(No Model.)

2 Sheets—Sheet 1.

C. J. HUBBELL.

GALVANIC BATTERY.

No. 435,346. Patented Aug. 26, 1890.

Fig. 1

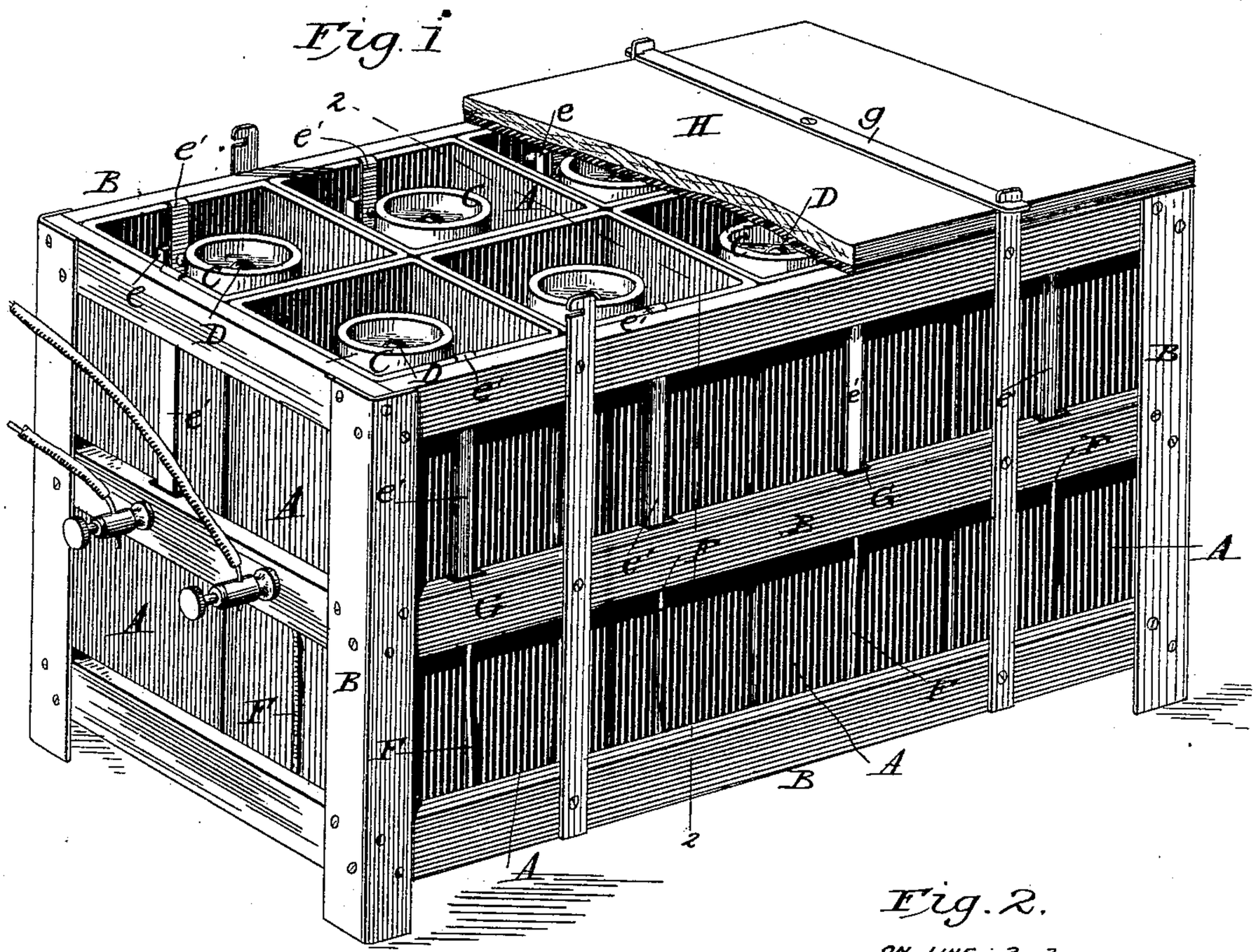
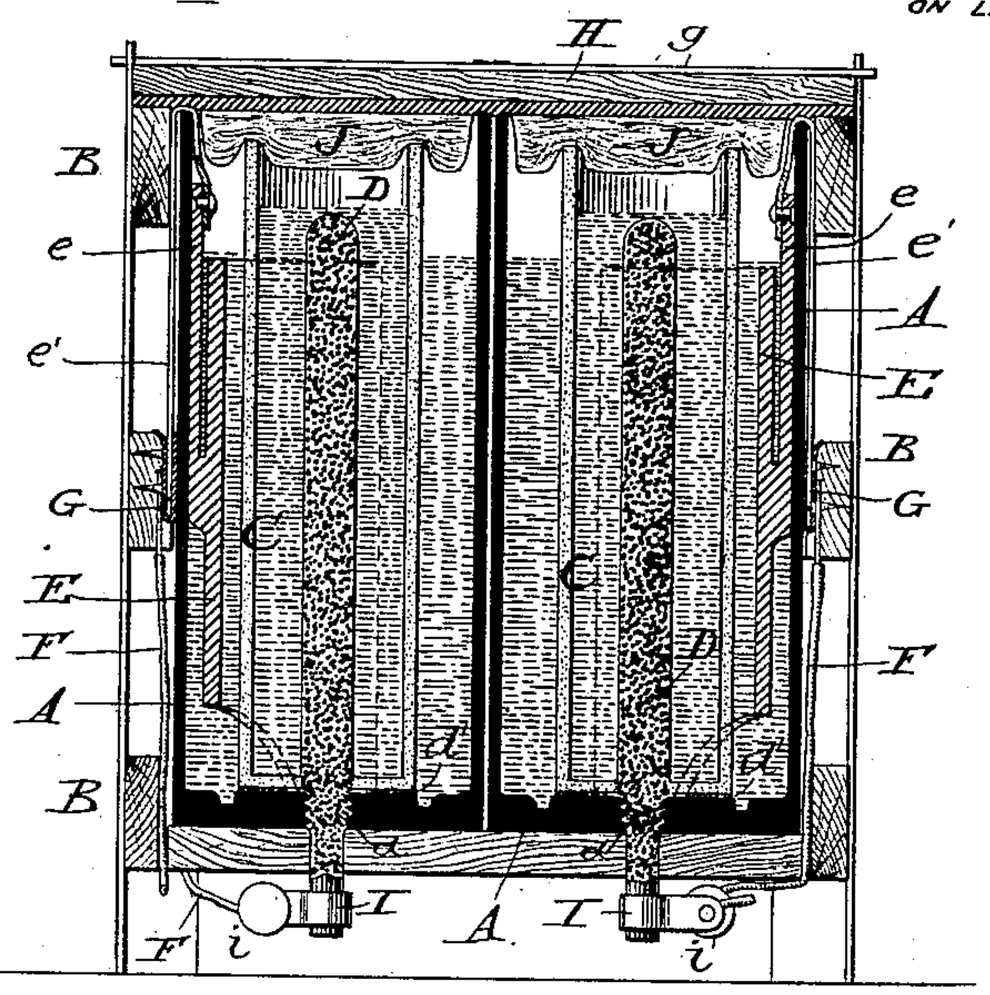


