(No Model.)

C. D. P. GIBSON.

ELECTRIC STORAGE BATTERY.

No. 379,572. Patented Mar. 20, 1888.

Fig: 1.

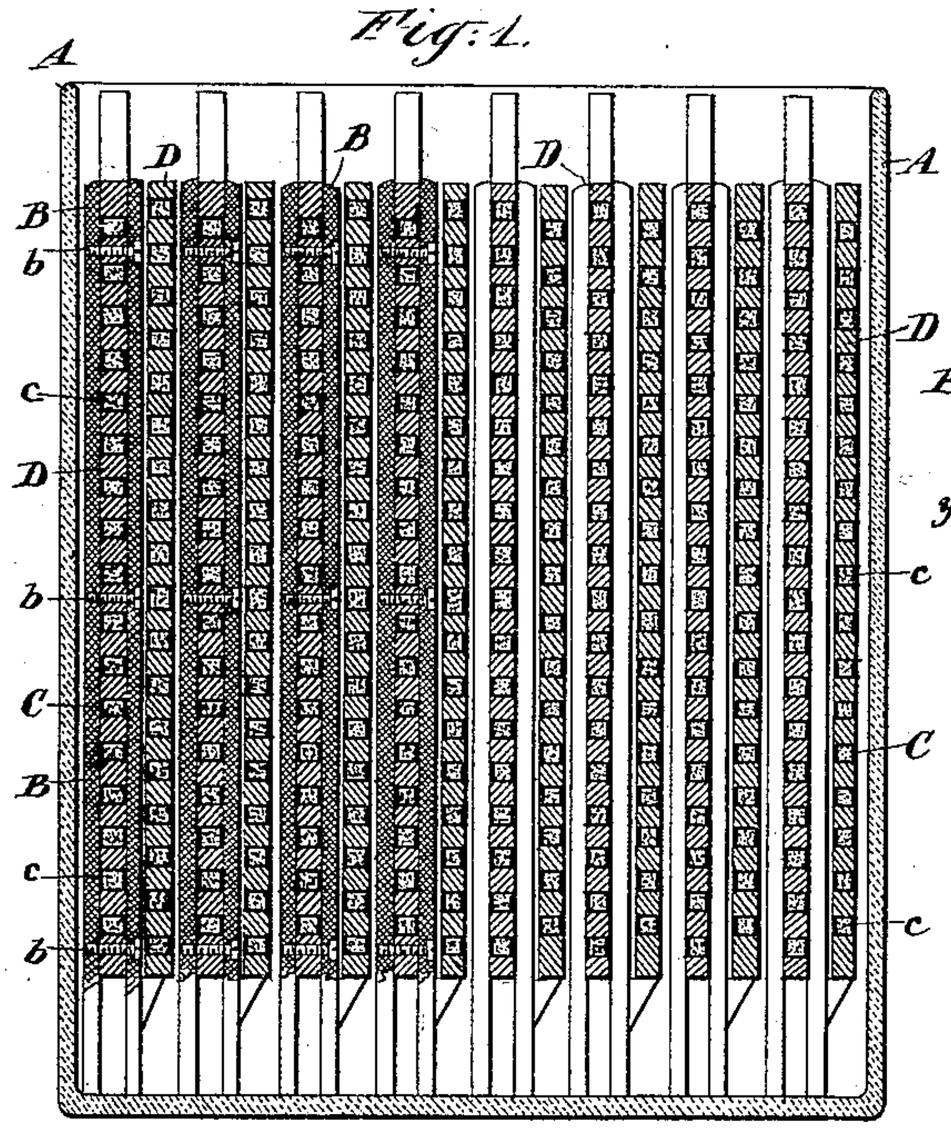


Fig: 2.

