(No Model.)

2 Sheets—Sheet 1.

C. D. P. GIBSON.

STORAGE BATTERY.

No. 382,968. Patented May 15, 1888.

Fig. 1.

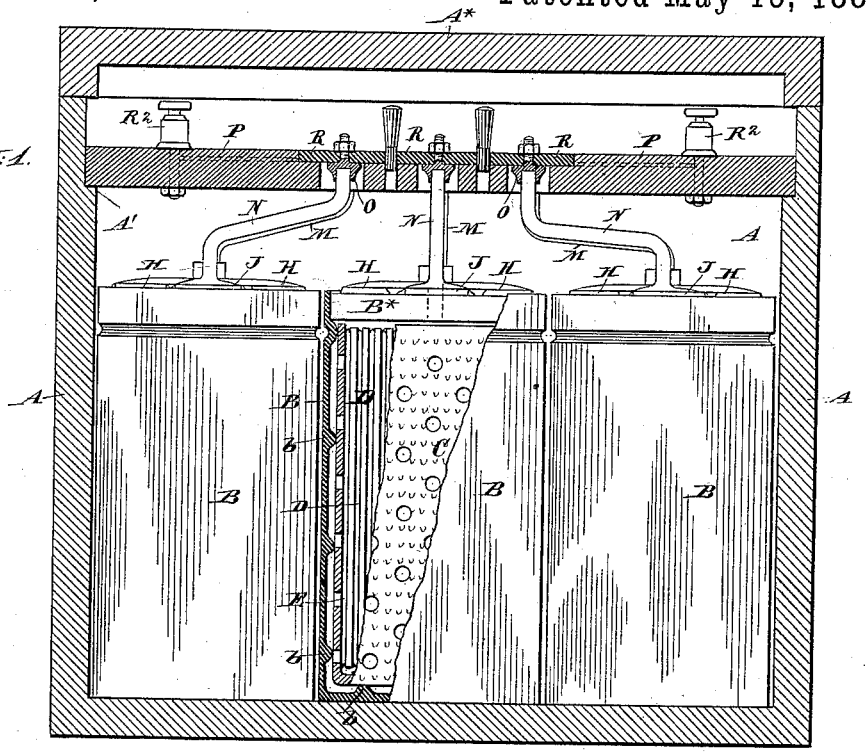
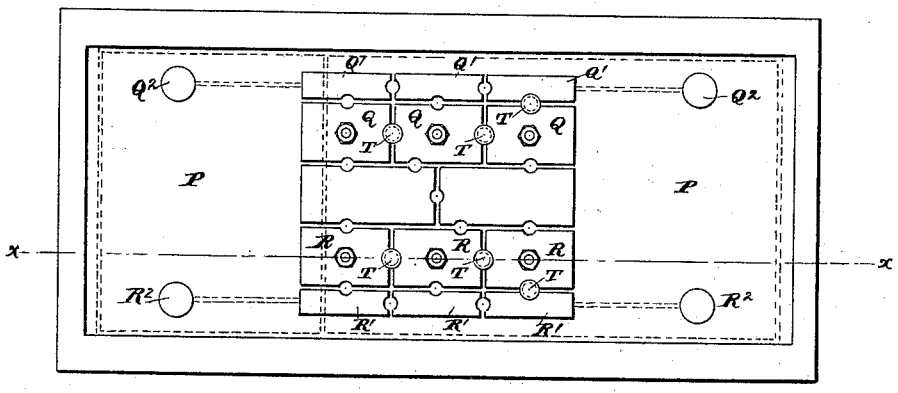


Fig. 2.



Witnesses:
Charles P. Searle.
H. A. Johnstone.

Inventor:
Charles D. P. Gibson.
by his attorney
Thomas Drew Stetson.

(No Model.)

2 Sheets—Sheet 2.

C. D. P. GIBSON.

STORAGE BATTERY.

