

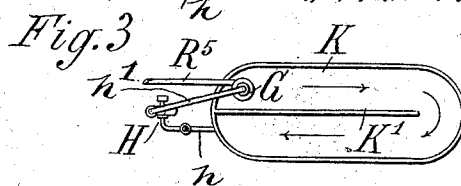
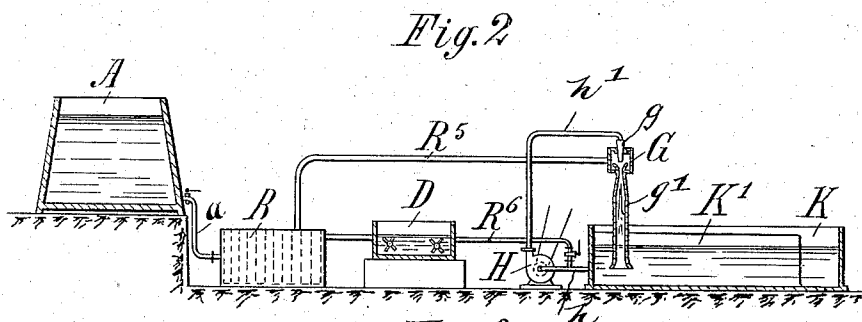
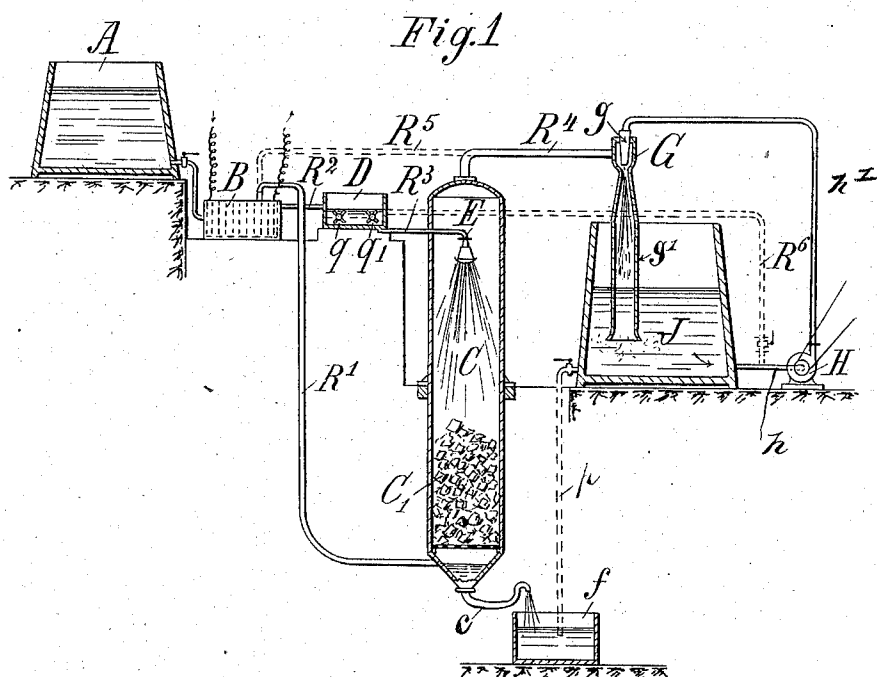
(No Model.)

C. KELLNER.

PROCESS OF AND MEANS FOR PRODUCING BLEACHING AGENTS.

No. 559,454.

Patented May 5, 1896.



Witnesses:
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UNITED STATES PATENT OFFICE.

CARL KELLNER, OF VIENNA, AUSTRIA-HUNGARY.

PROCESS OF AND MEANS FOR PRODUCING BLEACHING AGENTS.

SPECIFICATION forming part of Letters Patent No. 559,454, dated May 5, 1896.

Application filed November 1, 1892. Serial No. 450,605. (No specimens.) Patented in England May 28, 1892, No. 10,200, and in Austria-Hungary October 12, 1892, No. 26,679 and No. 42,114.

To all whom it may concern:

Be it known that I, CARL KELLNER, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in the Processes of and Means for the Production of Bleaching Agents, (for which I have obtained Letters Patent in Austria-Hungary, No. 26,679, and No. 42,114, dated October 12, 1892, and in England, No. 10,200, dated May 28, 1892;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention has relation to the production of liquid bleaching agents by electrolysis; and it consists in the method of and in the means for producing the said agents.

