

V. G. APPLE.
GALVANIC CELL.

APPLICATION FILED NOV. 19, 1914.

1,174,798.

Patented Mar. 7, 1916.

Fig. 1.

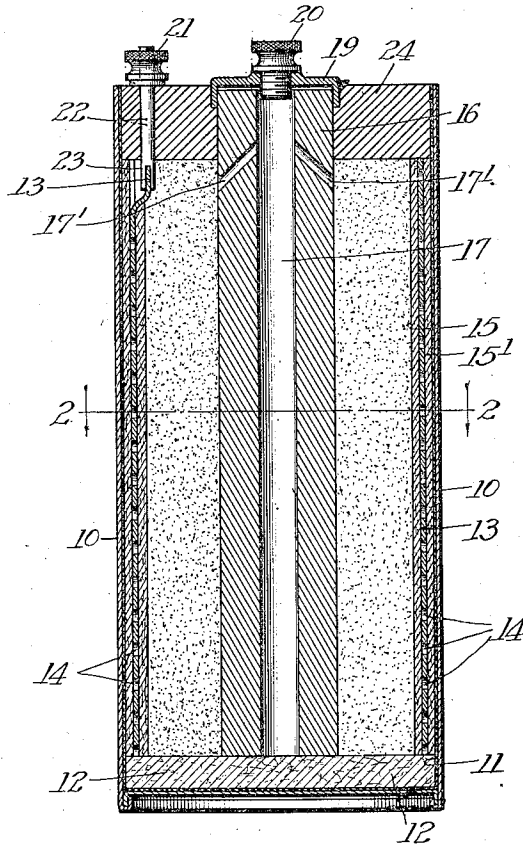
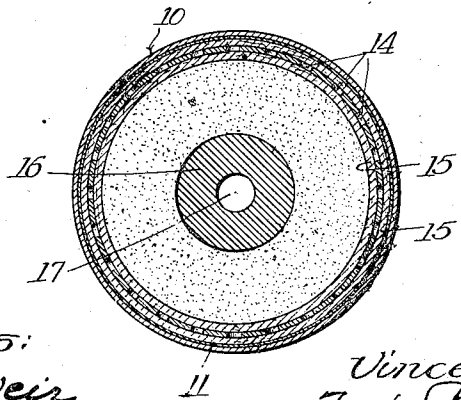


Fig. 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

VINCENT G. APPLE, OF DAYTON, OHIO.

GALVANIC CELL.

1,174,798.

Specification of Letters Patent.

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Application filed November 19, 1914. Serial No. 872,980.

To all whom it may concern:

Be it known that I, VINCENT G. APPLE, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Galvanic Cells, of which the following is a specification.

My invention relates to improvements in galvanic battery cells and has especial reference to the type known as dry batteries.

One of the objects of my invention is to cheapen the production; increase the efficiency and prolong the useful life and durability of such cells.

Other and further objects of my invention will become readily apparent, to persons skilled in the art, from a consideration of the following description when taken in conjunction with the drawings, wherein—

Figure 1 is a central, vertical section of my improved cell. Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1.

In all the views the same reference characters are employed to indicate similar parts.

Heretofore, so called dry cells have been made complete, capable of immediate operation without the necessity of any subsequent manipulation, treatment or preparation on the part of the user, after they have left the manufacturer's hands. In manufacturing such cells the zinc or positive element, is made in the form of a cup and used as the container for the depolarizing agent, the electrolyte and the carbon or negative element. In such structures only the inside surface of said cup element is available for contact with the electrolyte, the outside surface being without the interior of the cell, therefore, one-half of the surface efficiency is lost and, furthermore, the ultimate and unequal decomposition of the zinc, resulting from local action, renders the container weak in spots and insufficient for the purpose for which it is intended as a container, before it has lost its usefulness as an element of the cell and become exhausted.

The exposed or exterior surface of the metal of the cup, of the cell as now made, is liable to "ground" or "short-circuit" a battery, or series of such cells, when such a battery rests upon a damp floor or other conducting base.

The act of making the sheet zinc into a cup, or container, is an expensive operation and the application of solder to the seams

encourages disintegration due to local action, effected by contact of the zinc with the lead alloy, in the composition of solder, in the presence of the electrolyte.

Another disadvantage of the dry cell, as now constructed, and which my improved structure overcomes, is the ever presence therein of the hydrated excitant salts, which produces a deleterious local action and which action is intensified, in such structures where the salt is incorporated in a gelatinous mass or a spongy agency, such as agar-agar, wool glass or other like materials, as frequently occurs.

In carrying my invention into effect I provide a relatively cheap container or cup 10 made, preferably, of paper, or the like, and treated on the inside surface with a neutral, water-proofing lining 11, such as bakalite, condensite asphaltum, or the like, sufficiently elastic to prevent cracking in cold weather. The fibrous or paper body may be saturated with such materials as paraffin, or similar water-proofing and rather elastic agency so as to prevent moisture from penetrating the walls of the cell before the active electrolyte salts or solution are placed within it and to make the container waterproof after the addition of the electrolytic solution or water to the cell.

