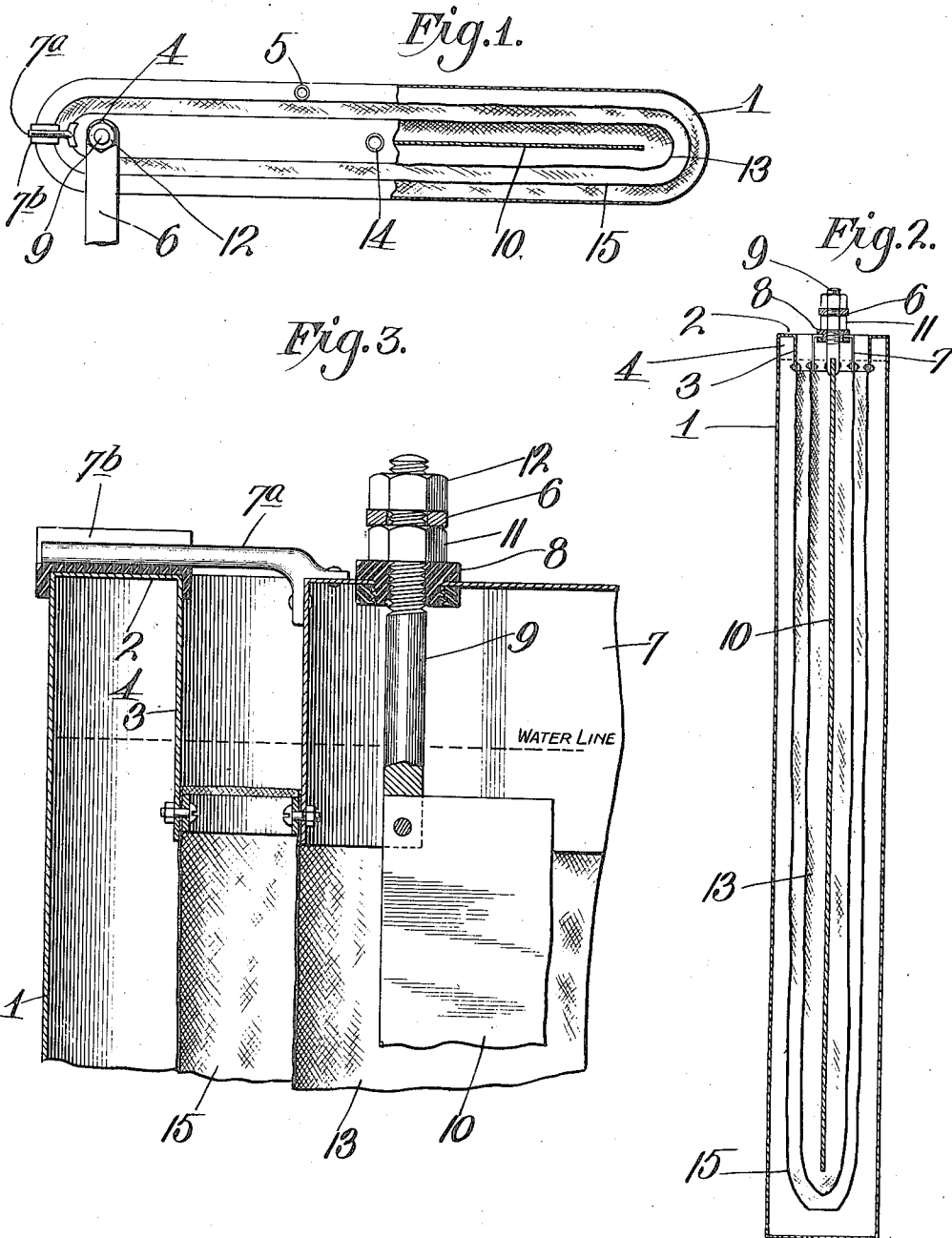


E. E. NORQUIST.
ELECTROLYTIC CELL.
APPLICATION FILED MAY 1, 1914.

1,153,438.

Patented Sept. 14, 1915.



WITNESSES:

Frank R. Gore
H. Rodgers

INVENTOR

E. E. Norquist

BY

George F. Thorpe
ATTORNEY

UNITED STATES PATENT OFFICE.

EMANUEL E. NORQUIST, OF KANSAS CITY, MISSOURI, ASSIGNOR OF ONE-HALF
TO OXYGEN GAS COMPANY, OF KANSAS CITY, MISSOURI, A CORPORATION OF
MISSOURI.

ELECTROLYTIC CELL.

1,153,438.

Specification of Letters Patent.

Patented Sept. 14, 1915.

Application filed May 1, 1914. Serial No. 835,587.

To all whom it may concern:

Be it known that I, EMANUEL E. NORQUIST, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Electrolytic Cells, of which the following is a specification.

