No. 883,651. PATENTED MAR. 31, 1908.

M. LE BLANC.

ELECTROLYTIC PRODUCTION OF CHROMIC ACID.

APPLICATION FILED JAN. 31, 1906.

Fig. 1.

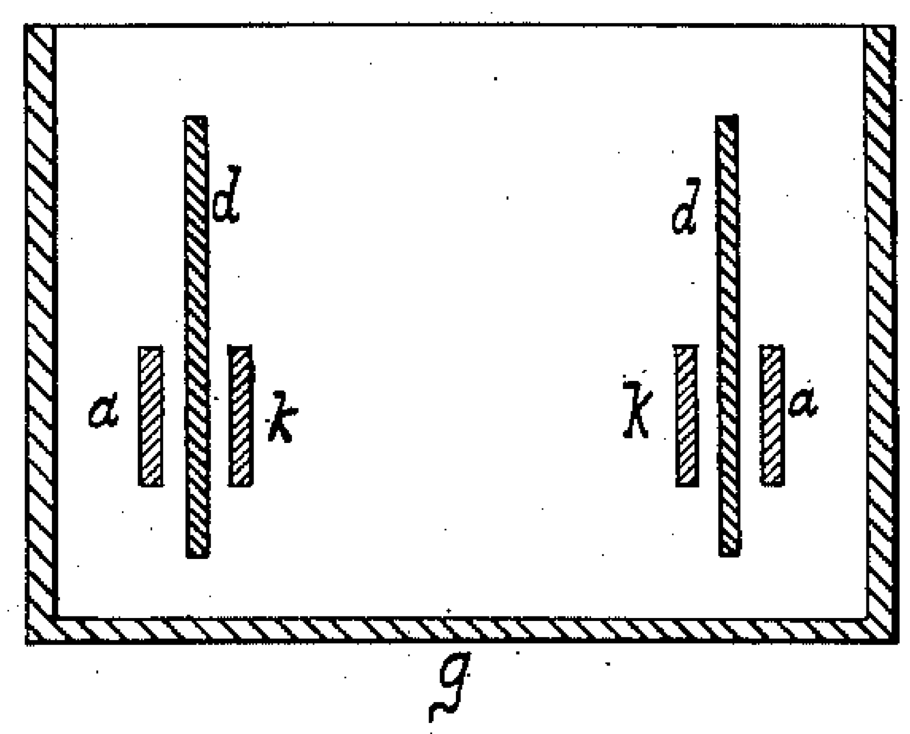
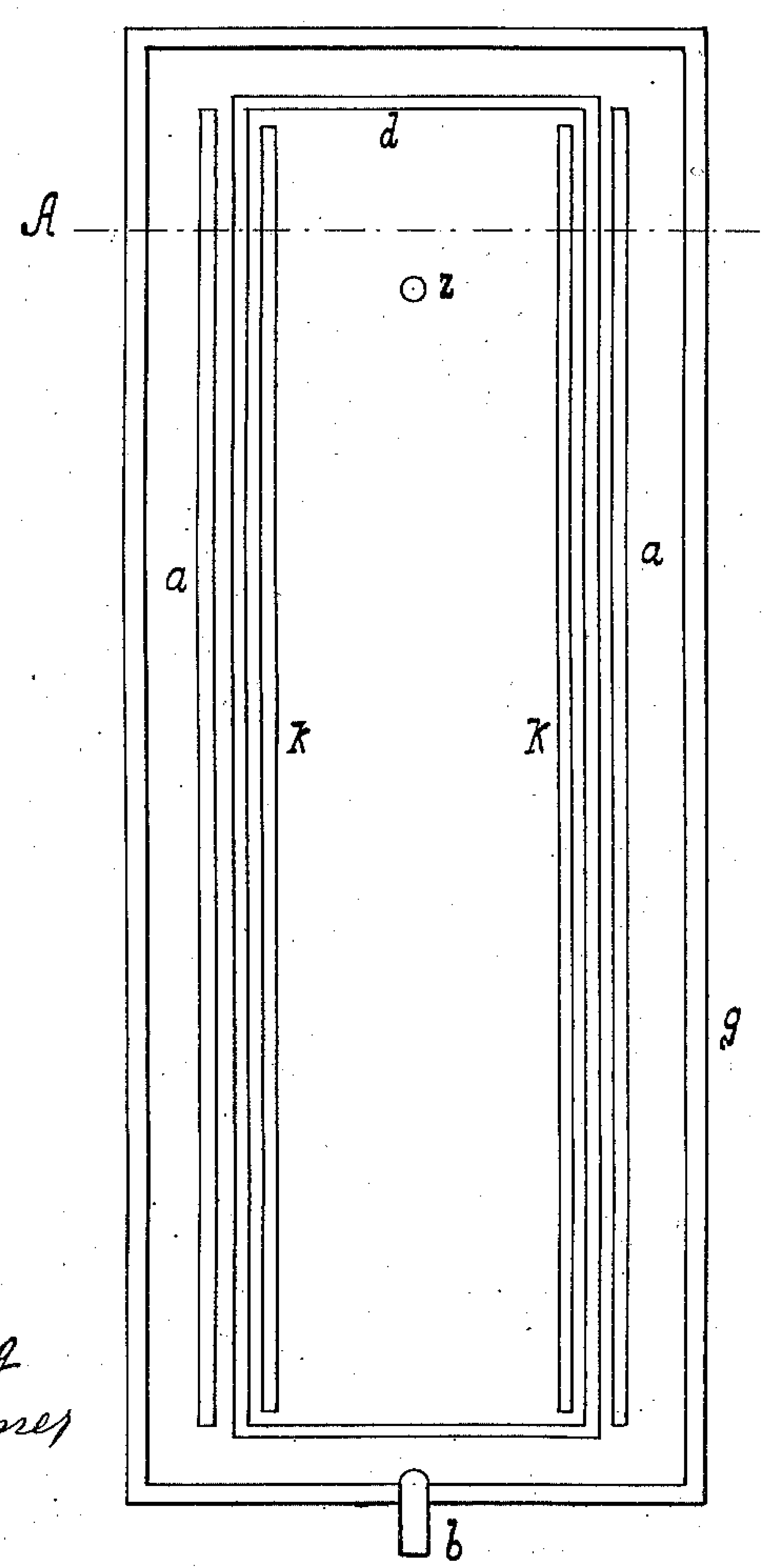


