(No Model.)

P. B. DELANY.

GALVANIC BATTERY.

No. 406,997. Patented July 16, 1889.

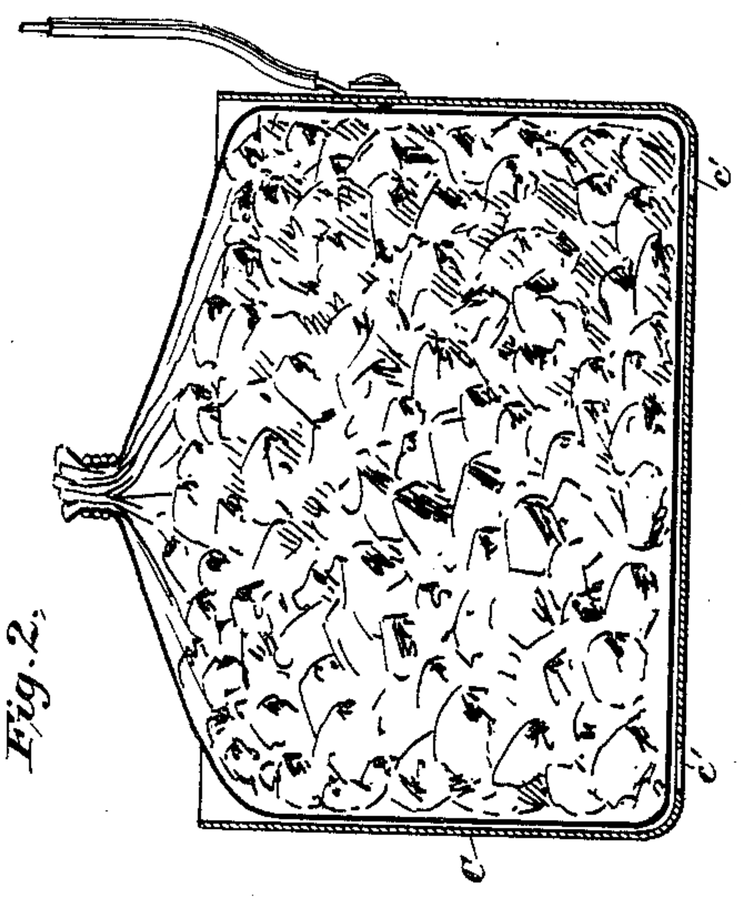

Fig. 2.

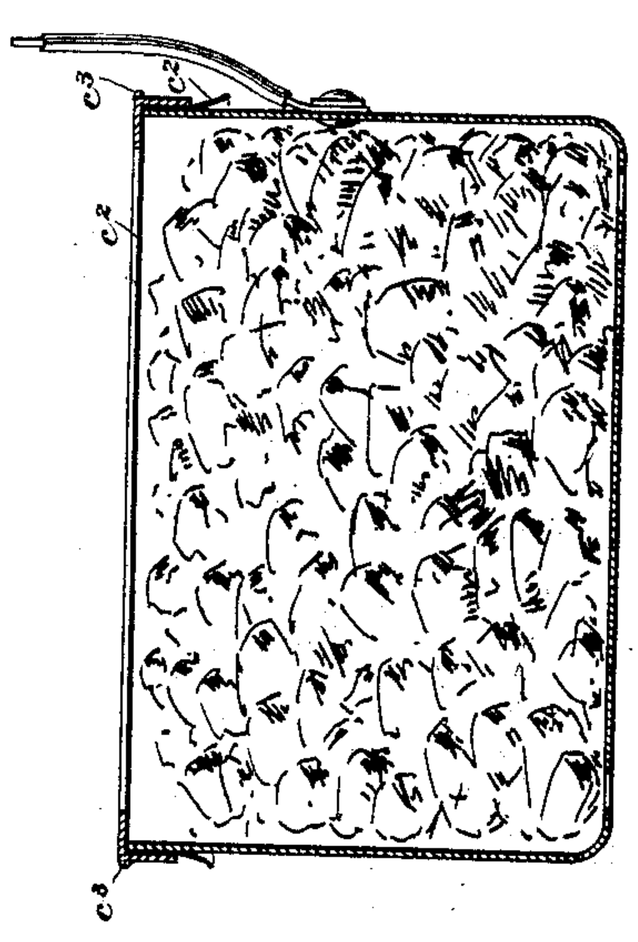

Fig. 3.