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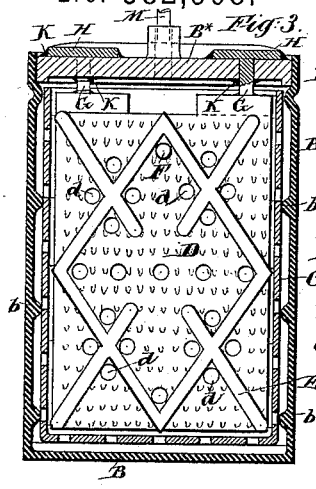

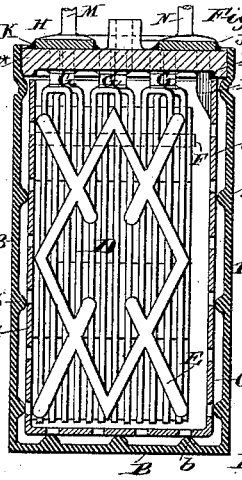

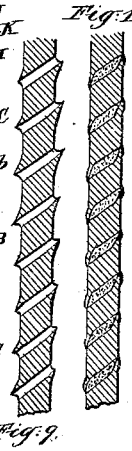

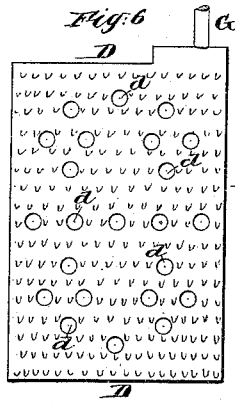

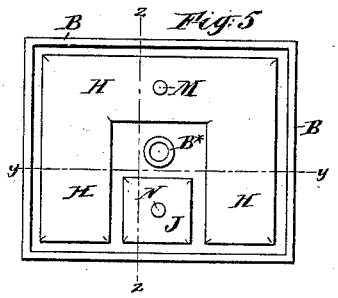

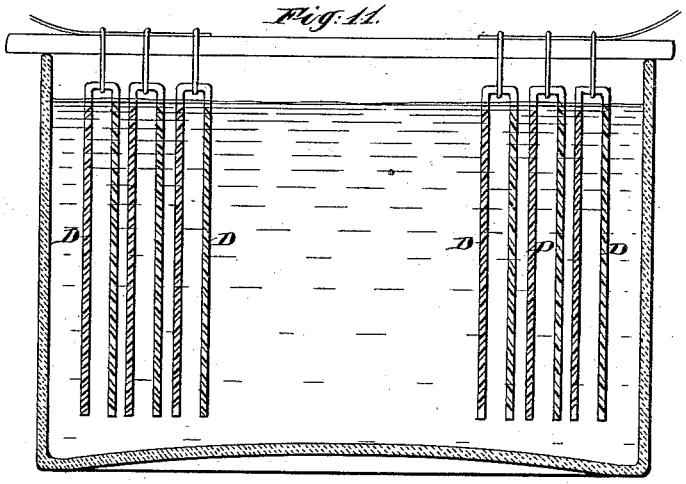

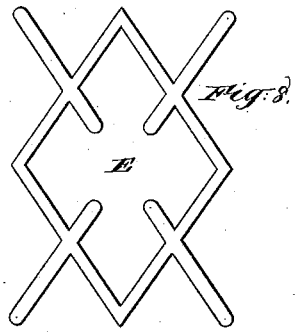

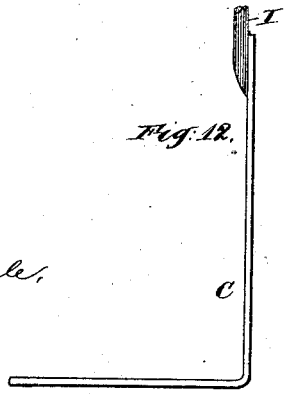

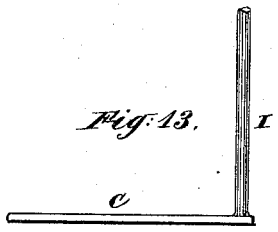

Witnesses:
Charles P. Searle,
H. A. Johnstone.

Inventor:
Charles D. P. Gibson,
by his attorney
Thomas Drew Stetson.

UNITED STATES PATENT OFFICE.

CHARLES D. P. GIBSON, OF NEW YORK, N. Y.

STORAGE-BATTERY.

SPECIFICATION forming part of Letters Patent No. 382,968, dated May 15, 1888.

Application filed March 31, 1887. Serial No. 233,111. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. P. GIBSON, of the city and county of New York, in the State of New York, have invented a certain new and useful Improvement Relating to Storage-Batteries, of which the following is a specification.

I have devised improvements whereby the battery is made compact and its parts conveniently exchangeable. I provide for complete electrical connections from the top of the plates without any possibility of the acid being drawn up, so as to render the apparatus unsightly.

