W. G. MICHEL.

ELECTROLYTIC CELL.

APPLICATION FILED AUG. 19, 1918.

1,309,148. Patented July 8, 1919.

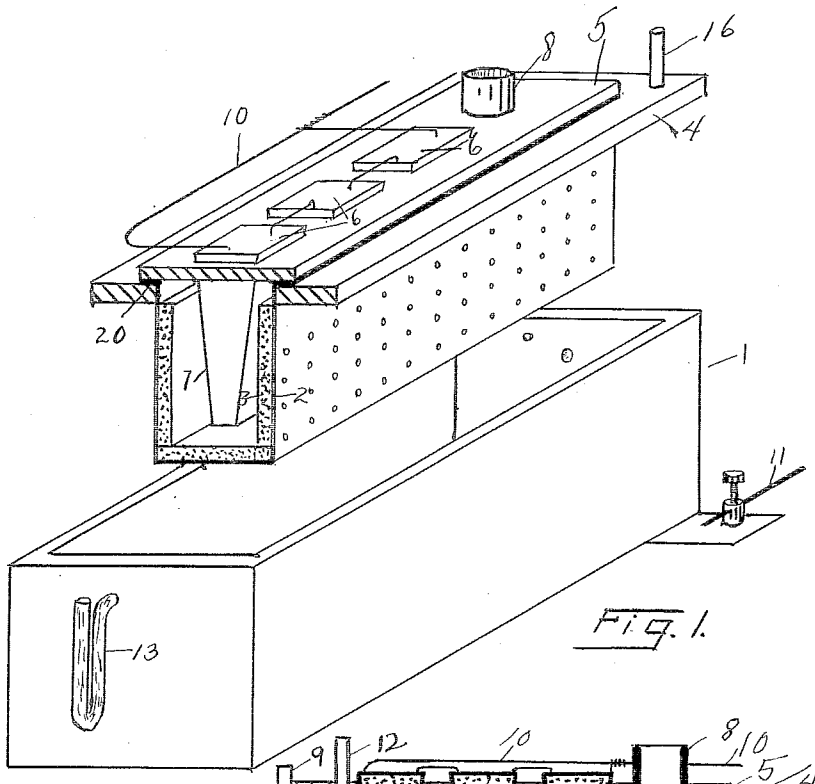


Fig. 1.

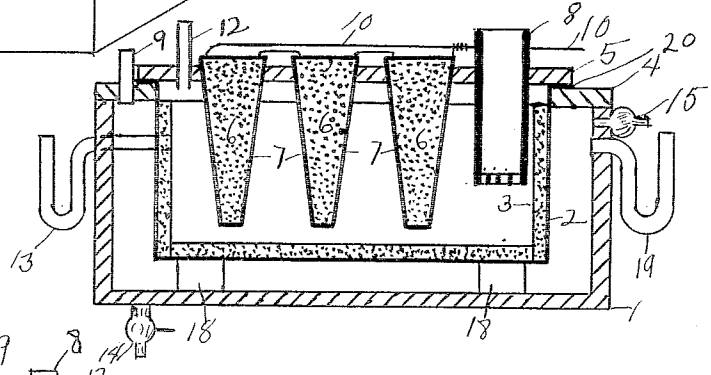


Fig. 2.

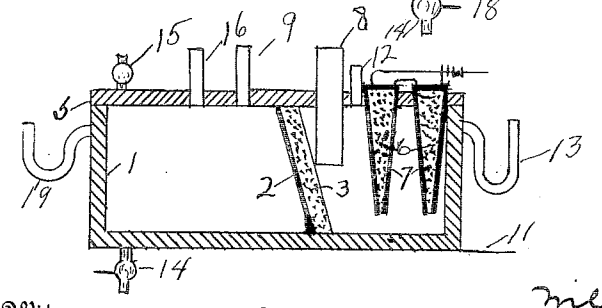


Fig. 3.

