No. 718,249. PATENTED JAN. 13, 1903.

M. HAAS.

ELECTROLYTIC APPARATUS.

APPLICATION FILED AUG. 6, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

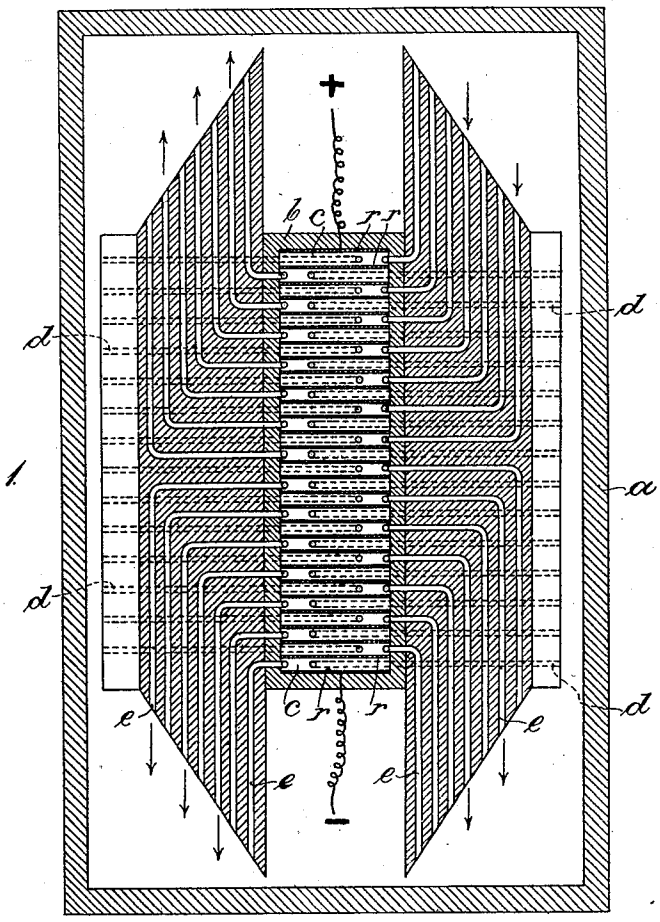
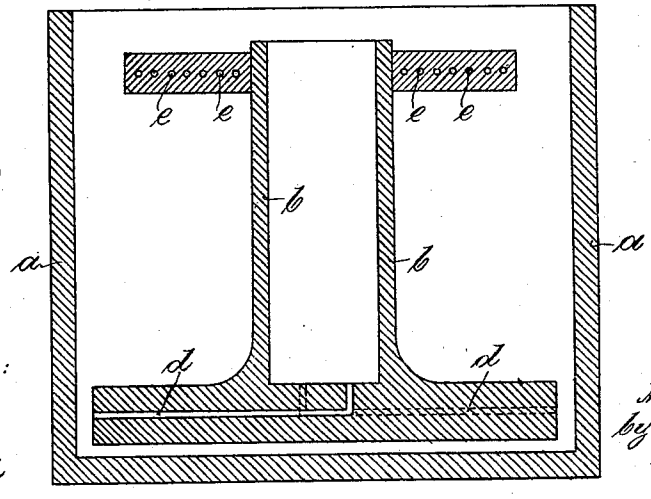


Fig. 2.



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 3.