A feature to which I attach special importance lies in my manner of filling the cavities in my plates by immersion in a solution and exposure to a current, so as to fill the cells by disintegration of the plates or by deposits from the solution, or partly by each, and the subsequent exposure to the sun and air, to crystallize the active material and absorb oxygen. I prefer to use plates of lead having cavities closed or nearly closed after being filled. By my present method of filling the cavities I attain the result very evenly and perfectly.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a vertical section on the line *x x* in Fig. 2, certain portions shown in the side elevation to save labor. Fig. 2 is a plan view with the cover removed. Figs. 3, 4, and 5 represent one of the hard-rubber or other non-conducting vessels and its contents detached. Fig. 3 is a vertical section on the line *y y* in Fig. 5. Fig. 4 is a vertical section on the line *z z* in Fig. 5. Fig. 5 is a top view of one of the cells complete. Fig. 6 is a face view of a pair of the oxygen-plates detached. Fig. 7 is a vertical section of the same. Fig. 8 is a side view of one of my insulating-frames detached. Fig. 9 is a section of a portion of one of the oxygen-plates before filling. Fig. 10 is a corresponding section after filling. Fig. 11 shows the method of filling. Figs. 12 and 13 are side elevations showing modified forms of the hydrogen-plates.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

A is a casing, preferably of rose-wood or other choice wood. A′ A′ are shoulders on the interior thereof adapted to support a switch-board. The case is provided with a hinged cover, A*.

B B, &c., are rectangular vessels of hard rubber. B* is a cover of the same material, which performs important functions.

C C are perforated leaden vessels fitted within the tight non-conducting vessels B. The interior of B is provided with a series of ridges or spurs, *b*, which serve to maintain a space between B and C, in which the exciting-solution may freely circulate.

D D are the oxygen-plates of the storage-battery; but other good plates may serve. They are arranged in pairs, folded, cut, and applied together, as shown in Fig. 4. A sufficient space is maintained between the interior of the perforated vessel C and the several plates and also between the several plates themselves by a series of open-work frames, E, of hard rubber. These frames are formed, as shown, of obliquely-arranged members, all the parts of one frame being molded or otherwise formed together in one piece. One face or both faces of each frame is rounded in cross-section. The form and inclination of the parts cause the easy disengagement of any bubbles of gas which may strike these frames in rising. The pockets or re-entering angles which lie below each crossing point are liable to accumulate gas. I make holes *d* in the plates D, arranged adjacent to the several pockets, so that the gas can easily traverse laterally through the hole, and its disengagement be thus facilitated. There may be more of the holes *d*, variously located; but I attach special importance to the holes arranged to coincide with these pockets.

F is a horizontal pin of hard rubber, which being thrust through the uppermost holes, *d*, tends to maintain all the plates D in their proper relative positions.

To produce my oxygen-plates, I cast or otherwise form the plates of any required height and width, and from one-eighth to one-quarter of an inch thick, with cavities extending obliquely through, and with an extension of the metal at each face. These plates, which may be of ordinary lead, are preferably made in pairs and joined at the top by making a plate twice

the proper depth, partially cutting across and folding, as indicated in Figs. 6 and 7.

The charging of the cavities with lead in the proper spongy condition, instead of being effected mechanically, with much labor and obviously with some degree of irregularity, is by my present invention effected by the current while the plates are immersed in a proper liquid. The plates provided with the cavities are suspended in the liquid by a wire or other proper connection to a cross-bar and electrical connection. The suspending-wire for each pair of plates serves both mechanically to support and electrically to convey a current. A current of proper strength is sent through the series, and the cavities are evenly filled with peroxide in a few hours. The solution may be one part of sulphuric acid to ten parts of water; but this and all the other proportions should under some circumstances be varied according to the judgment of the operator. After the cavities in the plates have been thus filled the plates are exposed to sunshine in the open air until the filling is thoroughly oxidized and partly or entirely crystallized. A section of a plate ready to be charged is shown in Fig. 9 of the present drawings.

The vessel C serves as the hydrogen-plate. It is provided throughout with pockets or cavities, the same as the plates D, and they are similarly filled by electrical disintegration or deposition, and similarly closed or nearly closed on each face, as shown in Fig. 10.

