O. MEYER.

ELECTROLYTIC APPARATUS.

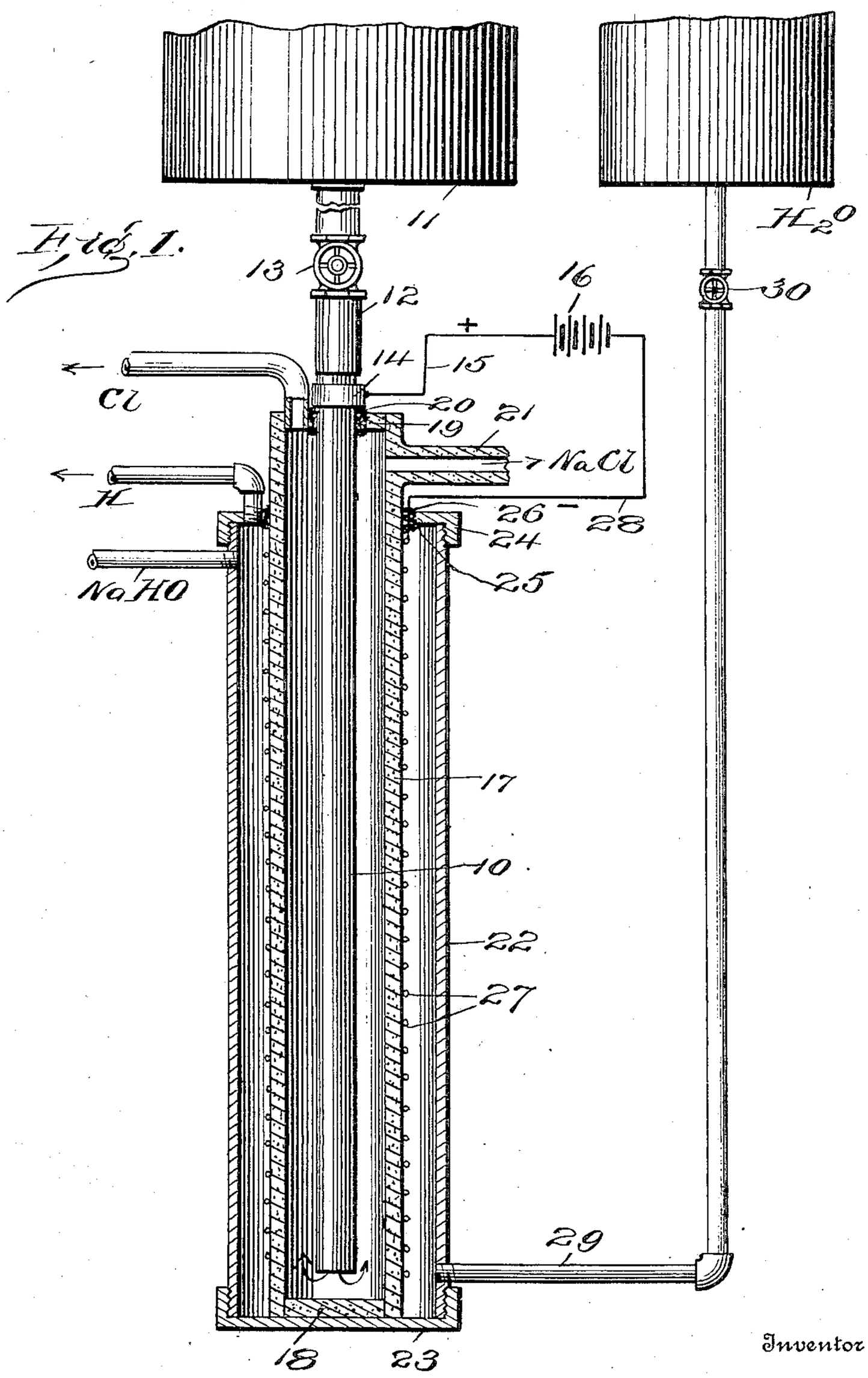
APPLICATION FILED FEB. 10, 1908.