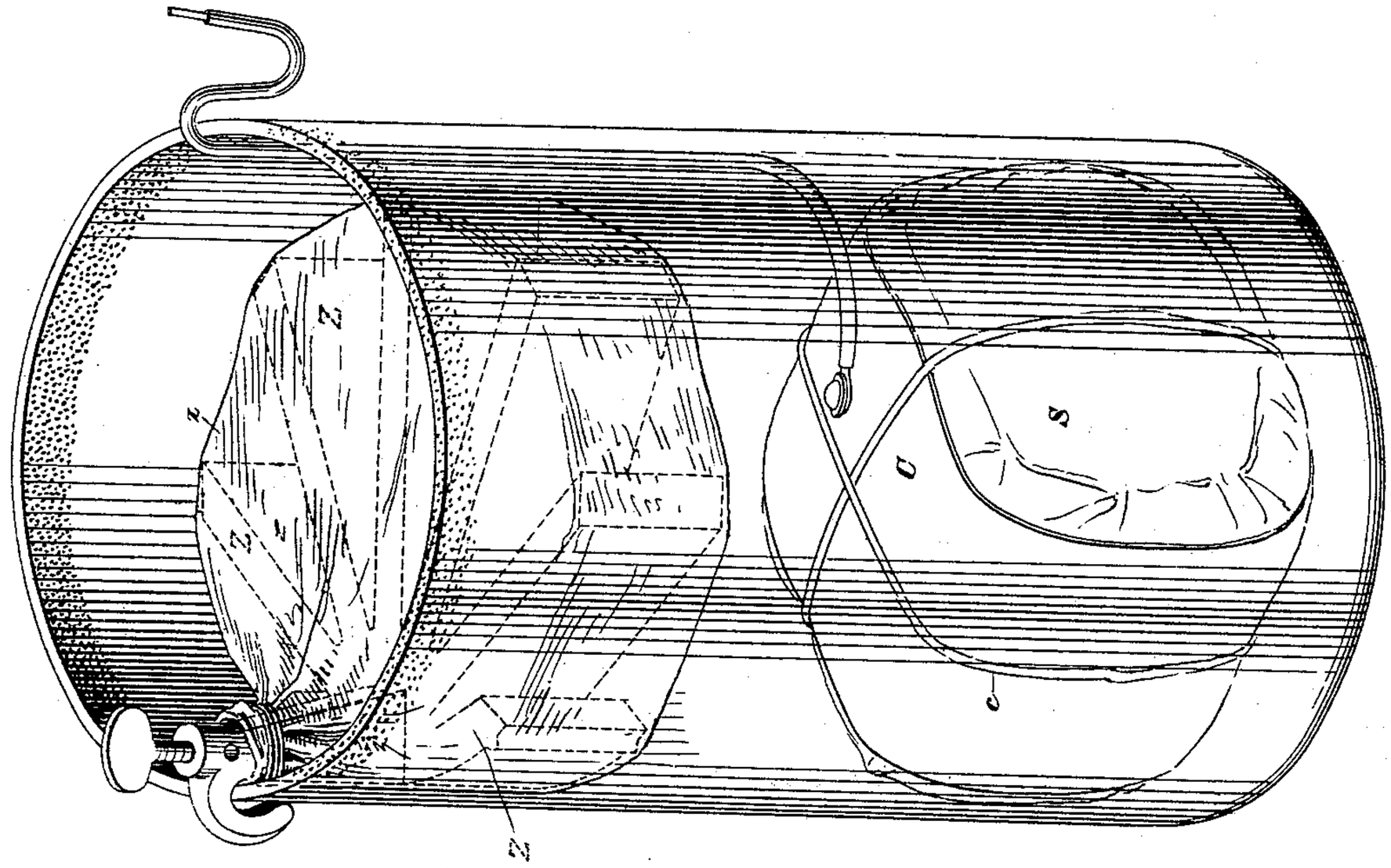

Fig. 1.

