

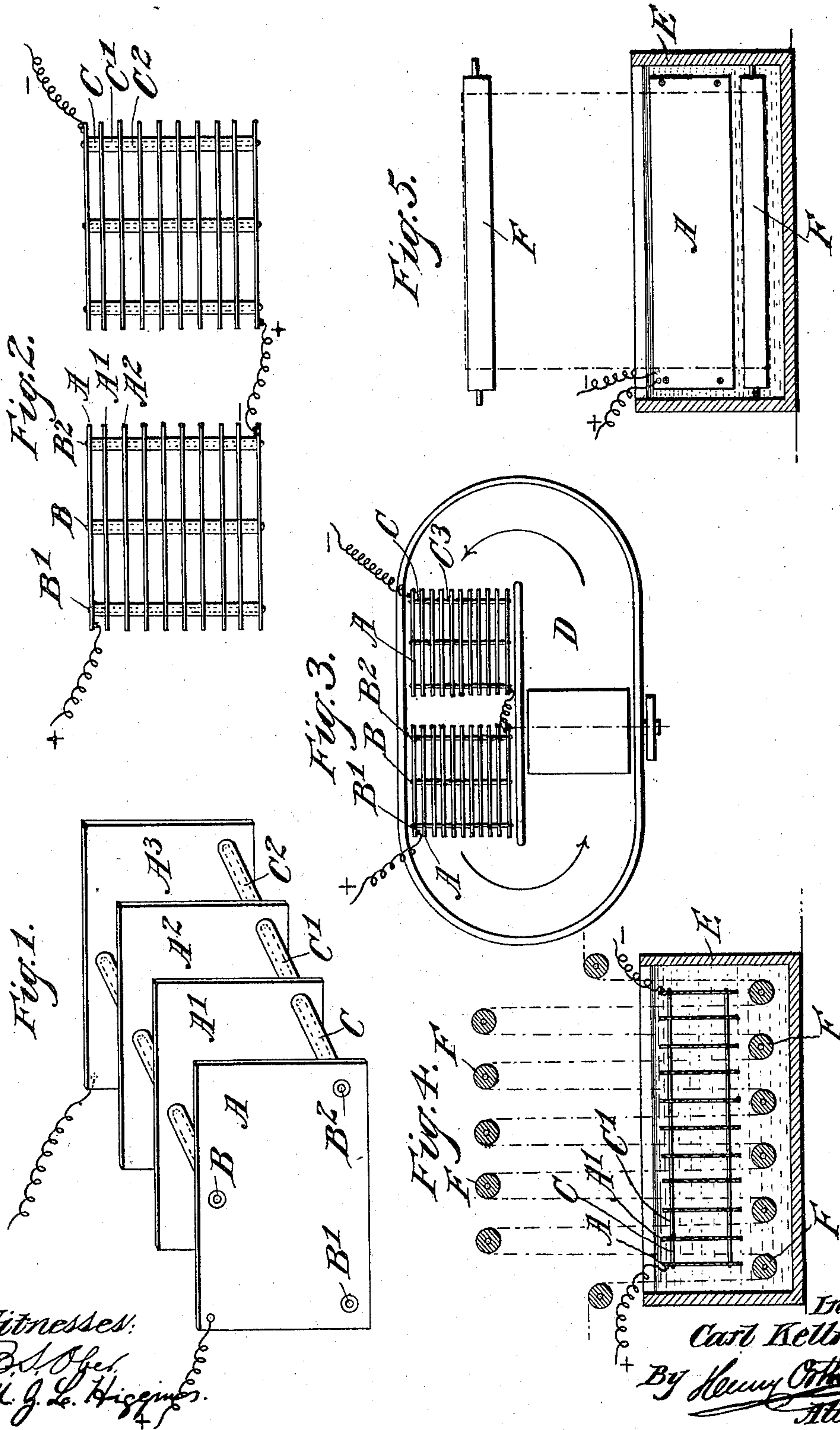
(No Model.)

C. KELLNER.

APPARATUS FOR ELECTROLYTICAL DECOMPOSITION OF SALT SOLUTIONS.

No. 585,959.

