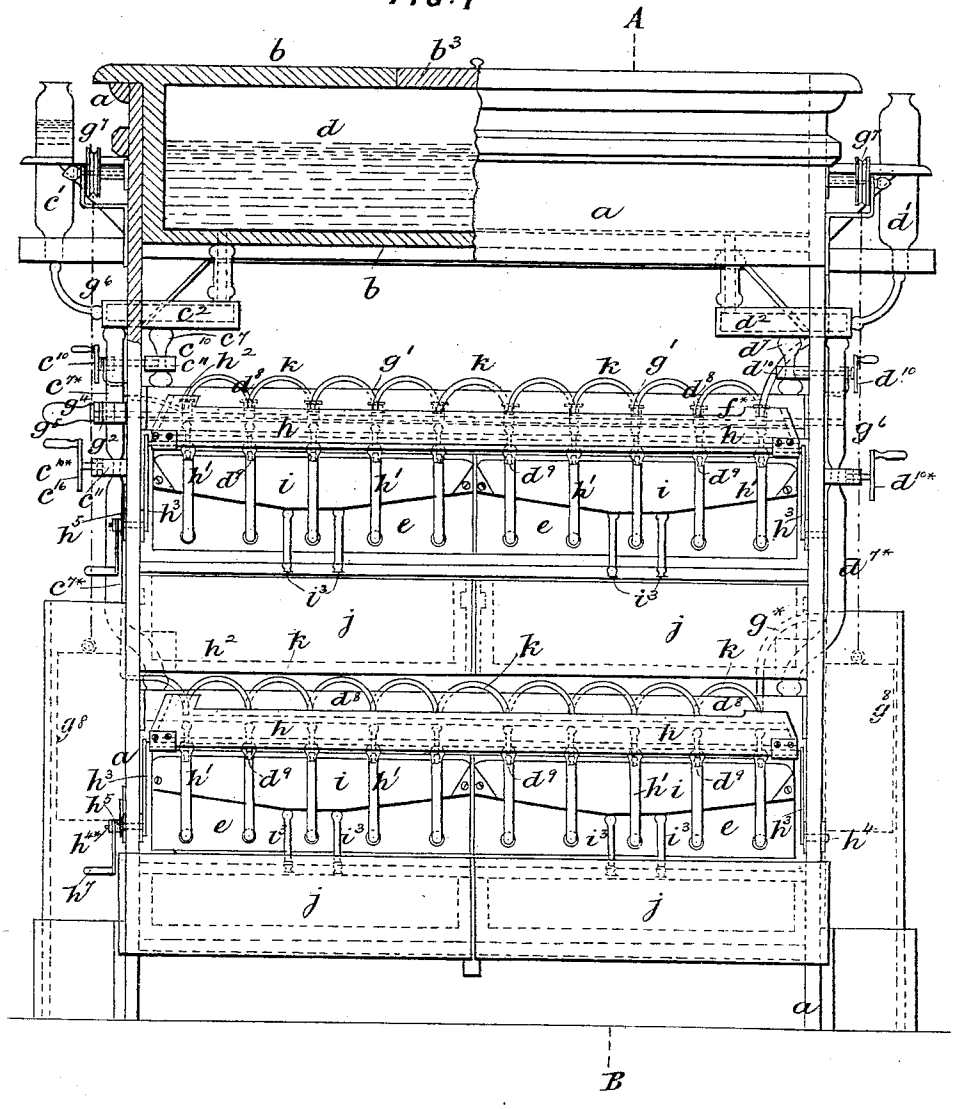
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GALVANIC BATTERY.

No. 396,329. Patented Jan. 15, 1889.

FIG: 1



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FIG: 2.