Fig. 2.

ON LINE 2-2



Attest.

Sidney P. Hollingsworth

N. R. Kennedy.

Inventor:

Chas. J. Hubbell

By his Atty

Phil. T. Dodge

(No Model.) 2 Sheets—Sheet 2.

C. J. HUBBELL.

GALVANIC BATTERY.

No. 435,346. Patented Aug. 26, 1890.

Fig. 3.

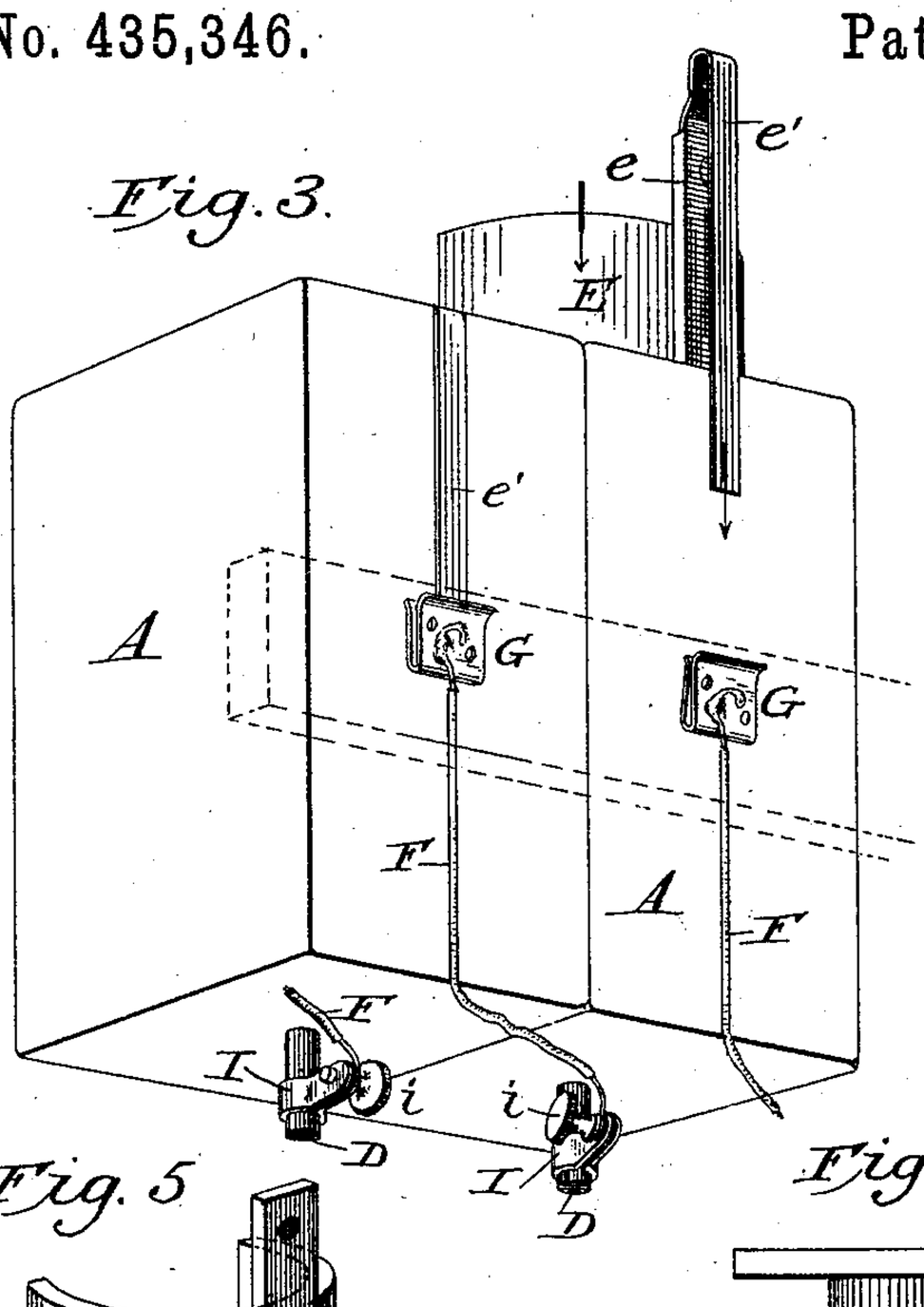


Fig. 4.

