No. 701,319. Patented June 3, 1902.

E. M. FISHELL & W. R. CLYMER.

PRIMARY BATTERY.

(Application filed Oct. 14, 1901.)

(No Model.)

Fig. 1,

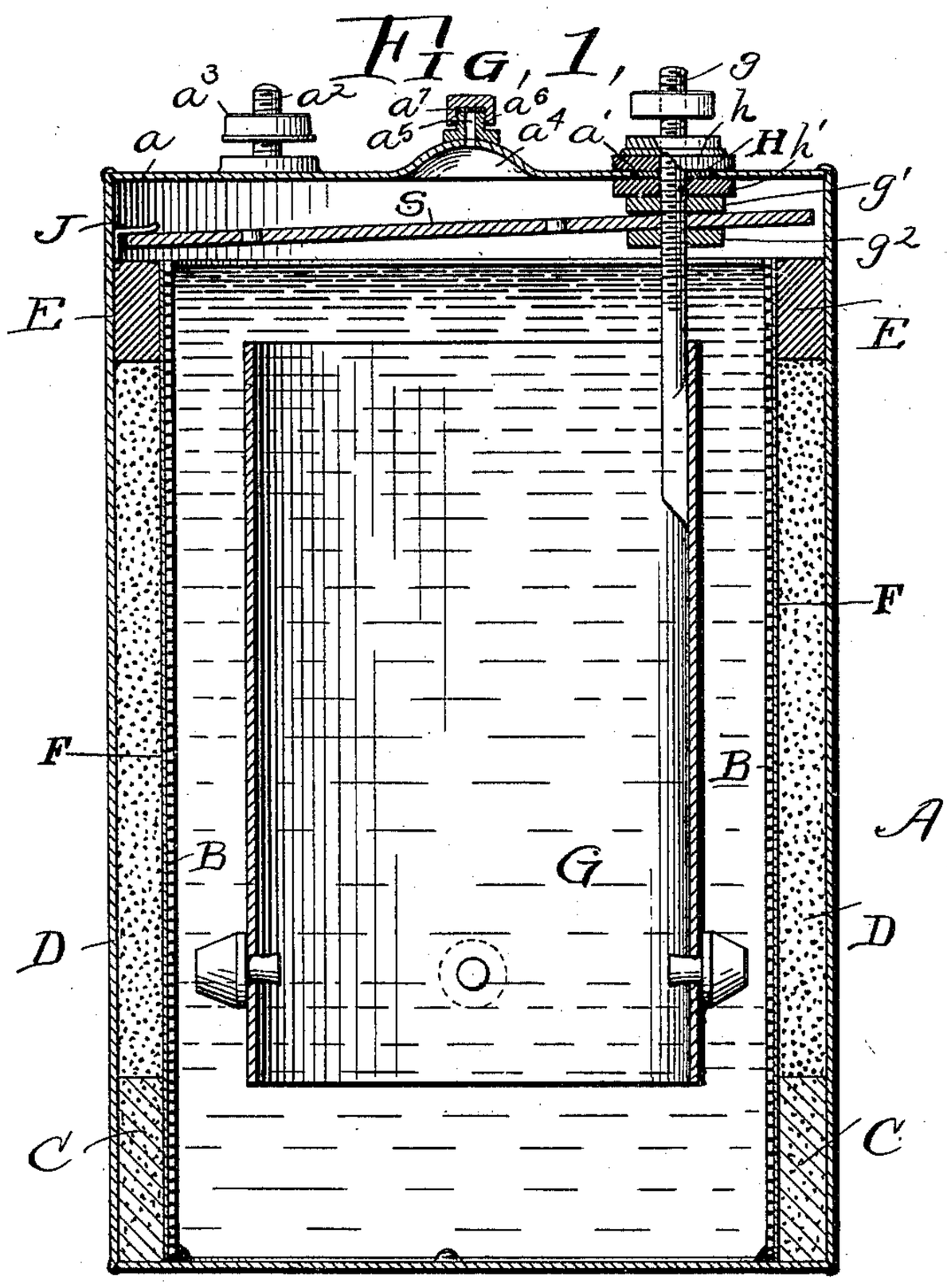
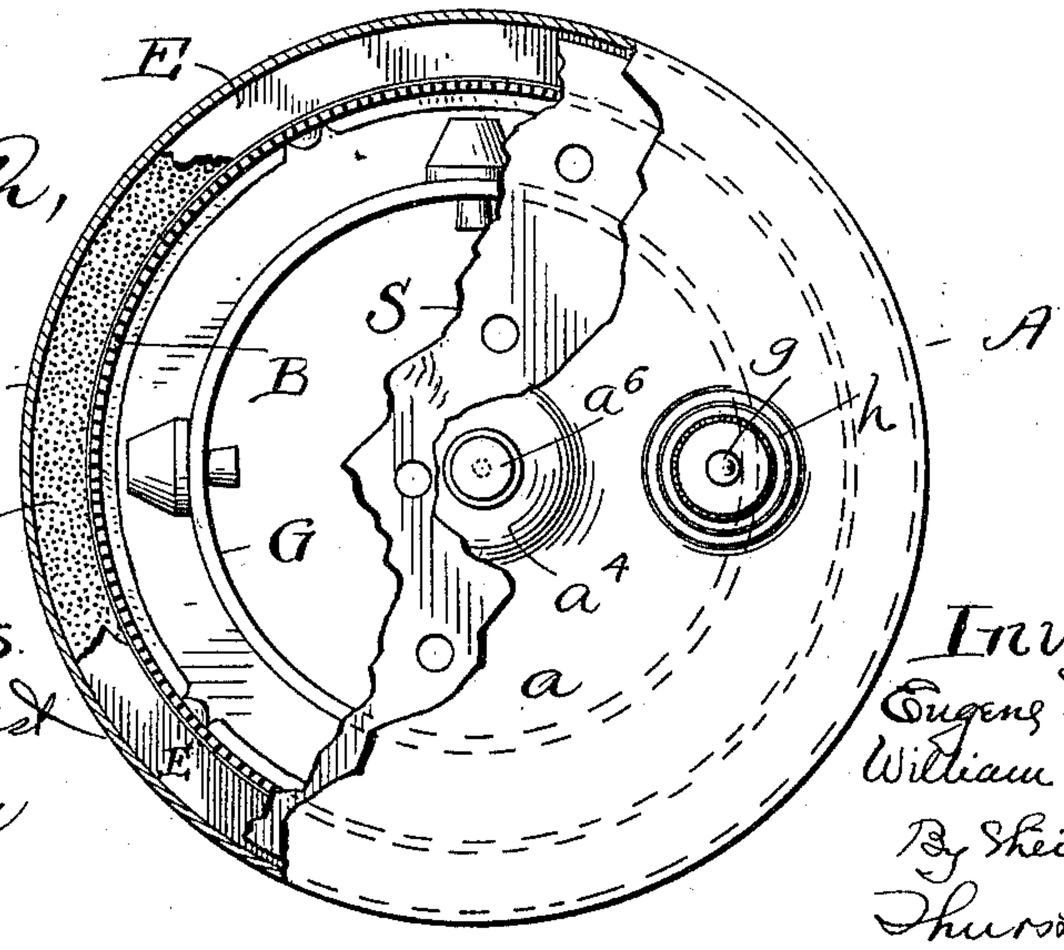