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UNITED STATES PATENT OFFICE.

PATRICK B. DELANY, OF NEW YORK, N. Y.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 406,997, dated July 16, 1889.

Application filed May 9, 1889. Serial No. 310,089. (No model.)

To all whom it may concern:

Be it known that I, PATRICK B. DELANY, of New York, in the State of New York, have invented certain new and useful Improvements in Electric Batteries, of which the following is a specification.

My invention relates to gravity-batteries in which are usually employed zinc and copper electrodes and a charge of crystals of sulphate of copper.

The general object of my improvements is to increase the longevity of such batteries, give them a constant potential, obviate the necessity for frequent cleaning, and increase the facility and convenience with which they may be set up for operation and replenished from time to time. These advantages, as well as others incident to my invention, appear from the following specification.

In the accompanying drawings, Figure 1 is a perspective view showing a cell of gravity-battery arranged according to a preferred form of my invention; Fig. 2, a section through the copper element of the battery, showing the copper electrode and a charge or cartridge of sulphate-of-copper crystals; Fig. 3, a similar view illustrating the same matter in a somewhat modified form.

Z indicates the ordinary zinc electrode, which is shown completely inclosed in a loose sheath or envelope *z*, of some porous material—such, for instance, as common cotton cloth.

The copper electrode is in Fig. 1 shown in the form of a strip or band of copper C, bent around a porous bag or cartridge of sulphate-of-copper crystals S. The copper may be held in place by a wire or cord *c*, as indicated. This is a construction which I have found very efficient, though of course the form of the copper and of the bag or cartridge of sulphate of copper inclosed by it may be varied, and instances of such possible modifications I have shown in Figs. 2 and 3. In the former a copper cup C, containing the porous bag or cartridge of sulphate-of-copper crystals, is shown. This copper cup may be formed with perforations *c'* in its bottom or not, as may be desired.

In Fig. 3 I have again shown a copper cup; but instead of the sulphate-of-copper crystals being inclosed entirely within a porous bag or envelope they are placed directly in the cup, and over the top of the cup is placed a porous cover—such, for instance, as common cotton cloth—c^2, held in place by rim c^3, which binds the cover around the edges of the cup. In this case the cup, porous cover, and crystals constitute a cartridge or charge for a gravity-battery, as they do also in Fig. 2; but in the latter figure the bag or cartridge of sulphate of copper may be separate from the cup, and constitutes a charge or cartridge that may be placed within a copper envelope, such as the cup shown in Fig. 2 or the band of copper shown in Fig. 1.

Among the advantages attending my improvements it may be mentioned that when the cell is first set up the sulphate-of-copper crystals, being divided from the liquid or solution by a cloth or suitable porous material, do not dissolve sufficiently to penetrate the covering for some little time, and then they dissolve comparatively slowly, so that the cell being in position and the fluid quiescent the sulphate-of-copper solution, by reason of its greater specific gravity, remains at the bottom and is not diffused through all the fluid in the jar, as is otherwise apt to be the case, and cause the deposition of copper on the zinc, coating it and producing local action, affecting the potential and general efficiency of the battery.

When the cell becomes active, the porous covering on the zinc protects it from the hydrogen gas, which constantly rises from the copper electrode, carrying with it sulphate of copper. The covering also prevents stalactite formations of copper on the zinc, which occur in the ordinary gravity-battery and reach down into the sulphate-of-copper solution, causing local action and rapid deterioration of the cell. When the formations are removed from the zinc while in the cell, as is often the case, they drop down on the sulphate-of-copper crystals in the condition of spongy metallic copper, and, subsequently hardening, make the crystals hard and caked together in mass, so that it is frequently impossible to remove them without breaking the glass jar. The covering also retards the dissolving of the sulphate of copper and an unnecessarily free action on the zinc and wasteful supersaturation. I have found by tests

that after three or four days, when the two elements—sulphate of copper and sulphate of zinc—have been produced to a proper working extent, the resistance of the battery is no higher and the current is quite as great as with batteries of the ordinary form. A very important consideration from an economic standpoint is the increased longevity of the battery, due to the conserving effect of the porous covering.

