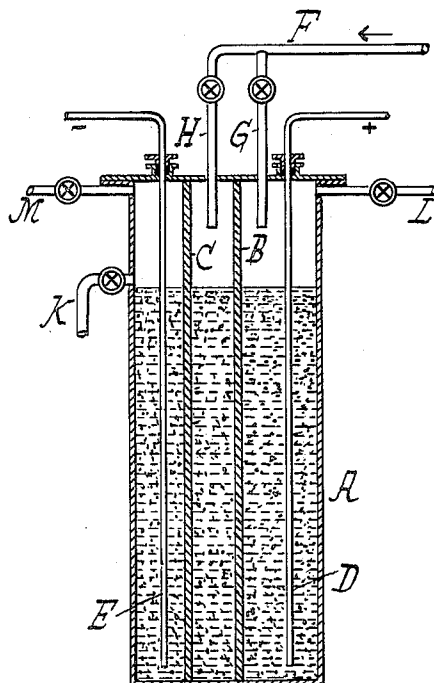


W. GAUS.
PROCESS FOR ELECTROLYZING ALKALI CHLORID SOLUTION.
APPLICATION FILED NOV. 11, 1912.

1,126,627.

Patented Jan. 26, 1915.



Witnesses:
William Miller
Christian H. Remstedt

Inventor
Wilhelm Gaus
By his Attorneys
Hauff & Wankmeyer

UNITED STATES PATENT OFFICE.

WILHELM GAUS, OF LUDWIGSHAFEN-ON-THE-RHINE, GERMANY, ASSIGNOR TO
BADISCHE ANILIN & SODA FABRIK, OF LUDWIGSHAFEN-ON-THE-RHINE,
GERMANY, A CORPORATION.

PROCESS FOR ELECTROLYZING ALKALI-CHLORID SOLUTION.

1,126,627.

Specification of Letters Patent.

Patented Jan. 26, 1915.

Application filed November 11, 1912. Serial No. 730,753.

To all whom it may concern:

Be it known that I, WILHELM GAUS, subject of the King of Prussia, residing at Ludwigshafen-on-the-Rhine, Germany, have invented new and useful Improvements in Processes for Electrolyzing Alkali-Chlorid Solution, of which the following is a specification.

During the electrolysis of alkali chlorids there is always a tendency for hydroxyl ions to wander, together with the chlorin ions, from the cathode space to the anode space and this tendency is greater when the cathodic decomposition is pressed in order to obtain a liquor as free from salt as possible. The presence of these hydroxyl ions at the anode is disadvantageous because they give rise to oxygen and diminish the yield and also attack the anode, which is generally made of carbon. To prevent, as far as possible, this wandering of the hydroxyl ions, a so-called filter diaphragm has been employed which is easily permeated by the electrolyte, and salt solution has been allowed to pass continuously through this filter diaphragm from the anode space to the cathode space, that is, in a direction opposite to that in which the hydroxyl ions move and, under certain conditions of motion of the electrolyte, it is possible to retain most of the hydroxyl ions in the cathode space. The action of the said filter diaphragm is, however, unsatisfactory on account of the varying size of the pores and consequently the different rate of flow through the various pores. Other methods have therefore also been employed with the view of preventing as far as possible the intrusion of the hydroxyl ions into the anode space. For instance, it has been proposed to wash away the cathode liquor immediately by means of water or steam, or to convert it into carbonate by blowing in carbon dioxid and thus diminish the concentration of the hydroxyl ions. It has also been proposed to mix the alkali drops which form at the cathode with a non-conductive oil, so as to form an emulsion and thus withdraw them from the further action of the electric current. These methods all have disadvantages.

The present invention relates to processes in which alkali chlorid solution is electrolyzed in vertical cells, that is, cells containing

vertical or substantially vertical electrodes and diaphragms.

I have found that the wandering of the hydroxyl ions in the vertical cells can be prevented in a very efficient manner, even when the liquor in the cathode space contains a high percentage of alkali, by employing two, or more, filter diaphragms separated from one another, and by causing electrolyte to travel successively through each diaphragm in the same direction, that is, from the anode space to the cathode space.

It is not necessary that the whole quantity of the electrolyte which is drawn off at the cathode be passed through each diaphragm. It is sufficient if this is the case with one of the diaphragms, while the motion through the other, or others, can be reduced to a minimum without essentially reducing the yield. It is often advantageous if only a part of the total liquid flows from the anode space, since then the finely divided precipitate which forms there can settle and does not tend to stop up the diaphragm pores.

One way for instance of carrying out my invention is to allow a part of the liquid to flow from the anode space through two filter diaphragms into the cathode space, while the greater quantity of the liquid is introduced into the space between the two filter diaphragms and passes thence into the cathode space. The quantity of liquid in each space can be regulated by suitably proportioning the hydrostatic pressure in the anode space and in the space between the two diaphragms. In order to prevent the anode liquid from becoming exhausted, the anode space is continually supplied with fresh salt solution and the surplus is taken away in any suitable manner.

The drawing accompanying this specification represents diagrammatically, in vertical section, a cell which can be used for the process of my invention.

In this drawing A represents the wall of the cell, B and C are two vertical diaphragms, D is the anode and E is the cathode. The salt solution, for instance, a solution of sodium chlorid, flows through the pipe F, which has two outlets G and H so arranged that the liquid leaving G centers the anode space, while the liquid leaving H enters the space between the two dia-

phragms B and C. The excess of liquid, containing caustic soda, flows out through the pipe K, while the chlorine is drawn off at L and the hydrogen at M.

5 Now what I claim is:—

1. In the electrolysis of alkali chlorid solution, passing electrolyte successively through a plurality of substantially vertical filter diaphragms in the direction from the
10 anode to the cathode.

2. In the electrolysis of alkali chlorid solution, passing a part of the total electrolyte from the anode space through a plurality of substantially vertical filter diaphragms
15 to the cathode space.

3. In the electrolysis of alkali chlorid solution, causing a part of the electrolyte to flow from the anode space through two substantially vertical filter diaphragms into the
20 cathode space, and introducing an additional

and greater part of the electrolyte into the space between the filter diaphragms.

4. In the electrolysis of alkali chlorid solution, causing a part of the electrolyte to flow from the anode space through two substantially vertical filter diaphragms into the cathode space, and introducing an additional and greater part of the electrolyte into the space between the filter diaphragms, and continually supplying the anode space with
25 fresh solution of alkali chlorid and removing the surplus. 30

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

WILHELM GAUS.

Witnesses:

J. ALEC LLOYD,
JOSEPH PEIFFER.