Fig. 2,



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UNITED STATES PATENT OFFICE.

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PRIMARY BATTERY.

SPECIFICATION forming part of Letters Patent No. 701,319, dated June 3, 1902.

Application filed October 14, 1901. Serial No. 78,550. (No model.)

To all whom it may concern:

Be it known that we, EUGENE M. FISHELL and WILLIAM R. CLYMER, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Voltaic Cells, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The invention relates to improvements in "copper-oxid batteries," so called. Such batteries employ zinc for the positive electrode, iron or copper for the negative electrode, cupric oxid for the depolarizing agent, and a solution of caustic soda for the exciting fluid.

The main objects of the invention are to provide a voltaic cell of the character specified which may be very cheaply constructed in such form that it may be shipped in condition to be used and in which the constituent parts are arranged to produce a long-lived cell which will give a maximum output of current until substantially all of its active constituents are exhausted. To effect these results, the negative electrode is formed so that it will also serve as the containing vessel, and it has a cover sealed to it, so that it will be liquid-tight for shipment. The other parts of the cell are constructed and combined with each other and with said vessel, substantially as shown, with a view to producing results above pointed out.

The invention may be conveniently summarized as consisting of the combination of parts provided for the purposes stated, which are shown in the drawings and hereinafter described, as specifically pointed out in the claims.

In the drawings, Figure 1 is a centrally vertical sectional view of a voltaic cell embodying the present invention. Fig. 2 is a top plan view with a part of the cover and a part of the splash-plate broken away and a part of the seal above the depolarizer also broken away.

Referring to the parts by letters, A represents a can or containing vessel which is preferably of cylindrical form and made of tinned iron, which serves both as the containing vessel and as the negative electrode or a part thereof. Within the vessel is a concentric perforated partition B, extending from the bottom up to within a short distance of the top thereof. In what is regarded as the best construction this partition is made of perforated tinned iron, in which case it is soldered to the bottom of the can and forms a substantial part of the negative electrode. The partition B might, however, be made of suitable metallic gauze (copper or iron) and even of some non-metallic materials sufficiently strong and porous. In the annular space between the vessel and this porous partition is placed, first, a layer of sand C; next, a layer of finely-subdivided (granular, flaked, or powdered) black oxid of copper D, (cupric oxid,) which extends to within half an inch, more or less, of the top of the perforated partition. A layer of pitch, asphalt, or other suitable sealing compound E is placed upon this copper oxid, filling the space around the perforated partition to the top thereof. In order to prevent the cupric oxid or the sand from flowing through the perforations of the cylinder B, a layer F, of cotton cloth or other suitable porous material, is laid next to its outer surface, which cloth also preferably extends beneath the partition, thereby forming a seal. When this cloth does so extend, said partition is soldered only at a few points *b* to the bottom of the vessel, the solder in that event passing through holes in the cloth.

The zinc electrode G is of any suitable or ordinary form, and it is suspended by its stem *g* from the cover *a* of the vessel. This cover is hermetically sealed to the top of the vessel, so that when the parts are combined, as shown, none of the caustic-soda solution can escape. The stem of the zinc electrode passes through a hole in the cover from which, if the cover is made of tinned iron, said stem is insulated. The precise construction shown for effecting this insulation and suspension consists of a rubber disk H, surrounding the stem and filling the hole *a'* in the cover, two washers *h* and *h'*, of insulating material, which lie just above and just below the cover, and nuts

g' g^2, which screw onto the stem, and thereby force the said washers against the cover. The projecting end of the stem g also serves as a binding-post. The other binding-post a^2 is a threaded stud secured to the cover a and having a nut a^3 thereon.

Before the vessel is closed it is filled up to about the level of the perforated partition with a solution of caustic soda, after which the cover is sealed upon the vessel, as described. When the circuit of the described cell is closed, a gas is generated. To provide for its escape, the cover is provided with a vent-hole, leading, preferably, from a recess a^4, formed in the under side of the cover. Over this vent-hole a stud a^5 is secured, having a corresponding hole through it. In the construction shown this stud has an external thread on which a screw-cap a^6 is fitted, and in the cap may be placed a rubber sealing-disk a^7. The described vent-hole is sealed by means of this disk and cap when the cell is being shipped. When it is about to be used, this seal is removed, but may be replaced to again close the vent for any subsequent removal or handling of the cell.