Patented July 6, 1897.



Witnesses:  
B. J. Ober,  
H. J. Le. Higgins.

Inventor:  
Carl Kellner.  
By Henry C. Kellner,  
Attorney.



# UNITED STATES PATENT OFFICE

CARL KELLNER, OF VIENNA, AUSTRIA-HUNGARY.

APPARATUS FOR ELECTROLYTICAL DECOMPOSITION OF SALT SOLUTIONS.

SPECIFICATION forming part of Letters Patent No. 585,959, dated July 6, 1897.

Application filed February 24, 1896. Serial No. 580,568. (No model.) Patented in Germany September 23, 1893, No. 77,128; in Switzerland October 17, 1893, No. 7,427; in France October 17, 1893, No. 233,483; in Belgium October 17, 1893, No. 106,791; in England October 17, 1893, No. 19,542; in Norway October 17, 1893, No. 3,518; in Italy December 31, 1893, XXVIII, 35,086, LXVIII, 495, and in Austria-Hungary March 22, 1894, No. 51,521 and No. 79,307.

*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 Apparatus for the Electrolytical Decomposition of Salt Solutions, (for which patents have been obtained in the following countries, to wit: Austria-Hungary, No. 51,521 and No. 79,307, dated March 22, 1894; Germany, No. 77,128, dated September 23, 1893; Switzerland, No. 7,427, dated October 17, 1893; France, No. 233,483, dated October 17, 1893; Belgium, No. 106,791, dated October 17, 1893; Italy, Vol. XXVIII, No. 35,086, Vol. LXVIII, No. 495, dated December 31, 1893; England, No. 19,542, dated October 17, 1893, and Norway, No. 3,518, dated October 17, 1893;) 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.

The apparatus hitherto proposed for the electrolytical decomposition of solutions of salt, especially of common salt for the production of bleaching agents possess disadvantages which make it impossible to employ them successfully in practice, among these disadvantages being the following, viz: They are complicated and costly and at the same time are liable to quickly wear out, they necessitate in the branches of industry in which they are used either entirely new plant or expensive alterations to existing plant—viz., the addition of pipe-conduits and pumps for connecting such plant with the electrolytical apparatus—and, lastly, in apparatus which work without diaphragms a large portion of the current is lost, because the nascent hydrogen reduces a portion of the already electrolytically-produced hypochlorite, and the latter with increasing enrichment becomes an electrolyte, and by the formation of the hypochlorite half of the separated chlorine is recombined into chlorid.

My invention relates to apparatus whereby the above-mentioned objections are obviated.

It comprises a number of conducting-plates held by insulating-rods at a suitable distance apart, the whole forming what I call a "bleaching-block."

Such apparatus is simple, cheap, and durable, it can be readily and quickly applied to any desired existing bleaching vessel in which the materials or articles to be bleached are contained and wherein the decomposition for this purpose of the salt solution is to take place, and it renders practically possible the complete utilization of the electric current, as hereinafter explained.

Referring to the drawings filed with the present specification, Figure 1 is a perspective view of an apparatus according to this invention. Fig. 2 shows the methods in which several such apparatus can be connected in series. Fig. 3 illustrates such apparatus arranged in an ordinary rag-engine; and Figs. 4 and 5 represent in longitudinal and in cross section, respectively, an apparatus of this kind arranged for bleaching textile fabrics.

A A A, &c., are conducting-plates held at a suitable distance from one another by distance-tubes C C C, preferably of glass, placed on rods B B B, &c., of non-conducting material, such as hard rubber, by which the plates are held together, so as to form practically one body.

The plates A A A, &c., are constructed by coating pieces of sheet metal—such, for example, as sheet-copper, tombac, or phosphor-bronze—on one side with platinum-foil and amalgamating it on the other side with mercury only.

For some purposes the plates may be of carbon or other material that is a good conductor of electricity and is not liable to be injuriously acted upon by the liberated ions, and the plates may sometimes be covered with a textile fabric made of asbestos or glass-wool.