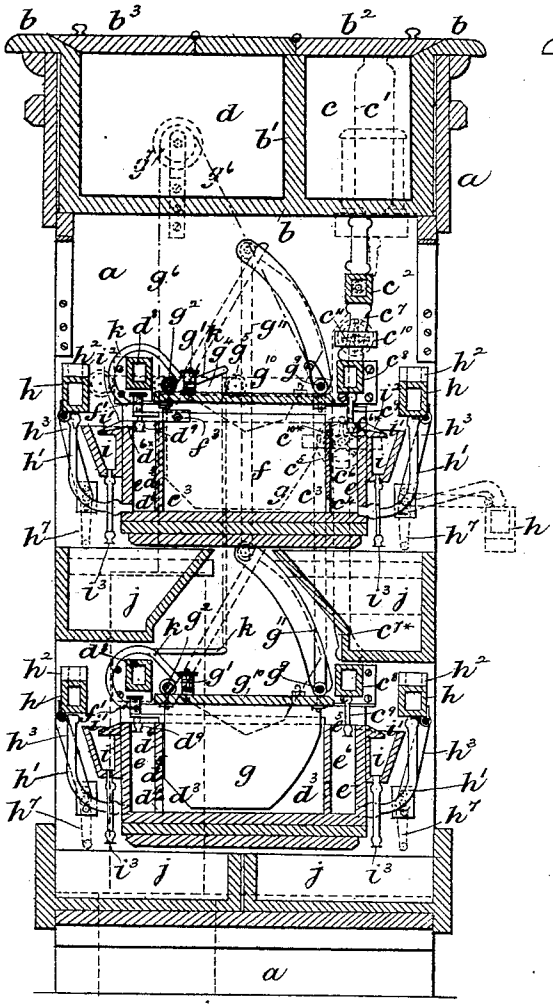
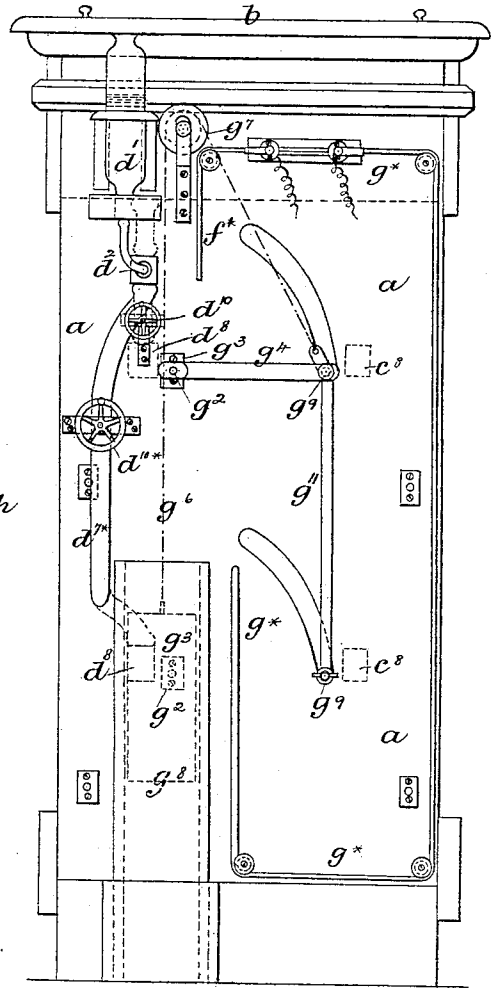


