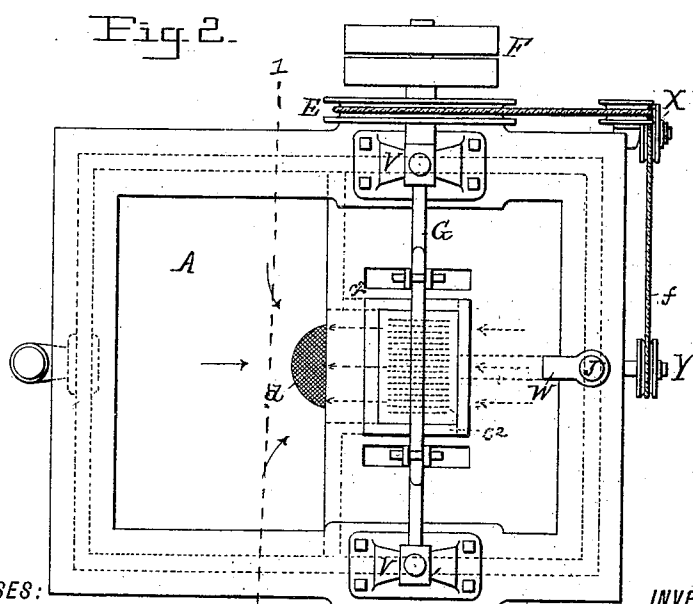
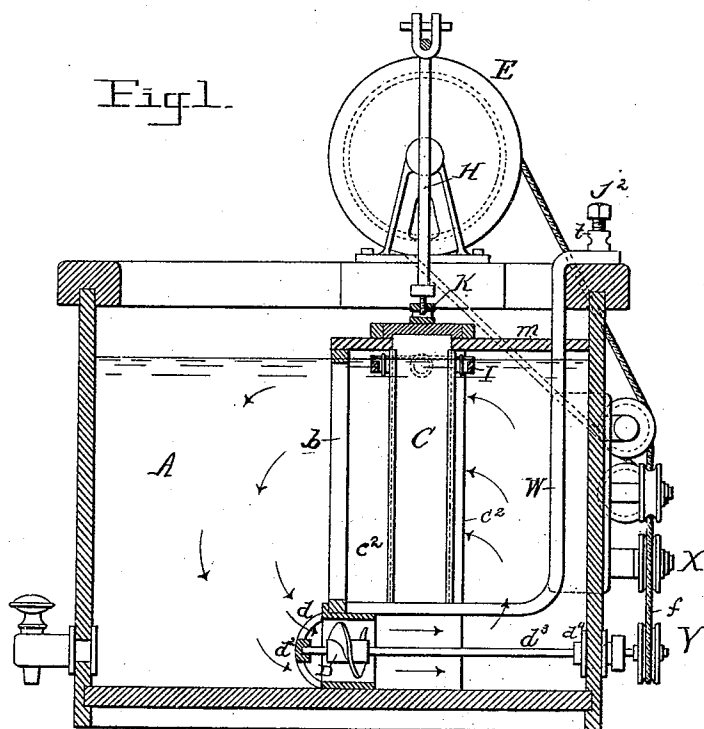


3 Sheets—Sheet 1.

APPARATUS FOR BLEACHING BY ELECTROLYSIS.

Patented Feb. 19, 1889.



WITNESSES:

E. J. Griswold.
John Revell.

E. Hermite, G. J. Paterson & G. F. Cooper.

BY

BY
Howson and Howson
their ATTORNEYS

(No Model.)

3 Sheets—Sheet 2.

E. HERMITE, E. J. PATERSON & C. F. COOPER.

APPARATUS FOR BLEACHING BY ELECTROLYSIS.

No. 398,045.

Patented Feb. 19, 1889.

