(No Model.)

O. KNÖFLER.

ELECTROLYTICAL APPARATUS.

No. 522,839. Patented July 10, 1894.

Fig: 1.

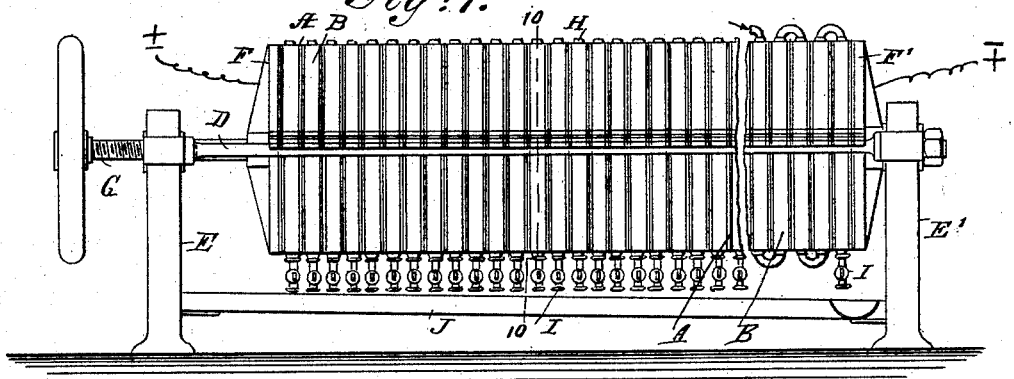


Fig: 2.

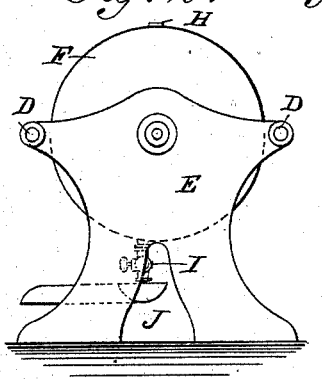


Fig: 6.

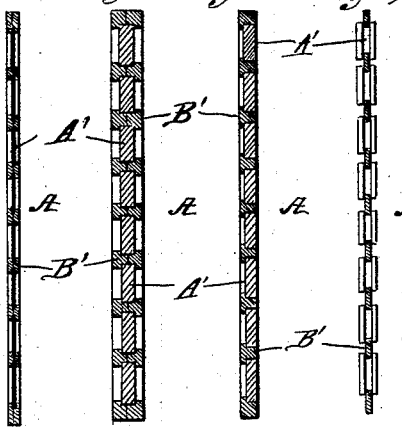


Fig: 7.

Fig: 8.

Fig: 9.

Fig: 3.

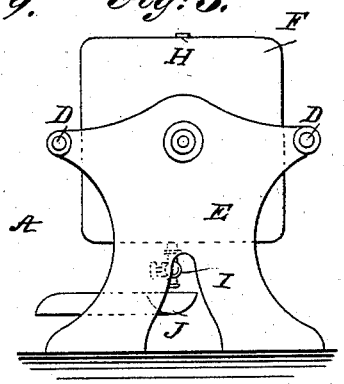
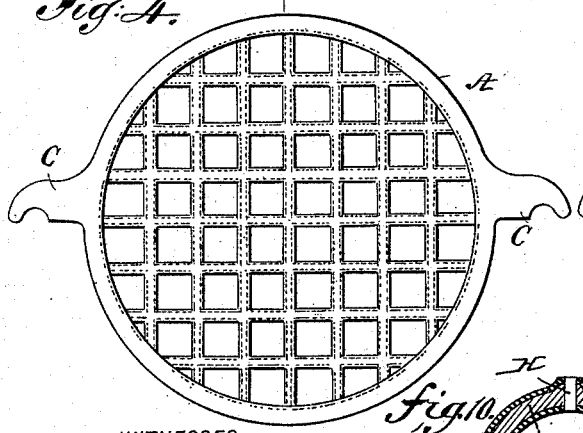


Fig: 5.

Fig: 4.



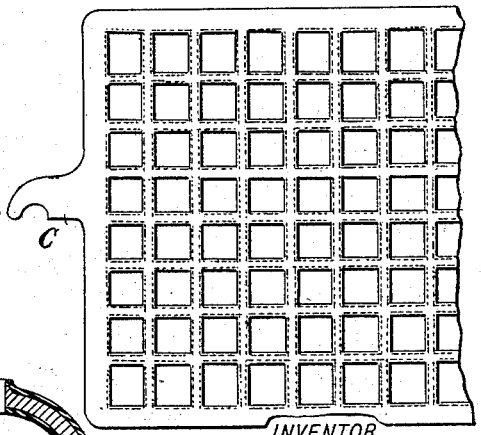
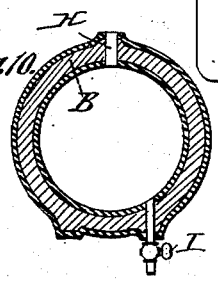


Fig. 10.



WITNESSES:

Chas. Viola.

G. Sedgwick

INVENTOR

O. Knöfler

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

OSKAR KNÖFLER, OF CHARLOTTENBURG, GERMANY.

ELECTROLYTICAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 522,839, dated July 10, 1894.

Application filed December 7, 1892. Serial No. 454,372. (No model.)