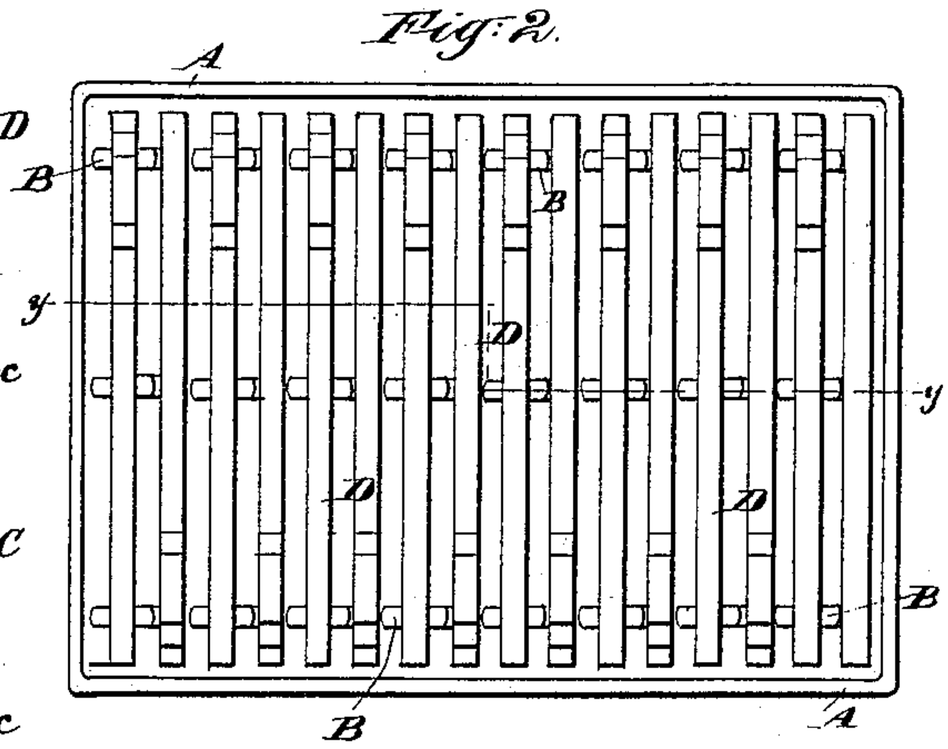


Fig: 3.

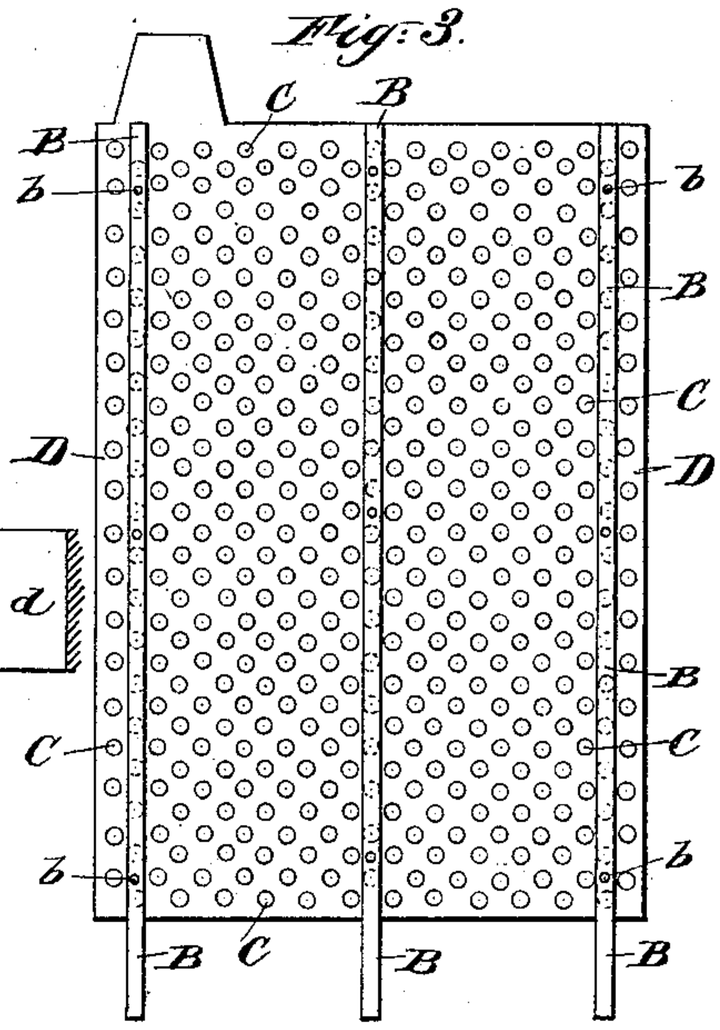


Fig: 4.

