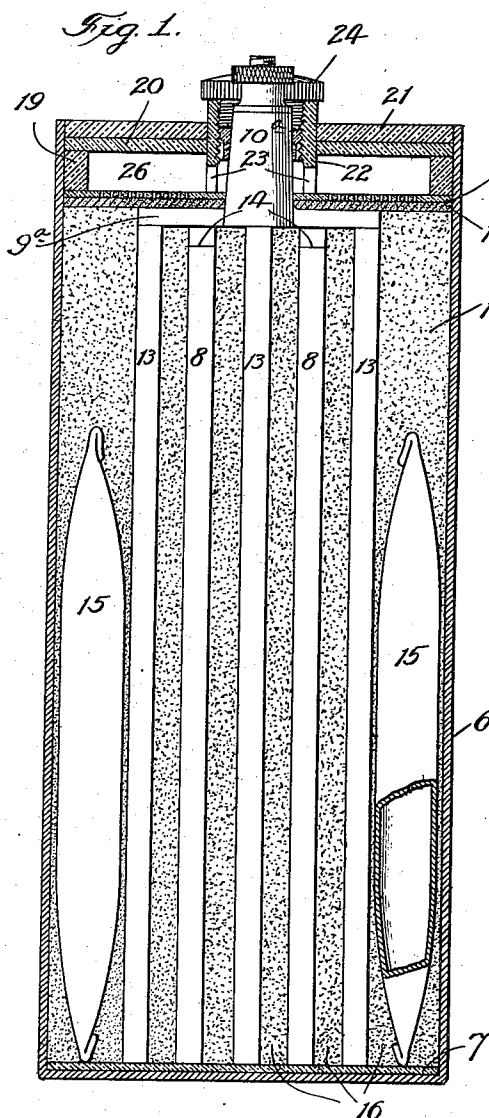
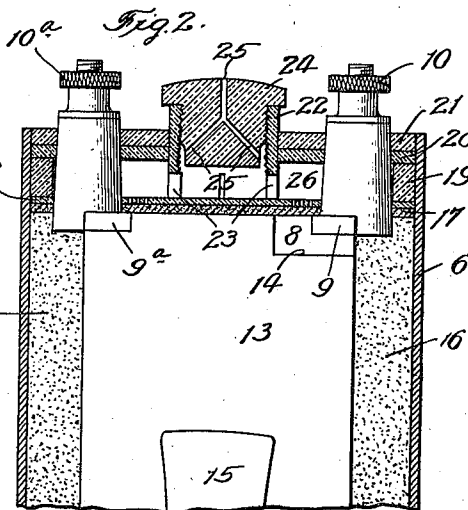
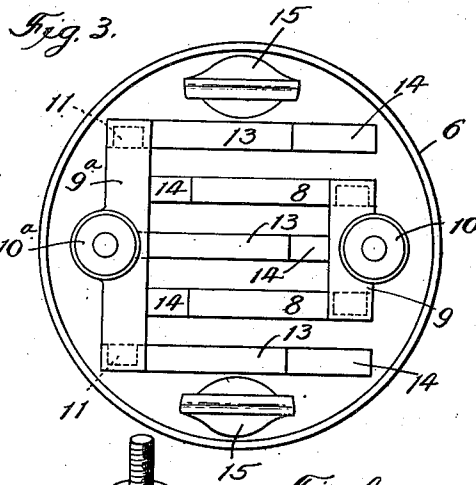
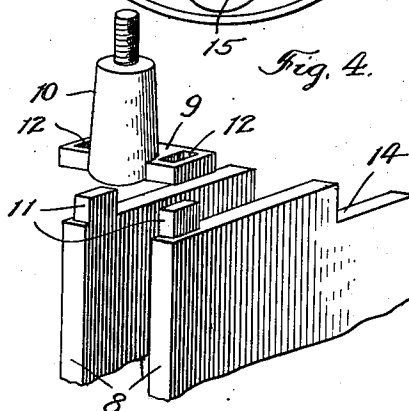
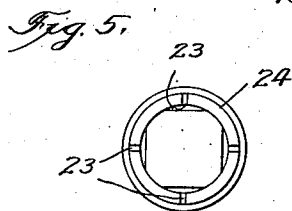


W. A. CROWDUS.
STORAGE BATTERY.
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WALTER A. CROWDUS, OF CHICAGO, ILLINOIS.

