(No Model.) 2 Sheets—Sheet 1.

L. A. W. DESRUELLES.

GALVANIC BATTERY.

No. 359,063. Patented Mar. 8, 1887.

FIG. 1.

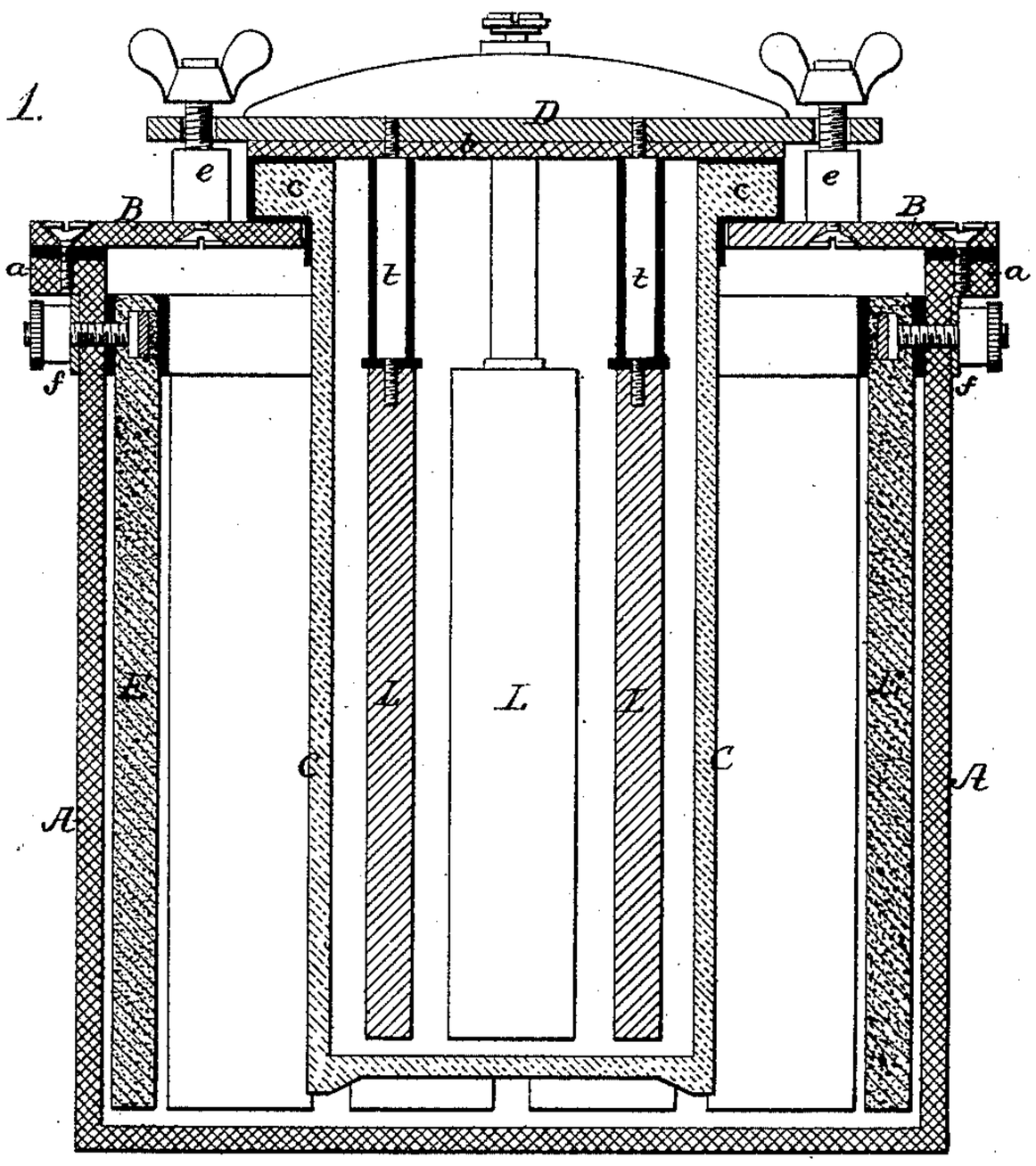
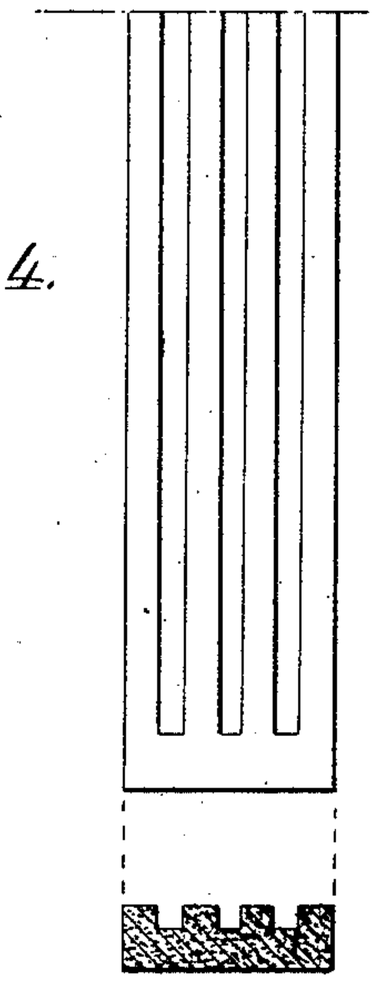