I place in the bottom of the cell a disk or series of disks 12 of porous material, such as blotting paper sheets, or other such substance, that is non-hygroscopic and will be substantially unaffected by the electrochemical action of the cell, or by any fluids contained therein. A sheet of zinc 13, or other similar material, composing the positive element of the cell, may be arranged concentrically in the container and provided with perforations 14, and on each side of this positive element I place a sheet of inert porous material 15—15' such as blotting paper or the like to operate as porous diaphragms and to assist the depolarizing agents to prevent the accumulation of gas or polarization of the positive element. The perforations 14 are placed through the sheet of zinc or the like, so that electro-chemical action on each side thereof may be available. Near the center of the cell I place a hollow cylindrical negative element 16 such as a carbon having a central axial bore 17 and one or more transverse intersecting bores 17', and having its base resting upon the mat of porous material 12.

Within the space, between the negative element 16 and the positive element 13, I fill in with a depolarizer such as carbon in a granular form mixed with a sufficient quantity of granular peroxid of manganese, and when desired a proper quantity of dry sal ammoniac, all of which substances, when in a dry state, are normally inert and which remain in this condition until the battery is charged by addition of a proper quantity of water to produce the necessary electrochemical activity.

The binding screw 21, which affords the negative terminal of the cell, is provided with a depending stem 22, split as at 23, which split portion straddles the element 13 and is attached or soldered thereto. In this connection both of the terminals 20, 21 are within the transverse boundary of the cell, or jar, so that the terminals of adjoining cells may not accidentally be brought into contact therewith.

A very good proportion of filling material, when a battery of the Le Clanche type is to be made and one which will produce most excellent results in a cell having 50 grams of zinc, is to place 100 grams of peroxid of manganese, 100 grams of sal ammoniac or chlorid of ammonia, mixed with a sufficient quantity of granular coke to fill in the space between the central cylindrical carbon and the zinc cylinder. After the cell has been filled and packed with the dry contents, as shown in Fig. 1, I prefer to seal the end of the containing cut 10 with a disk of pitch or asphaltum 24, to render it practically water tight. The cell is now completed, so far as the manufacture thereof is concerned, and in its present state it may be kept upon the shelves of the dealer for a protracted period of time without any perceptible deterioration. The substances within the cell are dry and electrically inert, in the absence of water, and do not possess the quality of deliquescence or of absorbing moisture, thereby to produce the electrolytic activity.

When it is desired to use the cell, it is then necessary to remove the cap 19 and terminal 20 and to fill the interior of the element 16 with water when a granular ammonia salt is one of the components of the cell, or with a saturated solution of ammonium chlorid or sal ammoniac in proper quantity dissolved in water, until the water will not take up any more of the material, when it is not. As soon as this solution is poured into the bore 17 it passes to the bottom and saturates the non-hygrosopic disk 12 and the granular contents and the depolarizing diaphragms or sheets 15-15' on either side of the zinc element, which will take up the electrolytic solution or water and communi-

cate it to the other element and to the granular contents. The liquid will also pass through the transverse openings 17' into the granular material surrounding the carbon.

In making the cell it is well to mix a few drops of mercury in the granular material, so that when the circuit is completed from the cell, an amalgam is formed which will coat the zinc surface rendering every available part thereof subject to a uniform electrochemical activity by the contained electrolyte.

After the water or electrolytic fluid, placed in the cell by the user, has become substantially exhausted, by decomposition, it may be replenished by other similar fluid of the same quality, in the same manner, and the cell will continue in useful operation until substantially all of the zinc and the peroxid of manganese has been consumed.

The chlorid of ammonia may be left out of the cell, when it is being manufactured, in which event it will be necessary to insert a saturated solution of chlorid of ammonium to prepare it for use instead of water alone.

While I have herein shown a single embodiment of my invention for the purpose of clear disclosure it is evident that considerable change may be made in the configuration and disposition of the parts, the form and character of the elements and materials used within the spirit and scope of the appended claims.

Having described my invention, what I claim is:—

1. A dry battery cell comprising a retaining cup, positive and negative elements, a granular material within said cup adapted to serve as a depolarizing agent on the addition of a liquid thereto, a liquid receiving duct electrically connected with one of said elements, and a wire-connecting terminal screw threaded into said duct and forming a closure therefor.

2. A dry battery cell comprising a retaining cup, a tubular negative element in the center of the cup, a positive element, a granular material within said cup adapted to serve as a repolarizing agent on the addition of a liquid thereto, a metallic cap overlying the upper end of the tubular element and having a threaded liquid receiving opening therein, and a wire-connecting terminal screw threaded into the threaded aperture and forming a closure therefor.

In testimony whereof I hereunto set my hand in the presence of two subscribing witnesses.

VINCENT G. APPLE.

In the presence of—
EDITH PRATHER,
MORRIS P. CROMER.