

1,214,934.

I. H. LEVIN.  
ELECTROLYTIC GAS GENERATOR.  
APPLICATION FILED DEC. 20, 1915.

Patented Feb. 6, 1917.

2 SHEETS—SHEET 1.

*Fig. 1.*

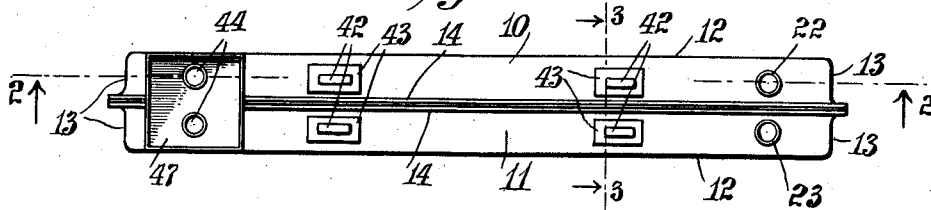
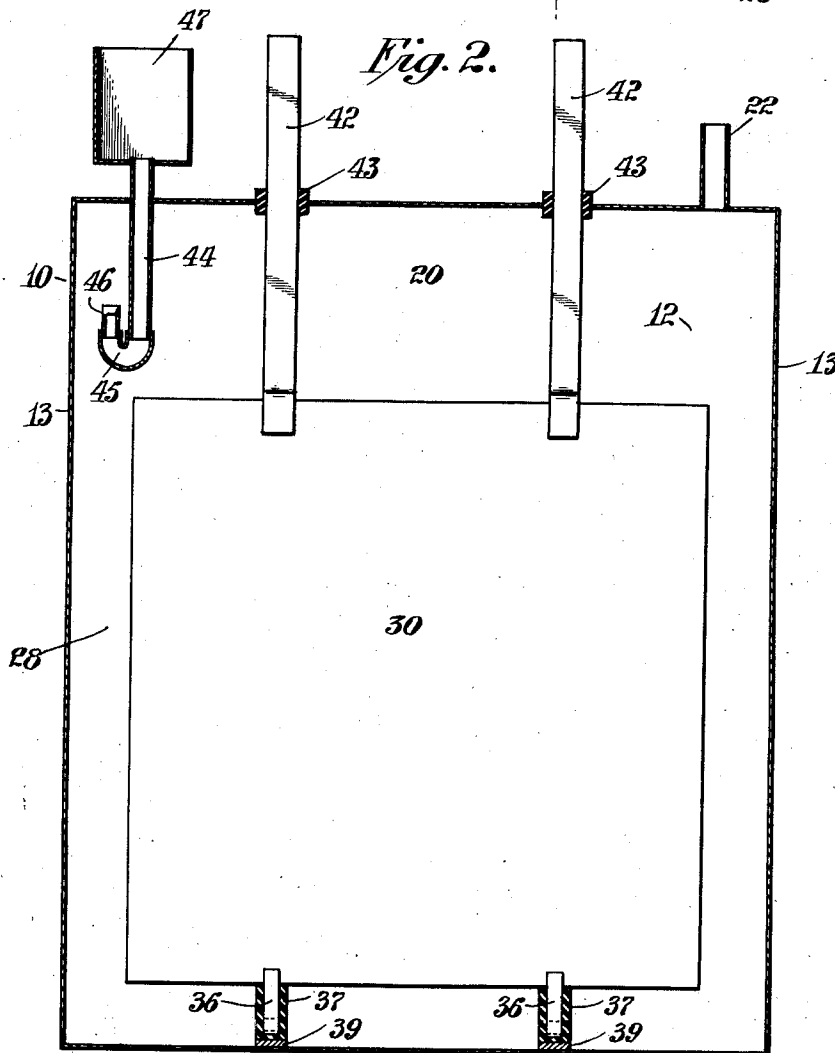