FIG. 4.



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Inventor:
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Howson and Sons

(No Model.) 2 Sheets—Sheet 2.

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GALVANIC BATTERY.

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FIG. 2

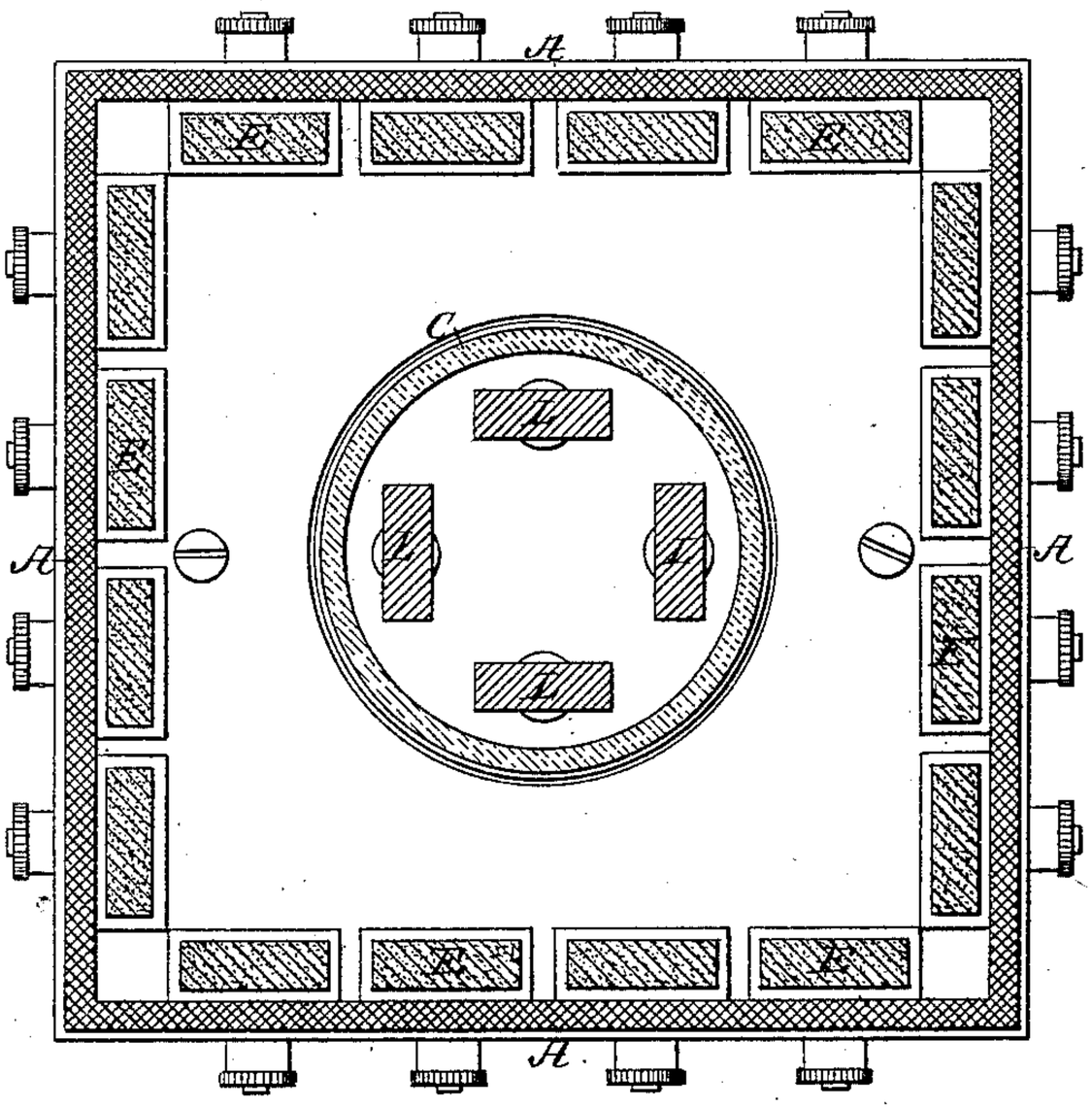
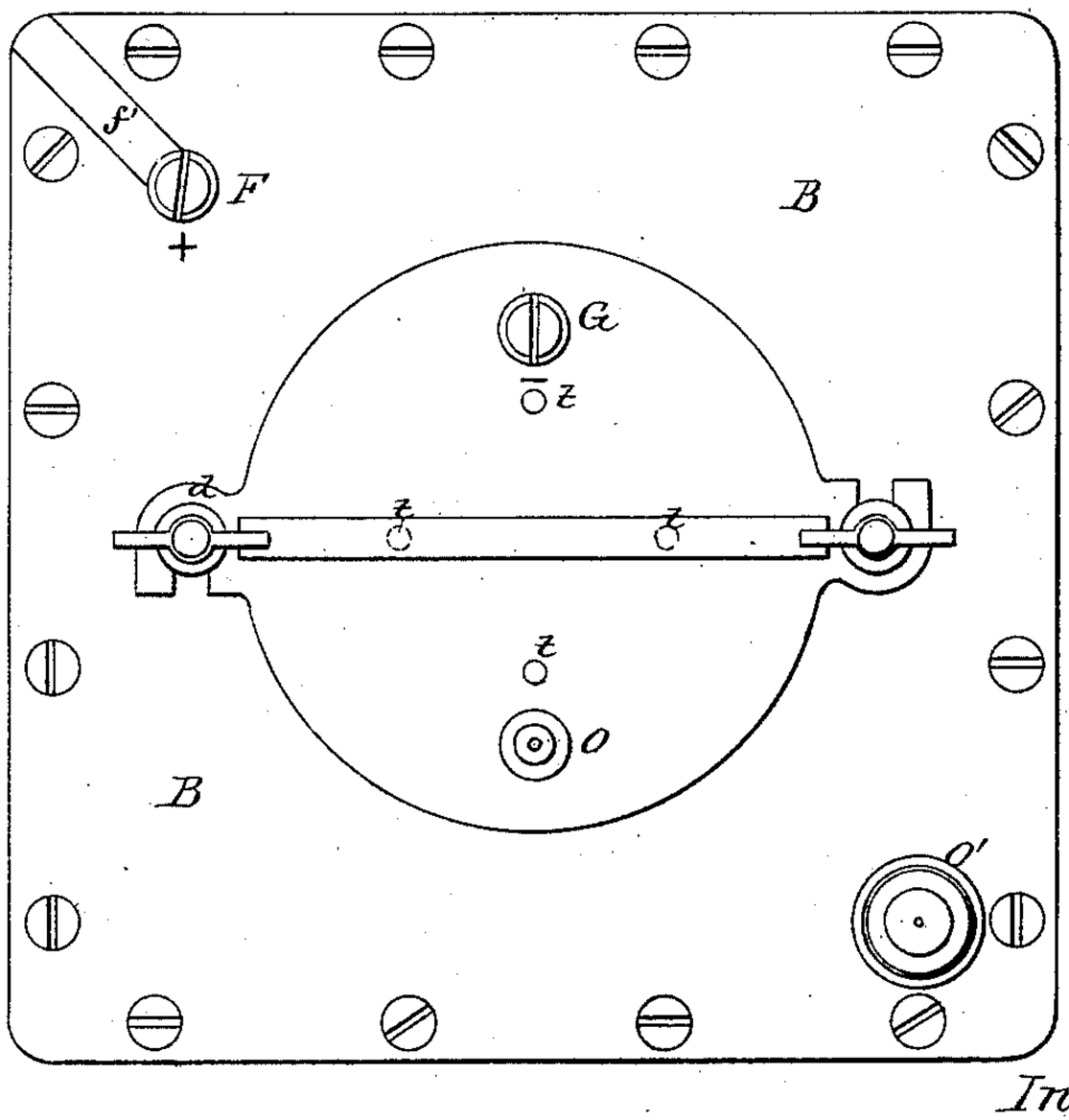