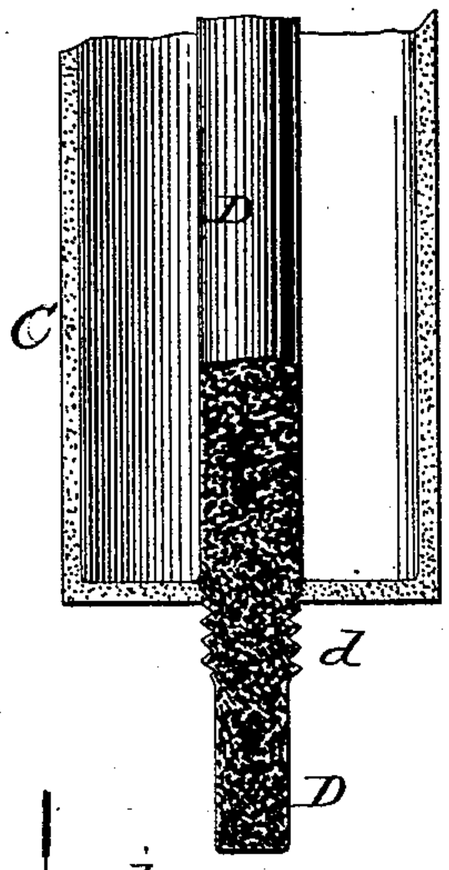


Fig. 5

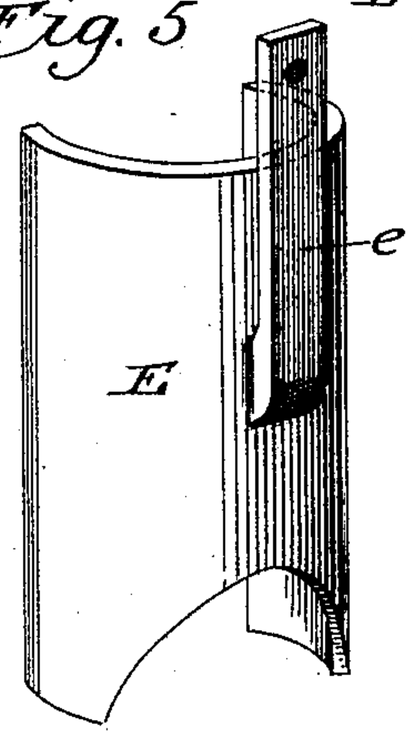


Fig. 6

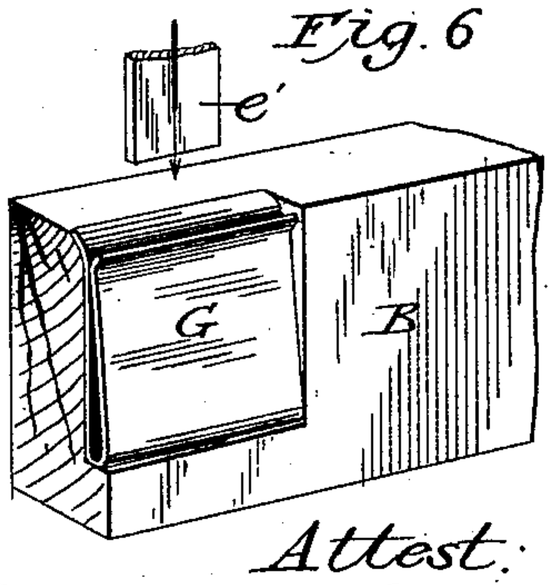


Fig. 7.

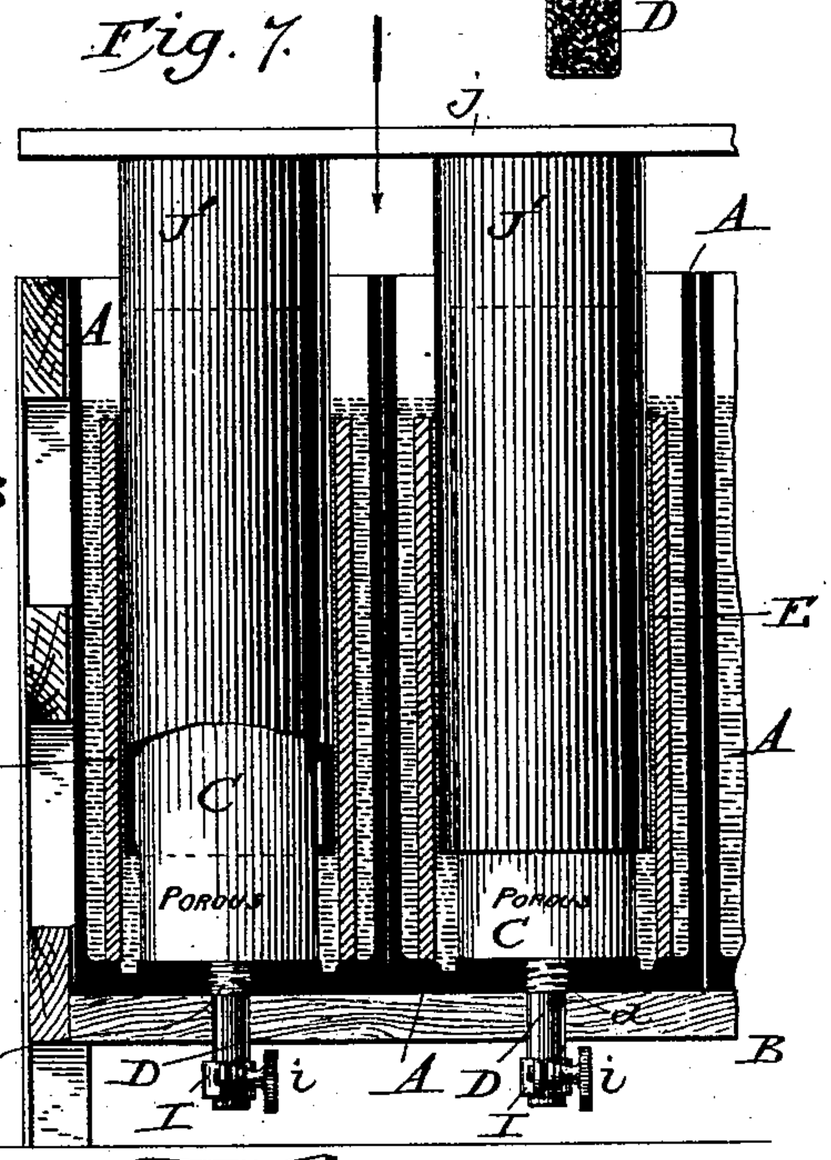
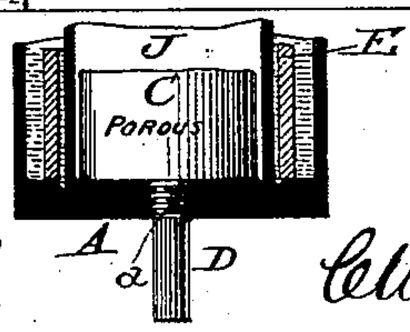


