No. 724,580. PATENTED APR. 7, 1903.

R. JOHANNS.

ELECTROLYTIC CELL.

APPLICATION FILED DEC. 11, 1902.

NO MODEL.

Fig. 1.

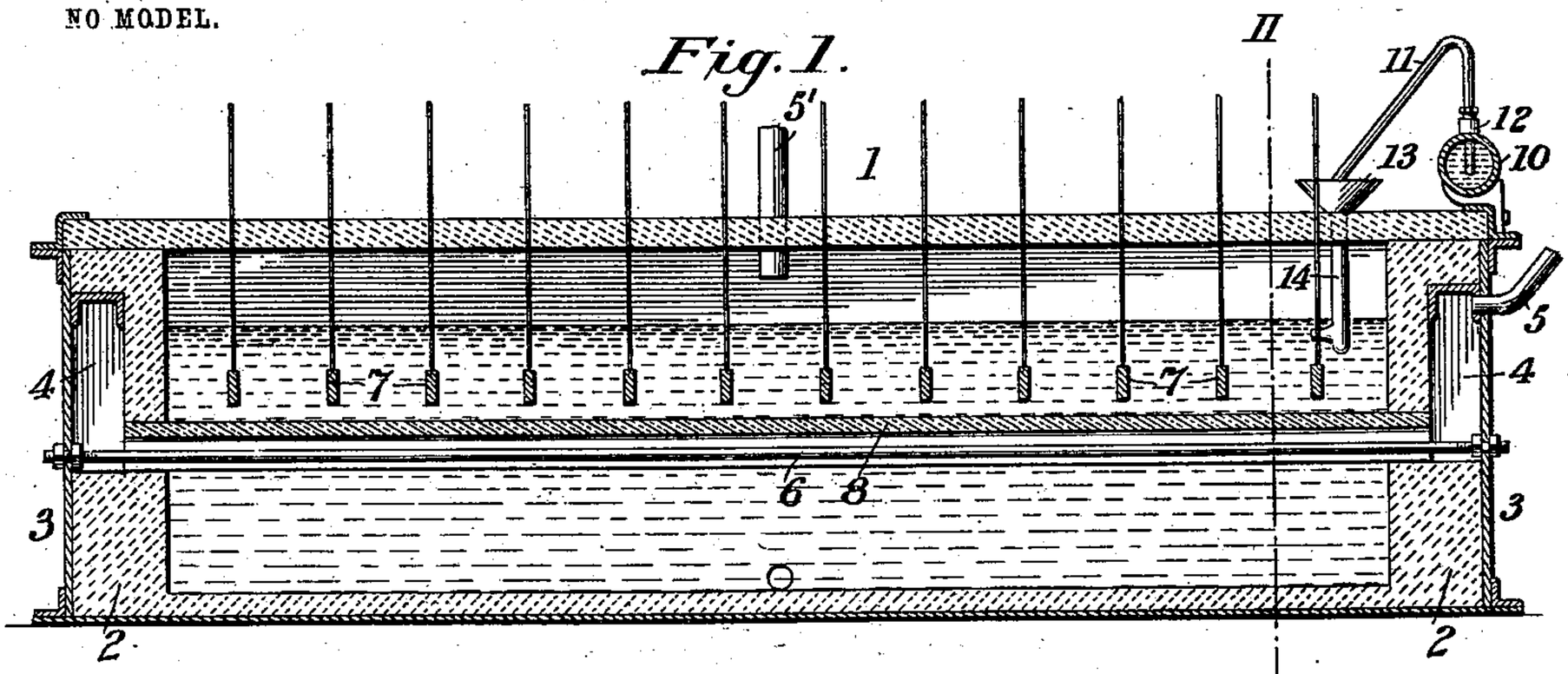


Fig. 2.

