No. 766,958. PATENTED AUG. 9, 1904.

J. A. LYONS & E. C. BROADWELL.

ACCUMULATOR.

APPLICATION FILED SEPT. 25, 1903.

NO MODEL.

Fig. 2.

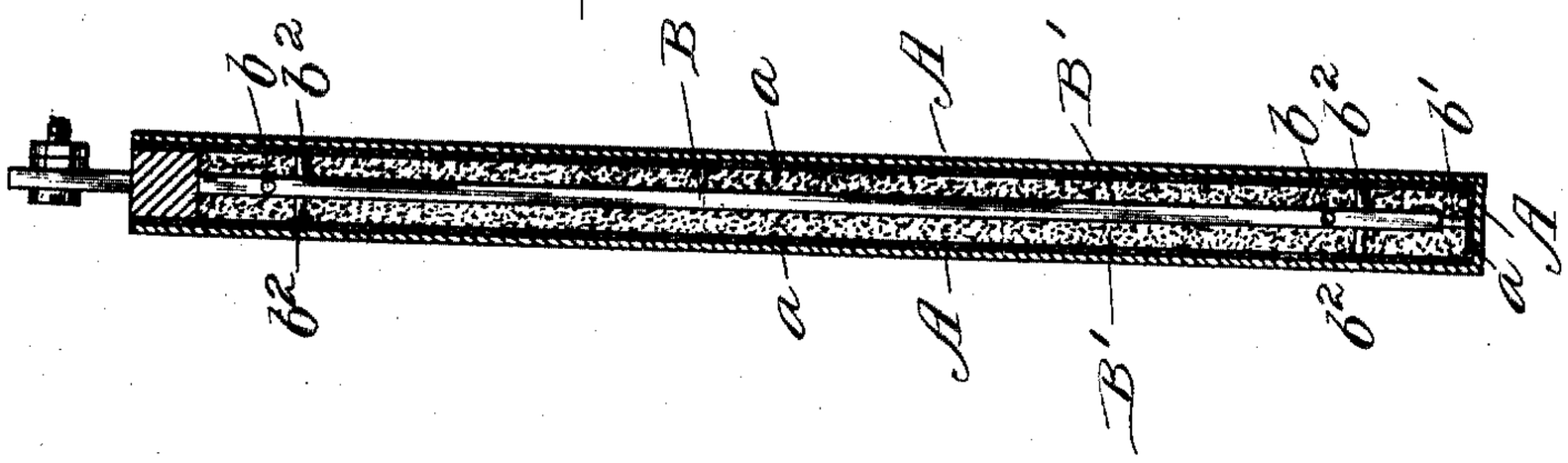
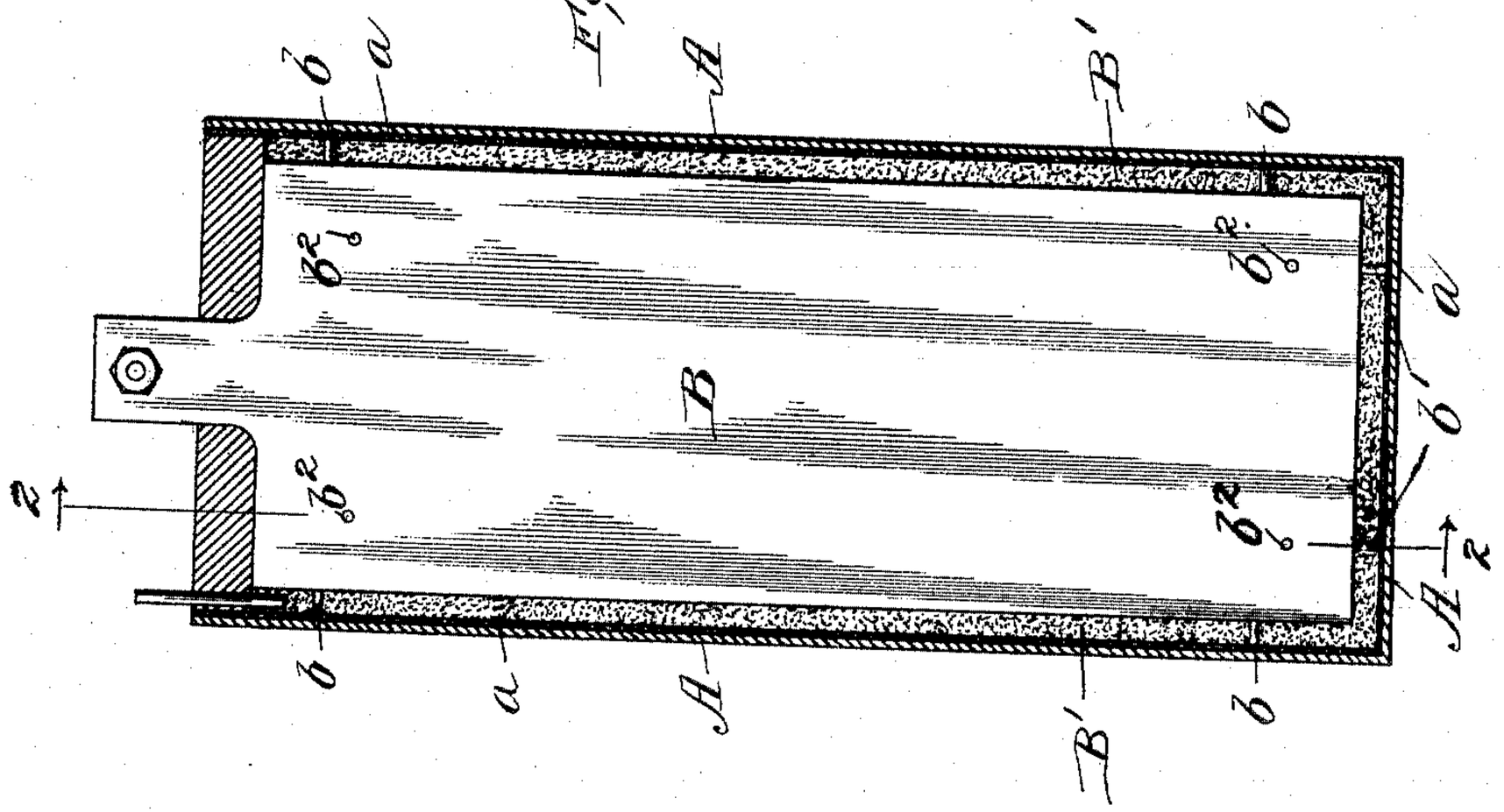