FIG: 3



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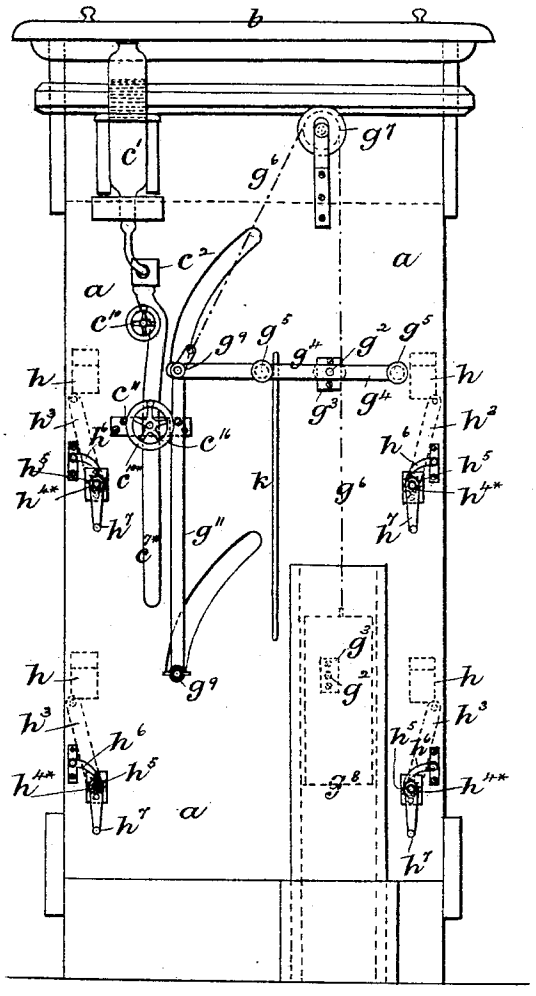
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FIG. 4.



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FIG: 5

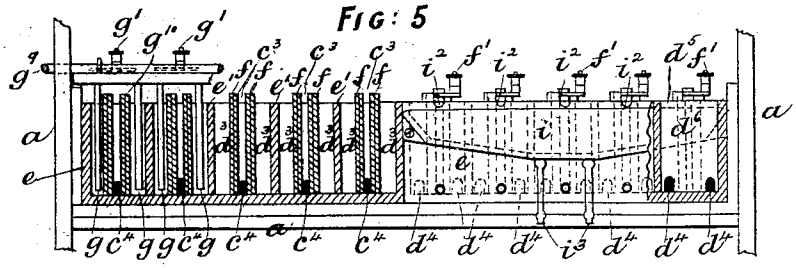


FIG: 6

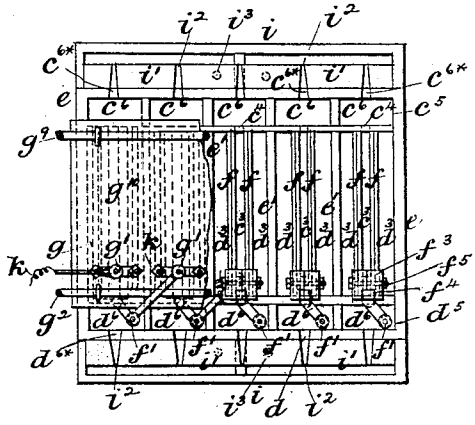
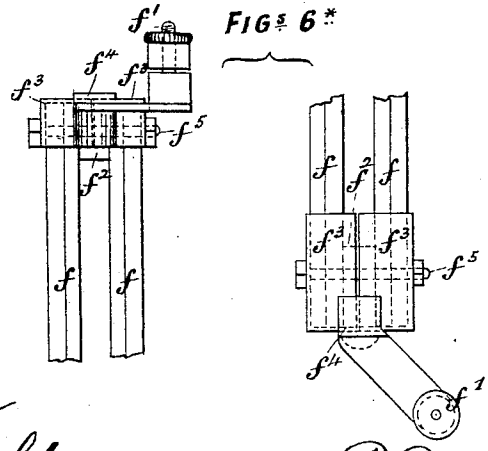


FIG: 6*



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FIG: 7.

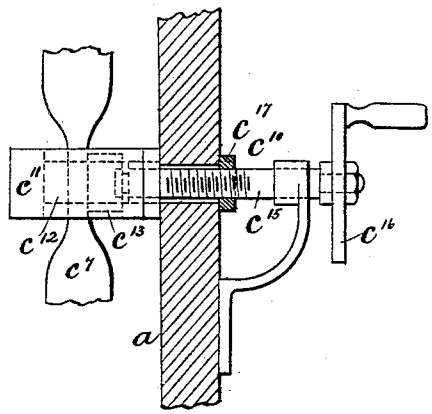


FIG: 9.