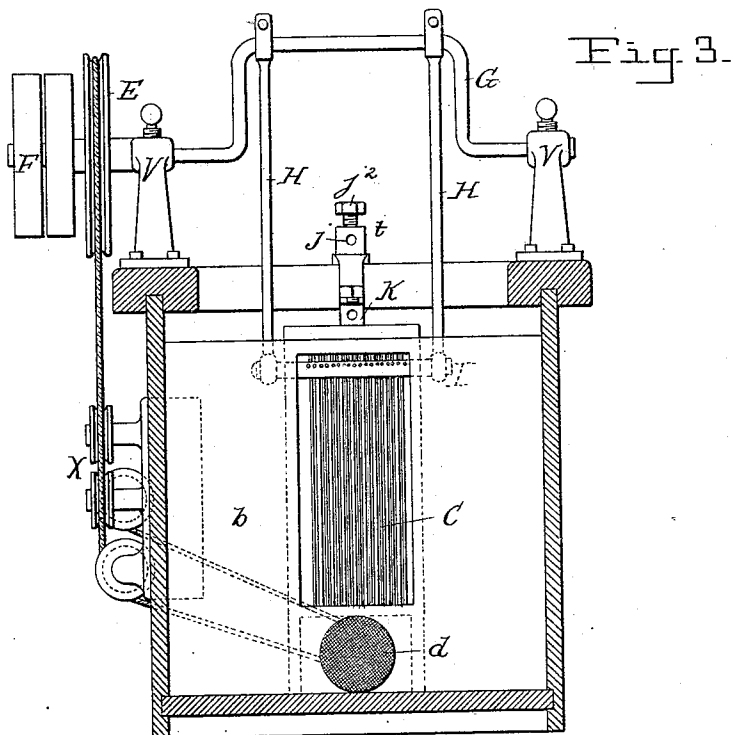
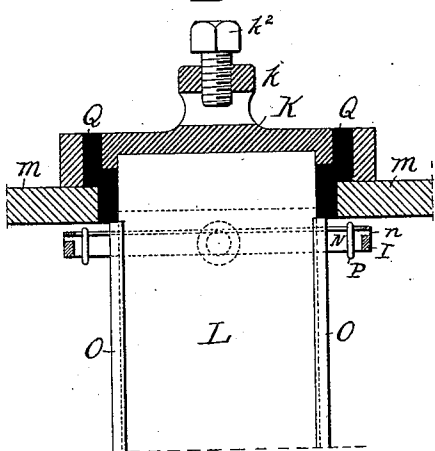


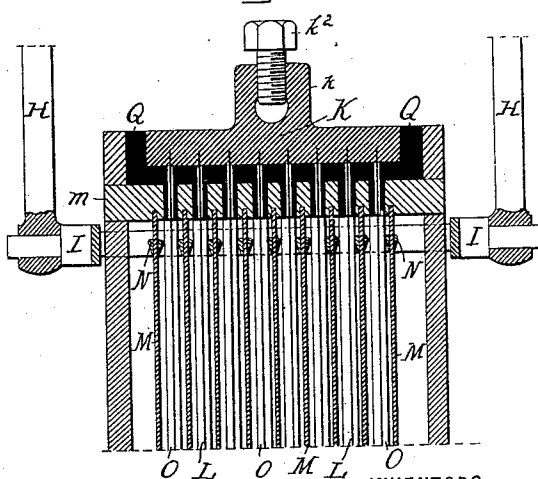
Fig. 4



WITNESSES:

E. J. Griswold.
John Revell.

Fig. 5



INVENTORS
E. Hermite, E. J. Paterson & C. F. Cooper.

BY

Howson and Howson
their ATTORNEYS

E. HERMITE, E. J. PATERSON & C. F. COOPER.
APPARATUS FOR BLEACHING BY ELECTROLYSIS.

No. 398,045.

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Fig. 6.

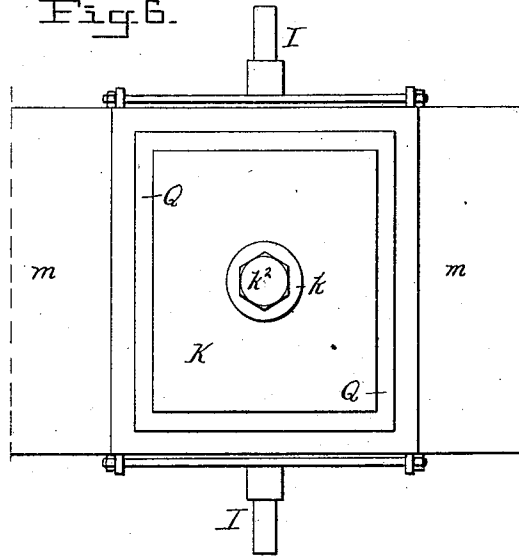


Fig. 7.

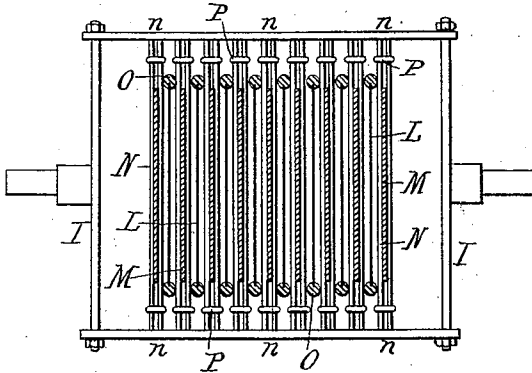


Fig. 9.