Fig. 1.



Witnesses:
Ray White
Harry D. Lubliste

Inventors.
John A. Lyons,
Edward C. Broadwell.
By Charles M. Higgins

No. 766,958. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

JOHN A. LYONS AND EDWARD C. BROADWELL, OF CHICAGO, ILLINOIS.

ACCUMULATOR.

SPECIFICATION forming part of Letters Patent No. 766,958, dated August 9, 1904.

Application filed September 25, 1903. Serial No. 174,674. (No model.)

To all whom it may concern:

Be it known that we, JOHN A. LYONS and EDWARD C. BROADWELL, citizens of the United States, and residents of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Accumulators; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in accumulators, and more particularly to an accumulator adapted to maintain a charged condition for a long period of time without injury.

Heretofore it has been customary to employ strong acids or a corrosively-alkaline electrolyte together with metallic elements or conductors adapted to be more or less affected thereby. This tends to shorten the life of the cell, especially if left in a charged condition for a considerable period of time.

The object of this invention is to provide an electrolyte which under all conditions is neutral or weakly basic, according to the indicator used for test.

It is also an object of the invention to secure high degree of efficiency with slight weight as compared with the accumulators now in use.

The invention consists in the matters hereinafter described, and more fully pointed out and defined in the appended claims.

In the drawings, Figure 1 is a vertical section of a cell, illustrating a cell embodying our invention. Fig. 2 is a section taken on line 2 2 of Fig. 1.

As shown in said drawings, A indicates a metallic jar or receptacle having fitted therein a lining of fabric *a*, such as cotton cloth or other material, and which, as shown, is in contact with the bottom and wall of the jar or containing vessel.

B indicates an anode-plate, of graphite platino-iridium or other inert substance, insulated from the receptacle by means of the supporting-pins *b b' b²*, which may be of carbon or other insulating material. This anode is surrounded by a mixture B' of carbonaceous material—such as charcoal, retort-carbon, or graphite—which may be mixed with infusional earth and the oxid, hydroxid, or oxysalts of such metals as give two or more forms of oxids—such as lead, nickel, cobalt, cerium, or such like—and which can pass from a lower to a higher state of oxidation. This in a pasty consistency is placed around said anode-plate and the mass saturated with a solution of either a basic haloid of the oxysalt or its equivalents of the metal, by the electrolysis of which deposition in reguline state occurs at the cathode. In practice we prefer to use as the electrolytic salt zinc oxychlorid or zinc chlorid or bromid holding zinc hydroxid or oxid, or a zinc-oxid-bearing salt holding the zinc oxid with weak affinity in suspension or weak chemical solution, although it is evident the basic sulfate, basic nitrate, or any other oxysalt of zinc can be utilized to carry out the purposes of our cycle of chemism and also that the oxy or other basic salt of tin, cadmium, copper, or the like can be substituted for the oxysalts of zinc; yet zinc oxid or hydroxid must always, if zinc salts are used, be present in excess. The function of the basicity of the salt, which is the foundation of the results obtained, lies in the neutralization of the acid anolyte set free with the oxygen, chlorin, or bromin at the anode, as the case obtains.