*Fig. 2.*



Attest:  
*W. B. Mitchell*

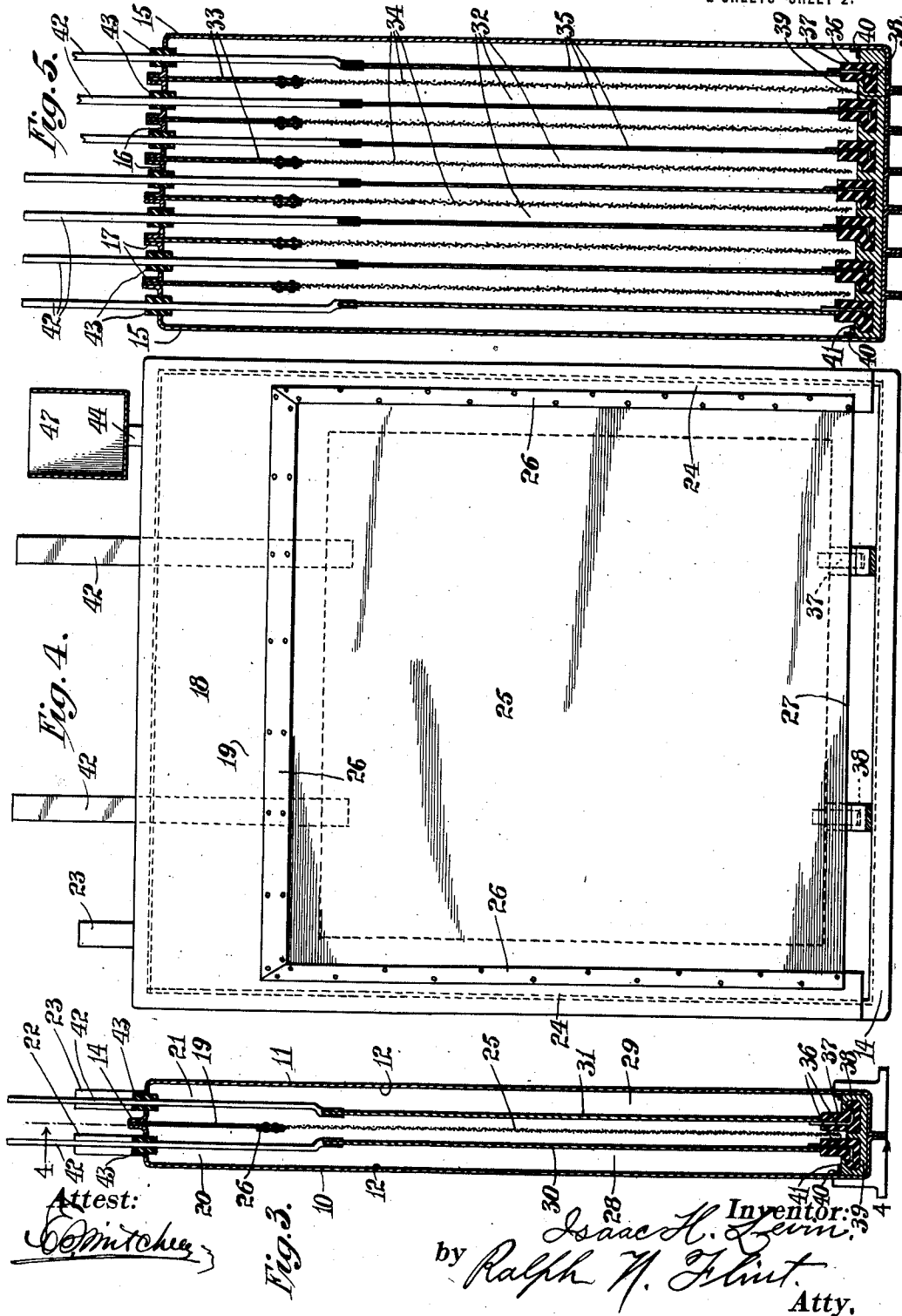
Inventor:  
by *Isaac H. Levin*  
*Ralph N. Flint*  
Atty.

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Inventor: *Isaac H. Levin*  
by *Ralph W. Flint* Atty.

# UNITED STATES PATENT OFFICE.

ISAAC H. LEVIN, OF NEW YORK, N. Y.

ELECTROLYTIC GAS-GENERATOR.

1,214,934.

Specification of Letters Patent.

Patented Feb. 6, 1917.

Application filed December 20, 1915. Serial No. 67,834.

*To all whom it may concern:*

Be it known that I, ISAAC H. LEVIN, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electrolytic Gas-Generators, of which the following is a specification.

My invention relates to electrolytic apparatus designed to produce hydrogen and oxygen gases by subjecting water containing a small quantity of a suitable electrolyte such, for example, as potassium hydroxid, sulfuric acid, etc., to the action of a current of electricity supplied to the water through suitable electrodes submerged therein; the electrolyte being dissociated by the water, oxygen being liberated at the positive electrode, and hydrogen at the negative electrode, all in accordance with the well known phenomena commonly referred to as the decomposition of water by an electric current.