FIG. 3



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UNITED STATES PATENT OFFICE.

LUCIEN ALFRED WILHELMINE DESRUELLES, OF PARIS, FRANCE.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 359,063, dated March 8, 1887.

Application filed April 23, 1886. Serial No. 199,958. (No model.) Patented in France July 22, 1885, No. 170,254; in Belgium July 23, 1885, No. 69,691; in England August 7, 1885, No. 9,415; in Germany August 9, 1885, No. 35,969; in Italy September 5, 1885, No. 18,781, and in Austria-Hungary October 2, 1885, No. 29,105.

To all whom it may concern:

Be it known that I, LUCIEN ALFRED WILHELMINE DESRUELLES, a citizen of the Republic of France, residing in Paris, France, have invented certain Improvements in Electric Batteries, (for which I have obtained a French patent, No. 170,254, dated July 22, 1885; British patent, No. 9,415, dated August 7, 1885; Austro-Hungarian patent, No. 29,105, dated October 2, 1885; Italian patent, No. 18,781, dated September 5, 1885; Belgian patent, No. 69,691, dated July 23, 1885, and German patent, No. 35,969, dated August 9, 1885,) of which the following is a specification.

My invention consists of certain improvements in electric batteries designed to yield a maximum amount of electric energy with a minimum weight, to secure a tight closure and to prevent the escape of liquid or liquids.

From an electric point of view my improved battery is a battery with two liquids, one being an exciting-liquid employed for dissolving the soluble electrode, the other a depolarizing-liquid, whose function it is to effect the absorption of the hydrogen set free during the process of electrolysis. The exciting-liquid which I employ is composed of one thousand grams of water, three hundred grams of sulphuric acid at 66°, macerated for eight days or a week with peroxide of manganese, eight grams of bisulphate, or sulphate of peroxide of mercury, one gram of colza oil, and two grams of glycerine. The depolarizing-liquid is composed of one thousand grams of water, with the addition of from one hundred grams to one thousand grams of bichromate of soda, according to the depolarizing power it is desired to obtain, and a quantity of sulphuric acid at 66° specific gravity, always equal to the quantity of bichromate of soda. This sulphuric acid is soaked or macerated with peroxide of manganese for about one month before it is used. To this mixture is added about one-quarter of its weight of nitric acid at about 40° specific gravity. In both the exciting-liquid and the depolarizing-liquid the reaction of the sulphuric acid on the peroxide of manganese produces sulphate of manganese.