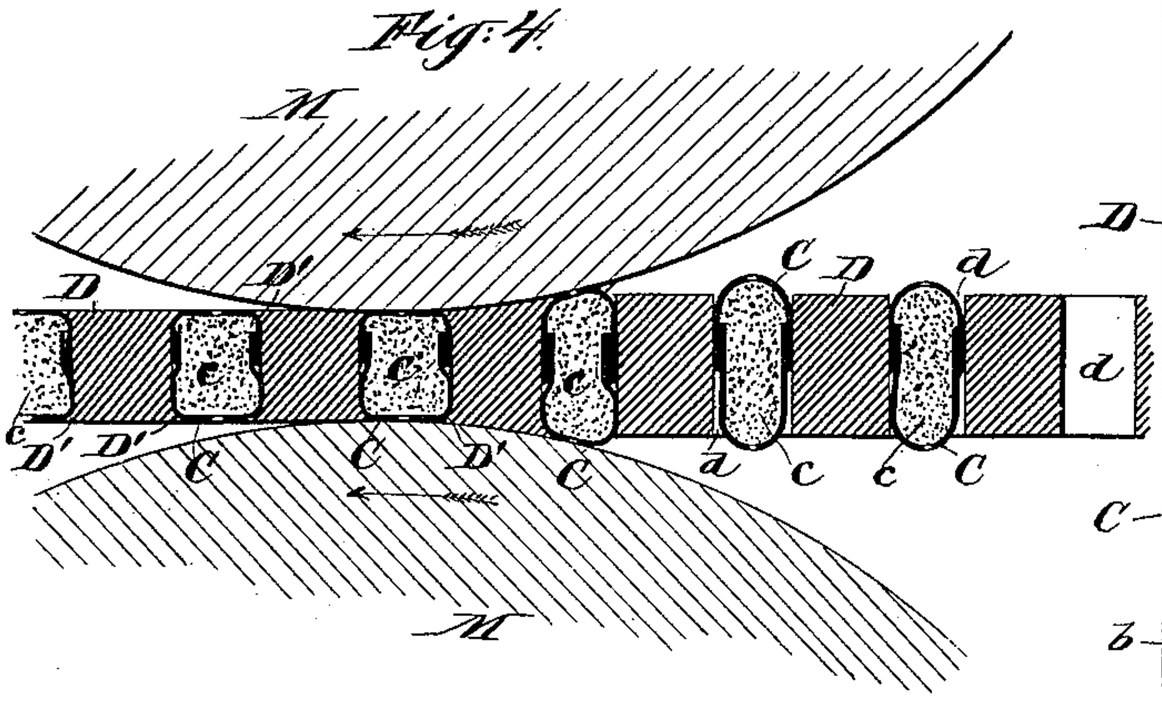
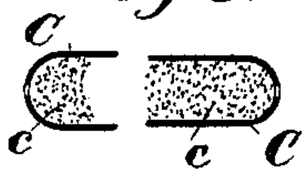


Fig: 5.



Witnesses:
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H. A. Johnstone.

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

UNITED STATES PATENT OFFICE.

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

ELECTRIC STORAGE-BATTERY.

SPECIFICATION forming part of Letters Patent No. 379,572, dated March 20, 1888.

Application filed August 25, 1887. Serial No. 247,815. (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 in Electric Storage-Batteries, of which the following is a specification.

The improved battery is of the class in which plates of lead are prepared with peroxide of lead and properly connected together and insulated, and alternately charged by connection to a dynamo-electric machine or other efficient source of electric currents, and after the proper condition of the metal has been thereby attained are allowed to maintain that condition for any required period, and are afterward allowed to discharge, producing a proper current while connected usefully, so as to produce any desired effect.