My invention relates particularly to that class of electrolytic cells, or electrolytic gas generators, in which the liquid acted upon is contained in a suitable containing vessel or casing, and in which the electrodes are entirely independent of the receptacle or casing, as distinguished from electrolytic gas generators in which the casing or container forms one of the electrodes.

The objects of my invention are to provide an electrolytic generator in which an improved form of closed liquid receptacle or casing is employed, within which the electrodes are located, the casing being made up of two similar dished sections or casing members formed from sheet metal, the free edges of which members are placed adjacent one another and the sections secured together; to provide an electrolytic generator in which the casing is made up of such casing members in connection with intermediate ring sections, so that a casing for a generator of any required capacity may be formed by assembling two end casing members together with the requisite number of intermediate ring sections; to provide an electrolytic generator in which leakage of the gases produced from one gas chamber to the other, whereby an explosive mixture would be produced, is avoided, or, should leakage occur, such leakage will escape directly into the external atmosphere, as distinguished from into the other chamber; to

provide an electrolytic generator in which the casing is made up of sections of such form and construction that they may be readily manufactured, and easily assembled to produce a casing having any required number of electrode chambers; and to otherwise improve electrolytic generators of the type to which my invention relates.

Further objects of my invention are to provide an electrolytic generator in which the electrodes are supported from the bottom wall of the casing thereof and held securely in place in such a manner that they cannot come into contact with one another or with the walls of the casing; to provide improved filling means for supplying liquid to the interior of the casing; and to provide an electrolytic generator in which all the parts thereof are assembled and fixed in proper position during the manufacture thereof, and remain in that condition during the life of the generator, the generator being manufactured and furnished to the user as a complete and unitary device the parts of which are permanently held in their proper relative positions.

Further objects of my invention are to provide an electrolytic generator in which cobalt is used as an electrode, preferably as the anode; to provide an electrolytic generator in which one of the electrodes is made of cobalt, and the other of iron; and to provide an electrolytic generator in which one or both the electrodes are subjected to a particular treatment before they are placed in the casing to form a generator, whereby the efficiency of the generator is enhanced, all as will be hereinafter pointed out at length.

With the above and other objects of invention in view, my invention consists in the improved electrolytic generator and constituent parts thereof illustrated in the accompanying drawings, described in the following specification, and particularly claimed, and in such variations and modifications thereof as will be obvious to those skilled in the art to which my invention relates.

In the drawings accompanying and forming a part of this application, and wherein the preferred embodiment of my invention is illustrated:

Figure 1 is a view showing my improved electrolytic gas generator in plan;

Figure 2 is a view showing a section thereof

upon a longitudinal plane indicated by the line 2, 2, Fig. 1, an electrode being shown in elevation;

Fig. 3 is a view showing a section taken upon a transverse plane indicated by the line 3, 3, Fig. 1;

Fig. 4 is a view showing a section of my device taken upon a vertical plane indicated by the line 4, 4, Fig. 3, the frame and diaphragm being shown in elevation; and;

Fig. 5 is a view similar to Fig. 3, but showing a modified form of my device.

Referring to the drawings, the reference numerals 10 and 11 designate two similar casing members each having an end wall 12 of comparatively large area, and a side wall 13 of comparatively slight height, whereby casing members of large area and small depth or height are provided, and which members are referred to herein as dished because of their dish or pan-like form. The end and side walls of these members are preferably integral with one another, as shown, although they may be separate from one another and the side wall secured to the end wall, if desired.

In the form of my invention illustrated in Figs. 1 to 4 inclusive, the casing of the generator is formed by two such casing members, the free edges of which members lie adjacent one another; and the two parts of the casing are secured together along the free edges of the members to thereby provide a unitary hollow closed casing adapted to contain the liquid operated upon when my improved electrolytic gas generator is in use. These casing members are shown as and are preferably provided each with a flange 14 at its free edge in order to thereby provide a greater area of the surface of contact at the joint along which the members of the casing are secured together.

In the form of my invention illustrated in Fig. 5, however, the end sections 15 only of the casing of the generator are formed by dished casing members of the form above referred to, the intermediate portion of the casing being made up of a plurality of annular or ring-like sections 16, each annular section having a flange 17 at each of its ends, whereby two dished end sections may be assembled with a greater or less number of intermediate ring sections, all of said sections being secured together as will be understood, to thereby provide a casing for a generator of any predetermined size and to enable generators of different sizes or capacities to be assembled from dished and ring sections all of one form and size.