Fig. 8.



Attest:

Sidney P. Hollingsworth

H. R. Kennedy

Inventor

Chas. J. Hubbell

By his atty

Chas. F. Dodge

UNITED STATES PATENT OFFICE.

CHARLES J. HUBBELL, OF NEW YORK, N. Y.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 435,346, dated August 26, 1890.

Application filed August 1, 1890. Serial No. 360,618. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. HUBBELL, of New York, in the county of New York and State of New York, have invented certain Improvements in Galvanic Batteries, of which the following is a specification.

My invention relates to that class of batteries in which carbon and zinc elements are used in combination with an intermediate porous cell and two acid solutions.

The objects of the invention are to simplify and cheapen the construction, to permit the cells to be readily grouped and connected in series, and to admit of their being rapidly separated and examined.

A further object of the invention is to avoid the exhalation of noxious fumes.

Another object of the invention is to prevent that admixture or assimilation of the two fluids which is likely to occur when the battery remains inactive for long periods of time; and it consists in means for temporarily cutting off communication between the fluids.

In the accompanying drawings, Figure 1 is a perspective view of a multiple-cell battery constructed on my plan, a portion of the cover being broken away. Fig. 2 is a cross-section of the same on the line 2 2. Fig. 3 is a perspective view of two of the cells removed from the case with the zinc partly lifted from one of the cells. Fig. 4 is a central cross-section through the lower part of the porous cup and its carbon. Fig. 5 is a perspective view of one of the zinc elements. Fig. 6 is a perspective view showing the contact devices used with the zinc elements. Fig. 7 is a vertical cross-section showing the manner of applying the tubes for isolating the two fluids. Fig. 8 is a similar section showing one of the tubes lowered to its place.

Referring to the drawings, A A represent independent cells of hard rubber, glass, or other appropriate material. Each cell is made complete in one piece and closed at the base, with the exception of a small central hole therethrough for the projection of the carbon, as hereinafter explained. I prefer to make the cells, as shown, of rectangular form, in order that they may be seated or nested closely together. For the purpose of supporting them in series I provide a skeleton box or casing B, which may be of any construction adapted to sustain them. Into each of the cells I introduce a cylindrical porous cup C, closed at the bottom. Centrally in each cup I mount the carbon pencil or element D, and between the porous cup and the outer wall of the cell I mount the zinc element E. The carbon is fixed rigidly and centrally within the porous cup and projects downwardly through its bottom. The preferred construction is to insert the carbon into the porous cup while the latter is in a soft or plastic condition, and then bake or burn the cup, as usual, with the carbon in place therein. The effect of this operation is to secure the carbon permanently and tightly within the cup, so that it cannot tip out of position, and so that leakage through the bottom of the cup around the carbon is prevented. The porous cup and the carbon thus united may be handled as one piece, which greatly facilitates the assemblage of the battery.

The lower end of the carbon outside of the porous cup is provided with a screw-thread *d*, and is screwed down tightly through a threaded hole in the bottom of the cell A, the screw serving the purpose of holding the carbon, the cup, and the cell in their proper relations, and of preventing leakage through the bottom of the cell. A rubber or other suitable packing *d'* may be inserted between the bottom of the porous cup and the bottom of the cell, as shown in Fig. 2, but in ordinary cases this is not necessary. The lower extremity of the carbon is preferably plated with copper or other metal to improve its conductivity, and is extended downward through the bottom of the inclosing box or case, which stands upon feet sufficiently high to hold the lower end of the carbon out of contact with the floor or other support on which the box is placed.