Within the cell in the space between the cover and the top of the perforated partition is an inclined splash-plate, which is preferably made of asbestos saturated with paraffin. The stem of the positive electrode passes through this plate, near one edge thereof, which plate is clamped between the nut g' and another nut g^2. The opposite edge of this splash-plate is held in place below the described point of attachment by means of a tongue J, secured to the vessel and bent over the edge of said plate. This plate does not fit the vessel in the preferred construction. If when the cell is being handled any of the solution splashes onto this plate, it will flow down to its lower edge and thence flow back into the space within the partition B. When gas is generated in the cell, it will flow toward and around the raised edge of this plate and thence to the recess in the cover, from which, as before explained, it will escape through the vent-hole.

In constructing the cell substantially as herein described many changes in the specific construction described may be made without departing from the invention as defined by the claims. The construction described is, however, the cheapest and best construction now known. It is so cheap that if the zinc, the depolarizer, and caustic-soda solution are properly proportioned when the cell is being constructed there will be little, if any, waste of either, all being used up at about the same time.

The cell is so cheap that instead of recharging with fresh material when it is exhausted it can be thrown away and a new one substituted. Moreover, this cell is so compactly constructed that it is only one-half the size of other like cells of the same capacity. It can, moreover, be conveniently shipped without spilling the solution or disarranging the parts. This of course makes it unnecessary for the user to handle the caustic-soda solution, and thereby subject himself to the danger of getting some of it on his hands or clothes.

Having described our invention, we claim—

1. In a voltaic cell, in combination, a combined containing vessel and negative electrode, an annular perforated partition within said vessel-electrode mechanically and electrically connected to the bottom thereof, depolarizing material packed in the space between said partition and vessel-electrode, an exciting solution in said vessel, a zinc electrode immersed in said solution, a cover sealed to said vessel, a vent for said vessel above the exciting solution, and means for opening and closing said vent, substantially as specified.

2. In a voltaic cell, in combination, a combined containing vessel and negative electrode made of a suitable metal, a cover sealed to said vessel but having a vent-hole, means for opening and closing said vent-hole, a perforated metallic partition in said vessel mechanically and electrically connected to the bottom thereof, finely-subdivided particles of depolarizing material in the space between said partition and vessel-electrode, an exciting solution in said vessel, a zinc electrode centrally located within said vessel and immersed in said solution and supported but insulated from said cover, substantially as specified.

3. In a voltaic cell, in combination, a combined containing vessel and negative electrode made of a suitable metal, a cover sealed to said vessel but having a vent-hole, means for opening and closing said vent-hole, an annular perforated metallic partition mechanically and electrically connected with the bottom of said vessel, a layer of cloth covering the outer face of said partition, a layer of sand in the bottom of the annular space between said cloth and the vessel-electrode, a layer of finely-subdivided cupric oxid packed in said space above said sand, and a seal in said space above said cupric oxid, a caustic-soda solution in said vessel-electrode, and a zinc electrode immersed in said solution and supported by but insulated from the cover, substantially as specified.

4. A cylindrical containing vessel made of a suitable metal whereby it also serves as the negative electrode, a cylindrical perforated metallic partition concentrically placed in said vessel and mechanically and electrically connected with the bottom thereof, finely-subdivided depolarizing material packed in the annular space between said partition and vessel, a centrally-placed zinc electrode, and an exciting solution of caustic soda in said vessel, substantially as specified.

5. In a voltaic cell, in combination, a combined containing vessel and negative electrode made of a suitable material, a cover sealed thereto but having a vent-hole, means

for opening and closing said vent-hole, a perforated metallic partition secured to the bottom of said vessel, finely-subdivided cupric oxid packed in the space between said partition and vessel, an exciting solution in said vessel, a zinc electrode immersed in said solution having a stem which is attached to but insulated from the cover, and an inclined splash-plate secured in said vessel between the cover and top of said perforated partition, substantially as specified.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

EUGENE M. FISHELL.
WILLIAM R. CLYMER.

Witnesses:
C. T. RICHMOND,
V. C. ERNST.