The casing of the generator is preferably rectangular in form, as shown, although the form thereof is of secondary importance, and the section members are made from comparatively thin plate or sheet metal, preferably iron, by any appropriate mechanical

process, such, for example, as by means of dies and appropriate shaping and pressing operations. The members or sections which comprise a casing are preferably coated with any suitable material whereby the liquid contained in the casing and the gases produced are prevented from acting upon the metal of the casing and corroding it.

Referring again to Figs. 1 to 4, inclusive, the reference numeral 18 designates a frame member located within the casing of the generator, the upper portion 19 of which member constitutes a partition extending across the upper portion of the interior of the casing, and which partition divides the upper portion of the interior of the casing into two parts and provides two gas chambers 20, 21, located within and at the upper portion of the casing, within which gas chambers the hydrogen and oxygen produced when the generator is in operation accumulate; and the generator casing is provided with suitable conduits 22, 23, leading from the gas chambers above referred to, and through which conduits the gases produced are conducted to suitable places of storage or use, as will be understood.

The frame member 18 above referred to includes two downwardly extending side portions 24, which sides terminate adjacent the lower end of the casing as best shown in Fig. 4. The top and side edges of the frame member preferably extend to the exterior of the casing, and lie between the flanges 14 of the casing members above referred to, as shown in Fig. 3, and said frame is held in place between the two casing members when the parts are assembled and secured together, as will be understood.

The casing members and frame are secured together along the joint between the parts to thereby provide a single unitary casing structure, preferably by welding the flanges of the casing member and the edges of the frame member together electrically; although the parts may obviously be secured together by soldering or brazing the joint, by means of rivets spaced along the joint, by providing an interlocking flanged seam along the joint between the parts, or in any other suitable way.

The frame member above referred to carries a diaphragm 25 made preferably of asbestos or other suitable porous material, the side and top edges of said diaphragm being secured to the depending side portions 24 and to the lower edge of the partition 19 as best shown in Fig. 4, suitable cleats 26 being preferably employed to protect the edges of the diaphragm and secure it firmly in place. The cleats are held in place by rivets, or otherwise, as will be understood, and the lower edge 27 of the diaphragm preferably terminates a short distance above the bottom wall of the casing, as shown.

Although the partition 19 is above referred to and is preferably formed by the upper portion of an integral frame member 18 having depending sides 24, as explained, said partition is, functionally considered, a separate and distinct element, and said sides may be omitted without in any way interfering with the function of the partition which, as stated, is to provide two gas chambers at the upper end of the casing. In such a case the diaphragm 25 will be supported by an element or frame separate both structurally and functionally from the partition, as will be appreciated.

The dished or recessed form of the casing members above explained provides two electrode compartments 28, 29, within the casing, see Fig. 3, one of said compartments being located upon each side of the frame and diaphragm above referred to, and the reference numerals 30, 31, designate the two electrodes of my electrolytic cell, one of said electrodes being located within each of the compartments above referred to and submerged in the liquid therein, as shown. In the form shown in Fig. 5, however, the intermediate annular ring sections as well as the dished end sections of the casing provide electrode compartments 32, the several sections being separated from one another by a plurality of frame members the upper ends 33 of which form partitions, and which frames carry diaphragms 34, all as above explained in referring to Figs. 1 to 4. The frame members are thus arranged in alternation with the sections of the casing, a frame being located between the adjacent ends of each two successive sections and held in place as hereinbefore explained, and the electrodes 35 are located within the electrode compartments and upon opposite sides of the frame members as in the form of my invention above described in which a casing having two parts is used.

The lower ends of the electrodes are suitably supported from the bottom wall of the casing, and are firmly anchored in place, so that said lower ends cannot become displaced or come into contact with the wall of the casing or into contact with the frame member or diaphragm. The means for supporting the lower ends of the electrodes may be of any suitable form, so long as the lower ends are held in fixed positions within the casing; said means, are, however, shown as comprising short metallic supports 36, as many as may be necessary, which supports are secured to the lower edges of the electrodes and are inclosed in a folded strip 37 of suitable insulating material. The extremities of the supports are bent to provide hooks 38, and said lower ends, together with their insulating strips or coverings, are supported in blocks 39 resting upon the bottom wall of the casing, which blocks are

shown as held in place by short pieces of angle iron 40. The supporting blocks 39 are provided with overhanging ledges 41 which extend over the hooks at the extremities of the supports, as shown, whereby the electrodes are prevented from moving upward, as will be understood; and, the supporting means being insulating in character, it follows that no metallic connection between the wall of the casing and the electrodes can occur.