Liquid bleaching agents have heretofore been obtained by electrolysis in two ways, either by decomposing a chlorid of a metal of the alkalies or alkaline earths, as magnesium or sodium chlorid, or a combination or mixture thereof, and in causing the resultant ions or ions formed by a secondary process to act upon one another in the decomposing cell or vessel itself in order to form hypochlorites, or by causing the chlorin separated from a chlorid of an alkali or of an alkaline earth to be absorbed by milk of lime.

In the first method the hypochlorites formed are in part decomposed by the hydrogen liberated at the cathode, and as the hydrogen is liberated under evolution of heat the hypochlorites are liable to be converted into chlorates, which have no bleaching properties, as is well known.

The second mode of obtaining liquid bleaching agents by electrolysis by passing or forcing the chlorin into milk of lime is not only inconvenient but comparatively expensive, for the reason that irrespective of the cost of the milk of lime the products formed at the cathode cannot be utilized, except in very rare instances, and for the further reason that an equivalent quantity of dilute solu-

tion of caustic alkali remains useless, while the electrolyte cannot be returned into the cycle of bleaching operations.

The object of this invention is to provide means whereby the difficulties and disadvantages just referred to are obviated, and whereby advantages are obtained, the essential ones of which are the following: First, bleaching solutions of any desired strength can be obtained; second, the electric current is completely utilized—that is to say, the electrochemical equivalent is absolutely attained; third, there is no outlay for a base for the formation of hypochlorites; fourth, the electrolyte can be used over and over again, and, fifth, the apparatus necessary to carry out the process is of a very simple and at the same time durable character.

According to my invention the ions—namely, the chlorin and alkaline solutions resulting from the electrolytical decomposition of a chlorid of a metal of the alkalies—are brought in contact and mixed with each other outside of the decomposing-vessel (electrolytic apparatus) in order to produce hypochlorites. This can be done in two ways, first, by allowing the chlorin liberated at the anode to pass off in a gaseous state into a mixer and combining the same with the alkaline solution obtained at the cathode—namely, the solution of the hydrate of the metal—or by drawing or forcing the chlorin gas through said solution, or by causing the gas to flow into the sprayed or otherwise finely-divided cathode solution, the two fluids flowing in opposite directions; secondly, the anode solution containing chlorin may also be combined with the cathode hydrate solution in a separate vessel in order to form hypochlorites; but I prefer to combine the gaseous chlorin with the cathode solution by absorption. In either case it is not only desirable but necessary that the alkaline hydrate formed at the cathode be freed from hydrogen before the ions are combined in order to avoid the formation of chlorates.

In the accompanying drawings I have illustrated apparatus of suitable construction for carrying out the above-described process, in which drawings—

Figure 1 shows the apparatus by a sectional

elevation. Fig. 2 is a like view of an apparatus wherein the operation of bleaching may be carried out simultaneously with the production of bleaching agents, and Fig. 3 is a detail plan view of the combining or mixing and bleaching vat.

I have deemed it unnecessary to show the electrolytic apparatus in detail, inasmuch as an apparatus may be employed of a well-known construction and containing a series of anode and cathode cells arranged in a well-known manner, so that the chlorin liberated at the anodes and the alkaline solution formed at the cathodes may be separately drawn off—as, for instance, an apparatus such as shown in my British patent, No. 9,346, of 1892.

In the above drawings, A indicates the tank that contains the solution of a chlorid or chlorids of the metals of the alkalies or alkaline earths, said tank being connected by a valved pipe *a* with the electrolytic apparatus R, which, as above stated, may be of any well-known and suitable construction. The chlorin liberated at the anode or anodes flows through a valved pipe R' to an absorption tank or tower C, said pipe R' being connected with the tank or tower near the bottom thereof, and said tank being partially filled with any suitable material whereby the entering gas is divided into numerous streams—as, for instance, pieces of brick or stone or glass balls or other equivalent material—as shown at C'. The alkaline solution obtained at the cathodes flows through a pipe R² into a vat or tank D, wherein it is agitated by means of agitators *q* *q'* for the purpose of liberating any hydrogen carried over with the solution. The tank or vessel D is connected by a pipe R³ with the upper end of the absorption-tower C, said pipe projecting into the tower and terminating in a downwardly-discharging rose-head E, whereby the alkaline solution is delivered in a finely-divided state into an atmosphere of chlorin, the absorption of the gas being thus greatly facilitated, while the hypochlorite or bleaching solutions formed by the combination of the chlorin with the alkali-hydrate solution flows through a siphon-pipe *c* at the lower end of the absorption-tower C into a vessel *f*. The chlorin gas not absorbed is drawn from the tower C into a vessel or tank J, partly filled with alkaline solution, the necessary suction being obtained through the medium of a pump H, connected with vessel J and with an ejector *g*, by suction and force pipes *h* *h'*, respectively, and to the casing G of said ejector the upper end of the tower C is connected by pipe R⁴, said ejector-casing G having connected thereto a pipe *g'*, terminating in a bell-mouth and extending down near to the bottom of vessel J. By means of the ejector the liquid is sprayed or finely subdivided, while the excess of chlorin is drawn from tower C into the finely-divided liquid and is absorbed thereby.