The zinc employed as the soluble electrode is carefully covered before being introduced into the exciting-liquid prepared, as hereinbefore described, with a coating composed of one hundred grams of tallow, twenty-five grams of paraffine, and three hundred grams of mercury, ground or pounded together. Thus protected the zinc may be allowed to remain for a considerable period in the exciting-liquid without being appreciably attacked when the circuit is open. When the circuit is closed, the coating which protects the zinc, possessing very small electrical resistance, the action of the battery is not impeded. The negative electrode of the battery is constituted by plates of carbon prepared by soaking them in water containing a small quantity of sugar. When dried, these plates of carbon are afterward passed over a smoky flame, so that the sugar they contain melts and is converted into burnt sugar or caramel. This renders adhesive the particles of carbon which are deposited upon the plates when they are passed over the flame. Such preparation greatly increases the depolarizing capacity of the carbon electrodes. The carbon plates being, moreover, provided with a certain number of grooves, as hereinafter explained, their superficial area, and consequently their depolarizing capacity, is further increased to a considerable extent.

Figure 1 of the accompanying drawings represents a vertical section of a portable electric-battery cell or element constructed according to this invention. Fig. 2 represents an inverted sectional plan of the battery. Fig. 3 shows the battery in plan, and Fig. 4 illustrates in side view and section the preferred form of carbon element used in my battery.

This portable battery is composed of an external vessel, A, in the form of a cube, and made of ebonite, glass, porcelain, or any other material capable of resisting the action of the acids. This vessel is provided with a flange, *a*, extending all round its upper edge, and to which is applied and secured by bolts or screws a cover, B, of ebonite hermetically closing the external vessel by means of a caoutchouc or rubber packing-ring interposed between the cover and the flange on the vessel. This cover presents a circular opening in its center, ad-

mitting of the introduction of a porous vessel, C, of cylindrical shape, the upper edge of which is provided with a flange, *c*, the under surface of this flange resting upon the cover. The flange on the porous vessel is entirely covered by a rubber ring or band, which laps round it in such a manner as to pack or fill the joint between the flange and the cover and also between the upper surface of the flange and an ebonite disk, *b*, which closes the porous vessel. Over this ebonite disk is placed a metal disk, D, for the purpose of imparting greater rigidity to the ebonite disk, being itself provided in the middle with a strengthening rib or web. The two extremities of this rib or web are in the form of lugs *d*, presenting slots in opposite directions, so as to form a species of bayonet-joint by engaging with two pillars, *e*, provided with tightening-nuts. These nuts, when tightened, press the ebonite disk *b* onto the rubber packing between it and the flange *c* on the porous vessel, and at the same time press the flange *c* onto the packing interposed between the latter and the ebonite cover B, thus accurately closing both the porous vessel C and the ebonite vessel A.

The ebonite disk which closes the porous vessel is attached to the metal disk, covering it by four copper rods, *t*, screwed at both ends. These four rods descend a short distance into the porous vessel beneath the ebonite disk and support the four zinc plates L, which are screwed to the said rods. Each copper rod is entirely protected by an india-rubber tube at the part where it enters the porous vessel. The lower end of this tube comes in contact with the upper edge of the zinc plate at the part where it is screwed to the rod, and effectually protects the latter from contact with the acid liquid contained in the porous vessel.