The upper ends of the electrodes are provided with inflexible bars or conductors 42, two such bars or conductors being shown as provided for each electrode in the embodiment of my invention illustrated; which bars are secured to the electrodes and extend through openings in the top wall of the casing and are prevented from coming into contact with said wall by insulating bushings or packings shown at 43. These bars or conductors serve as a means for connecting the electrodes with a suitable source of electric current, as will be understood; and they serve to hold the upper ends of the electrodes in proper position and to prevent them from coming into contact with the wall of the casing or with the frame which carries the diaphragm, because of their stiffness and inflexible character. It therefore follows that the electrodes are permanently held in definite and fixed position within the electrode compartments, and that no portion of the electrodes can come into contact with the wall of the casing, or with the frame or diaphragm.

In view of the premises it will be understood that when the generator is in operation oxygen will be produced at the surface of the electrode within one of the electrode compartments 28, 29, and hydrogen at the surface of the electrode within the other of said compartments, the gases thus produced rising into the gas chambers 20, 21, located in the upper portion of the casing. The diaphragm 25 will prevent the gases from one electrode compartment from passing through the liquid in such a way as to enter the other compartment and then rising into the wrong gas chamber; while the partition 19 will prevent the gases from mixing after they have entered the gas chambers. The side and top edges of the partition lying between the edges or flanges 14 of the casing members or sections, as explained, provide an extremely tight, secure and permanent joint between the casing sections and the interposed partition and, finally, should the joint between the parts in question be imperfectly made, or should a leak develop along the joint the leakage will take place from a gas chamber directly into the external atmosphere, and not from one gas chamber into the other.

Filling means is provided whereby water

may be supplied to each of the electrode compartments of the casing, said means comprising a conduit 44 leading into each compartment and the lower end of which is provided with a liquid seal; which seal is secured by means of a return bend 45 upon the lower end of the conduit, and a short upwardly extending pipe 46. Preferably each electrode compartment is provided with its own separate filling device, so that liquid may flow to all the compartments simultaneously. The upper ends of the conduits 44 communicate with a common trough 47 open to the atmosphere, so that when water is poured thereinto it runs into all the electrode chambers. The liquid seals at the lower ends of the several conduits 44 are provided for preventing the gases from escaping from the gas chambers into the atmosphere, the head of liquid in the seals being sufficiently great to prevent the liquid from being forced out of the seals and up the conduits by the pressure in the gas chambers, which pressure in turn is obviously dependent upon the pressure in the storage devices or gas holders into which the gases are conducted from the gas chambers. Should the liquid become low in any particular electrode compartment, or if for any reason gas is not properly generated therein, the liquid seal associated with such compartment will prevent the gas from passing back through the discharge conduit 22 or 23 connected therewith and through the liquid supply conduit for the compartment and into the atmosphere. If, on the other hand, one of the gas discharge conduits becomes obstructed so that the gas may not flow therethrough, the pressure in the particular gas chamber and electrode compartment affected will be relieved through the water seal, and gas will flow therefrom through the filling conduit associated with that compartment and escape into the atmosphere without in any way interfering with the operation of the other electrode compartment. The features here referred to are shown in a generator having two electrode compartments only, although such features are more particularly advantageous in generators having a larger number of electrode chambers such as is illustrated in Fig. 5.

While the electrodes 30, 31, employed in my improved electrolytic gas generator may be made of any of the materials heretofore proposed or now used in making electrodes, and may be electrodes which have been made or prepared for use in any of the ways or in accordance with any of the schemes, treatments, or processes proposed or heretofore used for producing an electrode or enhancing the efficiency thereof, I have discovered that electrodes one or both of which are made of, or the surface of

which comprises cobalt; and electrodes one or both of which have been prepared for use in a certain definite way, or in accordance with a particular treatment or process, are particularly effective in electrolytic gas generators; and that generators having electrodes of such metal, or electrodes which have been subjected to my improved method or process of treatment prior to being used, possess various and pronounced features of advantage over generators employing electrodes of other materials, or electrodes which have not been treated in accordance with my improved process. I have also discovered that an electrode made of, or the surface of which comprises cobalt, possesses particular features of advantage and results in increased efficiency in an electrolytic gas generator when used in connection with another electrode made of iron, or the surface of which is iron, thus forming a cobalt-iron pair or couple, the cobalt electrode being preferably made the anode.

I therefore regard an electrode made of or the surface of which comprises cobalt, used either in connection with another electrode of any material whatever, or, more specifically, when used with another electrode made of, or having a surface of iron to thereby provide a cobalt-iron couple, as parts of my invention.

