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Patented Nov. 11, 1902.

H. B. TAYLOR.

VOLTAIC CELL.

(Application filed Apr. 2, 1902.)

(No Model.)

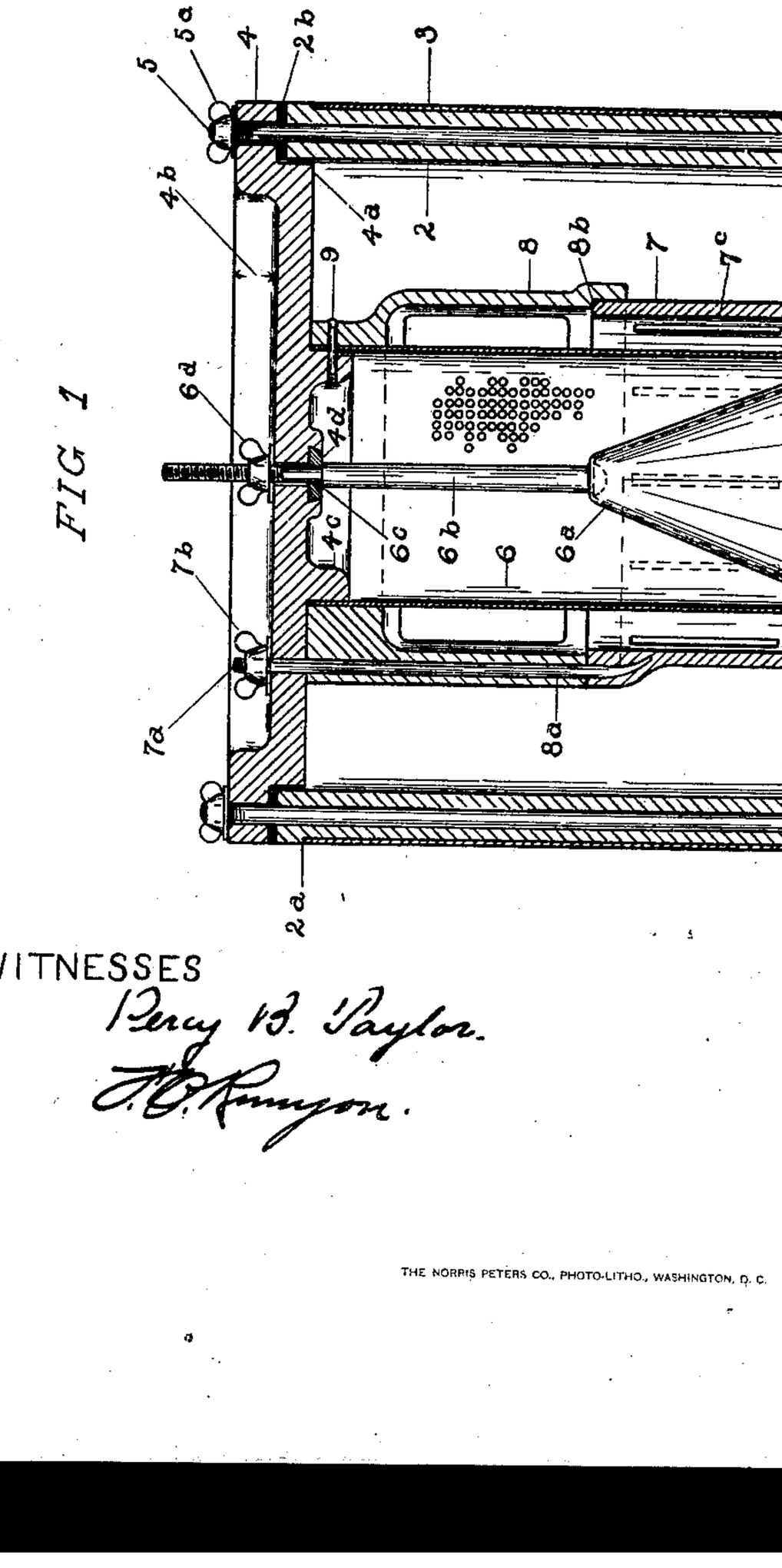

FIG 2

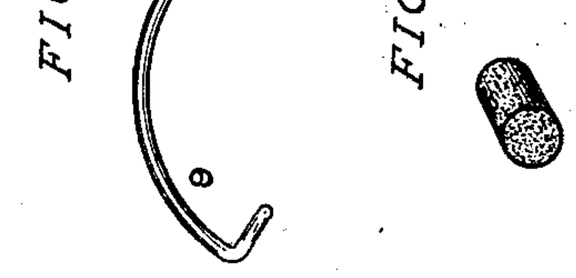

FIG 4

FIG 5

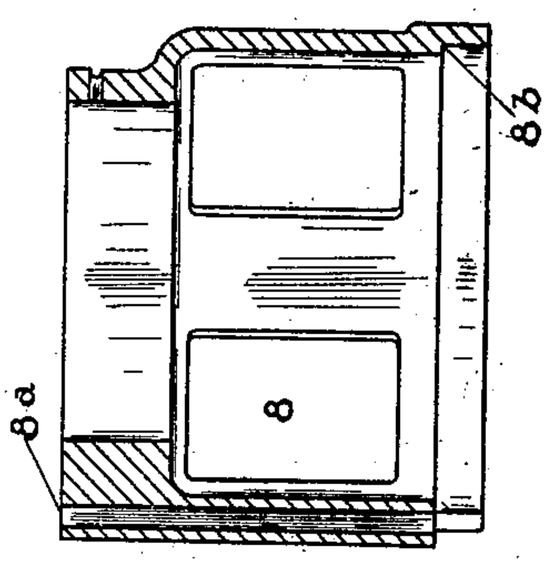

FIG 3

FIG 1

WITNESSES

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VOLTAIC CELL.

SPECIFICATION forming part of Letters Patent No. 713,174, dated November 11, 1902.

Application filed April 2, 1902. Serial No. 101,046. (No model.)

To all whom it may concern:

Be it known that I, HERBERT B. TAYLOR, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Voltaic Cells, of which the following is a specification.

This invention relates to improvements in voltaic cells, its object being to provide a cell of higher efficiency, of greater durability, of simple construction, and easy of access for renewal purposes.

The improvements hereinafter described are intended to relate to that class of voltaic cells using a solid depolarizer, which may be contained in a porous or perforated receptacle or which may be held in the solution of the cell in any other manner.

Among the novel features of my improved cell are the arrangements of the several parts, permitting quick renewals, the mechanical construction of the cell permitting renewals without handling any part of the cell that has been in contact with the solution, the form of the elements and their disposition in the cell, and the method of protecting the jar and of making the cell liquid tight.

To supplement this specification, I will accompany it with drawings, which are intended to clearly set forth my invention, with all the novel features pertaining thereto.

In the said drawings, Figure 1 is a vertical part-section view taken diagonally through the center of the cell, showing the jar, jacket, cover, bolts, container for depolarizer, positive element, and separator. Fig. 2 is a view, part in section, of the container open and separator, both attached to cover. Fig. 3 is a section view of the separator detached from the cover. Fig. 4 is a view of the clamp for binding the several parts together. Fig. 5 is a view of the preferred form and size of depolarizer.

In most of the voltaic cells in use the jar or vessel containing the solution and elements is made of glass or porcelain. It has been found that both of these materials, while generally accepted as suitable for the purpose, being reasonably cheap and also impervious to the solutions generally used in the cells, are very liable to be broken while handling and to become cracked or broken by the heat of combination of the solutions themselves. To overcome this evil, fiber and rubber jars or vessels have been made. The fiber jar, while cheap, is not impervious to the solutions unless mixed or treated with some other ingredient, in which case the material becomes somewhat brittle and about similar to hard rubber, and therefore liable to be cracked if subjected to any rough treatment. The enameled steel jar was introduced to overcome these difficulties. This jar, while not liable to break, is not suitable for all types of cells, as the enamel is attacked by some solutions, and in a short time the metal becomes exposed to the action of the solution and rapidly deteriorates.