STORAGE BATTERY.

1,269,162.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER A. CROWDUS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Storage Batteries, of which the following is a specification.

My invention relates to improvements in the class of dry storage-batteries, in which the electrolyte or excitant employed is non-flowing and comprises suitable absorbent inert solid matter holding the liquid excitant, which is distributed throughout the solid mass.

In charging a battery of the type referred to, the resultant gas-production augments the volume of the liquid, tending to cause it to overflow the jar or container and thus be wasted and produce impoverishment of the cell; and one of the more important objects of my invention is to provide against these effects. Another important object is to provide for automatically maintaining the proper degree of saturation of the solid absorbent matter with the liquid excitant in a manner to cause surplus thereof to become stored within the battery-cell and to exude from the storage into the solid matter or holder whenever the latter becomes impoverished of the liquid.

These and other objects are accomplished by the construction illustrated in the accompanying drawing, in which—

Figure 1 is a vertical section of a storage battery embodying my improvements; Fig. 2 is a vertical section of the same at a right-angle to the section on which Fig. 1 is taken, with the lower part of the structure broken away; Fig. 3 shows a plan view of the cell before it is filled with the solid liquid absorbent matter and "formed;" Fig. 4 is an enlarged perspective view showing two of the grids to which the active material, or material to be rendered active, is applied and a disassociated terminal of desired construction for uniting grids; and Fig. 5 is a bottom plan view of a plug or stopper for venting the overflow-chamber of gas generated in charging the cell.

The container 6 may be of glass, hard rubber, or other suitable material and of any desired shape (that shown being cylindrical) and dimensions. A pad 7, of hard rubber, vulcanite fiber, or the like, is shown in the container on its closed bottom. Grids 8 carrying, in the usual manner, the active

material, or material to be rendered active, and of which two are shown for the positive element of the battery, are connected across their upper ends by a bar 9 provided with a terminal binding-post 10. For this connection each grid has a lug 11 formed on its upper edge near one corner, and the bar 9 has openings 12 in its end-portions to fit over the lugs; and these parts may be lead-burned to unite them. Grids 13, like the grids 8, and of which three are shown for the negative element, have each end-grid likewise provided with a lug 11 to enter openings 12 in a bar 9^a carrying a binding-post 10^a; this bar being likewise secured to the end-grids 13 and also to the intermediate grid, which it crosses, as by lead-burning. The grids 8 have sections cut out of their upper edges, as represented at 14, where the bar 9^a crosses them to be spaced from the latter, and the same is the case of the grids 13 where they are crossed by the bar 9.

With the elements 8 and 13 introduced into the container 6, through its open end, and in which they extend short of the latter for the purpose hereinafter explained, a desired number of tubes 15 of adequately stiff porous material, such as porous paper, are inserted into the container between it and the element-forming grids. These tubes are preferably closed at their ends, as represented. The absorbent holder 16 for the liquid electrolyte, which may be acidulated water, is introduced into the container, filling it preferably to the upper ends of the grids. The inert material for this holder may be any that is suitable and properly porous and absorbent, and is by preference hygroscopic. A mixture of 3 to 4 parts of silicious earth and 1 part of plaster of Paris will serve the purpose. This mixture may be triturated with the liquid electrolyte and the saturated mixture is poured into the container, thereby embedding the elements 8 and 13 and the tubes 15. Thereupon a pad 17 of porous material, such as felt, is introduced to cover the filler 16 and retain it against dislodgment; and a porous or perforated diaphragm 18, which may be hard rubber, numerous perforations, is applied over the porous pad. A washer 19, of hard rubber, or the like, bears against the diaphragm and supports a cover 20, of like material; and a suitable substance 21, such as wax, is filled upon the cover into the container to seal the latter. The parts 17,

18 and 20 contain openings to adapt them to be applied over the binding-posts; and the cover 20 and wax 21 surround a central internally-threaded tube 22, preferably of
 5 hard rubber, bearing against the diaphragm 18 and provided in its inner end with openings 23, to receive a threaded cap or stopper 24, which may be of the same material and is provided with vent-passages 25.