Fig. 2.



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ELECTROLYTIC PRODUCTION OF CHROMIC ACID.

No. 883,651. Specification of Letters Patent. Patented March 31, 1908.

Application filed January 31, 1906. Serial No. 298,833.

To all whom it may concern:

Be it known that I, MAX LE BLANC, a subject of the Grand Duke of Baden, professor of chemistry and doctor of philosophy, residing at Karlsruhe, in the Grand Duchy of Baden, German Empire, have invented new and useful Improvements in the Electrolytic Production of Chromic Acid, of which the following is a specification.

My invention relates to the electrolytic production of chromic acid by the oxidation of chromium compounds of a lower degree of oxidation, and in particular to the regeneration of chromic acid solutions which have been used for oxidizing purposes, for instance for the production of anthraquinone from anthracene.

In the specifications of the German patents Nos. 103,860 of 1898 to the Farbwerke Höchst and 117,949 of 1899 to Darmstadter are described methods for the electrolytic production of chromic acid and in each of these use is made of an electrolytic cell in which the anode and the cathode compartments are separated by a porous diaphragm.

I have devised a process and apparatus by means of which I can effect the continuous electrolytic production of chromic acid, allowing a solution of the chromium compound which is to be oxidized to flow into the apparatus and obtaining therefrom a solution of chromic acid.