In my present improved battery I produce holes in the lead plates filled with peroxide of lead, the holes being arranged perpendicularly to the surfaces, or, in other words, extending directly across through the material of the plate. They are closed by the addition of a sheet of thin lead on each face, which is sunk into the plate so that its outer face coincides with the face of the plate on each side.

In the most complete form of the invention the material to fill each hole is first inclosed in a capsule or continuous envelope of thin lead. A good portion of the benefit can, however, be obtained by introducing the material in a plastic state directly into the holes, filling each a little more than full, and applying a thin sheet of lead across each end. In either mode of construction the material should be compressed by dies or otherwise, so as to bring the outer face of the sheet of lead which covers the ends flush with or preferably a little within the general surface of the plate.

The term "upsetting" is applied by metal-workers to the act of shortening and thickening. I will apply the term to my treatment of the capsules and their contents.

The following is a description of what I consider the best means of carrying out the invention. The accompanying drawings form a part of this specification.

Figure 1 is a vertical section through the battery on the line *y y* in Fig. 2. Fig. 2 is a plan view of the same. Fig. 3 represents one of the plates and the accompanying insulating-strips shown in face view. The connections (not represented) may be of the ordinary character. The remaining figures are on a larger scale. Fig. 4 is a section through a portion of the plate and the adjacent surfaces of the compressing-rolls in the act of compressing the plate and upsetting the capsule therein. Fig. 5 represents the material for a capsule with its two parts filled with peroxide and ready to be applied together.

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

A is a rectangular jar of glass.

B are insulating-strips, of hard rubber or other suitable non-conducting and incorrodible material, secured by screws *b*, of the same or analogous material.

D are plates of lead about one-quarter of an inch in thickness, punched or otherwise prepared with holes *d*, extending through, arranged zigzag, so that when the capsules are inserted and firmly locked they are correspondingly zigzag in arrangement. Care must be taken in placing the fastening-screws *b* so that they take hold of the metallic plate D, and not of the softer and weaker peroxide. The screws *b* pass through the lead plate, and are screwed into the rubber insulation B on the other side of the plate.

C *c* are capsules, applied one in each hole *d*, and of such size and form that when loosely introduced they project a little at each face; but when they have been compressed endwise with sufficient force they will be shortened and thickened, so as to each tightly fill its hole, and its end will lie flush with the face of the plate.

Each capsule is composed of a filling, *c*, of peroxide of lead, wrought into a paste, inclosed in a thin envelope of metallic lead. Each capsule may be made in two parts, cut and compressed into shape by one or more operations with suitable dies. The two parts are adapted to match together, one partially within the other, as shown in section in Fig. 4. The capsules in process of manufacture are pierced with a small hole at each end to allow the air to pass out when the active material

shall be forced in, also to facilitate the action of the current in disintegrating the thin end or ends of the capsules. The two thin metallic shells which are adapted to apply together, one matching partially within the other, are first oxidized by any of the known processes on both the outer and inner surfaces. They are then applied together, inclosing a proper quantity of the filling *c* in a pasty condition, and are ready for introduction into the plate. In filling the plate the capsules are inserted, by hand or otherwise, one in each hole *d*, projecting a little at each face. When all the holes are thus loosely filled, the plate, with its capsules, is subjected to pressure, which compresses the several capsules endwise, so as to shorten and thicken them. This treatment may be effected by passing the plate, with its contents, through a pair of rollers M; or it may be done by subjecting the same to compression between dies, or by hammering. In any case the thin coating of metallic lead which originally covers each end remains, extending across the hole on each face and forming a protection for the contents.

It is important that the capsules and their contents be locked reliably in the plate. To attain this end the pressure applied by the rollers M, or equivalent dies, in upsetting the capsules and compressing the adjacent metal, should be such as to distort the metal and cause the material of the plate D to overlap or clinch upon the capsule, as indicated at D′ in Fig. 4. Care is taken to properly proportion the capsules and the holes in the plate, so that the dies may compress the capsules and bring their previously projecting ends flush with the general face of the plate on each side.

