Feb. 26, 1924.

1,484,926

R. C. BENNER

DRY CELL

Filed May 18, 1921

3 Sheets-Sheet 1

Fig. 1.

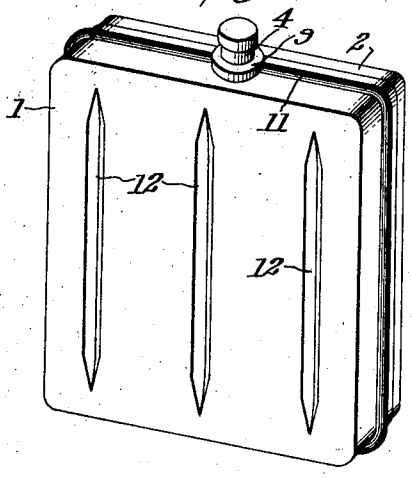


Fig. 2.

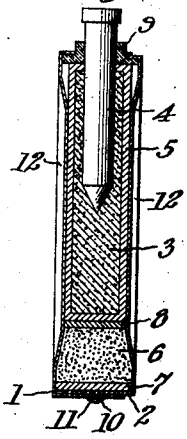


Fig. 3.

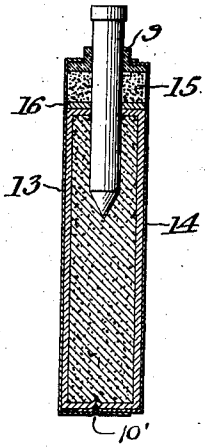
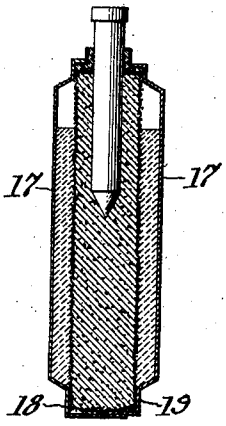


Fig. 4.



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Fig. 6.

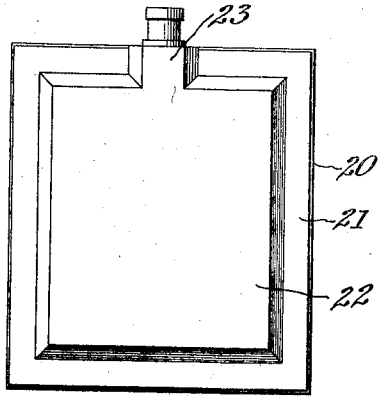


Fig. 5.

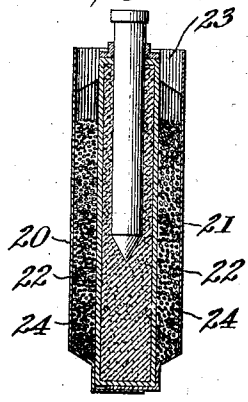


Fig. 7.

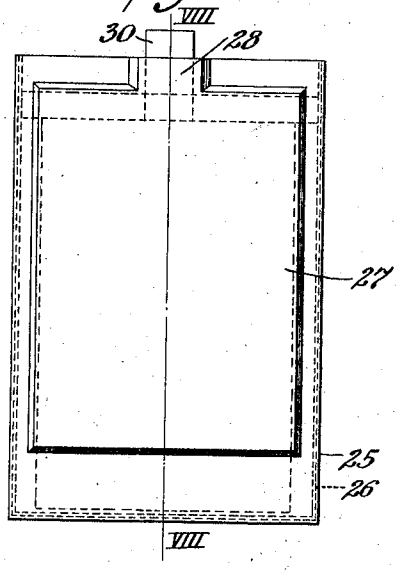
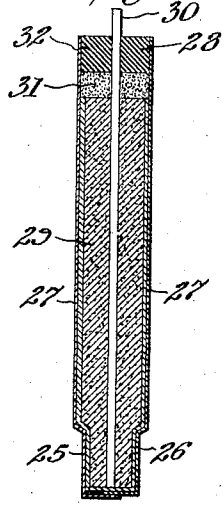


Fig. 8.



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Fig. 9.

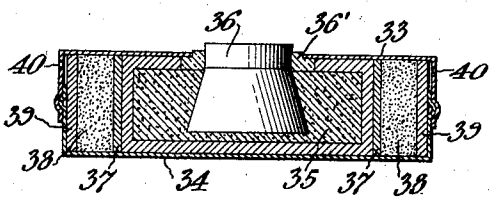


Fig. 10.

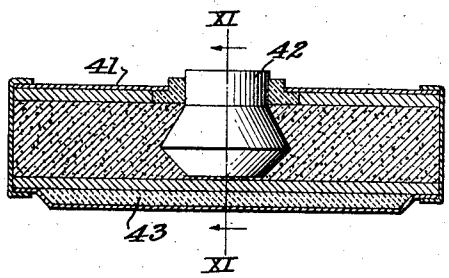
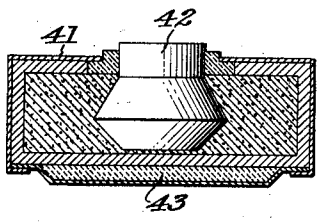


Fig. 11.