Witness
Francis P. Kiser

Inventor
William G. Michel

By Frank Kiser
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM G. MICHEL, OF NIAGARA FALLS, NEW YORK.

ELECTROLYTIC CELL.

1,309,148. Specification of Letters Patent. Patented July 8, 1919.

Continuation of application Serial No. 179,111, filed July 7, 1917. This application filed August 19, 1918. Serial No. 250,580.

To all whom it may concern:

Be it known that I, WILLIAM G. MICHEL, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Electrolytic Cells, of which the following is a specification.

The object of this invention is to provide a cell to be used for the electrical decomposition of some substances into their elements or the formation of new substances therefrom, and more especially for the separation of ordinary salt and the formation thereby of sodium hydroxid and chlorin gas. These and other objects of the invention will be illustrated in the drawings, described in the specification and pointed out in the claims at the end thereof.

Figure 1 is a perspective view of the cell and the cover therefor, the cover and inner tank being lifted and shown in section to expose the interior of the cell.

Fig. 2 is a longitudinal, vertical section through the cell and cover.

Fig. 3 is a longitudinal section of a modification of the tank.

In the drawings, reference numeral 1 indicates the outer tank of the cell, 2 indicates the casing and 3 indicates the lining of the inner tank of the cell. The casing 2 is made up of sheet steel or boiler iron, or reinforced concrete. The walls must be perforated below the water line to allow due circulation of the liquid therethrough.

Inside of the casing 2 the lining 3 is placed, which is made of slabs of anthracite coal, sawed to suitable dimensions, the joints between the slabs being filled with cement or other suitable material so as to form a substantially water tight receptacle which will nevertheless permit a circulation therethrough by osmosis due to electrolytic action. This coal protects the iron from the corrosive action of chlorin, both below and above the water line where the iron is left exposed, as, for example, around the top it may be protected in any suitable manner. The cover for the tank is made of two slabs of slate or concrete 4 and 5 although the outer cover 4 may be made of iron. The cover 4 is placed on the outer tank and is sealed on the rim thereof. The cover 4 of the outer tank has an opening therein large enough to admit the inner tank. The casing of the inner tank has a flange 20 which rests on the cover 4, by which the inner tank is supported therefrom. On top of the flange 20 rests the cover 5 of the inner tank. Both the covers 4 and 5 are sealed on the tanks to prevent the escape of gas from either tank or the circulation of gas between the tanks.

In the cover 5 is made one or more tapered openings to receive the anodes 6, 6 which are tapered to fit the sockets formed therefor. These anodes are made of a tile 7 which may be round or square, porous or non-porous and which has a perforated bottom and which may also have perforations in the sides. Into this tile is compressed anthracite coal preferably of buckwheat size. This coal can be compressed therein sufficiently tight so that the coal will hold itself therein and the bottom may, therefore, be left open without any danger of the coal falling out.

Directly on top of the coal in each anode is placed a lead plate with a wire attached thereto. The lead plate is sealed into the tile in electrical contact with the coal by tar, mino wax, paraffin, or other suitable material. These anodes can be readily inserted in the sockets in the cover plate 5 or removed therefrom. The anodes should extend well down into the solution in the inner tank when in position.

In the cover plate 5 is placed the exhaust pipe 12 and the supply pipe 8, and in the cover plate 4 is placed the exhaust pipe 9. The supply pipe extends below the water line. A conductor 10 is connected with the anodes 6, 6, 6 and a conductor 11 is grounded on the tank 1 so as to furnish current to the liquid contained therein. The inner tank is supported in the outer tank and spaced therefrom by the insulator blocks 18, 18. An overflow pipe 13 is provided for the inner tank and an overflow pipe 19 is provided for the outer tank, each of which overflow pipes is provided with an inverted siphon which acts as a seal to prevent the escape of gas from said tanks.