10 The wall of the annular gasket 19 is of a height to form a chamber 26 between the members 18 and 20. The gases generated in charging the battery pass through the retainer 17 and perforated diaphragm 18
 15 into the chamber and escape freely through the vented cap. These gases swell the volume of the liquid electrolyte, causing it to overflow through the members 17 and 18 into the chamber and be stored therein instead of overflowing and spilling out of the
 20 container with resultant wasteful loss and impoverishment of the cell; and when the gas-generation has subsided, the liquid electrolyte resumes its normal volume and the
 25 stored portion thereof returns from the chamber 26 into the holder 16 within the body of the container.

Any surplus of the liquid electrolyte enters the tubes 15 through their porous walls
 30 and is stored until the filler 16 becomes so far depleted of liquid from any cause, such as undue exposure to dry or warm air, that it absorbs thereof, for replenishment, from the store in the tubes or reservoirs 15, on
 35 the principle of action of the well-known "humidor."

The construction thus described provides a practical commercial portable and rechargeable dry storage-battery, costing little
 40 more than the ordinary dry zinc-carbon primary battery, and giving a much larger output than the latter of electricity, in amperes, volts and watt-hours, while capable of supplying a current practically as constant as that of a liquid-electrolyte battery.
 45 Moreover, the loss of the liquid electrolyte in the use of my battery is much less rapid than the loss in free-liquid cells; and it possesses the property in an exceptionally high
 50 degree of retaining its charge on open-circuit or intermittent work. Furthermore, the reservoir and element embedding filler is sufficiently solid and elastic to remain undisturbed and prevent disturbance of the
 55 electrolyte with which it is saturated, in any position of the cell, whether the latter be upright or inverted, and whether the terminals be on the top, as represented, or on the bottom.

I realize that considerable variation is possible in the details of construction thus specifically shown and described and I do not intend by illustrating a single specific embodiment of my invention to be limited thereto, my intention being in the following claims to claim protection upon all the novelty there may be in my invention as fully as the state of the art will permit.

I claim:

1. A storage-battery comprising a container and battery-elements therein, a non-flowing filler for holding a liquid electrolyte in the container and embedding said elements, a vented chamber in one end of the container, a fluid-pervious covering in the
 75 chamber-base confining said filler, and a tube extending through and open at its inner end to said chamber.

2. A storage-battery comprising a container and battery-elements therein, a non-flowing filler for holding a liquid electrolyte in the container and embedding said elements, a vented chamber in one end of the container, a porous retainer in the chamber-base and confining said filler, a fluid-pervious diaphragm covering said retainer, and
 85 a tube extending through said chamber to bear against said diaphragm and open at its inner end to said chamber.

3. A storage-battery comprising a container and battery elements therein, a non-flowing filler for holding a liquid electrolyte in the container and embedding said elements, a chamber in one end of the container, a fluid-pervious covering in the chamber-base confining said filler, a tube extending
 95 through said chamber to bear against said covering and open at its inner end to said chamber, and a vented stopper in said tube.

4. A storage battery comprising a container and battery-elements therein, a non-flowing filler for holding a liquid electrolyte in the container and embedding said elements, and a porous tubular reservoir embedded in said filler and operating to
 105 store liquid electrolyte within the chamber and exude it therefrom through the chamber-wall to said filler.

5. A storage battery comprising a container and battery elements therein, a non-flowing filler for holding a liquid electrolyte in the container and embedding said elements, and a tube of porous material having closed ends and embedded in said filler to form a receiving and exuding reservoir
 115 for the liquid electrolyte.

WALTER A. CROWDUS.