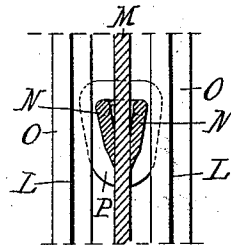
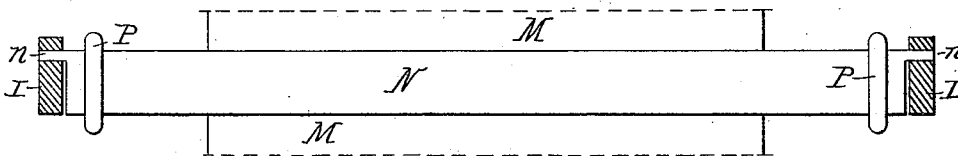


Fig. 8.



WITNESSES:

E. J. Griswold
John Revell.

INVENTORS

E. Hermite, E. J. Paterson & C. F. Cooper.

BY

Horsman and Horsman
their ATTORNEYS

UNITED STATES PATENT OFFICE.

EUGENE HERMITE, EDWARD JAMES PATERSON, AND CHARLES FRIEND
COOPER, OF LONDON, ENGLAND.

APPARATUS FOR BLEACHING BY ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 398,045, dated February 19, 1889.

Application filed October 26, 1887. Serial No. 253,474. (No model.) Patented in England November 12, 1886, No. 14,673; in France December 15, 1886, No. 180,291; in Belgium March 3, 1887, No. 76,559, and in Spain May 5, 1887, No. 10,747.

To all whom it may concern:

Be it known that we, EUGENE HERMITE, a citizen of the United States, and a resident of London, England, and EDWARD JAMES PATERSON and CHARLES FRIEND COOPER, subjects of the Queen of Great Britain and Ireland, and residents of London, (Pownall Road, Dalston,) in the Kingdom of Great Britain and Ireland, have invented Improvements in Apparatus for Bleaching by Electrolysis, (for which we have obtained British Patent No. 14,673, dated November 12, 1886; French Patent No. 180,291, dated December 15, 1886; Belgian Patent No. 76,559, dated March 3, 1887, and Spanish Patent No. 10,747, dated May 5, 1887,) of which the following is a specification.

This invention relates to an improved apparatus for preparing by electrolysis solutions employed for bleaching fabrics, fibers, paper-pulp, or other materials.

The object of our invention is to so construct the apparatus that the elements or electrodes will be freed from all deposits and the freed deposits be carried by the circulation of the solution to the point where the bleaching is to take place, so as to get a complete cycle of chemical changes so long as the electric current acts on the solution.

The apparatus is more particularly intended for carrying out the process of bleaching by electrolysis forming the subject of Letters Patent No. 382,159, dated May 1, 1888, granted to Eugene Hermite. In that process a solution of chloride of magnesium is employed and magnesia is deposited on the negative electrodes, and it is important to remove this deposit and carry it to the point where the bleaching takes place, in order that the hydrochloric acid formed there may combine with the magnesia and thus form again chloride of magnesium to be carried back to the electrodes. In this way a complete circle of changes takes place.

In the accompanying drawings, Figure 1 is a vertical and longitudinal section of an apparatus constructed according to our invention. Fig. 2 is a corresponding plan, and Fig. 3 is a transverse section taken along the line 1 2, Fig. 2. Figs. 4 to 9 illustrate details of

construction and are for the most part drawn to a larger scale than the other figures.

Referring to Figs. 1, 2, and 3, A is a vessel or tank, which may be made of slate, porcelain ware, glass, cement, or any other suitable material. It is divided into two compartments by a partition, *b*, having two openings. One of these openings is situated toward the upper part and forms a communication at that point between the compartment containing electrodes C and the adjacent compartment. The other opening, situated at the lower part, contains in a tube provided with a perforated plate or rose, *d*, a helical propeller, D, on a shaft, *d*³, working in bearings or stuffing-boxes *d*² and *d*⁴.

Externally to the vessel A the shaft *d*³ is provided with a pulley, Y, over which passes driving-cord, *f*. This driving-cord is carried over a series of guide-pulleys, X, and over a pulley, E, keyed upon a main crank-shaft, G. This main shaft turns in bearings V V, and is provided with fast and loose pulleys F. The group of elements C has at opposite sides walls *c*² for the purpose of directing the solution to be electrolyzed toward and through the spaces comprised between the positive and negative electrodes, as indicated by the arrows in the drawings. In the apparatus illustrated the bleaching is supposed to take place in the compartment at the left of the partition *b*.