The mechanism of reaction is as follows: After the zinc, cadmium, copper, tin, or other cathodic deposit occurs the cogent chlorin, if used or present, eliminated at the anode converts the lower oxid of the metal used as a depolarizer to a higher condition of oxidation, but in so doing free acid is formed. Thus, taking the use of lead oxid for illustration, $Cl_2+H_2O+PBO=PBO_2+2HCl$. From such reactions the presence of an excess of zinc demonstrates its own necessity. This hydrochloric acid, as it might without presence of zinc oxid accumulate, would begin to electrolyze, as well as the salt used for the electrolyte. Hydrogen gas, as well as zinc, cadmium, &c., would then become the cathion. Since the electrolyte is neutral or weakly basic, the free acid is immediately neutralized, forming fresh material for deposition at the cathode instead of furnishing free acid to inter-

fere with the perfect action of the cell, so that virtually as a secondary condition it is the oxid or hydroxid of the metal deposited that stores energy as well as the normal salt. Obviously, too, owing to the neutral or weakly-basic character of the electrolyte the charged cell may be put aside for a long period without loss of energy due to corrosive action of the electrolyte on the cathode or anode deposit. In use practically all of the lower analytic oxid is converted to the highest state of oxidation, so that its complete peroxidation obtains, which could not be possible were these oxids compressed into a solid mass. It is also evident that no loss of energy due to hydrogen formation at the cathode (as always occurs when strongly acid or alkaline solutions are used) can occur in cells such as described.

While in the drawings a particular cell and anode-plate are shown, it is evident that our invention is adaptable to many different forms of batteries, and we do not desire to be limited to any particular conformation of cell or elements contained therein, as obviously our invention is capable of embodiment in many different ways.

We claim as our invention—

1. In an accumulator an anode element comprising a mixture of carbonaceous matter and an oxid of a metal capable of more than one degree of oxidation and an electrolyte comprising a solution of a basic haloid of a metal which by electrolysis deposits reguline at the cathode.

2. In an accumulator an anode material comprising a mixture of oxygen compounds of a metal capable of assuming more than one degree of oxidation together with finely-divided carbonaceous materials and an electrolyte comprising in solution the oxysalt of a metal depositing reguline from aqueous solution during electrolysis.

3. In an accumulator an anode material comprising a mixture of carbonaceous material comprising an inert conducting-core, a mixture of carbonaceous material and the hydroxid of a metal capable of assuming more than one degree of oxidation surrounding the same and an electrolyte comprising a solution of the oxysalts of a metal which by electrolysis deposits reguline at the cathode.

4. In an accumulator of the class described an anode element comprising a mixture of carbonaceous matter and an oxygen compound of a metal capable of assuming more than one degree of oxidation, an electrolyte always neutral or weakly basic and containing in solution the oxysalt of a metal such as deposits reguline from its aqueous solution.

5. In an accumulator an anode comprising a conducting-core surrounded by a mixture of carbonaceous material and an oxygen compound of a metal capable of assuming more than one degree of oxidation, a neutral or weakly basic electrolyte comprising a solution of the basic haloid salt of a metal which deposits reguline from its aqueous solution.

6. In an accumulator the admixture of one of the oxygen compounds of a metal capable of assuming more than one state of oxidation with inert porous material as an anode, and an electrolyte containing in solution oxysalt of a metal which deposits reguline from its aqueous solution.

7. In an accumulator the combination with a retaining-cell of metal, of a porous non-conducting lining such as a fabric, lining the same, an anode element therein comprising a plate of inert conducting material such as carbon, surrounded by a mixture of divided carbon, and one of the oxids of a metal capable of assuming more than one state of oxidation, and an electrolyte comprising in a neutral or weakly basic solution such as the basic haloid or oxy salt of a metal which will deposit reguline from aqueous solutions upon electrolysis.

In testimony whereof we have hereunto subscribed our names in the presence of two subscribing witnesses.

JOHN A. LYONS.
EDWARD C. BROADWELL.

Witnesses:
ALFRED C. ODELL,
C. W. HILLS.