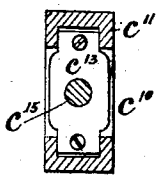


FIG: 8

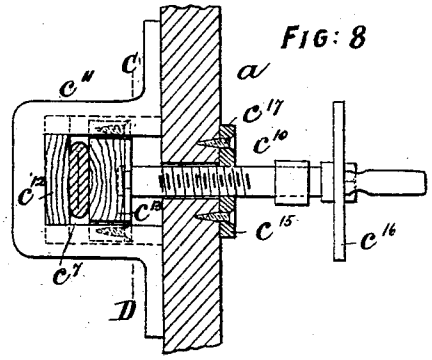
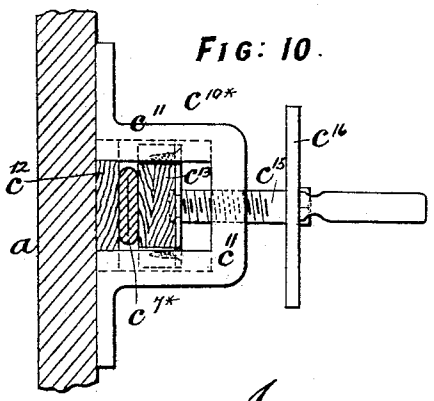


FIG: 10.



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UNITED STATES PATENT OFFICE.

PAUL R. DE F. D'HUMY, OF CLAPHAM RISE, COUNTY OF SURREY, ENGLAND.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 396,329, dated January 15, 1889.

Application filed August 15, 1888. Serial No. 282,789. (No model.)

To all whom it may concern:

Be it known that I, PAUL RAOUL DE FAUCHEUX D'HUMY, a citizen of the Republic of France, residing at 2 Carlton Mansions, Clapham Rise, in the county of Surrey, England, electrical engineer, have invented certain new and useful Improvements in Galvanic Batteries; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is to produce a compact and convenient form of battery, chiefly for lighting purposes, consisting of many cells, which are capable of being readily filled with the exciting-liquid and emptied, and into and from which the metal electrodes can be readily introduced and withdrawn, as required, in order to put the battery into or out of action.

And in order that my said invention may be clearly understood and readily carried into effect, I will proceed, aided by the accompanying drawings, fully to describe the same.

In the drawings, Figure 1 is a side elevation, partly in section, of a galvanic battery constructed according to my invention. Fig. 2 is a transverse section thereof, taken on the line A B of Fig. 1. Fig. 3 is an end elevation thereof. Fig. 4 is an opposite end elevation thereof. Fig. 5 is a part elevation and part vertical section of one range or group of cells. Fig. 6 is a plan of part thereof. Fig. 6* represents detail views of the contact plates or clamps of the carbon electrodes to an enlarged scale. Fig. 7 is a side view of one form of screw-compressor drawn to an enlarged scale. Fig. 8 is a plan thereof, partly in section. Fig. 9 is a transverse section taken on the line C D of Fig. 8; and Fig. 10 is a plan, partly in section, illustrating another form of compressor.

In the various figures of the drawings like parts are indicated by similar letters of reference.