914,856.

Patented Mar. 9, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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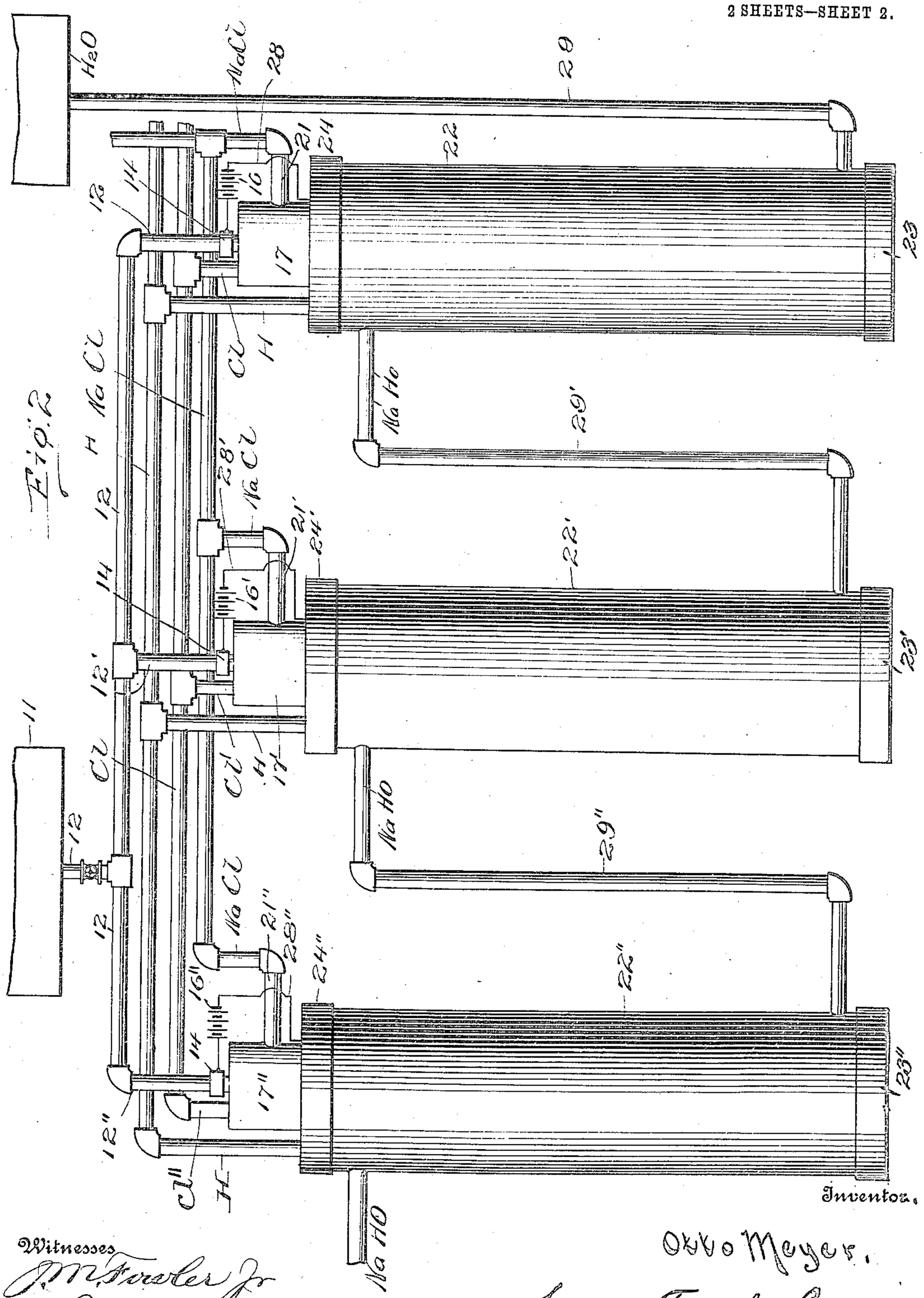

Fig. 2.

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UNITED STATES PATENT OFFICE.

