(No Model.) 2 Sheets—Sheet 1.

P. GARUTI.

APPARATUS FOR PRODUCTION OF OXYGEN AND HYDROGEN BY ELECTROLYSIS.

No. 534,259. Patented Feb. 19, 1895.

Fig: 1

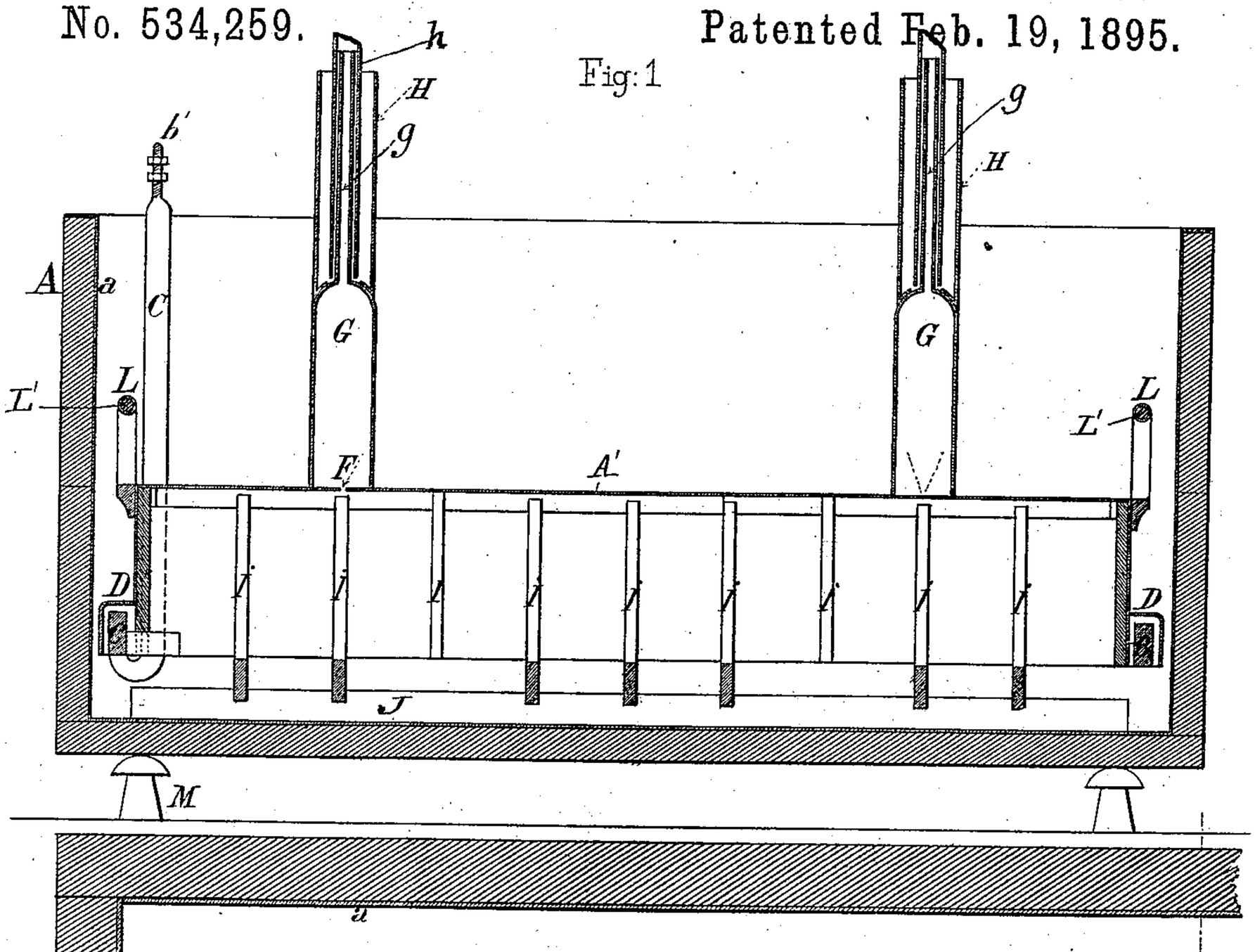

Fig: 2

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(No Model.) 2 Sheets—Sheet 2.