a represents the frame-work of the battery, and *b* represents a cistern which is supported at the upper part thereof. The cistern *b* is by a partition, *b'*, divided into two chambers or compartments, *c d*, one compartment, *c*, being intended to contain the depolarizing-liquid and the other compartment, *d*, water, acidulated water, or other suitable liquid, suitable hinged lids or covers, b^2 b^3, being employed to close and give access to the chambers or compartments *c* and *d*. Each of these chambers or compartments *c d* is respectively provided with a gage or level, *c' d'*, which gages *c' d'* are respectively connected with the supply-conduits c^2 d^2 in such a manner as to clearly indicate the height or level of the contents of the chambers *c d*. Beneath this cistern *b*, I, according to the plan shown in the drawings, arrange two groups of cells, *e e*, placed one above the other, each cell being formed by vertical wooden walls *e'*; or I might employ any other suitable number and arrangement of groups *e* of cells. Each of these cells is divided by two pairs of carbon plates, *f f*, into three compartments, (the two plates of each pair being placed in close juxtaposition,) the center compartment, c^3, constituting the porous cell and the outer ones, d^3, the cells to receive the metal electrodes *g*. The carbon plates *f f* form the negative electrodes and are fitted with terminals *f'*, and the metal or positive electrodes *g* are fitted with terminals *g'*. The carbon electrodes *f f* are held a given distance apart by means of carbon distance-pieces f^2, and they are connected at their upper parts by two angular plates, f^3 f^3, through which passes a bolt, f^5, the two contact-plates f^3 f^3 being connected by means of a plate, f^4, soldered thereto.

Each of the compartments c^3 d^3 is provided at the lower part of its end wall with an aperture, c^4 d^4, every compartment c^3 having its aperture at one end and every compartment d^3 having its aperture at the other end.

Along the entire length of the group *e* of cells, at one end thereof, is arranged a chamber or receiver, c^5, which is divided into a number of small compartments, c^6, into each of which the aperture c^4 in the end wall of the corresponding compartment, c^3, of the cell opens, and along the entire length of the group *e* of cells at the other end thereof is arranged a similar receiver, d^5, which is divided into a number of compartments, d^6, each communicating by an aperture, d^4, with a compartment, d^3, of the cell.

The depolarizing-liquid is conducted from the compartment *c* of the cistern *b*, through

the conduit c^2 and a flexible pipe, c^7, to a main conduit, c^8, running along the entire length of the upper group of cells at one end thereof, and a similar flexible pipe, c^{7*}, conducts the depolarizing-liquid from the conduit c^2 to the main conduit c^8 of the lower group of cells.

From the main conduit c^8 a number of short flexible or other tubes, pipes, or spouts, c^9, provided or not with taps or valves, are arranged one to overhang or to lead into each of the compartments c^6 of the chamber c^5 at the upper part thereof, and thus supply the depolarizing-liquid thereto, whence it flows by the apertures c^4 into the compartments c^3 of the cells.

The water, acidulated water, or other liquid is similarly conducted from the compartment d of the cistern b through the conduit d^2 and a flexible pipe, d^7, to a main conduit, d^8, running along the entire length of the upper group of cells at the other end thereof, and a flexible pipe, d^{7*}, conducts such liquid from the conduit d^2 to the main conduit d^8 of the lower group of cells. From this main conduit d^8 a number of short flexible or other tubes, pipes, or spouts, d^9, provided or not with taps or valves, as before stated, are arranged one to overhang or lead into each of the compartments d^6 of the chamber or receiver d^5 at the upper part thereof, and thus supply the water or other liquid thereto, whence it flows by the apertures d^4 into the compartments d^3 of the cells.

Screw-compressors c^{10} and c^{10*} are arranged to nip or compress the flexible pipes or tubes c^7 c^{7*}, and thus to regulate, cut off, or open the supply of depolarizing-liquid through the main conduit c^8 to the small compartments c^6 of the chamber or receiver c^5, and similar compressors, d^{10} d^{10*}, are employed to act upon the flexible pipes or tubes d^7 d^{7*}, supplying the water or other liquid to the small compartments d^6 of the chamber or receiver d^5.

Each of the small compartments c^6 d^6 of each chamber or receiver c^5 d^5 is connected at its lower part by a flexible tube, h', with a pipe or conduit, h, which is formed with a mouth or opening, h^2, on its upper side, and is carried by arms h^3, one at each end thereof, which are mounted upon short shafts or axes h^4 h^{4*}.

Upon the short shaft or axis h^{4*} is keyed a ratchet-wheel, h^5, into which a pawl, h^6, takes, in order to hold the pipe or conduit h in any desired position, and upon the same shaft or axis, h^{4*}, is also keyed a crank-handle, h^7.