To all whom it may concern:

Be it known that I, OSKAR KNÖFLER, a subject of the Emperor of Germany, and a resident of Charlottenburg, Germany, have invented certain new and useful Improvements in Electrolytical Apparatus, of which the following is a specification.

The object of the invention is to provide certain new and useful improvements in apparatus for electrolytical solutions, of all kinds, especially for treating solutions of chloride of sodium, chloride of potassium, of magnesium, and other metals to obtain bleaching solutions, the apparatus being arranged for convenient attachment to any high or low tension current from any suitable source of supply.

The invention consists of certain parts and details, as will be hereinafter described and then pointed out in the claim.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the apparatus; the right hand portion of the figure illustrating a slight modification. Fig. 2 is an end view of the same. Fig. 3 is a like view of a modified form of the same. Fig. 4 is an enlarged face view of an electrode. Fig. 5 is a like view of a modified form of the same; and Figs. 6, 7, 8 and 9 are transverse sections of modified forms of electrodes. Fig. 10 is a transverse vertical section of one of the frames, taken on line 10—10 of Fig. 1.

The improved apparatus is provided with a series of electrodes A, made in the shape of plates as more particularly described hereinafter and arranged alternately with insulated frames B, the latter, as well as the plates, being provided on opposite sides with lugs C, resting on longitudinally-extending insulated bars D, supported in suitable standards E and E′, as plainly shown in Figs. 1, 2 and 3. The electrodes are preferably made of a material that will not have any appreciable chemical action on the electrolyte, for instance carbon or platinum plates may be employed for this purpose. Such a material I will term "chemically indifferent." Any desired number of such alternating electrodes and insulating frames A and B, may be arranged for an apparatus, and the electrode at one end is held against the face plate F′, abutting against the standard E′, while a like face plate F engages the electrode on the opposite end, and this face plate F is pressed on by a suitable screw G, screwing in the standard E and serving to press the several electrodes and plates firmly one upon the other, as illustrated in Fig. 1.

The face plates F and F′ are connected with the poles of the battery or other source of electric supply, and the frames B, intervening between the electrodes are each provided on top with an inlet H, connected with a suitable source of liquid supply, and each frame is also provided on its bottom with an outlet I, discharging into a trough J, supported on the standards E and E′ and serving to carry off the liquid after it is treated. In practice the frames are provided with outlets to allow the air to escape when the liquid is poured in.

It will be seen that by the alternately arranged electrodes and frames, special compartments are formed in each frame for the liquid to pass through so that the electric current passes from one electrode through the liquid to the next following electrode, and so on, so that in each compartment the face of one electrode forms the anode and the opposite face of the other electrode the cathode.

It will be observed that the electrodes form partitions to separate adjacent cells or compartments, there being no direct communication between the said compartments.

It will be understood that there is no conducting connection between the individual electrodes except through the liquid, that is to say, the electrodes are arranged in tension, instead of being arranged in quantity, as in the usual electrolytical apparatus.

The frames B are preferably made of iron covered by hard rubber, so that the metal is insulated as will be seen in Fig. 10. The frames may also be made of ceramic material such as clay, glass or celluloid, or water-proof wood and other non-conducting material. The electrodes and frames may be round as shown in Fig. 2, or square as illustrated in Fig. 3, or of any other desired form, it being understood

that the frames fit on the plates to form compartments for the passage of the liquid, as above described. Instead of passing the liquid through each compartment, the latter may be arranged so that the liquid flows in at an end compartment and through the several compartments at the other end of the apparatus. This modification is illustrated at the right-hand end of Fig. 1. Instead of arranging the electrodes and frames one alongside the other, as illustrated, they may be arranged one on top of the other. Instead of using separate frames and electrodes, each electrode may be secured within a frame so that by placing several electrodes alongside each other the frames of adjacent electrodes will be brought in contact with one another to form cells or compartments for the reception of the liquid. Figs. 6 to 9 represent in vertical section several forms of such electrodes combined with their insulating frames. The electrodes are not continuous, but consist of numerous separate plates fastened to the frame like the panes of a window. In the drawings the frame is lettered B′, and the electrode plates A′. It will be seen that there is no electrical connection between the individual plates A′, and that the opposite surfaces of the plates will be in contact with the liquid in different compartments. As shown in Fig. 9, the plates A′ may be provided with circumferential grooves adapted to engage with the frame B′. It will be seen that by this arrangement, the electricity passes through the liquid in the several compartments with the same force, so that the liquid is acted on equally in each and every compartment of the apparatus.

The employment of chemically indifferent electrodes is particularly advantageous since it will prevent secondary reactions which are detrimental to the main electrolytic process. It will further be seen that any desired number of such arranged electrodes and frames may be arranged alongside each other, and connected with one and the same current which passes through all the apparatus. Thus, it will be seen that very high tension currents may be utilized especially such as for electric lighting purposes.

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

An electrolytic apparatus, comprising a series of electrodes consisting of an insulating frame and of separate conducting plates set therein after the fashion of window-panes, separate compartments arranged between the said electrodes for the reception of the electrolyte, and electrical connections to the end electrodes, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 8th day of November, 1892.

OSKAR KNÖFLER.

Witnesses:
FR. MEANEY,
BEHM.