The material to be bleached—as, for in-

stance, paper-pulp—may be introduced into vessel J for the purpose of partially bleaching the same by the action thereon of the weak bleaching liquor; but, if desired, the process of absorption and the production of bleaching liquor may be carried out in the same vessel in conjunction with or independently of the absorption-tower C, in which case the vessel D is connected with the suction-pipe of the pump by a valved pipe R⁶, and the anode-cells of said apparatus with the ejector-casing by pipe R⁵, the tank J being further connected by a valved pipe *p* with the vessel *f*, said connections *p* R⁶ R⁵ being shown in dotted lines.

In the production of bleaching liquor in tank J the latter should be supplied in starting the operation with just sufficient liquid to work the injector, so as to produce the necessary suction to draw the chlorin from the electrolytic apparatus. In order to increase the conductivity of the electrolyte, a suitable quantity of acid, as hydrochloric acid, may be mixed therewith, and if it is desired to produce hypochloric acid the absorption-tower is filled with limestone.

In Fig. 2 I have shown, instead of the vessel or tank J, a paper-pulp vat K of any usual or preferred construction, said vat being divided by a partition K', that does not extend from end to end of the vat, as shown in said figure and in Fig. 3. The suction-pipe of the pump is connected with the vat on one side of said partition, and the ejector-pipe *g'* extends into said vat on the opposite side of said partition, so that a constant circulation of the bleaching liquor is maintained, as shown by arrows, Fig. 3.

In the bleaching of textiles a vat without a partition and having a perforated bottom will be employed, as will be readily understood.

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

1. The herein-described process of producing liquid bleaching agents, which consists in subjecting a solution of a chlorid or chlorids of the metals of the alkalies or alkaline earths to the action of an electric current and combining the chlorin liberated at the anode with the alkaline hydrate solution flows through a siphon-pipe *c* at the lower end of the absorption-tower C into a vessel *f*. The chlorin gas not absorbed is drawn from the tower C into a vessel or tank J, partly filled with alkaline solution, the necessary suction being obtained through the medium of a pump H, connected with vessel J and with an ejector *g*, by suction and force pipes *h* *h'*, respectively, and to the casing G of said ejector the upper end of the tower C is connected by pipe R⁴, said ejector-casing G having connected thereto a pipe *g'*, terminating in a bell-mouth and extending down near to the bottom of vessel J. By means of the ejector the liquid is sprayed or finely subdivided, while the excess of chlorin is drawn from tower C into the finely-divided liquid and is absorbed thereby.

2. The herein-described process of producing liquid bleaching agents, which consists in subjecting a solution of a chlorid or chlorids of the metals of the alkalies or alkaline earths to the action of an electric current and combining the chlorin liberated at the anode with the alkaline hydrate formed at the cathode in a separate vessel by causing the gas liberated at the anode to flow in an upward direction and the alkaline solution formed at the cathode in a downward direction through said vessel, for the purpose set forth.

3. In an apparatus of the class described, the combination with the electrolytic apparatus, of an absorption tank or tower, separate pipes connecting the anode and cathode cell or cells of said apparatus respectively with the lower and upper ends of the tower, a tank or vat, an ejector having its casing extended to project into the vat, a pump connected with the ejector and vat, and a pipe connecting the upper end of the absorption-tower with the ejector-casing, for the purpose set forth.

4. In an apparatus of the class described, the combination with the electrolytic apparatus, of an absorption tank or tower, a pipe connecting the anode cell or cells of said apparatus with the lower end of the tower, a

vessel provided with agitating devices, separate pipes connecting said vessel with the cathode cell or cells of the electrolytic apparatus and with the upper end of said tower, respectively, a tank or vat, an ejector having its casing extended to project into the vat, a pump connected with the ejector and vat, and a pipe connecting the upper end of the absorption-tower with the ejector-casing, for the purpose set forth.

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

CARL KELLNER.

Witnesses:

W. B. MURPHY,
PAUL BERGER.