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Patented Feb. 26, 1924. 1,484,926

UNITED STATES PATENT OFFICE.

RAYMOND C. BENNER, OF FREMONT, OHIO, ASSIGNOR TO NATIONAL CARBON CO. INC., A CORPORATION OF NEW YORK.

DRY CELL.

Application filed May 18, 1921. Serial No. 470,492.

To all whom it may concern:

Be it known that I, RAYMOND C. BENNER, a citizen of the United States, residing at Fremont, in the county of Sandusky and State of Ohio, have invented certain new and useful Improvements in Dry Cells, of which the following is a specification.

This invention relates to dry cells and has special reference to improvements in that type in which the anode elements are substantially plane and the assembled cell has flat exterior surfaces.

It is an object of my invention to provide an improved flat cell construction embodying a new type of metal container electrode which facilitates assembly and holds the cell elements under compression. A further object is to provide a novel bag type cell, especially adapted to heavy service. Other objects and advantages of the invention will be apparent from the appended detailed description of preferred embodiments, illustrated in the accompanying drawings, in which—

Fig. 1 is a perspective view of a cell constructed according to my invention;

Fig. 2 is a vertical transverse section through the cell shown in Fig. 1;

Fig. 3 is a view similar to Fig. 2, showing a modification;

Fig. 4 is a vertical transverse section through a flat cell of the bag type;

Fig. 5 is a similar view, showing a cell of the deferred action type;

Fig. 6 is a front elevation of the cell shown in Fig. 5;

Fig. 7 is a front elevation of another type of cell, showing the interior elements in dotted outline;

Fig. 8 is a vertical transverse section on line VIII—VIII of Fig. 7;

Fig. 9 is a vertical longitudinal section through a flat cell having its carbon electrode protruding from the side;

Fig. 10 is a vertical longitudinal section through a cell having a modified form of container; and

Fig. 11 is a vertical transverse section taken on line XI—XI of Fig. 10.

Referring to Figs. 1 and 2, reference numerals 1 and 2 denote the cooperating sections of a metal container electrode. A flat mix cake 3, moist with electrolyte solution, is fitted within the smaller section 2 and carries a carbon rod 4, which projects through suitable alined openings in the metal sections. A lining 5 of pulpboard or other bibulous material, which may be provided with paste in the usual manner, is wrapped about the mix. An air space 6, defined by pulpboard strips 7 and 8, may be left at the bottom of the cell and is preferably filled with sand or other granular material so as to prevent crushing of the mix cake when pressure is applied in the assembly of the cell. A flanged insulating collar 9 encircles the projecting part of the carbon rod 4 and spaces it from the metal container sections 1 and 2.

These sections are preferably so shaped as to tightly engage each other and to exert a compressive force on the contents of the cell. This result is obtained, in the form shown by providing a bead 10 on the smaller section 2, and a cooperating groove 11 on the section 1 which may be sprung over the bead. Various other methods of holding the container sections together may be adopted, some of which will be referred to in connection with the other forms of the invention. The top and bottom of the container electrode may have longitudinally depressed portions 12 which increase their rigidity and bear against the inner elements of the cell.

The cell illustrated in Fig. 3 is in general similar to that just described, but its container sections 13 and 14 have plane surfaces pressing the lining against the mix and are adapted to be secured together by prick punching 10′ or the like. Also, the air space 15 is placed adjacent the carbon terminal, which arrangement presents some points of advantage over the bottom air space previously described. A pulpboard partition 16 and flanged insulating collar 9 provide the base and top of the air space 15.

In Fig. 4 a novel form of flat cell of the bag type is shown. The mix cake is wrapped in cheesecloth, or other suitable fabric, and relatively thick layers of paste, retained in depressed chambers 17 in the zinc container sections 18 and 19, rest against the sides of the wrapped mix. These chambers should not be completely filled, so that room may be allowed for expansion due to the evolution of gas or other causes when the cell is subjected to heavy current drain. The arrangement of the cell is in other respects like that previously described.

My invention as applied to a cell of the deferred action type will be described in connection with Figs. 5 and 6. In these figures, 20 and 21 denote telescoping container sections having chambers 22 pressed therein. A narrow passageway 23 forms an extension of each chamber and opens adjacent the top of the cell. The mix cake is wrapped and spaced from the metal parts as previously described, and should be substantially dry. A dry material 24, adapted to form an excitant paste when water or electrolyte solution is added through openings 23, is contained in chambers 22. It may be placed therein before assembling the cell or subsequently introduced through openings 23. As the cell contains no moisture it does not deteriorate through premature electrolytic action or other causes.