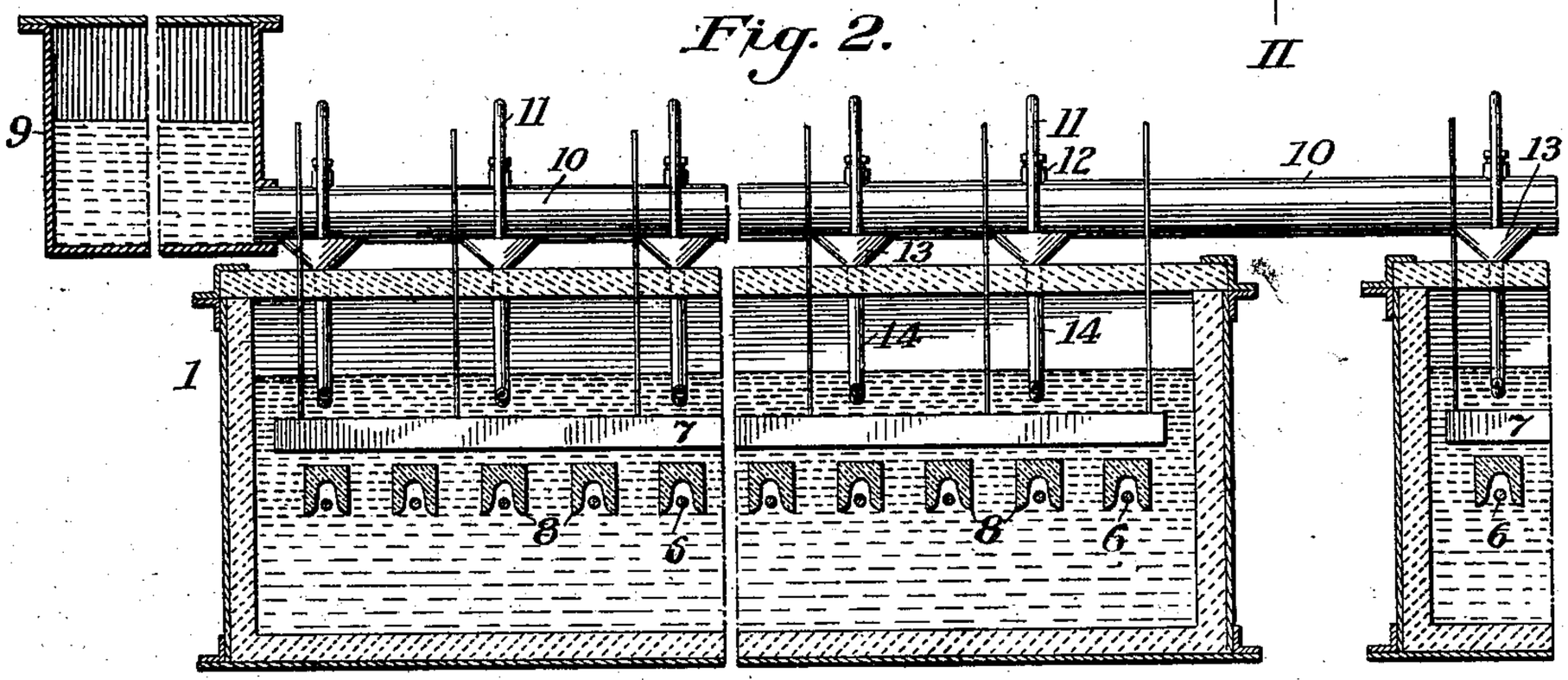


Fig. 3.

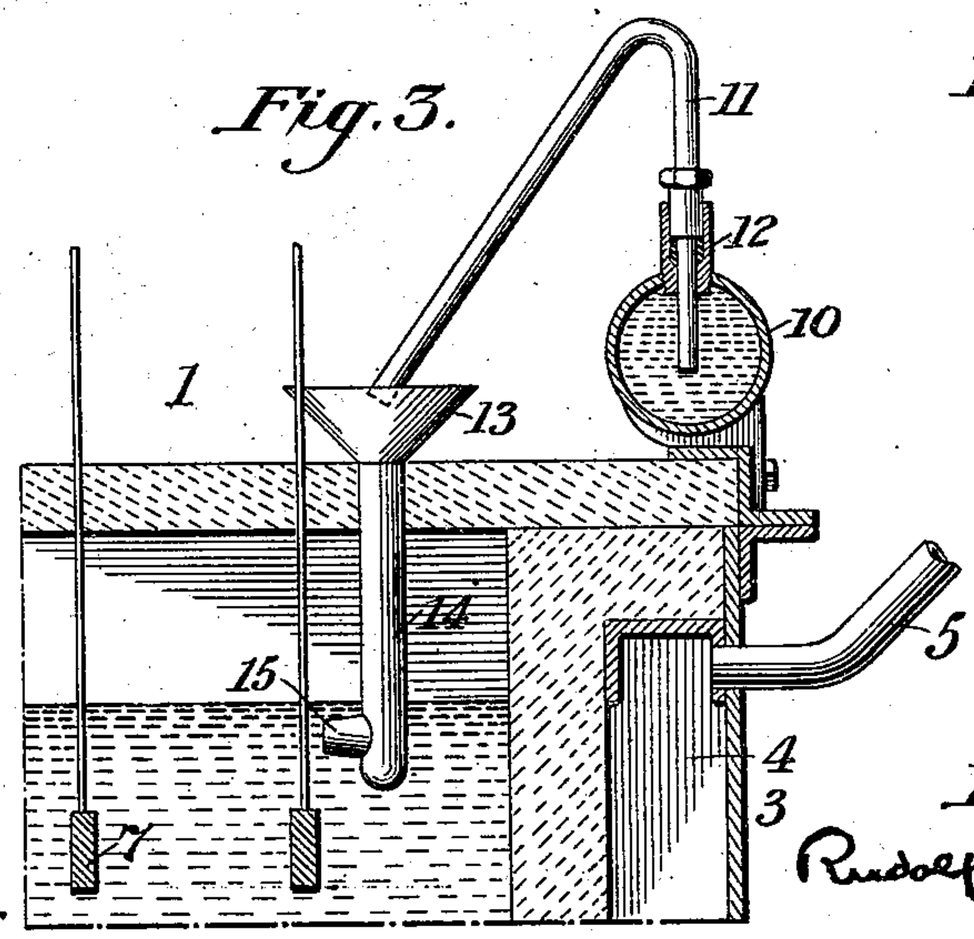
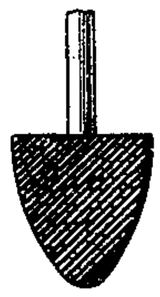


Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

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ELECTROLYTIC CELL.

SPECIFICATION forming part of Letters Patent No. 724,580, dated April 7, 1903.

Application filed December 11, 1902. Serial No. 134,820. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH JOHANNS, a citizen of the United States, residing at Brooklyn, State of New York, have invented certain new and useful Improvements in Electrolytic Cells, of which the following is a specification.

This invention is an apparatus intended particularly for the electrolysis of such compounds as yield at the cathode, as one of the products, a gas. More particularly, it is designed for the electrolytic decomposition of sodium or potassium chlorid solutions with the production therefrom of chlorin, hydrogen, and caustic soda or caustic potash.

For a clear understanding of the invention reference is made to the accompanying drawings, wherein—

Figure 1 is a vertical longitudinal section of a cell constructed according to my invention. Fig. 2 is a vertical transverse section of my apparatus. Fig. 3 is a sectional detail, on a large scale, of the feeding device; and Fig. 4 is a section of a modified form of anode.

Referring to the figures, 1 represents the electrolytic cell, which may be of iron interiorly lined with a non-conducting material 2, which should be substantially unattacked by the electrolyte or its products. Glass or cement are suitable lining materials for this purpose. Within the lining of opposite sides or ends 3 of the cell chambers 4 4 are formed, said chambers serving to collect the evolved hydrogen, as hereinafter more fully described. Eduction-pipes 5 are provided for withdrawal of the hydrogen and one or more pipes 5′ for the escape of chlorin. Horizontal bars, wires, or rods 6, preferably of iron, traverse the cell below the surface-line of the electrolyte and are suitably secured to the external metallic casing. As a suitable means of securing the rods I have shown them in Fig. 1 as being screw-threaded and secured to the cell-walls by means of nuts. These rods constitute the cathodes of the apparatus, and accordingly it is upon their surfaces that the formation of caustic soda and the liberation of hydrogen occur. Above the cathodes and in close proximity to them are suspended a series of parallel anode-bars 7. These bars are in position to be entirely immersed in the electrolyte and are preferably arranged, as shown, in a direction at right angles to that of the cathodes. They may be of platinum or of carbon. If of platinum, they are preferably given the form of rectangular bars or strips, as indicated in Figs. 1, 2, and 3. If of carbon, they are preferably of the form shown in Fig. 4.

Each cathode-bar 6 is surmounted and partially inclosed by a hood or inverted channel 8, which may be formed of glass or cement. Said hoods serve to collect and convey to the chambers 4, above referred to, the hydrogen evolved during electrolysis. It will be noted that the form of the channel and its position with relation to the cathode-rods are such as to provide for the removal of the hydrogen with a minimum disturbance of the electrolyte. It will also be noted that the hydrogen is not permitted to escape through or mingle with the body of the electrolyte and that the disposition of parts is such that any agitation of the liquid by the escaping gases will be substantially avoided.