This invention relates to electrolytic cells for use in effecting decomposition of water to liberate the components, oxygen and hydrogen thereof, and my object is to produce a cell of the character outlined in which it will be impossible for any such gases to become intermingled or pass to the same gasometer, it being well known that it is necessary to keep such gases separated on account of danger of explosion if mixed and subjected to pressure, and because pure oxygen is essential for restorative and analogous purposes, and pure hydrogen is desirable for purifying soaps and for other purposes.

To this end the invention consists in certain novel and peculiar features of construction and organization as hereinafter described and claimed; and in order that it may be fully understood reference is to be had to the accompanying drawing, in which:—

Figure 1, is a view partly in plan and partly in horizontal section of an electrolytic cell embodying my invention. Fig. 2, is a vertical transverse section of the same. Fig. 3, is a vertical section taken at right angles to the section shown by Fig. 2, of a fragment of the cell.

In the said drawing the cell is constructed as follows: 1 is a shell preferably proportioned as shown, and provided at its upper edge with an inturned flange 2, having a wall 3 depending from its inner edge, to form a chamber 4 for the reception of hydrogen gas liberated from water contained in the shell, and leading from said chamber 4 is a pipe 5 to conduct hydrogen gas to a gasometer, not shown. The shell forms the cathode of an electric circuit hereinafter mentioned.

Depending into the water contained in the shell is a gas bell 7 supported by a pair of arms 7^a, resting on insulation pieces 7^b, and extending vertically through and insulated at 8 from the top of said bell is a pair of screw bolts 9 from which is suspended the anode 10, nuts 11 engaging the upper ends

of said bolts and resting on the insulation pieces 8, and clamped between one of said nuts and an extra nut 12 on the same bolt, is a plate 6, for connection with a source of electric energy (not shown), which source of electric energy is also adapted for connection with the cathode or shell, as customary in the operation of electrolytic cells or batteries thereof. The parts 7^a, 7^b, 8, 9, 10, 11 and 12, are in duplicate, but only one of each of such parts is shown. A bag-shaped diaphragm 13 of asbestos or equivalent material is suspended from the bell and is of length to nearly reach the bottom of the shell, and in conjunction with the bell completely incases the anode so as to insure that all oxygen liberated from the water or equivalent electrolyte shall pass up into the bell and be conducted thence through pipe 14 to a gasometer, not shown. This diaphragm not only retains all of the oxygen liberated adjacent to the anode but guards against the entrance into the sack of hydrogen liberated externally of the sack. As a further precaution against the possibility of mixture of the gases, a tube-shaped diaphragm 15 of asbestos or its equivalent completely incases but is spaced from the bag-shaped diaphragm, and is suspended at its upper end from the flange 3 of the shell, and in order that this tube-shaped diaphragm may collect substantially all of the hydrogen liberated and conduct it to the collecting chamber 4, the said diaphragm preferably tapers at its lower end, so as to cover almost the entire bottom of the shell and underlie the bag-shaped diaphragm. By the coöperative use of the diaphragm, it is clear that oxygen may escape from the bag-shaped diaphragm and hydrogen may escape inwardly through the tube-shaped diaphragm without any danger of the two gases being collected in the same gasometer, as an occurrence of the kind mentioned will result in the escape of the gas upwardly from the cell externally of the diaphragm 13 and internally of the diaphragm 15. There is, of course, only a remote possibility of both diaphragms becoming defective at adjacent points whereat their respective gases may escape, but even should this occur the gases will escape from the cell because the diaphragms are spaced apart and the tendency of the gas is to pass upward.

In practice the completion of the electric

circuit results in the flow of the current from the anode to the cathode through water in the shell, the asbestos diaphragms 13 and 15 affording free passage for the current but not for the gases liberated by the electrolysis of the water. The oxygen passes, as hereinbefore stated, to a gasometer and the hydrogen to a different gasometer, and in the event that excess pressure is produced in compartment 4 or in the bell, and gases are forced through the diaphragms 13 and 15, such gases will escape to the atmosphere as hereinbefore suggested. It will therefore be seen that a battery of these cells can be used to produce and separately collect oxygen and hydrogen with safety.

From the above description it will be apparent that I have produced an electrolytic cell embodying the features of advantage enumerated as desirable, and which may be modified in minor particulars without departing from the principle of construction involved.

I claim:

An electrolytic cell, comprising a shell or cathode to contain water and provided with an inturned flange at its upper end, terminating in a depending wall to form a chamber to receive gas liberated from the water, a gas bell in the space inclosed by said wall and spaced from the latter, supporting means secured to the bell and resting on but insulated from the shell, an anode suspended from the bell, in the water in the cathode, a flexible bag-shaped diaphragm inclosing the anode without contact therewith and suspended from the bell, and a flexible tube-shaped diaphragm suspended from the said wall and inclosing the said bag-shaped diaphragm without contact therewith.

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

EMANUEL E. NORQUIST.

Witnesses:

FRANK R. GLORE,
G. Y. THORPE.