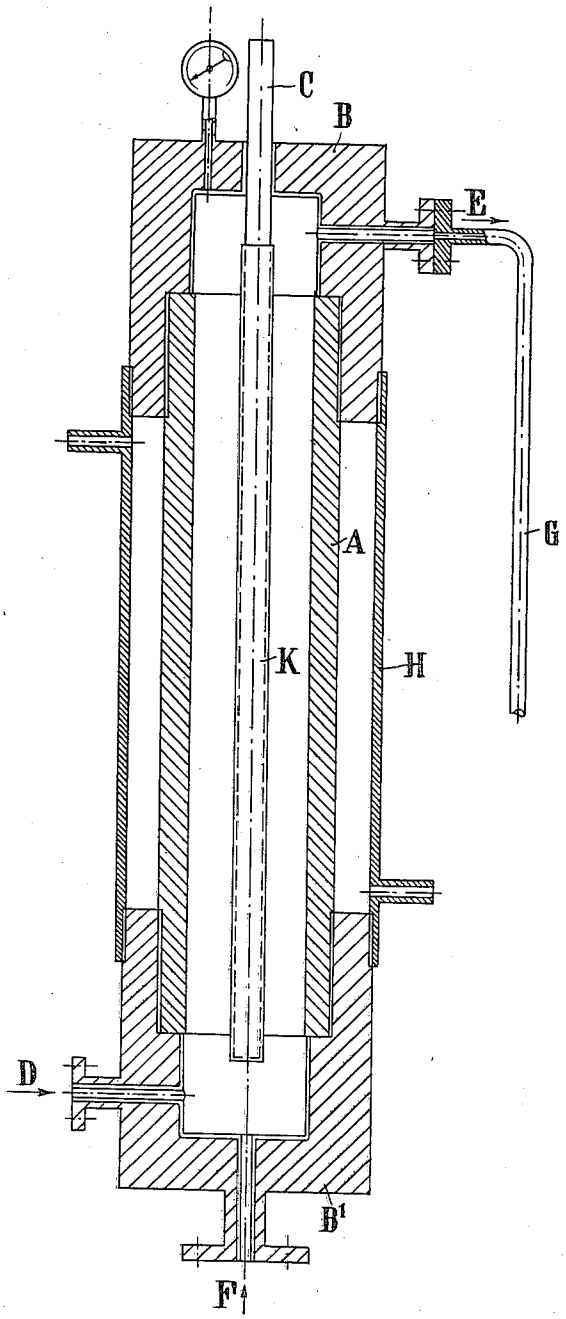
W. WEBER.

APPARATUS FOR THE CONTINUOUS PRODUCTION BY SYNTHESIS OF HYDROGEN PEROXID.

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1,144,271.

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Witnesses:

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE CONTINUOUS PRODUCTION BY SYNTHESIS OF HYDROGEN PEROXID.

1,144,271. Specification of Letters Patent. Patented June 22, 1915.

Application filed December 5, 1914. Serial No. 875,704.

To all whom it may concern:

Be it known that I, WALTER WEBER, citizen of the German Empire, residing at Dusseldorf, Germany, have invented certain new and useful Improvements in an Apparatus for the Continuous Production by Synthesis of Hydrogen Peroxid, of which the following is a specification.

My invention relates to apparatus for the continuous production, by synthesis, of hydrogen peroxid.

In a former application for Letters Patent of the United States, filed June 16, 1913, Serial No. 774053, and for which a patent was issued on the thirtieth day of September, 1913, numbered 1,074,549, an apparatus has been described which consists of a tubular anode inclosed within a tube adapted to stand high pressure and surrounding the cathode, all these parts being separated from each other by tubular diaphragms.

In using the aforesaid apparatus for the production of hydrogen peroxid on a commercial scale there arose the difficulty that it was not possible to make the electrolyte pass through it several times so as to increase its percentage of peroxid. Such a mode of operation was out of question for the simple reason that the hydrogen peroxid formed in the first operation would, if introduced into the apparatus anew, pass also through the anode chamber and, in passing therethrough, be decomposed instantaneously. For this same reason it proved impossible also to connect a plurality of such apparatus in series in order to gradually increase the percentage of hydrogen peroxid. Although the concentration of about three per cent. obtainable in an apparatus of this kind is sufficiently high for most technical purposes, a higher concentration is very desirable indeed, but it is impossible to obtain it except by causing the electrolyte to circulate within a single apparatus or to pass through a series of apparatus connected with each other. Another draw-back connected with the old device is the impossibility of cooling the anode itself although considering the current density preferably used such a cooling would greatly contribute to an increase in output.