When the battery is to be filled, the pipe or conduit h is by means of the crank-handle h^7 turned into its raised position, as shown by the full lines in Fig. 2, and there held by the pawl h^6, when it will be above the level of the liquid in the battery; but when the battery is required to be emptied the pipe or conduit h is turned down into the position shown by the dotted lines in Fig. 2, when it will be below the bottom of the cells, and the contents thereof and of the chambers or receivers c^5 d^5 will flow into the pipe or conduit h, and may thence be led away, as desired.

Along the entire series of the small compartments c^6 d^6 of each receiver c^5 d^5, at each end of the cells, is placed a trough, i, and each compartment c^6 d^6 is formed with a notch, c^{6*} d^{6*}, in the upper part of its outer wall, and a lip or ledge, i', provided with grooves or channels i^2, corresponding with the notches c^{6*} and d^{6*}, runs along the entire series of compartments to conduct any liquid which may overflow therefrom into the trough i.

Each trough i is provided at its bottom with flexible or other pipes i^3, which lead into a tray or receiver, j, beneath, such tray or receiver j being formed movable, in order that it may be carried away and emptied of its contents from time to time.

The metal electrodes g for each group or series of cells d^3 are all fixed upon one shaft or axis, g^2, mounted in bearings g^3, with capability of partially revolving or oscillating, and upon one end of the shaft or axis of the upper group is fixed a lever, g^4, provided with handles g^5, by which it may be operated, and upon the other end of the shaft g^2 is also fixed a lever, g^4; but this lever is not provided with handles. These levers g^4 are at one end thereof each connected by a cord or chain, g^6, passing over a pulley, g^7, with a counterbalance-weight, g^8, and a rod, g^9, fixed to the same ends of these levers g^4, passes along the entire series of electrodes g and is securely fixed to the cover g^{10}, to which they are bolted. The electrodes g of both the upper and lower groups are coupled by means of links or connecting-rods g^{11}, fitted at each end thereof upon the rods g^9 in such manner that they will all move in unison, so that by revolving the shaft or axis g^2 in one or the other direction by means of the hand-lever g^4 the whole of the metal electrodes g may be simultaneously immersed in or withdrawn from the liquid contained in their respective cells.

It will be readily understood that k are the short connections between the negative and positive poles, and that f^* and g^* are the conductors from the carbon and metal electrodes, respectively.

In the enlarged views, Figs. 7 to 10, of the screw-compressors Figs. 7, 8, and 9 represent the form of compressor hereinbefore referred to as c^{10} and d^{10}, and Fig. 10 shows the compressor hereinbefore referred to as c^{10*} and d^{10*}. In both of these forms the pipe or tube c^7 c^{7*} (or d^7 d^{7*}) is nipped or compressed between a fixed wooden block, c^{12}, held in a frame, c^{11}, and a wooden traveler, c^{13}, moving in guides or grooves c^{14}, formed in the frame c^{11}, a screw, c^{15}, provided with a hand-wheel, c^{16}, and screwing through a hole tapped to receive it in the end of the frame c^{11}, or in a separate plate or nut, c^{17}, giving the necessary compressing power. Both of these compressors are practically the same, but are arranged in a convenient form, the one, c^{10} or d^{10}, to oc-

cupy a position on the inside of the frame of the battery, and the other, c^{10*} or d^{10*}, to occupy a position on the outside of such frame.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, what I claim is—