Comparative tests already made show that the new battery will last at least one-third longer than the ordinary cell with the same weight of zinc and copper sulphate at starting. In the new battery, when the first charge of sulphate has been used up completely, the supply-bag or porous envelope is thrown away. It is only necessary to put another charge in the copper pot or band. The zinc is put back without disturbing the cover; for, unlike the zincs of the ordinary battery, these do not require scraping or cleaning. The protection against copper sulphate afforded by the covering and the concentration of zinc in solution around the metallic zinc prevents the hard coating from forming on the zinc, so that the supply of sulphate of zinc is ample until the metallic zinc is reduced to impracticable proportions. This saves much labor and preserves a perfectly clean and clear battery. When it is necessary to add water to the cell to make up for evaporation or for what may have been drawn off for the purpose of equalizing the solutions, the equilibrium of the solutions is not disturbed as the fresh water is poured on the top of the porous covering of the zinc and gently diffused throughout the cell.

Another advantage lies in the firmness with which the copper electrode is held in position. Much trouble and annoyance is now experienced by this electrode being pulled out of position and the difficulty of getting it back again, owing to the crystals getting under it. By reason of this defect the resistance of cells of the same battery is often widely different and constantly subject to change.

The sulphate of copper being in cartridges or contained in a porous envelope or cover in proper quantities for each cell, shipment and handling are rendered easy, and all cells are supplied with the same quantity.

I have found a common cotton cloth suitable for inclosing the zinc and sulphate-of-copper crystals. The resistance of the battery may be varied by the character of the covering—for instance, light sail-cloth or "duck" gives a higher resistance than more loosely-woven material.

When it becomes necessary to renew the supply of copper, or, in other words, to insert a fresh charge or cartridge, the old bag or envelope may be removed at once without any inconvenience or difficulty, and since the zinc will not require cleaning or any special manipulation the zinc electrode will be immediately returned to its place, and the concentrated solution of sulphate of zinc contained within and throughout the porous sheath causes the battery to promptly again become active and delay is avoided.

I have shown around the interior rim of the glass jar a roughened or sanded border. This may be formed by coating the interior lip of the jar with asphaltum varnish, for instance, and then applying ordinary white sand. I have found that with such an arrangement the liquid of the battery will not creep up to and over the edge of the jar. This is a material advantage, as all who have had any experience with this and other forms of battery know. Ordinarily the salts are deposited upon the inner side, edge, and exterior of the jar and form a coating which draws the liquid by capillary action from the jar, not only depleting the battery, but destroying insulation between the cells, covering the battery-shelves, and causing injury and general untidiness to the surroundings.

So far as I am aware I am the first to provide a cartridge for the copper element of a gravity-cell. I am also, so far as I am aware, the first to encircle the sulphate-of-copper crystals with the copper electrode and intervene between the crystals and the battery-fluid a porous medium, preferably cloth, as shown in different forms in the several figures in the drawings.

I claim as my invention—

1. In a cell of battery, the zinc electrode enveloped in a bag or cover of porous material, in combination with a charge of sulphate-of-copper crystals having interposed between it and the battery solution a porous medium.

2. In a gravity-cell of battery, the combination, with the zinc and copper elements, of a cartridge consisting of crystals of sulphate of copper enveloped in porous material, substantially as set forth.

3. The herein-described cartridge for a cell of battery, consisting of a charge of crystals—of sulphate of copper, for instance—inclosed in an envelope of porous material.

4. The cartridge of sulphate-of-copper crystals for a cell of gravity-battery, encircled by the copper electrode of the battery and having a porous medium to separate the crystals from the fluid of the battery.

5. The copper element of a gravity-battery, consisting of a band of copper and a bag of sulphate-of-copper crystals encircled by the copper band.

6. A battery-cell having its rim roughened or sanded, for the purpose set forth.

In testimony whereof I have hereunto subscribed my name.

PATRICK B. DELANY.

Witnesses:
AUGUSTUS MERRITT,
LLOYD B. WIGHT.