OTTO MEYER, OF RICHMOND, VIRGINIA.

ELECTROLYTIC APPARATUS.

No. 914,856. Specification of Letters Patent. Patented March 9, 1909.

Application filed February 10, 1908. Serial No. 415,178.

To all whom it may concern:

Be it known that I, OTTO MEYER, a citizen of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Electrolytic Apparatus; 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.

This invention relates to apparatus for the electrolytic decomposition of electrolytes in general and the decomposition of sodium chlorid or common salt in particular.

The object of the invention is to provide an electrolytic apparatus of convenient and economical form and construction adapted to the production of caustic soda from the electrolytic decomposition of common salt.

Figure 1 is a sectional view of the improved electrolytic cell. Fig. 2 is a view in elevation of a number of the cells shown at Fig. 1 grouped in a battery.

It is to be understood that while the arrangement shown in Fig. 2 may be employed to connect the cells in series, such showing is only one of the almost unlimited systems of connecting such cells.

The invention is characterized by the structure wherein an anode, anode cell, cathode, and cathode cell are formed of a system of concentric tubes.

In the accompanying drawing one form of construction is shown in which the innermost tube 10 serves the double purpose of anode and of conducting the salt solution from the reservoir 11 through the tube 12 and within the anode cell, such passage being regulated by means of valve or cock 13. The anode tube 10 is preferably a commercial carbon tube and is connected by means of a collar 14 with a conductor 15 from any convenient source of electricity as 16. While carbon tubes of the kind described are obtainable in the market as commercial articles it is to be understood that a tube of glass, hard rubber, wood, or other suitable material may be substituted therefor in which case the anode is provided by means of metallic covering formed upon the exterior of the tube, such metal being of necessity platinum or a similar metal not acted upon by the process performed.

The anode cell or compartment is a porous tube shown at 17 of clay or other suitable material closed at the bottom by means of a block of cement 18 set therein and also closed at the top, except for an opening 19 formed therein through which the anode tube 10 is inserted and a tube Cl also inserted in the top of the anode compartment. The opening 19 about the anode is in operation closed by means of cement as shown at 20 whereby a tight joint is established and of such consistency that the anode tube may be removed or replaced without disturbing the anode compartment, other than breaking away and replacing the cement. The anode compartment is also provided with an offset pipe 21 through which spent sodium chlorid is discharged.

Upon the outside of the anode compartment is the cathode compartment or receptacle 22 preferably of iron pipe screw-threaded at its opposite ends and at its lower end closed by a cap 23 and at its upper end by a cap 24 which latter is provided with an opening 25 through which the cathode cell 17 projects and with a pipe H with a cement 26 closing the opening 25 about the cathode cell and permitting the removal of such cell from the receptacle 22 by the simple removal of the cement. About the cathode cell a metallic cathode terminal is provided, preferably of copper and here shown conventionally as of wire 27 wound spirally about the exterior of such cathode cell and connected by means of the wire 28 with the source 16 of electrical energy, although it is to be understood that such spiral winding is not material to the formation of the electrode as any form of covering for the cathode cell, which does not obstruct passage through the pores of such cell may be employed, such, for instance, as perforate metal sheet, wire gauze or the like.

Adjacent the bottom of the receptacle 22 a pipe 29 enters communicating with a reservoir H_2O from which source water is conducted through the said pipe 29 to the receptacle 22, such passage being controlled by a valve or cock shown conventionally at 30.

Adjacent the upper end of the receptacle 22 a pipe NaHO is provided through which the product of decomposition is discharged.

In operation sodium chlorid solution is discharged from the reservoir 11 through the pipe 12 and anode 10 passing out at the bottom of said tube which stops short of the bottom of the anode compartment and upwardly within such anode compartment as indicated by the arrows. At the same time

water is discharged from the tank H_2O through the pipe 29 to the bottom of the receptacle 22 and passes upwardly through such receptacle and the water within receptacle 22 and the sodium chlorid solution within the cell 17 are subjected to an electrolytic action from the source of energy 16. It will be obvious that such electrolytic action will result in the discharge of chlorin gas from the pipe Cl, of hydrogen-gas from the pipe H and caustic soda from the pipe NaHO, while the spent sodium chlorid solution will be discharged from the pipe 21.