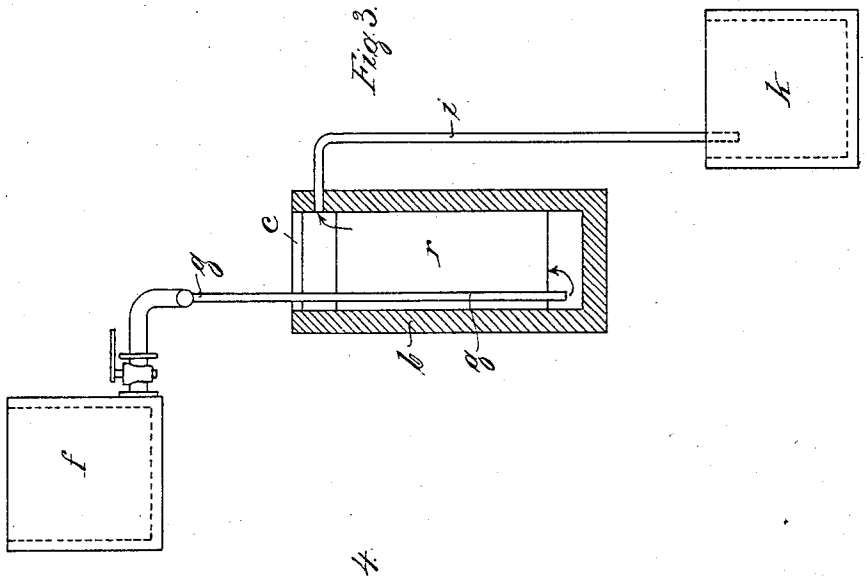
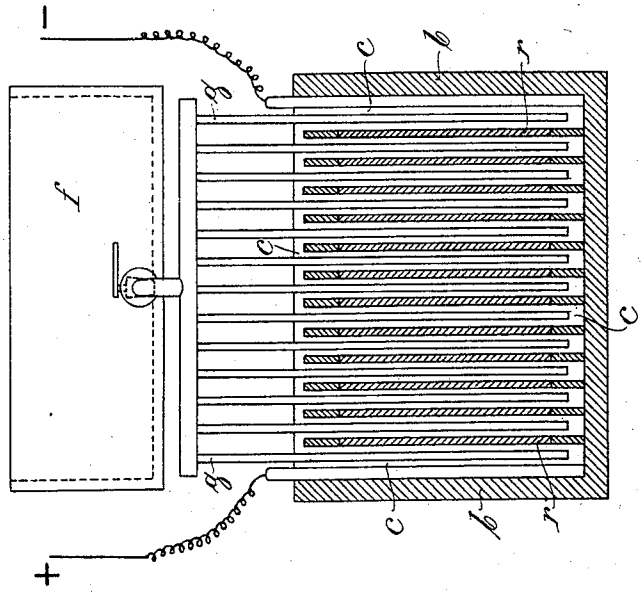


Fig. 4.



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APPLICATION FILED AUG. 6, 1901.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.

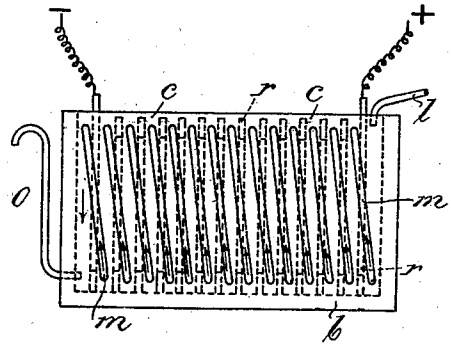


Fig. 6

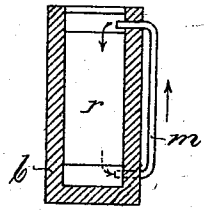
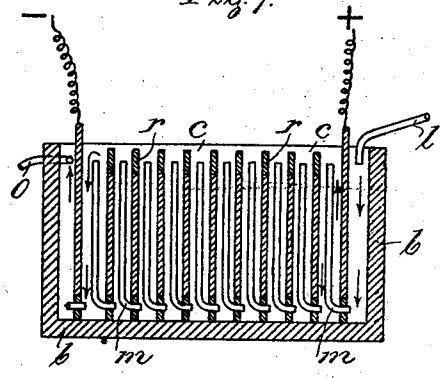


Fig. 7.



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UNITED STATES PATENT OFFICE.

MAX HAAS, OF AUE, GERMANY.

ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 718,249, dated January 13, 1903.

Application filed August 6, 1901. Serial No. 71,074. (No model.)

To all whom it may concern:

Be it known that I, MAX HAAS, a subject of the King of Saxony, and a resident of Aue, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Electrolytic Apparatus, of which the following is an exact specification.

My invention relates to electrolytic apparatus employed for the production of bleaching liquor and the like. In electrolytic apparatus with double-pole electrodes the current can only be perfectly utilized in case no current can run through the liquid from the — pole side to the + pole side of each electrode—that is to say, in case the liquid does not form a connection between the several compartments of the apparatus. Practically it is impossible to perfectly avoid this connection, because in the electrolytic apparatus hitherto used the liquid either flows directly from one compartment into the other one, as shown, for instance, in my former Letters Patent, No. 651,849, or flows from a storage vessel directly into each compartment, as shown, for instance, in my former application, Serial No. 20,341, filed June 14, 1900. In all constructions the liquid forms a connection between several compartments, by means of which connection losses of current arise. These losses increase with the diminution of the resistance opposed to the current by the liquid—that is to say, the losses are the greater the greater the cross-section and the smaller the length of the liquid connection between the poles of each electrode is. These losses are considerably reduced by the object of the present invention by providing long narrow tubes manufactured of a non-conducting material, through which tubes the liquid has to flow in order to pass from one compartment of the apparatus into another one or from the storage-reservoir into the several compartments and from these compartments to the collecting vessel. The resistance opposed to the current by the long pipe connection is much greater than the resistance opposed to the same within the compartments, so that the loss of energy can only be so small that it practically does not come in consideration at all.