Although the electrodes may be made in any suitable way, we prefer the following arrangement: The negative electrodes or zinc elements M, Figs. 4 to 6, have their upper extremities embedded in grooves formed in a cover-plate, *m*. The positive electrodes or platinum elements are secured at their upper ends in a block, K, having a central projection or raised part, *k*, forming a terminal or binding-post, to which a conductor from one of the poles of the generator is attached by means of a binding-screw, *k*². The conductor from the other pole of the generator is connected to a binding-post, *t*, at the end of a bar, W, Fig. 1, which is bent and connected to the lower extremities of the zinc elements M. Insulating material Q is interposed between the cover-plate *m* and the block K,

Figs. 4 and 5, for the purpose of insulating the upper extremities of the platinum elements L. A suitable mode of connecting these platinum elements in the block K consists in making mortises or recesses in the cover-plate *m* and inserting therein the upper parts of thin sheets of platinum, which are maintained at the desired distance apart by any suitable means. This being done, sand is put in to form a species of core for the places which are to be subsequently occupied by the insulating material. The block K is afterward cast on the projecting extremities of the platinum sheets. The sand is then removed, and the insulating material Q is caused to run into spaces previously occupied by the sand. The platinum elements L are, moreover, maintained laterally by fixed vertical rods O, provided with mortises for the reception of the edges of these plates, Figs. 4, 5, 6, and 7.

We provide on each side or surface of the zinc elements scrapers for the purpose of automatically scraping the same in a continuous manner in order to remove any deposit that might be formed thereon, not only for the purpose of preventing any diminution in the efficiency of the apparatus by the increased resistance to the current due to accumulated deposits, but also that the freed deposits of magnesia (where chloride of magnesium is used) may be carried by the circulating solution to the point of bleaching, to combine therein with the hydrochloric acid, and that the resultant chloride of magnesium formed may be returned by the solution to the electrodes, and a complete cycle of changes be thus kept up so long as the current acts on the solution. The arrangement of these scrapers is illustrated in plan in Fig. 6, in longitudinal view or side elevation enlarged in Fig. 8, and in enlarged transverse section in Fig. 9. The scrapers are in the form of blades N, which are pivoted or hinged at *n* to a rectangular frame, I, in pairs. A pair of these blades embraces each zinc element. A caoutchouc or rubber ring, P, surrounds the extremities of each pair of blades against the surfaces to be scraped, Fig. 9.

The frame I is suspended by rods H H from the cranked shaft G, which in rotating imparts to the frame and scraper-blades a reciprocating motion in a vertical direction. The frame is guided in its movements by the scraper-blades which work on the plates and between the fixed vertical rods O, Fig. 6.

The action is as follows: A solution of chloride of magnesium or other suitable solution for electrolysis is poured into the vessel A, and the apparatus or mechanism is set in motion by shifting the belt onto the fast or fixed pulley of the shaft G. By means of the helical propeller D the solution is caused to circulate from one compartment to another, and is brought into contact with the group C of the electrodes for the purpose of being electrolyzed. The scraper-blades N, working continually up and down the zinc elements, scrape off the deposits that are formed on the zinc, and the solution in continuous circulation carries off the freed deposits to the point where needed and returns to the electrodes again, as before described.

We claim as our invention—

1. In an apparatus for preparing solutions for bleaching by electrolysis, the combination of a vessel or tank with a partition dividing it into two compartments, a group of electrodes on one side of the partition, and a propeller to maintain a circulation from one compartment to the other and through the group of electrodes.

2. The tank and its partition having a tubular opening at its lower end and the two compartments communicating at the upper part of the partition, in combination with a propeller in said tubular opening and electrodes on one side of the partition, all substantially as described.

3. The combination of the plate K, carrying one set of electrodes, with a plate, *m*, carrying the other set of electrodes, and through which the electrodes of the plate K pass, and insulating material between the plates, substantially as described.

4. A bleaching apparatus comprising an electrolyzing vessel or tank containing electrodes with scrapers to remove the deposits from the negative electrodes, a bleaching-compartment, and means to circulate the liquid and freed deposits to the bleaching-point and to return the solution to the electrodes, as and for the purpose set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

EUGENE HERMITE.

EDWARD JAMES PATERSON.

CHARLES FRIEND COOPER.

Witnesses:

ALFRED DONNISON,

JOHN ALFRED DONNISON.