To the lower extremity of each carbon I apply an encircling contracting clip I, having its ends united by a contracting screw *i*, which admits of its being instantly applied and removed. From each of these clips a conducting-wire F is extended upward to a contact-plate G, fixed to the inside of the inclosing-case and consisting of a piece of elastic soft metal bent into U form. There is one of

these contact-plates or clips adjacent to each cell, and when the battery is coupled in series the conducting-wire from the carbon of one cell is led to the contact-plate adjacent to the next cell.

My zincs are constructed preferably in the form of a tube or segment of a tube, as shown in Fig. 5, their lower ends having feet or downward extensions seated in the bottom of the cell to sustain them. I cast on each of the plates an arm *e*, commencing at or near its middle and extending to the top of the cell, where it is attached to a conducting-strip *e'*, which extends downward on the outside of the cell and is inserted at its end within the clip G. It is to be observed that the arm *e* acts merely as a conductor, and not as a support or suspension device, for the zinc, which is seated on the bottom of the cell, so that it has no tendency to tip or fall out of position—a matter which is a source of much trouble in batteries which have the zinc suspended from one side.

Solutions of any appropriate character—such as are used in the art in batteries of this type—may be employed; but I prefer to use within the porous cup a solution consisting of three parts of sulphuric acid and two parts of water, to which a small amount of nitrate of soda is added. In the cell outside of the cup I prefer to use a solution composed of one part of sulphuric acid with sixteen to twenty parts of water.

It will be observed that under my construction each of the cells may be lifted out of position complete without the exercise of special precaution other than the loosening of the conducting-clip at the bottom.

In order to absorb and neutralize the fumes which result from the action of the battery, I propose to provide the box inclosing the cells with a lid or cover H, and to attach to the under side of this cover a porous sack or pad J filled with asbestus, or with that fibrous product made from glass, and commercially known as "mineral wool." This pad will be charged with bichromate of potash. The lid may be constructed and secured in place upon the box by a pivoted cross-bar *g*, or by any other suitable means which will hold the absorbent pad down snugly upon the top of the cells.

In practice it is found that when the battery remains at rest for a long period of time a rapid assimilation of the two fluids through the porous cup occurs. To avoid this difficulty I propose to introduce into each cell during the time that the battery is not in operation a vertical tube J', of rubber, glass, or other impervious materials of proper size and height to completely isolate the two fluids. These tubes will rest upon the bottom of the cell, and are preferably made to fit closely around the porous cup, although it may of course be inserted within the same, if preferred. I commonly attach these tubes in series to a top plate *j*, by means of which they may be introduced to and removed from the battery.

Having thus described my invention, what I claim is—

1. The porous cup having the carbon element baked in place thereon.

2. The porous cup having the carbon inserted through and baked in place therein.

3. The porous cup having the carbon fixed through its bottom and provided with a screw-thread, substantially as shown.

4. In a galvanic battery, the cell A, in combination with the porous cup and the carbon passing through the bottom of the cup and screwed into the bottom of the cell, whereby it is held in place and caused in turn to hold the cup.

5. In a galvanic battery, the combination of the cell, the zinc electrode seated on the bottom thereof and provided with an arm attached to the center of said zinc electrode and separated therefrom at all other points and extending outside of the solution.

6. In combination with the battery-cells having the down-reaching conductor or terminal *e'*, the receiving box or casing provided with the spring contact-plates G, to receive the ends of the terminals, as described.

7. In a galvanic battery, the cells each having a top and a bottom terminal, in combination with the containing box or case provided with contact-plates G, each adapted to receive one of the upper terminals and attached to a conductor having a clip for attachment to a lower terminal.

8. In combination with a galvanic battery containing a porous cup and two solutions, a removable impervious tube J' for isolating said solutions.

9. In combination with a battery comprising a series of cells with porous cups therein, a plate or carrier *j*, provided with a series of impervious non-conducting tubes adapted to enter the cells to isolate the solutions therein.

10. In combination with a galvanic battery of the type herein described, a top or cover having an absorbent pad charged with bichromate of potash.

11. In combination with the galvanic battery, an absorbent pad charged with material to absorb or neutralize the fumes from the battery.

In testimony whereof I hereunto set my hand, this 30th day of July, 1890, in the presence of two attesting witnesses.

CHARLES J. HUBBELL.

Witnesses:
P. T. DODGE,
W. R. KENNEDY.