In most of the cells now in use no provision is made for the renewing of the elements of the cell without handling the remaining portions of the old elements, and thereby coming in contact with the solution, which in many cases is either acid or alkaline and injurious to the body and closing. Improvements in the construction looking to the elimination of the above-described undesirable features will be fully explained and hereinafter set forth, and suitable claims made for what are considered new and patentable features.

In Fig. 1, 2 is a jar or vessel of material suitable for resisting acid or alkaline solutions, preferably of hard fiber. This jar may be of any desired shape or size. I prefer, however, to make it rectangular, with the corners rounded, thereby utilizing otherwise wasted space when the jars are packed together to be used in batteries. The interior of the jar is filleted in all corners. This filleting not only strengthens the jar, but also provides material in the corners of the jar between the interior and exterior in which the cover-holding bolts may be molded or otherwise fixed. The jar 2 is covered on the outside with a metal jacket or lining 3 of suitable thickness. These jackets are made to gage, and the jars are then molded or pressed into them. The jar is constructed with a flange 2^a, extending downward from its upper edge to any desired depth and projecting outward a distance equal to the distance of the metal covering, so that when the jar is invested by the covering, which abuts the under side of the flange 2^a, the outer surfaces of the covering and jar

are flush. This method of lapping the jar over the jacket makes it impossible for any of the solution contained in the cell getting between them. It will therefore be seen that the jar protects its covering from attack by the solution, while the covering protects the jar from damage from the outside. The cover 4 is of any suitable material, preferably of the same material as the jar, and is of such size and shape that it will be flush with the sides of the jar when placed thereon. A portion of the cover 4 is reduced sufficiently (4^a) to admit of its fitting the interior of the jar, the depression 4^b is to lighten the cover and to retain any of the solution that may ooze out of the cell owing to careless filling, the inwardly-projecting ring 4^c on the under side of the cover 4 is intended only for a support, to which the container 6 and the separator or insulator 8 are secured.

A washer of metal 4^d is embedded in the cover 4 for a purpose which will presently be made clear. The bolts 5 extend through the material of the cell and are entirely removed from the solution. They may be molded in the material or may be inserted in suitable openings before the metal covering 3 is attached. These bolts are prevented from pulling out by the head on the lower end thereof and extend far enough above the top of jar 2 to permit of wing-nuts 5^a being attached after cover 4 is in place. Suitable holes are located in cover 4 to permit of bolts 5 passing through said cover. Gasket 2^b of suitable material for withstanding the solution and possessing elasticity is placed between the top of jar 2 and the under side of cover 4. This gasket 2^b is of such size as to completely cover the space bounded by the external and internal lines of a horizontal section of the jar and is adapted to seal the cell when the cover is placed thereon and wing-nuts 5^a are screwed down.

The container 6, Fig. 1, is of cylindrical form and may be of perforated metal or of a porous material. In this type of cell I prefer to use perforated metal. This cylindrical container fits snugly on the outside of the ring projection 4^c of cover 4 and is preferably permanently secured thereto, but may be so attached as to be removed therefrom if desired. The bottom of the container 6 is made in the form of a frustum of a cone of suitable metal, preferably copper. This shaped bottom is not absolutely necessary but it is so made that the material in the container may slide down the incline quickly when released. A flat bottom, however, can be used, and if shaken when released will answer the same purpose.