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APPARATUS FOR PRODUCTION OF OXYGEN AND HYDROGEN BY ELECTROLYSIS.

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Fig: 3

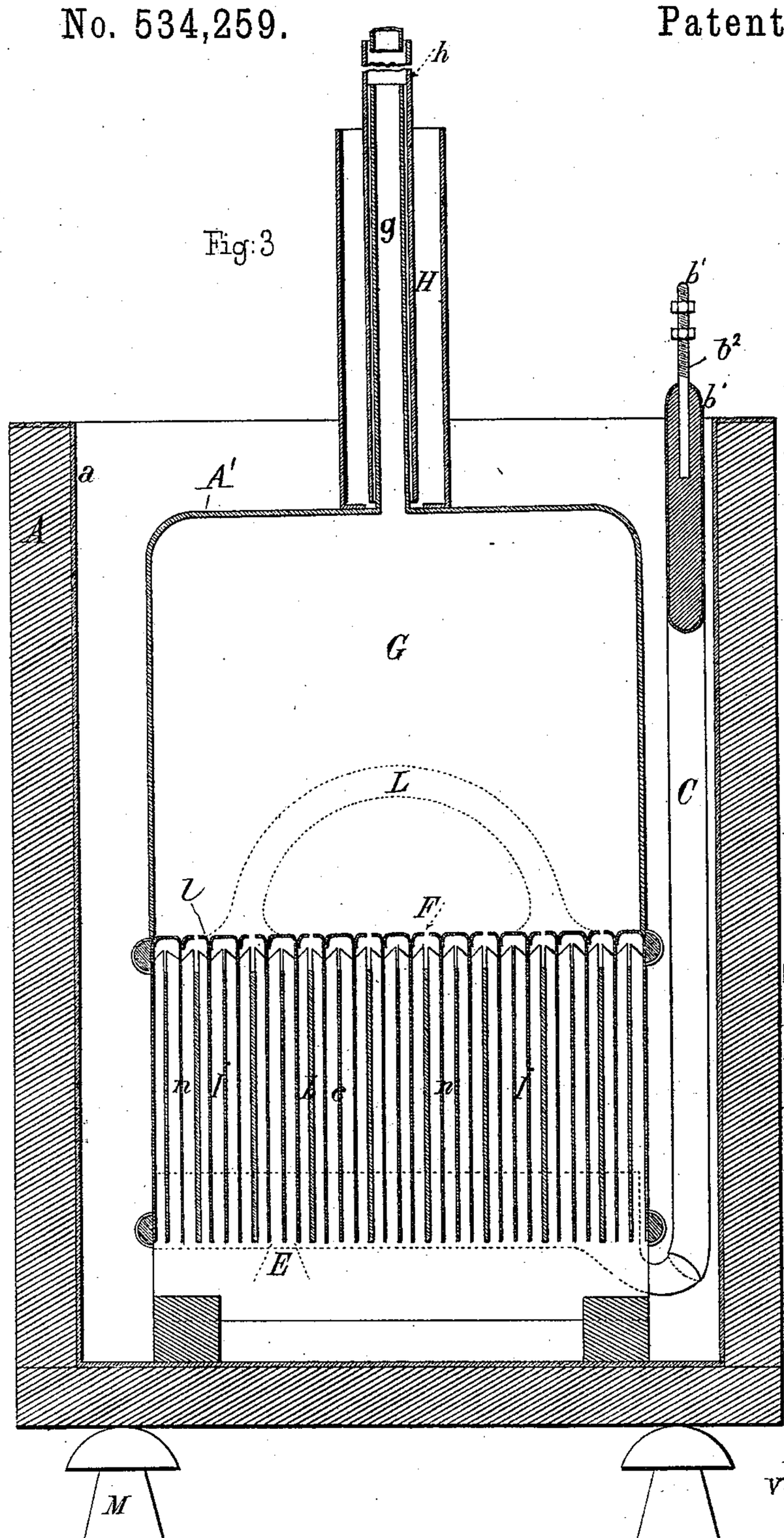

Fig: 4.

