B. THOMAS.

ELECTROLYTIC CELL.

APPLICATION FILED JUNE 10, 1918.

1,359,002.

Patented Nov. 16, 1920.

2 SHEETS—SHEET 1.

Fig. 1

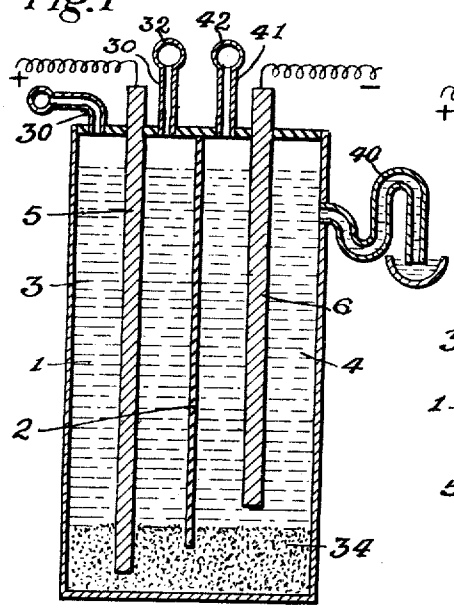


Fig. 2

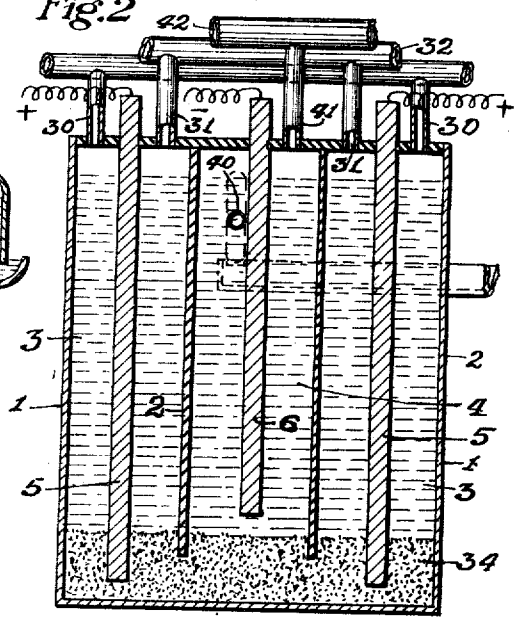
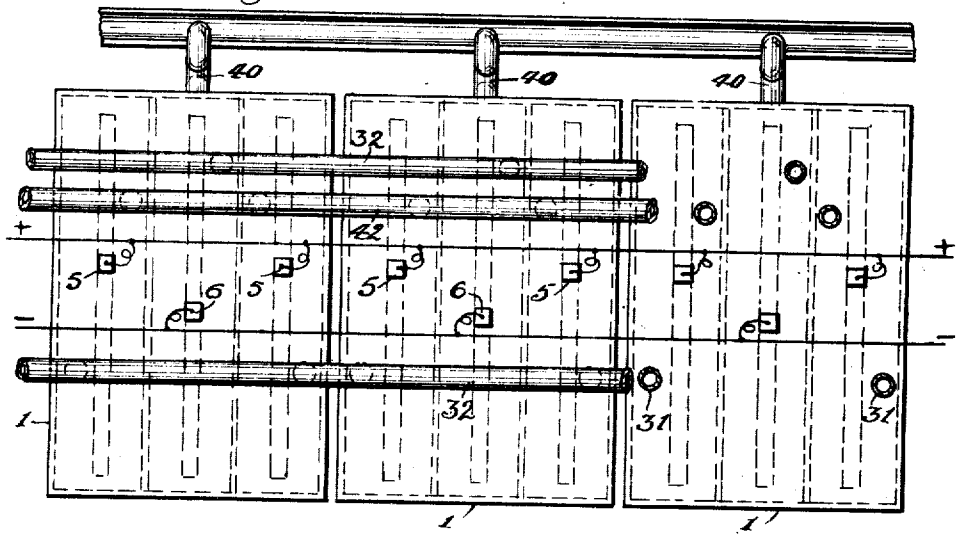


Fig. 3



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2 SHEETS—SHEET 2.

Fig. 4.

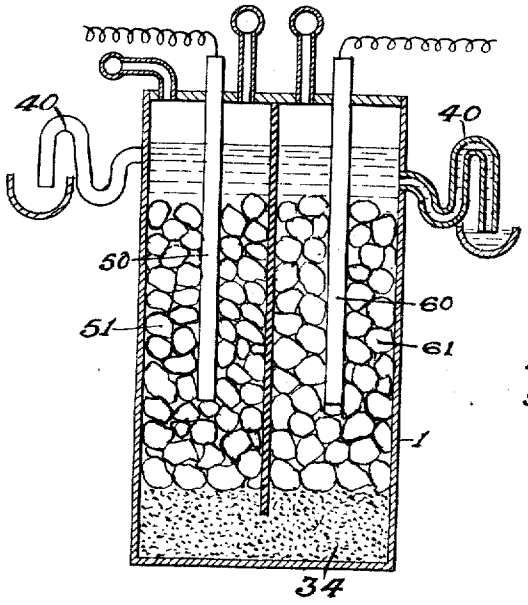
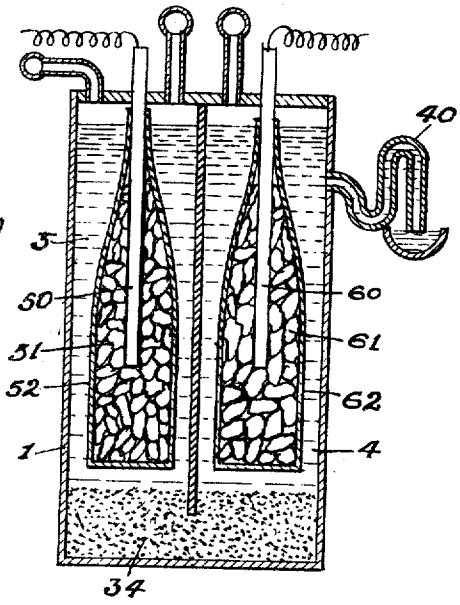


Fig. 5.