The cobalt electrode may be made entirely of cobalt; or it may be made by rolling, electro-plating, or otherwise providing a thin layer of cobalt upon a base or support of other and less expensive metal; in which case while the surface of the electrode is cobalt, the greater part of the mass thereof would be of another and cheaper material. The same remarks apply with reference to the iron electrode, and, while perhaps little would be gained in cost by the procedure above referred to so far as concerns the iron electrode, I have found that an iron electrode upon which a thin layer of iron has been deposited electrolytically, or electro-plated, the surface thereof thus comprising a thin layer of iron deposited electrolytically upon an iron base or support, possesses distinct features of advantage over an electrode made of iron in other conditions, such, for example, as cast or rolled iron.

Among the advantages secured by the use of an anode formed of or the surface of which comprises cobalt, and particularly when such an anode is used in connection with a cathode formed of or comprising iron, is that the excess electro-motive force or overvoltage over and above that theoretically necessary to accomplish the continuous decomposition of water is less when a cobalt anode is used than when the anode is of other material, and less in the case of a cobalt anode used with an iron cathode than when the cobalt anode is used with a cathode of a

material other than iron. It therefore follows that the use of a cobalt anode, and, to a greater degree, of a cobalt-iron couple, results in a gas generating device in which the decomposition of water may be accomplished with less electro-motive force or voltage than heretofore, and that the expenditure of electrical energy necessary to that end is reduced in such a device; the current flowing through the device and upon which the amount of water decomposed in a given time depends being greater in the case of a cobalt anode with its concomitant low overvoltage, than in the case of an anode which when in use requires a greater overvoltage to accomplish the liberation of oxygen at the surface thereof. A further advantage following the use of an electrode the surface only of which is cobalt, the cobalt being commonly deposited upon a supporting base by electro-plating processes as explained, is that an extremely thin layer or coating of cobalt will suffice, and the quantity of cobalt necessary to be used to provide an effective electrode is extremely small; whereas in prior plated electrodes it has been necessary to deposit a comparatively thick layer, and to employ a comparatively large amount of the metal which forms the active material thereof, in order to provide an effective electrode.

The treatment or process above mentioned to which one or both the electrodes are subjected preparatory to use in my improved electrolytic gas generator consists in placing a metallic electrode in a plating bath containing in solution a suitable salt or compound of the metal of which the electrode, or its surface, is made, and passing a current of electricity from the electrode through the bath, the electrode being treated thus forming an anode, during which treatment a portion of the metal of the electrode is removed from the surface thereof and passes into the bath in accordance with well known electrolytic phenomena. Such a treatment results in an electrode which, when used in an electrolytic gas generator, materially reduces the excess electro-motive force or voltage over and above that theoretically necessary to accomplish the decomposition of water always present in the actual operation of electrolytic gas generators; and, furthermore, results in an electrode which will be less liable to be injured by an excessive current or overload than is the case with electrodes which have not been subjected to such treatment.

It will be understood that my invention includes a cobalt electrode used in connection with a second electrode of any suitable material, either or both of said electrodes being used without having been first subjected to any special treatment, or used after having been prepared for use in accordance with my method or process of treatment; that my invention includes a cobalt electrode used in

connection with an iron electrode, either or both of said electrodes being used without having been first subjected to any special treatment, or used after having been first treated in accordance with my method or process of treatment; that my invention includes an electrode of any material which has been prepared for use in accordance with my method or process; and that my invention includes the method or process hereinbefore described for treating electrodes prior to using them. In each of the cases here referred to the general efficiency of the generator is increased. However, and as stated above, I have obtained the best results by using a cobalt anode in connection with an iron cathode, both having been first prepared for use in accordance with my improved method or process of treatment.

Having thus described and explained my invention, I claim and desire to secure by Letters Patent:—

1. In an electrolytic gas generator, a closed receptacle or casing formed from two similar dished casing members the free edges of which lie adjacent one another; two electrodes located within the casing; filling means for the casing; and means for conducting the gases produced from the interior of the casing.

2. In an electrolytic gas generator, a closed receptacle or casing made up of a plurality of parts or sections secured together; a partition located within the upper portion of the casing and between two adjacent sections thereof, whereby the interior of the casing is divided to thereby provide two gas chambers; two electrodes located within the casing; and means for conducting the gases produced from said gas chambers.

3. In an electrolytic gas generator, a closed receptacle or casing; a partition located within the upper portion of the casing whereby the interior thereof is divided to thereby provide two gas chambers; a diaphragm extending downward from said partition; two electrodes located within the casing; and means for conducting the gases produced from said gas chambers.