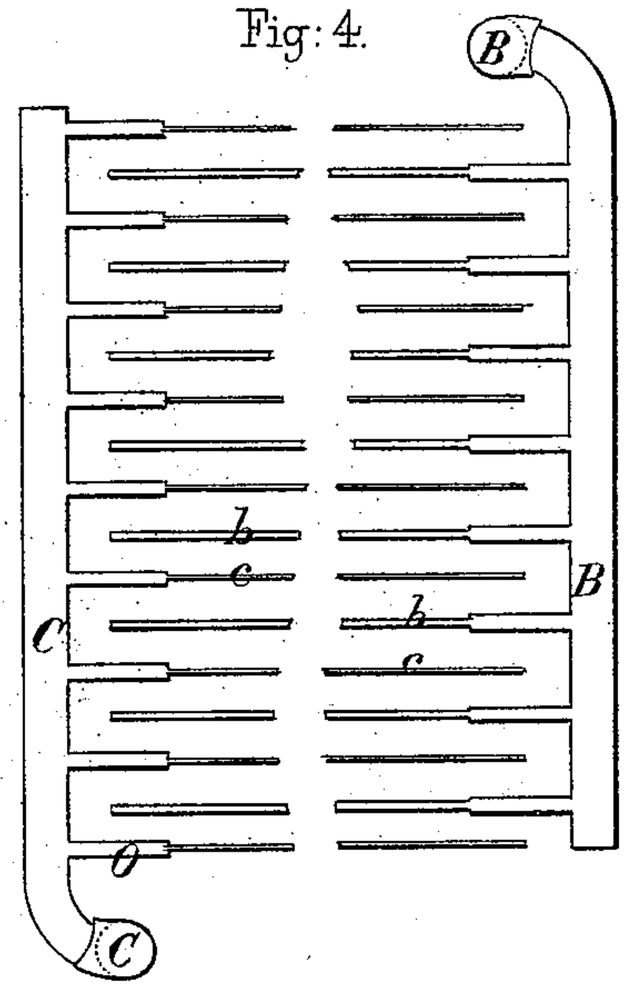

Fig. 5.

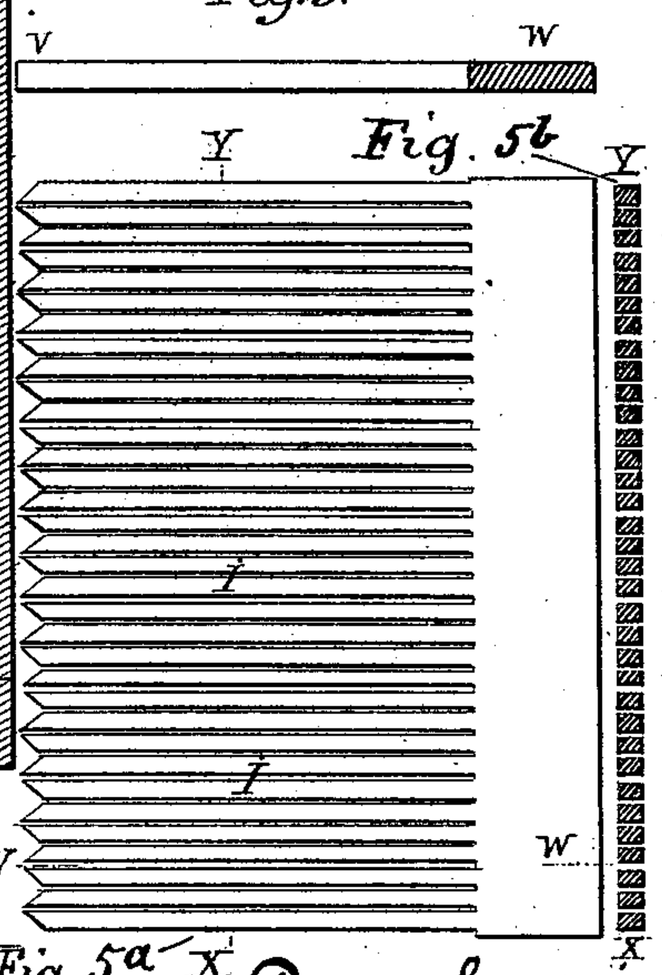

Fig. 5b

Fig. 5a

Fig. 6.

