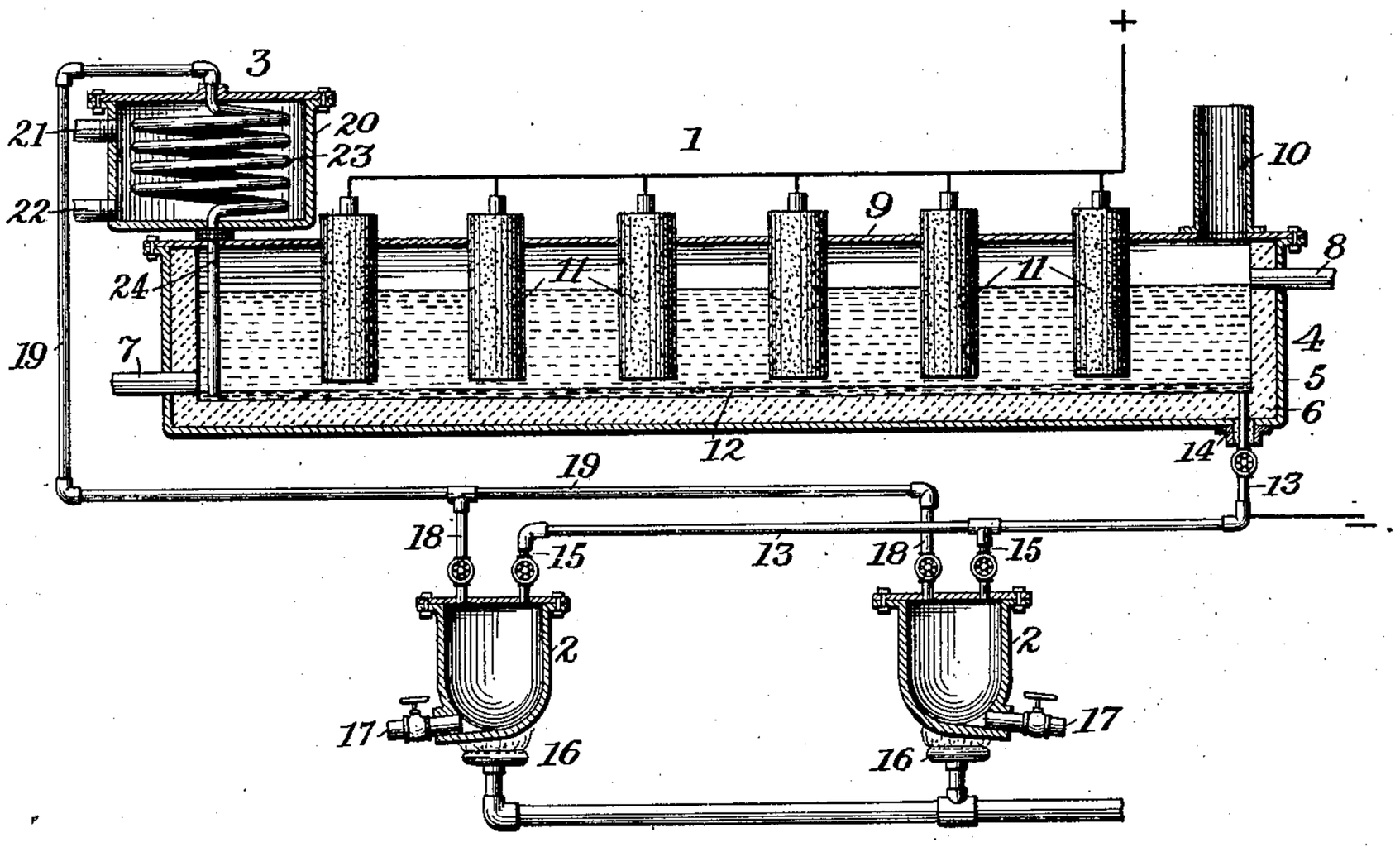
No. 734,499. PATENTED JULY 28, 1903.

C. E. BAKER & A. W. BURWELL.

ELECTROLYTIC APPARATUS FOR RECOVERING METALS FROM THEIR COMPOUNDS.

APPLICATION FILED NOV. 11, 1902.

NO MODEL.



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UNITED STATES PATENT OFFICE.

CHARLES E. BAKER AND ARTHUR W. BURWELL, OF CLEVELAND, OHIO.

ELECTROLYTIC APPARATUS FOR RECOVERING METALS FROM THEIR COMPOUNDS.