The frustum 6^a has attached to it rod 6^b, which is shouldered at 6^c. The frustum when in position fits at its base the inside of the container 6 and projects upward into the container and is flush at its base with the lower edge of container 6. The shoulder 6^c of the rod 6^b at the same time engages the metal washer 4^d, of which reference has been made, of the cover 4, thus permitting no further movement of the frustum in an upward direction. The rod 6^b above the shoulder 6^c is threaded to suit a wing-nut 6^d, which when screwed down holds the frustum rigidly in the container 6. The rod 6^b also extends above the wing-nut 6^d a suitable distance to permit of the wing-nut being unscrewed some distance on the said rod without becoming detached therefrom. When the wing-nut 6^d is backed off to the extreme end of the rod 6^b, the said rod may be pushed downward, carrying with it the frustum or bottom of the cylinder 6 to a point below the said cylinder equal to the distance allowed on the rod 6^b. When the said bottom is thus pushed below the lower edge of the container, the contents of the said container instantly fall out, either into the jar 2 or outside, if the cover has been removed. Suitable vents should be provided in small end of the frustum to permit the escape of air or gas that may be in or may form in the said frustum. There is also attached to the cover 4 the separator or insulator 8, of the same material as the jar and cover, which fits snugly the outside of the container 6 at its upper end and is secured, with the said container, to the cover 4 by the clamp-spring 9, Fig. 4. This separator is preferably not to be removed from the cover, but may be, if desired. As shown in Fig. 3, portions are cut out in order to lighten it. The function of the separator is to support the positive element 7, preferably of zinc, and to separate it from the container and to hold it suspended in the position shown in Fig. 1.

As will be seen in Fig. 3, the separator is circular in form, different cross-sections being of different diameters, and that at one point the material is built out or increased to permit the location of hole 8^a. This hole is of a size sufficient to allow the rod 7^a of the positive element 7 to pass loosely through it. The material of the separator thus forms an insulator for the rod 7^a and protects it from attack by the solution of the cell and prevents local action between the said rod and the zinc and also prevents a short circuit between the rod 7^a and the container 6, which otherwise could occur owing to the light particles which become detached from the elements and rise to the top of the solution, forming a metallic bridge of low resistance between the rod 7^a and the said container 6. The zinc element when in place rests against the shoulder 8^b of separator 8 and is held firmly in place by wing-nut 7^b, which is screwed on the threaded portion of the rod 7^a which extends through the cover 4. If this wing-nut 7^b is removed, the element will instantly drop to the bottom of the jar or to any other place if the cover be removed.

The zinc element 7 is circular in form and of any suitable thickness and is provided with a number of slots 7^c, extending through the wall of the element. These slots 7^c per-

mit of the proper circulation of the solution or electrolyte.

The spring-clamp 9 is adapted to be sprung around the upper part of separator 8. The ends of the clamp 9 are bent and adapted to project through suitable holes in the said separator and also through the container into the ring projection 4^c of the cover 4. More than one clamp may be used, if desired.

Suitable marks may be located on the inside of the jar to indicate how much electrolyte should be used.

The depolarizer used will be solid and of any suitable material. I prefer, however, to use cupric oxid, which may be properly treated and pressed into small cakes or pellets, preferably of about one-quarter inch in diameter and one-quarter inch long, as shown in Fig. 5. Larger or smaller pellets may be used to suit different sizes and forms of the cell, however. It will be apparent that by making the depolarizer in this form that a greater depolarizing-surface is obtained for the same weight of material than in other forms, and that consequently more rapid depolarization takes place, thereby increasing the efficiency of the cell.

The type of cell here shown and described is what is generally called a "liquid-tight" cell—*i. e.*, the liquid will not leak out if the cell is used on boats or automobiles, where it is liable to be constantly kept in motion. If, however, a liquid-tight cell is not required, the cover 4 may be made without the bolt-holes, and the bolts 5 of the jar 2 and the gasket 2^b may be dispensed with.