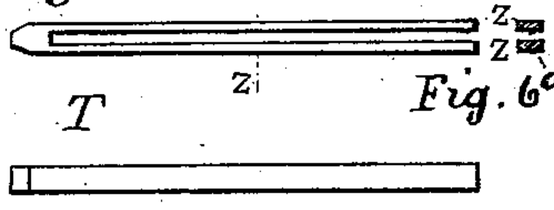

Fig. 6a

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UNITED STATES PATENT OFFICE.

POMPEO GARUTI, OF FLORENCE, ITALY.

APPARATUS FOR PRODUCTION OF OXYGEN AND HYDROGEN BY ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 534,259, dated February 19, 1895.

Application filed September 14, 1892. Serial No. 445,869. (No model.) Patented in Italy April 25, 1892, LXII, 324.

To all whom it may concern:

Be it known that I, POMPEO GARUTI, a subject of the King of Italy, and a resident of Florence, in the Kingdom of Italy, have invented certain new and useful Improvements in Apparatus for the Production of Oxygen and Hydrogen by Electrolysis, (for which I have received a patent in Italy, dated April 25, 1892, LXII, 324,) of which the following is a specification.

This invention relates to the production of oxygen and hydrogen by electrolysis.

Heretofore, these gases have never been practically produced on a large scale, the apparatuses now in use being highly expensive and complicated, and owing to the great resistance that these devices offer to the electric current, they are found to have very little productive power in comparison with the energy expended.

The object of my invention is to overcome these difficulties, and to provide an apparatus capable of producing oxygen and hydrogen cheaply and in large quantities for commercial purposes; such as for use in gas engines, in the production of Drummond light, and in divers other ways.

In the accompanying drawings, in which like letters of reference indicate similar parts of the device: Figure 1 is a longitudinal vertical section through the center of the apparatus. Fig. 2 is a corresponding horizontal section of one end of the same. Fig. 3 is a vertical cross section of the same. Fig. 4 is a broken plan view of the conductors and electrodes. Fig. 5 is a section on line *w*—*v* of Fig. 5ª. Fig. 5ª is a lateral view of Fig. 5. Fig. 5ᵇ is a section on line *x*—*y* of Fig. 5ª. Fig. 6 is a similar view of the forks *l*. Fig. 6ª is a section on line *z*—*z* of Fig. 6.

My invention is constructed and operated substantially as follows:

I take a tank A, of a suitable size, made of deal or other non-conducting material, and secure to the inside thereof a lining *a* of sheet lead. In this tank I place the electrolyzing apparatus, in a position horizontal to the liquid to be electrolyzed. The tank is isolated from the ground by insulators M preferably of porcelain.

The apparatus for the decomposition of the water consists of a box or case, A′, turned upside down. Longitudinal diaphragms *n* divide it into cells E. The case is made of lead or its alloys, and is open only at the bottom so as to permit the water to enter the cells.

Anodes *b* and cathodes *c* are placed one in each cell alternately, care being taken that each anode is between two cathodes. The partitions of the cells will thus separate the anodes and cathodes one from the other, and prevent the mixing of the gases, which as they form, pass, the oxygen into the anode cells, and the hydrogen into the cathode.

The cells E have openings F, at the top, through which the gas escapes, into chambers G situated at the top of the apparatus, which chambers serve to collect the gases. All the anode cells communicate with the oxygen chamber and the cathode cells with the hydrogen chamber. These chambers connect with the distributing pipes by means of small pipes *g* over which are pressed insulating tubes *h*, made of glass or porcelain.