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UNITED STATES PATENT OFFICE.

BRUNO THOMAS, OF SEATTLE, WASHINGTON.

ELECTROLYTIC CELL.

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Application filed June 10, 1918. Serial No. 239,112.

To all whom it may concern:

Be it known that I, BRUNO THOMAS, a citizen of the United States, and resident of the city of Seattle, county of King, and State of Washington, have invented certain new and useful Improvements in Electrolytic Cells, of which the following is a specification.

My invention relates to electrolytic cells and consists in an improved construction of such cells by reason of which their action may be made continuous.

The object of my invention is to produce an electrolytic cell which is adapted for certain reduction processes and which may be operated continuously.

My invention consists of certain parts combined together to adapt them to act in a certain manner and to secure certain results such as will be hereinafter described and then pointed out in the claims.

In the accompanying drawings I have shown my invention embodied in a type of construction which is that now preferred by me.

Figure 1 is a transverse sectional elevation of a two compartment cell.

Fig. 2 is a like view of a three compartment cell.

Fig. 3 is a top plan view of a series of three compartment cells.

Figs. 4 and 5 are cross sections of cells having certain modifications of structure.

Certain electrolytic processes are employed for producing chemical transformations in the electrolyte, whereby new chemical compounds are produced. As an instance, by a certain process ammonium nitrate is produced by the electrolytic decomposition of nitric acid. In this process hydrogen is liberated at the cathode, which unites with the nitric acid to form ammonium nitrate.

Such cells may be either of the diaphragm or bell type. In the usual cell as employed in the above named process, the cells are charged and discharged before and after the period during which the current is employed and during which the electrolytic action takes place. This keeps the capacity low.

The cells herein illustrated are a combination of the bell and diaphragm type. The outer casing 1 has a diaphragm or diaphragms, 2, which stop short of the bottom. The chamber, 3 is the anode chamber and 4 the cathode chamber, 5 is the anode and 6 the cathode. The anode chamber 3 is supplied through a pipe 30 and the contents of the cathode chamber maintained at constant level by a water sealed overflow at 40. Pipes 31 and 41 connecting with the respective chambers, serve to carry off gases generated by the electrolytic action which are not used in the chemical actions occurring.

The space beneath the diaphragm 2 which space connects the anode and cathode chambers, is provided with a sand lock 34, or porous communicating medium which permits slow transfer of liquid from the anode chamber 3 to the cathode chamber 4. The function of this sand lock is to permit slow passage of a diffused stream from the anode chamber to the cathode chamber.

The partition wall or diaphragm 2, should consist of an antacid material, as for instance, sintered and semi-permeable arenaceous quartz (silica) or glass.

In Figs. 4 and 5 modified forms of electrodes are shown. Central cores, 50 for the anode and 60 for the cathode, are used with which to connect the circuit conductors. 51 and 61 represent pieces of coal, coke, carbon or such suitable material which, as shown in Fig. 4, substantially fill the electrode chambers, while in Fig. 5 this is held together by an enveloping casing, 52 and 62, which may be of asbestos, or any other suitable material.

In using such a cell for the electroyltic production of ammonium nitrate, the nitric acid would flow continuously in regulated volume into the anode chamber 3 from pipe 30. The transfer of electric current takes place largely through the diaphragm 2. The electrolytic action liberates hydrogen gas at the cathode which unites with the nitric acid to form ammonium nitrate. The greatest concentration of this takes place adjacent to the surface and flows off through the liquid seal at 40. As this flows off, acid from the anode cell 3 flows through the sand lock 34 and thus maintains a continuous supply of acid. The result is a continuous process in which the ammonium nitrate solution flows off at 40 and the acid is renewed at 30. The reduction takes place in the cathode chamber 4.

By reason of the buoyancy of the gas it rises and the greatest chemical action takes place toward the surface. The operation is correctly adjusted when the supply of

acid and the strength of current are so proportioned that the cathode product is neutral.

If raw acid, which normally contains a considerable percentage of lower oxid of nitrogen, be used, the liberation of oxygen which occurs at the anode, being in a nascent state, will readily combine with these oxids to form the higher oxids, or nitric acid. There will thus be a purification of the nitric acid in the anode chamber and the formation of ammonium nitrate in the cathode chamber. The two products may be drawn off from adjacent the respective electrodes, as is indicated by the extra pipe 44 of Fig. 4. By this plan two useful results and differing products may be obtained.

In Fig. 2 I have shown a central cathode cell and an anode cell at each side thereof. The construction is in all its essentials like that of Fig. 1.

The construction illustrated and described is a combination of a bell cell and a diaphragm cell. The percolating bed or sand lock 34 keeps the contents of the two cells separate and distinct and yet permits flow to take place as freely as is required.

What I claim as my invention is:

1. An electrolytic cell having an anode chamber and a cathode chamber, and a diaphragm separating and forming a common wall between said chambers and of a character to permit electric current to flow therethrough while preventing liquid flow, said diaphragm stopping short of the bottom of the cell, and a bed of porous filter-like material closing the space beneath said diaphragm and permitting a seepage flow of liquid between the chambers.

2. An electrolytic cell of the type described in claim 1 in which the diaphragm is composed of arenaceous quartz which has been sintered together.

Signed at Seattle, Washington.

B. THOMAS.