The improved apparatus described in the present specification offers the advantage of avoiding all the draw-backs aforesaid.

According to the present invention the inner surface of a tube consisting of a suitable metal adapted to withstand high pressure is coated with a suitable electrode material serving as cathode, while the anode covered with a suitable tubular diaphragm is arranged in the middle axis of the tube aforesaid. This arrangement of parts renders it possible to either cause the electrolyte to circulate within the apparatus by aid of a pump, or else to pass through a plurality of such devices, one after the other without passing through the anode chamber, so that the hydrogen peroxid formed is not decomposed again. It is further possible to effect an electrical connection of a plurality of such apparatus in series so as to cause the electrical current to pass through one after the other, in order to diminish the costs for the generator and the conductors. Moreover the metallic tube being easily inclosed within a water jacket a very effective cooling of the whole cathode is rendered possible. The surface of the cathode employed is exceedingly great as compared with the cathode substance.

The drawings show in section the form of my new apparatus at present preferred by me.

A tube A of a suitable metal having walls 2½ to 3 in. thick is coated inwardly with a thin layer of cathode substance. It is closed at both ends by screw-caps B B′ inwardly coated with some substance resisting the action of the electrolyte. A rod shaped anode C covered by a tubular diaphragm K passes through cap B. The electrolyte is pressed through an inlet D into the tube A and leaves it through an outlet E. Oxygen forced in through a flanged socket F provided with a suitable nozzle is made to rise in the liquid in minute bubbles. The electrolyte and the oxygen are then conducted through the tube G into a second apparatus of the same type, and so on. It is, however, quite feasible to cause the electrolyte to circulate within a single apparatus, the tube G being then connected both to the out-

let E and to the inlet D. By forcing in oxygen in excess a stirring effect of the gas is obtained.

Tube A and the inner ends of screw-caps B B′ are surrounded by a sheet metal jacket filled with a cold salt solution designed to cool the cathode and the electrolyte. At the end of the series of apparatus a vessel is arranged for operating the separation of the oxygen gas from the solution of hydrogen peroxid. The oxygen in excess is sent back to the compressor, while the solution of hydrogen peroxid may be either removed or else be passed through the battery of apparatus once more in order to increase the concentration.

I claim:

1. In electrolytic apparatus for making hydrogen peroxid, in combination, a metallic vessel adapted to withstand high pressure, a layer of suitable cathode material on the inner surface of said vessel, an anode within said vessel and a diaphragm surrounding the anode.

2. In electrolytic apparatus for making hydrogen peroxid, in combination, a metal tube closed at both ends and adapted to withstand high pressure, a layer of suitable cathode material on the inner surface of said tube, an anode arranged in the middle axis of said tube and a tubular diaphragm surrounding the anode.

3. In electrolytic apparatus for making hydrogen peroxid, in combination, a metal tube closed at both ends and adapted to withstand high pressure, a layer of suitable cathode material on the inner surface of said tube, an anode arranged in the middle axis of said tube, a tubular diaphragm surrounding the anode and a water jacket surrounding said tube.

4. In electrolytic apparatus for making hydrogen peroxid, in combination, a metal tube adapted to withstand high pressure, screw-caps on the ends of said tube, a layer of suitable cathode material on the inner surface of said tube, an anode passing through one of said screw-caps and extending along the middle axis of said tube, a tubular diaphragm surrounding the anode, a liquid inlet and a gas inlet in one and a liquid outlet in the other screw-cap and a water jacket surrounding said tube.

5. In electrolytic apparatus for making hydrogen peroxid, a plurality of metallic vessels adapted to withstand high pressure, coated inwardly with cathode material, surrounding an anode covered with a tubular diaphragm, each vessel provided with liquid and gas inlets and outlets and tubes connecting the liquid outlet of a vessel with the liquid inlet of another vessel.

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

WALTER WEBER. [L. S.]

Witnesses:
HELEN NUFER,
CLARICE EAGER.