To the top of each chamber G I solder a receptacle H, of sufficient diameter, which surrounds the pipe *g* and forms a hydraulic closing, preventing the escape of gas at the junction of the said pipe with the chamber.

Two conductors, one positive, B, and one negative C rest over the top of the tank, and extending down to the bottom of the apparatus enter through chambers D, without having electrical contact therewith. Arms O branching off from the conductors pass through the sides of the apparatus, and connect with the electrodes. These conductors up to the surface of the water, are covered with a coating of caoutchouc *b′*, isolating them from the liquid, and at their extremities terminate in a junction of copper b^2, where the current enters. The chambers D serve to collect any gas that forms on the surface of the conductors, the gas passing through an opening in the said chamber into the cells that contain the same gas.

The electrodes are isolated from the diaphragms *d* by combs I, made of deal or other non-conducting material, the teeth of which enter into the cells, and fill out the space between the electrodes and the diaphragms, to prevent them from coming into contact, one with the other. The combs I are fastened to longitudinal beams J lying on the bottom of

the tank, and are cut out at the points of the teeth so as to allow free passage of the gases to the top of the cells E.

The electrodes do not extend quite to the bottom of the tank, so that any sediment which the water deposits does not interfere with the working of, nor damage, the apparatus.

To prevent the electrodes from touching the top of the cells, every electrode has at each end at the top a fork, *l* of a material similar to that of the combs I. This fork has two prongs T, between which the electrode enters, and the whole fork rests between two of the diaphragms, its base touching the top of the cell.

In order that the apparatus may be easily lifted out of the tank, I affix to each side thereof a handle L, preferably made of lead with an iron core L′.

The water to be decomposed must be drinking water, or better still rain water mixed with about twelve per cent. of its weight of commercial sulphuric acid of 60°.

The water in the tank should be substantially level with the top of the gas-chambers G, so as to give the gases the requisite pressure, and force them up to their respective chambers, thus preventing the formation of deposits of gases, which in contact with the electrical current might recompose. By thus immersing the apparatus, moreover, any leaks therein, or contact between the electrodes and diaphragms may be quickly detected, such contact being indicated by bubbles rising to the surface.

I prefer to make my apparatus entirely of lead or its alloys, on which metal neither the acidified water nor the oxygen have any deteriorating effect, but if alkalized water containing about fifteen per cent. of caustic soda or potash be used for the electrolysis, the apparatus can be made of cast or wrought iron or steel.

In the apparatus above-described, the electrodes should have about one half square decimeter of surface for each ampère of current. By dispensing with the diaphragms except for about an inch at the top and sides of the cells E, the resistance is so much lessened that but one quarter square decimeter of surface is required for each ampère of current, though in this case the distance between the electrodes should be somewhat increased, in order to prevent electrical contact between them. Hence it will be seen that the measures and directions herein given are not absolute, but can if desired, be modified in many particulars.

Having thus described my invention, what I claim is—

1. An electrolyzing apparatus, consisting of an inverted case divided into cells, having slits at the top in which are placed anodes and cathodes, the said case being provided with chambers having pipes surrounded by receptacles, substantially as shown and described.

2. An electrolyzing apparatus consisting of an inverted case, divided by diaphragms into cells in which are placed anodes and cathodes insulated from the said diaphragms by combs supported on beams, substantially as shown and described.

3. In an electrolyzing apparatus, the combination with the case divided into cells in which are placed electrodes, of collecting chambers, situated at each side of the case and connecting one with the anode and the other with the cathode cells through which the electric conductor enters, substantially as shown and described.

4. In an electrolyzing apparatus, the case divided by diaphragms into cells having slits at the top in which are placed alternately anodes and cathodes having at their tops the forks and separated from the said diaphragms by combs, in combination with the chambers having pipes, surrounded by receptacles, and a tank containing the liquid to be decomposed, and in which the whole apparatus is placed all substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 8th day of August, A. D. 1892.

POMPEO GARUTI.

Witnesses:
WILLIAM DE BULMERINCO,
CORYDON P. BENTOR.