SPECIFICATION forming part of Letters Patent No. 734,499, dated July 28, 1903.

Application filed November 11, 1902. Serial No. 130,846. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. BAKER and ARTHUR W. BURWELL, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electrolytic Apparatus for Recovering Metals from Their Compounds, of which the following is a specification.

This apparatus is intended for the recovery of metals which will dissolve in or amalgamate with mercury, and more especially for the production of metallic sodium and chlorin from an aqueous solution of sodium chlorid.

The apparatus comprises means for the electrolysis of a solution of the metallic compound with a mercury cathode, means for distillation of the resulting amalgam to volatilize and separate the mercury from the metal to be recovered, and means for the condensation and return of the mercury to the electrolytic cell.

One form of the apparatus is shown in the accompanying drawing, in which the figure is a vertical longitudinal section.

The apparatus shown comprises an electrolytic cell 1, retorts 2, and a condenser 3. The electrolytic cell comprises a vessel 4, which may be of boiler-iron 5, with a lining 6 of Portland cement. The vessel has suitable pipes 7 8, preferably at its opposite ends, for the introduction of the electrolyte and discharge of the spent solution. The vessel has a cover 9, with outlet-flue 10 for the chlorin or other gaseous product. Through the cover pass a series of anodes 11, which may be carbon cylinders or plates. A layer of mercury 12, lying upon the bottom of the cell, serves as the cathode. Connection from the source of electric current to this layer of mercury is effected by a valved pipe 13, which also serves as a means for removing the amalgam produced by electrolysis. Pipe 13 is insulated from metal casing 5 by a bushing 14. Pipe 13 has two valved branches 15, which severally pass through the covers of the retorts 2. The retorts may be heated by gas-burners 16 beneath them. Each retort has a valved bottom outlet 17. From the cover of each retort leads a valved outlet 18, delivering to a common pipe 19. A condenser 3 is arranged to receive the mercury vapor from the pipe 19 and to deliver the condensed mercury back to the electrolytic cell to be recharged with the metal. The condenser shown comprises a vessel 20, with water inlet and outlet 21 22 and a worm 23 delivering to a pipe 24, by which the condensed mercury is carried back to the cathode layer 12. The pipe 24 is preferably of non-conducting material to prevent any short-circuiting of the electrolyzing-current.

In operation the electrolyte—for example, an aqueous solution of sodium chlorid—is continuously introduced at one end of the electrolytic cell by pipe 7 and flows longitudinally through the cell while supported upon the mercury cathode, the metallic base being thereby deposited upon and taken into solution by the mercury. The spent brine escapes through pipe 8 at the other end of the cell. The chlorin escapes through flue 10 and may be liquefied or utilized for the production of bleaching-powder. The mercury when sufficiently charged with the deposited metal escapes through the pipe 13 and is delivered to one of the retorts 2. This retort is heated to a temperature sufficient to volatilize the mercury, but not the metal dissolved therein. The mercury vapor escapes through outlet 18 and is delivered by pipe 19 to condenser 3, wherein it is liquefied and is thence returned to the cathode. The metal remaining in the retort is removed through outlet 17 or otherwise. A single retort may be employed; but it is preferable to use two, which receive the amalgam alternately.

The condensing-worm may, if preferred, be arranged in and cooled by the electrolyte. While the apparatus is especially intended for the recovery of sodium from an aqueous solution of its chlorid, it may obviously be employed for the recovery of any metal which is less volatile than the cathode metal and whether the metallic compound be in solution or molten. The cathode may be any metal or alloy which is more volatile than the metal to be recovered and if solid at ordinary temperatures may be maintained in a molten state by the heat generated by the passage of the current through the electrolyte or otherwise.

We claim—

1. An electrolytic apparatus for recovering metals from their compounds, comprising an

electrolytic cell having a liquid cathode of a metal which is more volatile than the metal to be recovered, means for distilling the amalgam or alloy produced in the electrolytic cell, means for condensing the vaporized cathode metal, and connections between the electrolytic cell, distilling means and condensing means, as set forth.

2. An electrolytic apparatus for recovering metals from their compounds, comprising an electrolytic cell having a liquid cathode of a metal which is more volatile than the metal to be recovered, a plurality of retorts, a condenser, separate connections from the electrolytic cell to the retorts and from the retorts to the condenser, and an outlet from the condenser to the electrolytic cell, as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

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Witnesses:
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