Sixteen carbon plates, E, of prismatic form are ranged side by side in the interior of the external ebonite vessel and against the sides of the latter. These plates are grooved, as indicated in Fig. 4, and are attached to the ebonite vessel, as indicated in Fig. 1, by bolts passing through the sides of the vessel, and provided with heads which are embedded in the plates. The height of the head being less than the depth of the recess provided for their reception in the carbon plates, a space is formed above the heads, which is partially filled with lead poured in over the head of the bolt and covered with paraffine, so that the heads of the bolts being sealed to the carbon by the lead, a perfect contact is formed between the bolts and the carbon. The paraffine prevents the corrosive liquid contained in the ebonite vessel from attacking the lead and the head of the bolt, so that the connection between the latter and the carbon is rendered indestructible. The shank of each bolt supporting the carbon plates projects on the outside of the ebonite vessel, and is provided with a screw-thread for the reception of a nut, which draws the bolt tight by being screwed up against a copper hoop surrounding the vessel and serving to connect all the bolts. By these means all the carbons are joined in quantity. A caoutchouc washer is placed over each bolt between the carbon plate and the side of the vessel for the purpose of preventing leakage of the liquid from taking place at this point, and also protecting the shanks of the bolts. This arrangement also has the advantage of imparting a certain degree of elasticity to the points of suspension of the carbon plates, and renders the latter less liable to break under sudden movements.

The copper hoop *f*, connecting all the bolts, is connected to a strip, *f'*, of the same metal, which is bent over the cover of the cell, Fig. 3, and is fixed thereto by a terminal or binding screw, F.

Upon the metal disk D, to which are screwed the four rods *t* which support the zinc plates in the porous vessel, there is provided at one side of the metal rib or web a terminal or binding screw, G, which forms the negative pole of the cell. On the other side of the rib or web a hole, O, is made in the metal disk and in the ebonite disk, and this hole is closed by a stopper provided with a very fine perforation, serving for the escape of the gases generated in the porous vessel. A similar hole, O', is formed near one corner of the cover B, closing the ebonite vessel A. This hole is provided with a stopper likewise perforated with a very fine orifice, through which the gases produced in the external vessel escape.

By means of this combination of arrangements the operations of charging and discharging the battery may evidently be performed with great facility. After introducing into the external vessel a suitable quantity of the depolarizing-liquid the porous vessel is introduced through the central opening, having been previously filled with the exciting-liquid. The zinc plates are then inserted into the porous vessel, and when the cover to which they are attached rests upon the flange of the latter the cover is turned so as to cause the lugs to engage with the columns provided with the tightening-nuts, and when these nuts are tightened, the external vessel and the porous vessel being perfectly closed, the cell may be shaken or transported from place to place without risk of spilling the liquids.

I do not wish to claim in this application the protection of zinc electrodes by the mixture of mercury and fat, as that forms the subject of a patent granted to me October 5, 1886, No. 350,297.

I claim as my invention—

1. The herein-described exciting-liquid for an electric battery, said liquid consisting of sulphate of manganese (from the reaction of sulphuric acid on peroxide of manganese) in combination with bisulphate of mercury and water.

2. The herein-described exciting-liquid for an electric battery, said liquid consisting of sulphate of manganese (from the reaction of

sulphuric acid on peroxide of manganese) in combination with bisulphate of mercury, oil, glycerine, and water.

3. The combination of an exciting-liquid of sulphate of manganese, bisulphate of mercury and water, with a depolarizing-liquid consisting of sulphate of manganese (from the reaction of sulphuric acid on peroxide of manganese) in connection with an alkaline bichromate, nitric acid, and water.

4. The combination of the outer cell and its closing-cover having a central opening, with the inner porous cell passing through said opening and having a flange resting on said cover and provided with a gasket, a cover for the porous cell, and devices for gripping the flange of the porous cell between the covers, all substantially as set forth.

5. The combination of the cell of a battery, and carbons E, having headed bolts embedded with lead in the carbon and having their screw-shanks passing through the wall of the cell, and provided on the outside with nuts, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LUCIEN ALFRED WILHELMINE DESRUELLES.

Witnesses:
LÉON FRANCKEN,
ROBT. M. HOOPER.