In operation the outer tank is filled with water up to the water line of the overflow pipe 13, the electrical conductivity of which is improved by the addition thereto of some of the salt that is to be made by the tank, such as sodium hydroxid or potassium hydroxid. The inner tank is filled with water to the overflow pipe 13, to which is added the salt

that is to be decomposed by electrolytic action, which salt is added in sufficient quantity to give to the solution a specific gravity of 20 Baumé. In the supply pipe 8 is placed a quantity of the salt to be decomposed, from five to ten pounds being sufficient, more being added as it is used up. This salt dissolves in the solution in the inner tank and keeps the solution at the proper strength as the electrolysis proceeds. For example, common salt may be used in the inner tank. This salt is composed of sodium and chlorin in equal parts. When the electric current is turned on, the chlorin will be separated from the sodium and the chlorin will rise as a gas from the liquid and will pass off through the exhaust pipe 12. The sodium passes through the anthracite coal wall of the inner tank by osmosis and combines with the oxygen and hydrogen of the water of the outer tank, forming sodium hydroxid in solution in the outer tank and setting free the excess of hydrogen that is contained in the water that is decomposed, the hydrogen passing off through the exhaust pipe 9. The hydrogen from the exhaust pipe 9 and the chlorin from the exhaust pipe 12 may be combined in any suitable manner to form hydrochloric acid or the chlorin may be combined with lime for the purpose of making bleaching powder and the hydrogen may be used for other purposes.

In like manner, potassium chlorid may be used as the salt in the inner tank and when subjected to the electrolytic action potassium hydroxid will be formed therefrom in the outer tank, chlorin and hydrogen being set free in the same manner as above described.

I have found by experience that the tank lined with anthracite coal will not only hold the two solutions in complete separation from each other but that it is also a sufficiently good conductor of electricity for the purpose of electrolytic action and will also resist the corrosive effect of chlorin gas.

After the solution of sodium hydroxid has been sufficiently developed in the outer tank, it may be drained off through the cock 14 and fresh water may then be added to the outer tank. More of the salt may be added through the supply pipe 8.

An air vent 15 is provided in the outer tank to facilitate the emptying and filling thereof and a water supply pipe 16 may also be provided for the outer tank so that the outer tank can be drained and filled without breaking the seal of the cover. The operation of the tank may be carried on continuously with brief interruptions in draining and filling the outer tank.

In Fig. 3 I have shown a modification of my improved cell which modification is made of a concrete tank divided into two parts by a partition composed of an iron plate 2 and a layer of anthracite coal slabs 3. This partition is shown inclined to better hold the anthracite coal slabs in place, the plate 2 on one side being the only support therefor. The salt solution and anodes are placed on the right hand side and the hydroxid made therefrom will accumulate on the left hand side of the partition as shown in Fig. 3.

This applicaton is a continuation of my prior application No. 179,111, filed July 7, 1917.

I claim:

1. An electrolytic cell comprising two tanks separated by a partition made of slabs of anthracite coal cemented in place with water tight joints.

2. An electrolytic cell comprising an inner and outer tank, the inner tank having a perforated casing, said casing being lined with slabs of anthracite coal connected with waterproof joints forming a tank.

3. A cover for an electrolytic cell, said cover having tapered openings therein, and tapered anodes adapted to set into and fill said openings.

4. An anode for an electrolytic cell made up of a hollow tile having anthracite coal compressed therein.

5. An anode for an electrolytic cell made up of a hollow tile having anthracite coal compressed therein, said tile being tapered.

6. An anode for an electrolytic cell made up of a hollow tile having anthracite coal compressed therein, said tile having perforations therein permitting electrical contact with the surrounding electrolyte,

7. An electrolytic cell made of anthracite coal in its natural state, and a container for said cell, the coal in its natural state being shaped to fit the cell.

8. An electrolytic cell made of anthracite coal in its natural state shaped to form a container.

9. An electrolytic cell made of anthracite coal in its natural state shaped to fit the cell.

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

WILLIAM G. MICHEL.

Witnesses:

GLADYS HAZEL,

ESTELLA CUNNY.