In carrying out the process according to my invention an electrolytic cell is employed in which the cathode and the anode are separated from each other by a wall which does not reach to the bottom of the cell, and the solution to be electrolyzed is introduced into the cell in such a manner that the cathode liquid always contains a sufficient quantity of acid to allow the electrolysis to proceed properly. This introduction can take place in various ways, for example, the solution can be introduced continuously, or intermittently, and either into the top of the cathode compartment, or as a horizontal layer at the bottom of the cell, preferably under the cathode compartment. This latter method is particularly suitable if the solution to be electrolyzed contains any chromic acid as otherwise such acid would tend to be reduced and cause loss of electric energy. When the solution is thus introduced at the bottom of the cell, the greater part of the cathode liquid does not take part in the circulation, but the loss of acid due to the movement of the ions does not exceed a definite amount, since a corresponding quantity of acid enters by diffusion, or convection, from the lower layer of liquid. The electrodes may be made of lead, or of any other suitable material, and can be of any convenient shape. The wall which divides the anode from the cathode may be either pervious or impervious to electrolysis.

The best results are obtained when the solution to be electrolyzed approaches the anode at the points of greatest current density, afterwards passing to points of lower current density.

It must not be expected that good results will always be obtained immediately the apparatus is started working, since it is often only after a period, for instance fourteen days, of undisturbed working that the best results are shown.

The following is a description of a method of procedure suitable for carrying out my invention, but the invention is not limited to this example.

Referring to the accompanying drawings, Figures 1 and 2 respectively represent a vertical cross-section and a plan of a cell of which the containing vessel *g* may be made of glass, wood, stone, or other suitable material; *d* represents the wall which separates the anode *a* from the cathode *k*, but which does not reach to the bottom of the said vessel. The solution to be electrolyzed is introduced at *z* near to the bottom of the said vessel and the oxidized product flows out at *b* at the upper part of the other end of the said vessel. The electrodes are made of hard lead. The dimensions may be as follows, for example. Length of cell forty (40) centimeters, width of cell fourteen (14) to fifteen (15) centimeters, depth of liquid seven (7) centimeters, length of cathode compartment thirty-five (35) centimeters, width of cathode compartment eight (8) to nine (9) centimeters, distance from the bottom of the cell of the wall *d* which separates the cathode and anode two (2) centimeters, distance of the electrodes from the bottom of the cell three (3) centimeters, length of electrodes thirty-four (34) to thirty-five (35) centimeters and height of electrodes three (3) centimeters. The electrodes are placed only a few millimeters from the aforesaid separating wall *d*. The solution used can be prepared by dissolving eighty (80) grams of chromium oxid (Cr_2O_3)

in one (1) liter of twenty-four (24) per cent. sulfuric acid and, on an average, seventeen hundred and thirty (1730) cubic centimeters of this solution may be introduced into the cell every twenty-four (24) hours. An electric current of seven (7) amperes, at three and four-tenths (3.4) volts, can be passed through the cell and the temperature of the contents can be about twenty-six (26) degrees centigrade. After the apparatus has been in operation for about fourteen (14) days, the chromium in the solution will be found to be getting oxidized to a very satisfactory extent, while only a very little of the electric current supplied will be wasted.

Now what I claim is:

1. The process of making chromic acid continuously by electrolytically oxidizing a chromium compound of a lower degree of oxidation by treating an acid solution of the said chromium compound with an electric current while continuously passing the said solution into an electric cell in such strength and quantity that the liquid treated at the cathode remains acid, all substantially as described.

2. The process of making chromic acid continuously by electrolytically oxidizing a chromium compound of a lower degree of oxidation by treating an acid solution of the said chromium compound with an electric current while continuously passing the said solution into an electric cell in such strength and quantity that the liquid treated at the cathode remains acid and approaches the anode at the points of greatest current density afterwards passing to points of lower current density, all substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

MAX LE BLANC.

Witnesses:
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