The method of removing the used elements and of renewing the cell is as follows: Supposing the zinc element to be used up, the solution entirely exhausted, and the oxid reduced, the wing-nut 6^d is run up to the top of the rod 6^b and pressure is applied to the rod, thus forcing it down, and with it the frustum-shaped bottom of the container 6. The oxid pellets then drop into the jar, and the wing-nut 7^b is then removed from the rod 7^a of the zinc element 7, which element, or what is left of it, also falls into the jar. The cover wing-nuts 5^a are then removed and the cover 4 lifted off. The used solution, with the remains of the elements, is then thrown out of the jar and new solution placed therein. The cover 4, with its attached parts 6 and 8, is then reversed or turned upside down. While in this position a new zinc 7 is placed into the end of the separator, its rod 7^a being inserted in the hole 8^a. This end projects through the cover 4, to which threaded end is secured wing-nut 7^b. The zinc is now firmly secured to the separator and cover. The inverted frustum 6^a, while in this position, extends enough above the end of the container 6 to admit of pouring fresh oxid from a suitably-shaped carton into the said container. When the contents of the carton has been placed in the container 6, the rod 6^b, with the bottom 6^a, is pulled down until the shoulder 6^c engages with the washer 4^d of the cover 4. The wing-nut 6^d is then screwed tight against the cover 4, thus firmly securing the oxid in the container. The cover 4, with the renewals attached, is then placed over the bolts 5 on the jar 2 and the wing-nuts 5^a replaced and tightened up, and the cell is then ready to be placed in commission. The amount of time consumed in renewing my improved type of cell is less than one-half that required for the renewal of any other cell now in use. The principal advantage, however, is that it is not necessary to handle either the solution or elements. This feature alone will be of great value to users of cells requiring frequent renewals. Any person without experience in setting up cells may set up or renew this cell without fear of injury to body or clothing, and do so in extremely short time.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a voltaic cell the combination of a jar or vessel with suitable cover, a container for holding one of the elements, and attached to the said cover and having a releasable bottom, said bottom arranged and adapted to be released and replaced by manipulation from the outside of said cell.

2. In a voltaic cell the combination with a jar or vessel and cover for same of an insulating-support attached to the said cover, said support adapted to receive and hold suspended one of the elements, this said element adapted to be released from the said support by manipulation from the outside of the cell.

3. In a voltaic cell the combination of a vessel and cover for same, a container for holding one of the elements and attached to said cover and having a releasable bottom, an insulating-support for holding the other element, also attached to cover means on the outside of said cell for releasing each or both of said elements without having to touch any internal part of the cell.

4. In a voltaic cell the combination of a vessel and cover for same, a container for one of the elements and having a displaceable bottom, a connection with said bottom accessible from the cover of the cell, said connection when manipulated adapted to displace or replace the said bottom.

5. In a voltaic cell, the combination of a vessel and cover for same a support for one of the elements and attached to the said cover an element and connection for same, said connection extending through and protected by the said support and means on the outside of the cell for holding the said element and releasing it from the said support.

6. In a voltaic cell the combination of vessel for holding the fluid, a cover for the cell having suspended therefrom a receptacle for holding one of the elements, and an insulating-support for holding the other element, connections on the said cover arranged to permit of the release of each or both elements.

7. In a voltaic cell the combination of a vessel for holding the fluid, a detachable cover for the said vessel, a receptacle for containing one of the elements, and suspended from the under side of said cover, into the said vessel, a displaceable bottom for the said receptacle, means on the outside of said cover admitting of the displacement of the said bottom and of retaining the said bottom in the displaced position, so that when the cover and receptacle are turned over, sufficient space exists between the bottom and the end of the receptacle to admit of refilling the receptacle, and means for replacing and securing the said bottom in the receptacle.

8. In a voltaic cell the combination of a containing vessel and cover for same, a support for one of the elements, and a hollow receptacle for the other element, the said receptacle having a displaceable bottom which is arranged to be displaced and replaced without touching any interior portion of said cell, and said receptacle adapted to be emptied and refilled without touching it with the hands.

In testimony whereof I have hereunto signed my name, this 28th of March, A. D. 1902, in the presence of two subscribing witnesses.

HERBERT B. TAYLOR.

Witnesses:

PERCY B. TAYLOR,

F. O. RUNYON.