1. In a galvanic battery, the frame a, cistern b, divided into two compartments, c d, provided with gages or levels c' d', a series of cells, c^3 d^3, formed with openings c^4 d^4, leading into compartments c^6 d^6 of a receiver, c^5 d^5, having overflow-notches c^{6*} d^{6*}, corresponding with grooves or channels i^2 of a lip or ledge, i', discharging into a trough, i, furnished with conducting-pipes i^3, leading into removable trays j, the means for filling the cells, consisting of conduits c^2 d^2, c^7 d^7, c^{7*} d^{7*}, and c^8 d^8, compressors c^{10} c^{10*} d^{10} d^{10*}, for cutting off or admitting the supply of liquid to the cells, the means for emptying the cells, consisting of pipes h', leading from the cells to a conduit, h, carried by an arm, h^3, and capable of being raised and lowered by means of a crank-handle, h^7, and retained in its raised position by means of a pawl, h^6, and ratchet-wheel h^5, or their equivalent, the means for counterbalancing and raising and lowering the metal electrodes g, consisting of shaft g^2, upon which the metal electrodes g are fixed, levers g^4, fixed upon shaft g^2, rod g^9, fixed to covers g^{10}, to which the electrodes g are bolted, connecting-link g^{11}, for coupling the two series of metal electrodes of two groups of cells so that they shall move in unison, and counterbalance-weights g^8, connected by cords or chains g^6 to the levers g^4, all arranged and operating in manner substantially as hereinbefore shown and described, as and for the purpose stated.

2. In a galvanic battery, the combination, with a suitable frame or support, of a cistern divided into two compartments, a series of cells beneath the cistern comprising two elements, each with separate compartments, receivers arranged on opposite sides of the cells and having compartments corresponding and communicating with the compartments in the cells, communication between the compartments of the cistern and the respective receivers, and receivers mounted without the cells and connected to the bottoms thereof by means of flexible tubes, said outer receivers being mounted on hinged arms, whereby they may be lowered or raised to allow the liquid to flow into or from the same, substantially in the manner and for the purpose specified.

3. In a galvanic battery, the combination, with a cistern, a series of cells located beneath the cistern, communication between the cistern and the cells, and a reservoir or trough, h, mounted on arms h^3, and connected with the cells by means of a flexible tube, h', said arms h^3 being mounted on shafts or axes h^4 h^{4*}, one of said axes having a pawl and ratchet and a crank-handle for controlling the arms, substantially in the manner specified.

4. In a galvanic battery, the combination, with two or more series of cells, and electrodes fitting said cells and pivoted at one side to the cells, of rods to which the electrodes are connected at their other sides, pivoted arms carrying one of said rods, a lifting cord and weight connected to said arms, and connections between the rods for the different series of cells, whereby they move in unison, substantially as herein set forth.

5. In a galvanic battery, substantially as described, the combination, with the cell or cells, of pivoted electrodes g, pivoted guide-arms g^4, connection between the guide-arms and the electrodes, and a lifting weight and cord, g^8 g^6, for raising said electrodes out of the cells, as herein explained.

6. In a galvanic battery, the combination, with the cells e, of the electrodes f, fitting said cells, substantially as set forth, and forming the compartments d^3 between the sides of the cell e and the electrodes f, and the compartments c^3 between the electrodes f, the former for receiving the other electrode and the latter for forming the porous cup for the depolarizing-liquid, substantially in the manner explained.

7. The combination, with the cell or cells of a galvanic battery, of an emptying and filling device consisting of troughs h, mounted on arms h^3, having tubes h' communicating between the trough and each compartment of the cells, and means, substantially as described, for controlling the elevation of said trough, whereby it may be raised to fill and lowered to empty the compartments, substantially as set forth.

8. The combination, with the cells of a galvanic battery comprising each two compartments, of a pair of troughs mounted on pivoted arms on each side of the cells and having communication, respectively, with the different compartments of the cells, and suitable controlling mechanism for raising and lowering the troughs, whereby the compartments may be emptied and filled at will.

9. The combination, with a galvanic battery having a series of cells, of troughs fixed at the sides of the cells and having communication with the respective compartments of the cells, and swinging troughs, substantially as described, communicating with the fixed troughs and having means for fixing them in any desired elevation, whereby the amount of liquid in the cells may be regulated at will, in the manner explained.

10. The combination, with cells e, of the troughs h, having communication with the cells, and elevating-arms h^3, substantially as and for the purposes herein set forth.

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