Fresh brine is fed to the cells continuously by means of the device shown in detail in Figs. 2 and 3. A reservoir 9 is provided, in which the brine is maintained at constant level by means of a float actuating a valve or by any other approved means. Said reservoir communicates with a main 10, which lies adjacent to each cell of a series, and individual feed-tubes 11, preferably bent in the manner indicated, are provided, several of such tubes being preferably employed in connection with each cell in order to insure therein a proper and equal distribution of the inflowing brine. Each tube 11 passes through a stuffing-box 12 in the wall of the main 10 and is vertically adjustable therein in order to control the rate of flow. It is essential that the discharge end of each tube 11 be at a lower level than the surface of the liquid in the supply-tank 9. I prefer that the level of the liquid in tank 9 be kept below the bends of the tubes 11, whereby the latter function as siphons. Under such conditions a given vertical movement of the tube corresponds to a greater difference of flow than if the level in the supply-tank were higher and adjustment

to the precise degree required is more easily made. The tube 11 discharges into a funnel or other receptacle 13, and the brine passes thence through the stem 14 and lateral discharge-nozzle 15 into the electrolytic cell. The nozzle 15 is placed slightly beneath the surface of the electrolyte and discharges the fresh brine into the latter in a substantially horizontal direction. In this way an approximately uniform surface distribution of the incoming brine is secured and the fresh salt solution descends into the field of electrolysis with the minimum disturbance of the electrolyte. At the same time a thorough admixture of the fresh and partially-exhausted electrolyte is secured.

The chief purpose of the several details of construction above described is to provide for the conduct of the electrolysis with the minimum amount of agitation of the electrolyte, and to this end the form of the cell and the several elements coöperate. The inflowing brine is evenly distributed over the surface of the liquid and mingles evenly with the main body of the electrolyte. This flow is adjustable within narrow limits and may be reduced to a drop-by-drop feed, whereby the additional function of breaking any electrical connection between several cells of a series is accomplished. The arrangement of the anodes and cathodes at an angle to each other tends to avoid the presence of concentration-currents in the liquid arising from the impoverishment of the electrolyte around the electrodes, and the withdrawal of the liberated hydrogen is effected without disturbance or agitation of the main body of the electrolyte.

I claim—

1. An electrolytic cell comprising an anode, a cathode, an inverted trough above the cathode, and a conduit extending from said trough to a point beyond the limiting-surface of the electrolyte, as set forth.

2. An electrolytic cell comprising an anode, a cathode, an inverted trough above the cathode, a gas-collecting chamber, and a conduit communicating with said trough and chamber whereby agitation of the electrolyte by escaping gases is avoided, as set forth.

3. An electrolytic cell comprising an anode, a cathode, an inverted trough above the cathode, a gas-collecting chamber exterior to the cell, and a conduit communicating with said trough and chamber whereby agitation of the electrolyte by escaping gases is avoided, as set forth.

4. An electrolytic cell comprising an anode, a horizontal cathode, an inverted trough above the cathode, a gas-collecting chamber, and a conduit communicating with said trough and chamber whereby agitation of the electrolyte by escaping gases is avoided, as set forth.

5. An electrolytic cell comprising an anode, a horizontal cathode, an inverted horizontal trough above the cathode, a gas-collecting chamber, and a conduit communicating with said trough and chamber whereby agitation of the electrolyte by escaping gases is avoided, as set forth.

6. An electrolytic cell comprising an anode, a cathode, an inverted trough above the cathode, a gas-collecting chamber in the wall of the cell, and a conduit communicating with said trough and chamber whereby agitation of the electrolyte by escaping gases is avoided, as set forth.

7. A plurality of electrolytic cells, a supply-main adjacent thereto and vertically-adjustable tubes adapted to convey electrolyte from said main to each of said cells, as set forth.

8. A plurality of electrolytic cells, a supply-main adjacent thereto and vertically-adjustable siphon-tubes adapted to convey electrolyte from said main to each of said cells, as set forth.

9. An electrolytic cell comprising a plurality of anodes, a plurality of cathodes, a conduit at the side of an anode for the introduction of electrolyte, and a lateral orifice arranged to discharge beneath the surface of the electrolyte, as set forth.

10. An electrolytic cell comprising a plurality of anodes, a plurality of cathodes, and a series of conduits at the side of an anode for the introduction of electrolyte, said conduits being provided with lateral orifices arranged to discharge beneath the surface of the electrolyte, as set forth.

11. An electrolytic cell comprising a series of horizontal cathodes, a series of horizontal anodes situated above said cathodes and having their longest dimensions at an angle thereto, and a supply device at the side of an anode, as set forth.

12. An electrolytic cell comprising a series of horizontal cathodes, gas-collecting devices above each cathode, a series of horizontal anodes situated above said cathodes and having their longest dimensions at an angle thereto, and a supply device at the side of an anode, as set forth.

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

RUDOLPH JOHANNS.

Witnesses:
HERMANN FRÄNK,
HENRY STERLING.