Modifications may be made in the details without departing from the principle or sacrificing the advantages of the invention. The capsules may be square or hexagonal instead of circular, and in such case the holes *d* in the plate should be correspondingly formed, but always sufficiently larger to allow the capsules to be easily inserted, depending upon the upsetting of the capsules to make them fill their holes. When the pressure is produced by dies, the dies may be formed with projections matching the positions of the holes, so that the peroxide of lead filling the hole and the metal immediately adjacent to the hole will be compressed, so that the covering of thin metal C will be a little within the faces of the plate.

Some of the advantages of the invention may be attained without previously charging the peroxide of lead into capsules. In such case the holes are filled directly with the peroxide of lead in a pasty condition, and after allowing it to become partially dry lead-foil in sufficient-sized pieces is applied on each face and is confined by compression. With this construction of the plates it is more important than with the capsules to sink the covering metal C a little within the general face of the plate. I extend the insulating-strips below the plates to serve as foot-pieces, with a step on one side of each plate to support the oxygen-plate. The insulations are fastened to the hydrogen-plate (the everlasting plate) with a row of step insulations on one side. The oxygen-plate, when used up, can be taken out and a new one substituted with very little trouble or expense. The insulation mechanically supports the entire perpendicular of plate. The plate does not rest on a thin edge, and will not buckle or bend by its own weight or otherwise. There is no chance for the sulphate or débris, which is constantly falling, to "catch on" and short-circuit the battery. The arrangement of these parts saves the expense of foot-pieces, as the step on the insulation does not add to the cost.

Instead of peroxide of lead, other active material may be employed. I prefer the peroxide mentioned. Instead of a pasty condition, it may be introduced in the form of powder. The shells of the capsules may be in the ordinary metallic condition without being oxidized on the surface.

I attach importance to the incasing of the peroxide or other active material in capsules, because of the convenience and reliability of its retention.

The loaded capsule can be arranged in many ways to take and give off reliable currents. I can use any metal box made from practical material, or a box made of rubber or any insulating material, with a metal wire coiled inside or a straight piece of metal placed in the center of the box, and the loaded capsules packed around so as to have contact with them, the wire or bar of metal to serve as a conductor and terminal. The capsule can be held in between wire-netting placed in troughs, suspended with wire passing through each capsule, or placed loosely in cells, forming strata of loaded boxes with the proper insulations, which would separate the oxygen strata from the hydrogen, with the metal wire or strip leading above the solution for terminals. The small hole *d* in each end of each capsule allows the air to pass out when filling and gives the solution a chance to circulate through. I propose to prepare and sell the capsules commercially and permit the buyer to use them in his own way.

I can make the loaded capsules without the ends pierced—for illustration, making the plate as above described and placing the capsules in the holes and pressing or hammering the ends down even with the plate. Place such plate in circuit with a dynamo and disintegrate the entire surface of the plate and the Planté crust is formed. The ends of capsules as well as the plate must be necessarily disintegrated. When this condition is complete, the thin metal end of the capsule has solidified with the active material in the little capsules, and the plate is ready for use.

I claim as my invention—

1. In a storage-battery, the plate D, having holes *d* at right angles to its faces, in combi-

nation with the two-part capsules C, each part having a perforation in its outer end for the purpose described, and a filling of peroxide of lead in said capsules, said capsules fitting loosely in said holes *d*, substantially as specified.

2. In a storage-battery, the plate D, having holes *d* at right angles to its faces, in combination with the capsules C, fitting said holes and clamped therein by pressure, said capsules being filled with peroxide of lead, substantially as specified.

3. In a storage-battery, the plates D, having holes *d* at right angles to the faces, in combination with the filling *c* and coverings C, separately formed and applied, substantially as herein specified.

4. In a storage-battery, the combination, with the vessel A, of the non-conducting strips B and suitable fastening means, *b*, and plates D, having holes *d*, filled with peroxide of lead and protected by a covering, C, on each face, substantially as herein specified.

In testimony whereof I have hereunto set my hand, at Auburn, New Hampshire, this 11th day of August, 1887, in the presence of two subscribing witnesses.

CHAS. D. P. GIBSON.

Witnesses:
F. H. PRESCOTT,
JOHN C. BICKFORD.