To the folds at the upper edges of the several pairs of plates D are soldered lead wires G, which lead up through the cover B*, and are soldered or otherwise joined to a horizontal plate of lead, H, which extends along near three edges of the cover. There are as many of these wires G as there are pairs of plates D. A corresponding lead wire, I, is soldered to the edge of the perforated vessel C, which vessel serves as the hydrogen-plate, and similarly leads up through a hole in the cover B*, and is soldered or otherwise joined to a horizontal plate of lead, J, on the top, which is smaller and out of connection with the previously-described plate H. A layer of bitumen or a suitable cement, K, is applied hot between each plate of lead H or J and the cover B*. It fits tightly around the wires G and I, stopping all the joints, so that the fluid in the vessel B cannot be drawn up by capillary attraction or other cause and exposed to evaporate on the cover B*. There is a non-oxidizing conductor or wire, M, leading up from the plate H of each cell. It is embraced in a screw-cap, which is inserted through a plate, Q, in the switch-board P.

N are corresponding non-oxidizable wires leading upward from the smaller plates, J, and similarly connected by screw-caps O to plates R.

The switch-board P rests on the shoulders or stops A′ and carries binding-posts Q^2 R^2, which are ready, on raising the cover A*, to be connected to any wires which may be introduced and perform their usual functions. My switch-board is equipped for allowing the three battery-cells to serve singly, in series, or in multiple arc. The provisions for effecting the changes in this respect are simple and will readily become familiar to electricians. The switch board P being itself a good non-conductor, or being faced with material, as hard rubber, which fulfills this condition, I arrange upon its upper surface the two series of isolated plates Q and R, each insulated from the other and from all surrounding objects, except as they shall be connected by switch-plugs or switches. Just outside of the series of plates R are corresponding auxiliary plates, R′. One of these is connected by a wire to the binding-post R^2.

The switch-plugs T may be made in the ordinary manner of metal with rubber handles. Holes are formed in the switch-board, and the edges of the plates are indented to receive these switch-plugs in the several positions indicated. By inserting the switch-plugs in the different holes and removing and shifting them as required I can connect any one or two of the batteries to the respective binding-posts in multiple or series.

Among the advantages due to my switch-board and the connection of the several battery-cells thereto and to each other in the manner shown, is the facility afforded for varying the number of cells which are made available at any time, and for changing from one battery-cell to another by simply changing the switch-plug.

Another advantage to which I attach much importance is the facility afforded for lifting all the battery-cells out of the case A for examination or repairs and for returning them at will. The lifting out and returning of the parts may be effected instantly without labor or skill.

Modifications may be made in the details without departing from the principle or sacrificing the advantages of the invention. I can use the vessels B and their contents differently proportioned. I can use a greater or less number of plates D. I can use the perforated plates without closing the holes. I can use other material than hard rubber for the frames E, vessels B, and covers B*. For the hydrogen or oxygen plates I can use any other oxidizable material in place of lead. I can employ other means than soldering for attaching the lead wires G to the plates D. One good way would be to cast or otherwise make the plates with prolongations equivalent to the wires G attached. I prefer under ordinary conditions to make them separately of lead, and to solder with a quick movement by a hot iron. I can use more than three battery-cells B.

Parts of the invention may be used without the whole. I can dispense with the perforated lead vessel C and employ ordinary plane plates instead.

I claim as my invention—

1. In a storage-battery, the open-work insulating-frame E, composed of members crossing each other, in combination with the storage-plates D, provided with holes *d* opposite the angles formed by the crossing of said members, substantially as specified.

2. In a storage-battery, the open-work insulating-frames E, composed of members crossing each other, in combination with the storage-plates D, having holes *d*, and the pin F, arranged for joint operation, as herein specified.

3. In a storage-battery, in combination with two or more sub-batteries, B, and their plates and connections, the switch-board P, comprising a number of separate plates, Q, connected to one pole of the several batteries, a number of remote and separate plates, R, connected to the other pole of the several batteries, a number of independent auxiliary plates, Q′, arranged adjacent to each of said plates Q, a number of independent auxiliary plates, R′, arranged adjacent to said plates R, binding-posts Q^2, connected to said independent plates Q′, and binding-posts R^2, connected to said independent plates R′, all of said plates being provided with notches in their adjacent faces, whereby said several batteries are adapted to be connected at will in series or multiple by plugs T, substantially as specified.

4. The method described of filling cavities in the plates of a storage-battery by immersing in a suitable liquid and electrically connecting and sending a current through the plates under such conditions as to fill the cavities with peroxide by disintegration or deposition, or both, and exposure of plates to crystallize and absorb oxygen, substantially as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, this 26th day of March, 1887, in the presence of two subscribing witnesses.

CHAS. D. P. GIBSON.

Witnesses:
H. A. JOHNSTONE,
M. F. BOYLE.