The passage of the electrolyte through the apparatus is controlled by the use of the cocks 13 and 30 and the products discharged from the cell may be, if desired, subjected to further electrolytic action in duplicate of the apparatus shown at Fig. 1, it being understood that such cells may be arranged in series as shown at Fig. 2 or otherwise so that the products may be further acted upon by further and similar cells communicating with the initial cell and that the passage of the electrolyte and the products through the cells is controlled by gravity.

In the arrangement of the cells in series as shown in Fig. 2, 22′ and 22″ indicate the additional cathode receptacles, and 17′ and 17″, the additional cathode cells. Pipes 29′ and 29″ connect receptacles 22 and 22′ and 22′ and 22″ respectively. 23′ and 23″ are the caps which close the bottom of the receptacles 22′ and 22″. 24′ and 24″ are the caps which close the caps of the receptacles. 12′ and 12″ are the branch pipes which connect the pipe 12 with the cathode cells 17′ and 17″. Cl′ and Cl″ are the tubes similar to the tube Cl which are inserted in the top of each of the anode compartments. 28′ and 29′ are the connecting wires which are similar to the wire 28, and 16′ and 16″ are sources of electricity similar to the source 16. 21′ and 21″ are pipes similar to pipe 21 and connect with the cathode cells 17′ and 17″.

The apparatus as shown, it will be noted, is constructed wholly of commercial materials, procurable on the market, such for instance as iron pipe for the outer receptacle, porous clay pipe for the intermediate receptacle, and carbon tubes for the inner tube or anode and connected up by the usual and ordinary pipes and other well known devices so that the inner apparatus is and may be economically, quickly and conveniently made without resorting to special forms or special molds, dies or the like for its products. The main object of the apparatus is, however, to provide in a small space, a very large surface action, as the salt solution and the water form flowing concentric tubes. Also, the concentric tube form of anode and cathode brings the electrical resistance down to a minimum. Altogether it is the object of the apparatus to provide large surfaces for both electrolytes and for anode and cathode, in a small space and with simple means.

It is obvious that with a few slight mechanical changes the device may be employed with steam to wash away the caustic soda from the cathode instead of water. It is also obvious that the cell may be so arranged that the streams of salt solution and caustic soda solution instead of flowing in the same direction may be made to flow in opposite directions. Also that the cell instead of being arranged vertically may, with but slight changes be constructed so as to be disposed horizontally or in an inclined position.

What I claim is:—

1. An electrolytic cell comprising a pipe having caps at its extremities, a porous pipe disposed concentrically within the pipe and having a discharge opening, a tube disposed within the porous pipe, means to supply an electrolyte to the tube, means to employ the tube as an electrode and an electrode of the opposite sign surrounding the porous tube, and means to discharge the products of electrolysis from the several members.

2. An electrolytic cell comprising a cylindrical casing having its opposite ends provided with closures, a porous cylindrical receptacle disposed concentrically within the outer receptacle, a tube disposed within the porous receptacle, means to supply an electrolyte to the tube, means to employ the tube as an electrode, an electrode of the opposite sign disposed upon the exterior of the porous receptacle, and openings formed in the outer receptacle and the porous receptacle adapted to permit the discharge of the products of electrolysis.

3. An electrolytic cell comprising a cylindrical container, a porous pipe disposed within the container, a cap closing the top of the container and positioning the porous pipe and adapted to permit the porous pipe to extend upwardly therefrom, a tube disposed within the porous pipe, means closing the top of the porous pipe and adapted to position the tube, means to supply an electrolyte to the tube, means to employ the tube as an electrode, an electrode of the opposite sign carried by the porous pipe, and discharge tubes communicating with the casing and the porous tube adapted to permit the discharge of the products of electrolysis.

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

OTTO MEYER.

Witnesses:

JAMES C. PAGE,

CHAS. C. RUSSELL.