4. In an electrolytic gas generator, a closed receptacle or casing formed from two similar dished casing members the free edges of which lie adjacent one another; a partition located within the upper portion of the casing whereby the interior thereof is divided to thereby provide two gas chambers; two electrodes located within the casing; filling means for the casing; and means for conducting the gases produced from said gas chambers.

5. In an electrolytic gas generator, a closed receptacle or casing formed from two dished casing members the free edges of which lie adjacent one another; a partition located within the upper portion of the casing and

which partition extends between the edges of said casing members, whereby the upper portion of the interior of the casing is divided to thereby provide two gas chambers; two electrodes located one within each of the dished casing members aforesaid; filling means for the casing; and means for conducting the gases produced from the gas chambers.

6. In an electrolytic gas generator, a closed receptacle or casing formed from two dished casing members the free edges of which lie adjacent one another; a partition located within the upper portion of the casing and which partition extends between the edges of said casing members, whereby the upper portion of the interior of the casing is divided to thereby provide two gas chambers; a diaphragm extending downward from said partition and terminating adjacent the lower end of the casing; two electrodes located one within each of the dished casing members aforesaid; filling means for the casing; and means for conducting the gases produced from the gas chambers.

7. In an electrolytic gas generator, a closed receptacle or casing formed from two similar dished casing members the free edges of which are provided each with a flange, and which flanges lie adjacent one another; a partition located within the upper portion of the casing and which partition extends between said flanges, whereby the upper portion of the interior of the casing is divided to thereby provide two gas chambers; two electrodes located one within each of the dished casing members aforesaid; filling means for the casing; and means for conducting the gases produced from said gas chambers.

8. In an electrolytic gas generator, a closed receptacle or casing formed from two similar dished casing members the free edges of which lie adjacent one another; a partition located within the upper portion of the casing and extending between the free edges of said casing members, whereby two gas chambers are provided within and at the upper end of the casing; a diaphragm extending downward from said partition and terminating adjacent the lower end of the casing; two electrodes located one upon each side of said diaphragm; filling means for the casing; and means for conducting the gases produced from said gas chambers.

9. In an electrolytic gas generator, a closed receptacle or casing formed from two similar dished casing members the free edges of which are provided each with a flange, and which flanges lie adjacent one another; a frame located within said casing and which frame extends between said flanges; a porous diaphragm carried by said frame; two electrodes located within the casing and lying one upon each side of said diaphragm; fill-

ing means for the casing; and two conduits leading one from the upper portion of each of said casing members.

10. In an electrolytic gas generator, a closed receptacle or casing formed from two similar dished casing members the free edges of which are provided each with a flange, and which flanges lie adjacent one another; a frame located within said casing and having an upper portion, and two depending side portions, and the side and top edges of which frame lie between said flanges, the upper portion of said frame forming a partition whereby the upper portion of the interior of said casing is divided to thereby provide two gas chambers; two electrodes located within the casing and lying one upon each side of said frame; a porous diaphragm the upper end of which is secured to the upper portion of said frame, and the side edges of which are secured to the depending side portions of said frame; filling means for the casing; and means for conducting the gases produced from said gas chambers.

11. In an electrolytic gas generator, a closed receptacle or casing made up of a plurality of parts or sections secured together, the end sections of said casing comprising dished casing members; electrodes located within the casing; filling means for the casing; and means for conducting gases produced from the interior of the casing.

12. In an electrolytic gas generator, a closed receptacle or casing having an internal chamber or compartment; an electrode located within said compartment; a filling device comprising a supply conduit open to the atmosphere at its upper end and leading into said compartment, and having a liquid seal adjacent its discharge end; and a gas outlet conduit leading from said compartment; said supply conduit being located above and the lower end thereof terminating adjacent the level of the liquid contained in said compartment when the generator is in operation.

13. In an electrolytic gas generator, a closed receptacle or casing having an internal chamber or compartment; an electrode located within said compartment; a filling device comprising a supply conduit open to the atmosphere at its upper end and extending through the top wall of the casing and into said compartment, and the lower end of which conduit terminates adjacent the level of the liquid contained in said compartment when the generator is in operation and is provided with a return bend and an upwardly extending portion, whereby a liquid seal is provided at the lower end of said conduit; and a gas outlet conduit leading from said compartment.