The paste forming substance may be of any desired kind, but I prefer to use a dry granular material of the type specified in the copending application of R. C. Benner and H. F. French, Serial No. 356,496, filed February 5, 1920, as such material permits the water or electrolyte solution to percolate rapidly throughout its entire mass and substantially immediate activation is obtained. If desired, an easily removable plug may be inserted in openings 23 to prevent the paste forming material from being shaken out on handling the cell.

Figs. 7 and 8 illustrate a somewhat modified form of cell in which the carbon electrode is a thin flat plate having an area approximating that of the container electrode. Container sections 25 and 26 have depressed portions 27 with communicating passageways 28. A wrapped mix cake 29 is formed about the electrode 30 and is shaped to be snugly received between the recessed container sections, which are compressed upon it and secured in any desired manner. An air space 31 is left adjacent the top of the cell and is preferably filled with sand, on which is placed a seal 32 of plastic material encircling the protruding end of the carbon electrode 30 and spacing it from the container.

Fig. 9 shows a flat cell having its electrodes so arranged that series connection between the cells may be made by merely piling them one upon the other. Zinc container sections 33 and 34 are locked, as shown, about a flat wrapped mix cake 35 in which is embedded a carbon block 36 having a narrowed portion extending through an opening in the top of section 33. A collar 36′ insulates the carbon block from the container. Spacing sheets 37 form the inner wall of an air space 38, which may have a sand filling. At the outer sides of the air space and adjacent the zinc container, paraffined pulpboard sheets 39 are placed. A vent 40 is provided in the section 33 for the escape of gases. Cells of this type desired for especially heavy service may have a pocket pressed in the bottom of the lower container section, as indicated by reference numeral 43, Fig. 10. The pocket may contain less than a full charge of paste. If desired, no paste need be placed in the pocket and it will serve merely as an expansion chamber to receive displaced excitant and thus prevent leakage.

A simplified form of container electrode is shown in Figs. 10 and 11. This consists of a sheet of zinc 41 closely folded about a flat mix cake and compressing a pasted pulpboard lining upon it. The sheet 41 has an opening through which the narrowed portion of a carbon electrode 42 projects and may also have a depression 43 adapted to receive paste. The carbon electrode is embedded in a wrapped mix cake and is provided with an insulating collar, as previously described. The ends of the zinc sheet have an overlapping engagement. The rigidity of the metal may be depended upon to hold the sheet in position or positive securing means may be used. The exposed ends of the assembled elements may be coated with a waterproof cementing material, such as celluloid dissolved in a suitable volatile solvent, which aids in retaining them in position and prevents evaporation of moisture.

The construction of flat cells is considerably simplified by employing container electrodes of the types described herein, as the metal parts may be rapidly formed by stamping or extrusion and securely fastened without the use of solder. In addition, the service characteristics of the cells are improved. An increased zinc surface is provided and the elements are retained in a state of compression, thus increasing the amperage and preventing loosening of the mix.

The flat carbon electrode of large area used in the cell shown in Figs. 7 and 8 diminishes the internal resistance of the cell and may be used advantageously in place of the rod shaped electrodes illustrated in certain of the other figures. The form of the carbon element in the cells of Figs. 9 and 11 may also be considerably varied, but it is desirable to make the embedded part conical, beveled or otherwise so shaped as to resist movement in the mix. Numerous other alternative arrangements may be made without departing from the invention as defined in the appended claims.

I claim:

1. In a dry cell, a cathode element, and an anode about said element, said anode having a recessed portion adapted to receive excitant paste displaced during operation of the cell.

2. In a dry cell, a cathode element, and an anode comprising cooperating sections adapted to receive said element, said anode

having a recessed portion adapted to receive excitant paste displaced during operation of the cell.

3. In a flat cell, a cathode element, and an anode comprising cooperating sections adapted to receive said element, said anode having a recessed portion adapted to receive excitant paste and a filling opening for said portion.

4. An article of manufacture for use in voltaic cells of the flat type, comprising a mass of depolarizing mix having flat sides adapted to form the upper and lower surfaces of the mix when in operative position, and a carbon electrode embedded in the mix and protruding from one of such sides.

5. The invention according to claim 4, in which the carbon electrode has an embedded portion of such conformation as to prevent loosening of the electrode in the mix.

6. A dry cell comprising a metal container provided with an opening, a block of depolarizing mix having a flat side and adapted to fit within the container, and a carbon element projecting from said flat side through the opening.

7. A flat cell comprising a container electrode, an electrode of opposite polarity within the container and surrounded thereby, means for making contact with the second electrode through the side of the container, and an air chamber adjacent the second electrode.

In testimony whereof, I affix my signature.

RAYMOND C. BENNER.