In order to make my invention more clear, I refer to the accompanying drawings, in which—

Figures 1 and 2 show my invention as applied to the apparatus shown in my former application, Serial No. 20,341. Figs. 3 and 4 show the invention as applied to an apparatus in which the liquid is brought from a storage-reservoir separately into the several compartments. Figs. 5 and 6 show my invention as applied to an apparatus in which the liquid is brought into the first compartment and flows from there into each successive compartment, leaving the apparatus at the last compartment, while Fig. 7 shows a modification of the construction shown in Figs. 5 and 6.

In the construction shown in Figs. 1 and 2 *a* is a storage vessel. *b* is the electrolyzing apparatus proper, consisting of a vessel divided into several compartments *c* by divisions *r*, manufactured of coal or any other suitable material, forming the intermediate electrodes. The electrolyzing apparatus *b* is mounted in the storage-receptacle *a* in such a manner that a free space of few inches is left between its bottom and the storage vessel. The liquid enters the electrolyzing apparatus *b* through narrow passages *d* on the bottom of the same, one of which passages *d* leads to each compartment *c*. As soon as the electrical current is conducted into the apparatus gases develop in each compartment *c* of the internal vessel *b*. Owing to the ascending gas-bubbles, the specific weight of the contents of the compartment diminishes and the liquid is carried along, so as to flow through channels *e*, provided on the upper part of the vessel, into the storage-receptacle *a*, as shown by the arrows. By the arrangement of the long narrow channels *d* and *e* the resistance opposed to the current is rendered so great that nearly no current at all will flow from one side of a division *r*, forming the electrode, through the channel *e*, the storage vessel, and the channel *d* to the next compartment—viz., to the other side of the respective division or electrode *r*. Hereby it is attained that nearly no losses of energy arise and that the whole current led to the apparatus is utilized.

In Figs. 3 and 4 the invention is shown as applied to another construction of electro-

lyzing apparatus. In this construction the storage vessel *f* is situated above the electrolyzing apparatus proper, *b*. The liquid contained in this vessel *f* flows through narrow pipes *g* to the different compartments *c* of the vessel *b*—that is to say, a separate pipe *g* is provided for each compartment. As may be seen from Fig. 3, the pipes *g* lead until nearly to the bottom of electrolyzing vessel *b*. The liquid is taken off near the top of vessel *b* and is led through long narrow pipes *i* to the collecting vessel *k*. In consequence of the long narrow pipes *g* and *i* being provided, a great resistance is opposed to the current by the liquid, as the current which would pass through the liquid from one side of the electrode *r* to the other one would have to pass either through two pipes *g* or through two pipes *i*.

In the construction shown in Figs. 5 and 6 the liquid is brought into the apparatus through the pipe *l* at the top of the first compartment and flows vertically through this compartment. It leaves the same at the bottom through the pipe *m*, which ends at the top of the second compartment. The liquid after passing the whole apparatus leaves the same through the pipe *o*. The pipe *m* being narrow and relatively long, a great resistance is opposed to the current in the same way shown above.

The construction shown in Fig. 7 differs from the construction shown in Figs. 5 and 6 only by the pipes *m* for leading the liquid from one compartment to the other one being fixed in the lower part of the divisions *d*, which lower part consists of an insulating material, and by the pipes not being situated outside, but inside, the compartments.

Having thus fully described the nature of this invention, what I desire to secure by Letters Patent of the United States is—

In electrolytic apparatus, the combination of a vessel, bipolar electrodes dividing this vessel in several compartments, long narrow channels manufactured of an insulating material connecting these compartments, said channels forming the only liquid connection between these compartments, substantially as described and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MAX HAAS.

Witnesses:
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W. R. HUBRICK.