The plates A A A, &c., the number of which will depend upon the potential of the current employed, are placed on the connecting-rods B B B with the sides that are coated with platinum all facing in one direction, if metallic plates of the kind referred to are used,



and the first and the last plates are placed in connection with the source of the current, the platinum-coated side of the first plate being connected to the positive terminal and the  
5 non-coated (amalgamated) side of the last plate to the negative terminal.

According to the capacity and accommodation of the bleaching vessel into which the apparatus is to be placed the latter may consist of one block or of several blocks arranged  
10 side by side and placed in series in such a manner that the non-coated side of the last plate of one block is conductively connected with the platinum-coated side of the first  
15 plate of the next block, as shown in Fig. 2. In this way the platinum-coated side of each plate serves as an anode, while the non-coated side of the plates forms the cathode, where sodium is separated or caustic soda, in the  
20 case of the decomposition of common salt, is formed and hydrogen disengaged.

It will be understood that this apparatus, which, as experiments have shown, is not injuriously attacked by the ions and in consequence of its construction renders attainable the production of a very large electrode surface with a small amount of platinum, is simply placed in the salt solution to be decomposed, which may advantageously be contained in the same vessel as the material or articles to be bleached, so that the formation of bleaching liquid resulting from the electrolytical decomposition is effected in the presence of the substances to be bleached.  
35 For example, when bleaching paper-pulp the salt solution is placed in an ordinary rag-engine D, Fig. 3, which contains the paper-pulp, and one or more of the hereinbefore-described apparatus is or are suspended therein and can  
40 be immediately put into operation by connecting it or them with the terminals of an ordinary dynamo employed for lighting purposes.

For bleaching textile fabrics the apparatus  
45 may, as shown in Figs. 4 and 5, be suspended in a vat E, containing salt solution, and the material to be bleached be conducted over and under rollers F and through the solution, so as to pass between the several plates A A  
50 A, &c., the rods and distance-tubes by which the plates are held together being suitably arranged to enable this to be done.

The apparatus possesses the following advantages:

55 First. Much energy is saved, as the liberated ions come into operation in a nascent condition.

Second. The material being bleached itself forms a kind of diaphragm, on one side of  
60 which chlorin is liberated and on the other side caustic soda is formed, these two sub-

stances exercising a joint dissolving or decolorizing effect, the chlorin oxidizing the coloring substances and rendering them soluble in alkalis; the caustic soda then dissolving  
65 them, whereupon this solution is decomposed by the sodium hypochlorid, which is formed in excess, and sodium chlorid is reproduced.

Third. The hydrogen being liberated at the cathode is prevented by the material submitted to bleaching from reaching the anode and exerting an injurious reducing action.  
70

Fourth. The enrichment of the electrolyte with hypochlorite and the decomposition of this salt by the current is prevented owing to  
75 the presence of the material to be bleached, the hypochlorite produced being retransformed into chlorid by the bleaching process very soon after its production.

Fifth. The direct formation of hypochlorite is avoided because the material being bleached prevents to a certain extent the combination of the ions.  
80

From the foregoing description it will be seen that by means of apparatus constructed  
85 according to this invention the bleaching operations can be carried out in a simple and certain manner in existing appliances with cheap raw materials and with a comparatively small expenditure of electrical energy.  
90

I claim—

1. In apparatus for the electrolytic decomposition of common salt for the purpose of producing bleaching agents, electrodes consisting of a group of interspaced plates having one of their surfaces platinized and the other amalgamated, said plates rigidly connected by non-conductive connections passing through the plates, the opposite surfaces of each plate forming an anode and a cathode  
95 respectively, and electric conductors respectively connected with the platinized and amalgamated faces of the first and last plates of the group, for the purpose set forth.  
100

2. The combination of a vessel containing  
105 a solution of common salt, one or more groups of electrodes each composed of a series of interspaced plate electrodes rigidly connected together by non-conductive connections, said grouped electrodes suspended in said vessel,  
110 means for passing a web of material in a zig-zag way through the salt solution and between the plate electrodes, and suitable electric conductors for the first and last of the series of plate electrodes, for the purpose set  
115 forth.

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

CARL KELLNER.

Witnesses:

DEAN B. MASON,  
HARRY BELMONT.