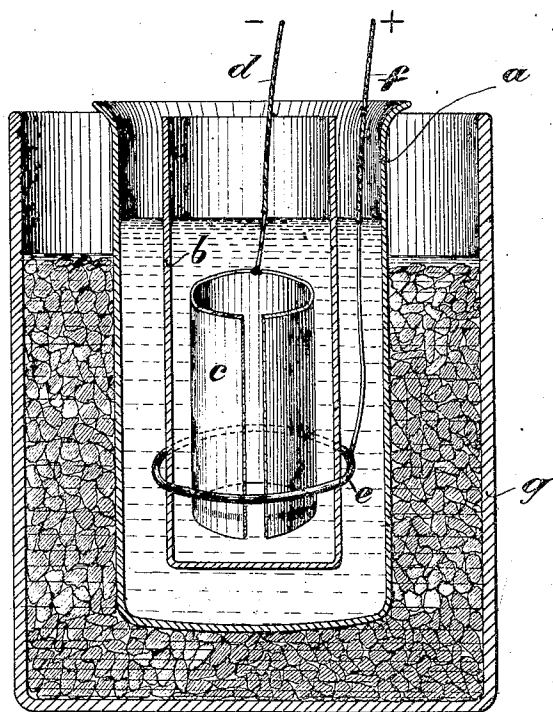


(No Model.)

E. J. CONSTAM & A. VON HANSEN.
PROCESS OF MANUFACTURING PERCARBONATES.

No. 579,317.

Patented Mar. 23, 1897.



Witnesses:

B. S. Ober
M. J. L. Higgins

Inventors:

Emil Joseph Constam
Arthur von Hansen

By *Henry Oth*

UNITED STATES PATENT OFFICE.

EMIL JOSEPH CONSTAM AND ARTHUR VON HANSEN, OF ZURICH, SWITZERLAND, ASSIGNORS TO THE ALUMINIUM-INDUSTRIE-ACTIEN-GESELLSCHAFT, OF NEUHAUSEN, SWITZERLAND.

PROCESS OF MANUFACTURING PERCARBONATES.

SPECIFICATION forming part of Letters Patent No. 579,317, dated March 23, 1897.

Application filed September 4, 1896. Serial No. 604,884. (No specimens.)

To all whom it may concern:

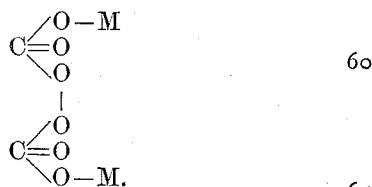
Be it known that we, EMIL JOSEPH CONSTAM, a citizen of the United States of America, and ARTHUR VON HANSEN, a subject of the Czar of Russia, and residents of Zurich, in the Republic of Switzerland, have invented certain new and useful Improvements in Processes of Manufacturing Percarbonates, of which the following is a specification.

Our invention relates to the manufacture of new chemicals termed "percarbonates" by electrolysis that are strong oxidizing and bleaching agents, that are cheaply and easily manufactured, and that have a strong and quick action.

We electrolyze at 10° centigrade below zero or lower saturated aqueous solutions of the carbonates of the alkali metals or of ammonium, forming at the anodes the percarbonates and at the cathodes hydroxids of the metals of the alkalis or of ammonium.

The following is an example of the manner of forming our compounds: A solution of potassium carbonate saturated at 10° centigrade below zero is placed in a porous cell *b* with a platinum cathode *c*, and this cell and contents are placed in a beaker *a*, containing the same solution, and a platinum anode *e*, said electrodes being connected to the terminals *d f* of a source of electricity. The beaker *a* is then immersed in a freezing mixture in a suitable vessel *g*, so that the temperature is reduced to about 16° centigrade below zero. We then pass a current from three to six accumulators through the solution, regulating the resistance so as to avoid a rise in the temperature, which is attained by using a current of three amperes, the internal potential of the bath being about five volts. After a short time a bluish amorphous salt is deposited in the compartment containing the anode, which is the percarbonate of potassium mixed with more or less carbonate and bicarbonate, is readily soluble in water at ordinary temperatures, and must be filtered and dried rapidly, and becomes almost white when dry. In preparing these substances the current density may be varied from one ampere to three hundred amperes per square decimeter of the anode-surface. The process may be carried out in practice

without the use of a diaphragm, and electrodes of other material may also be used—as, for instance, nickel, amalgamated zinc, and the like. The new compounds thus formed are salts of percarbonic acids, having the following constitutional formula:



It is assumed that the salts dissolved in our highly-concentrated solutions are partially dissociated into the anions MCO_3 (M representing an alkali metal or ammonium) and into the cations M, and that under the influence of the electric current the percarbonates $\text{M}_2\text{C}_2\text{O}_6$ are formed by the union of two atomic groups MCO_3 and deposited at the anode.

The percarbonates are powerful oxidizing agents and decompose in water at ordinary temperatures with evolution of oxygen and carbonic acid. Acids act on them in a similar manner, besides producing some peroxid of hydrogen, and caustic potash with potassium percarbonate will form potassium carbonate with evolution of oxygen.

Potassium percarbonate is a strong bleaching agent, readily bleaching indigo, cotton, wool, silk, hair, feathers, &c., and can readily be used in place of permanganate of potassium, peroxid of sodium, peroxid of hydrogen, persulfate of ammonium, &c.

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

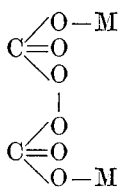
1. A process for the manufacture of percarbonates, which consists in electrolyzing a saturated solution of a carbonate at a temperature below zero centigrade.

2. A process for the manufacture of percarbonates of the alkali metals and ammonium, which consists in electrolyzing a saturated solution of their carbonates at temperatures below zero centigrade.

3. As new chemical compounds, percarbonates of the alkali metals and ammonium, which are bluish-white amorphous substances, read-

ily soluble in water at ordinary temperatures,
of the following constitutional formula,

5



10

and possess strong oxidizing properties, substantially as described.

In testimony whereof we hereunto sign our names, in the presence of two subscribing witnesses, this 11th day of August, 1896.

EMIL JOSEPH CONSTAM.

ARTHUR VON HANSEN.

Witnesses:

MORITZ VEITH,

H. RABBARD.