14. In an electrolytic gas generator, a closed receptacle or casing having a plu-

ality of internal chambers or compartments; an electrode located in each of said compartments; a plurality of supply conduits, one for each of said compartments, the upper ends of said conduits being open to the atmosphere and the lower end of each being provided with a liquid seal; means for supplying liquid to said conduits; and a plurality of gas outlet conduits, one leading from each of said compartments; said supply conduits being located above and the lower ends thereof terminating adjacent the level of the liquid contained in said compartments when the generator is in operation.

suitable receptacle or casing adapted to contain a liquid; two electrodes submerged in and whereby a current of electricity may be made to pass through the liquid, the active surface of one of said electrodes being formed of cobalt and the active surface of the other being formed of iron. 70

21. In an electrolytic gas generator, a suitable receptacle or casing adapted to contain a liquid; two electrodes submerged in and whereby a current of electricity may be made to pass through the liquid, the anode being cobalt and the cathode being iron. 75

22. An electrode for use in an electrolytic gas generator and which electrode comprises a metallic surface from which metal has been removed by electrolytic action. 80

23. In an electrolytic gas generator, a metallic electrode which has been subjected to electrolytic action while submerged in a suitable bath and made to form an anode, whereby a portion of the metal of the electrode has been removed by electrolytic action. 85

24. The process of producing an electrode for use in an electrolytic gas generator which consists in submerging a metallic electrode in a solution containing a suitable salt of the metal of which the electrode is formed, and passing a current of electricity from the electrode and through the solution, the electrode thus forming an anode, whereby a portion of the metal at the surface of the electrode is removed therefrom by electrolytic action. 90 95 100

25. In an electrolytic gas generator, a suitable receptacle or casing adapted to contain a liquid; a plurality of metallic electrodes submerged in said liquid and whereby a current of electricity may be made to pass therethrough, said electrodes having been subjected to electrolytic action while submerged in a suitable bath and made to form anodes, whereby a portion of the metal of the electrodes has been removed by electrolytic action. 105 110

26. In an electrolytic gas generator, a closed receptacle or casing formed from two similar casing members the free edges of which lie adjacent one another; a partition located within the upper portion of the casing whereby the interior thereof is divided to thereby provide two gas chambers; a diaphragm extending downward from said partition; two electrodes located within the casing; and means for conducting the gases produced from said gas chambers. 115 120

27. In an electrolytic gas generator, a closed receptacle or casing formed from two similar casing members the free edges of which are provided each with a flange, and which flanges lie adjacent one another; a partition located within the upper portion of the casing whereby the interior thereof is divided to thereby provide two gas cham- 125 130

15 15. In an electrolytic gas generator, a closed receptacle or casing; an electrode located within the casing; a support adjacent the lower end of the casing whereby the lower end of said electrode is held in a fixed position; an inflexible conductor connected with the upper end of said electrode and extending through an opening provided in a wall of the casing; and a gas outlet conduit leading from the casing. 20 25

16. In an electrolytic gas generator, a closed receptacle or casing; two electrodes located within said casing and having each an inflexible bar connected with its upper end and extending through openings provided in the top wall of the casing; insulating members whereby said bars are prevented from coming into contact with said top wall; insulating supports whereby the lower ends of said electrodes are supported from the bottom wall of the casing; and means for conducting the gases produced from the interior of the casing. 30 35

17. In an electrolytic gas generator, a closed receptacle or casing; two electrodes located within said casing and having each an inflexible conductor connected with its upper end and extending through openings provided in the top wall of the casing; insulating members whereby said conductors are prevented from engaging said top wall; insulating supports whereby the lower ends of said electrodes are supported from the bottom wall of the casing; a diaphragm located between said electrodes; a partition located above said diaphragm and whereby the upper part of the interior of the casing is divided to thereby provide two gas chambers; and gas outlet conduits communicating one with each of said gas chambers. 40 45 50 55

18. An electrode for use in an electrolytic gas generating device, the surface of which electrode is cobalt.

19. In an electrolytic gas generator, a suitable receptacle or casing adapted to contain a liquid; and electrodes whereby a current of electricity is made to pass through the liquid, one of said electrodes being cobalt. 60

20. In an electrolytic gas generator, a 65

bers; two electrodes located within the casing; filling means for the casing; and means for conducting the gases produced from said gas chambers.

5 28. In an electrolytic gas generator, a closed receptacle or casing made up of a plurality of parts or sections secured together; means for dividing the interior of said casing into a plurality of electrode  
10 compartments; a plurality of electrodes

located one within each of said compartments; a plurality of filling devices, one for each of said compartments; and means for conducting the gases produced from said compartments.

In testimony whereof I have signed my name to this specification this 18th day of December, 1915.

ISAAC H. LEVIN.