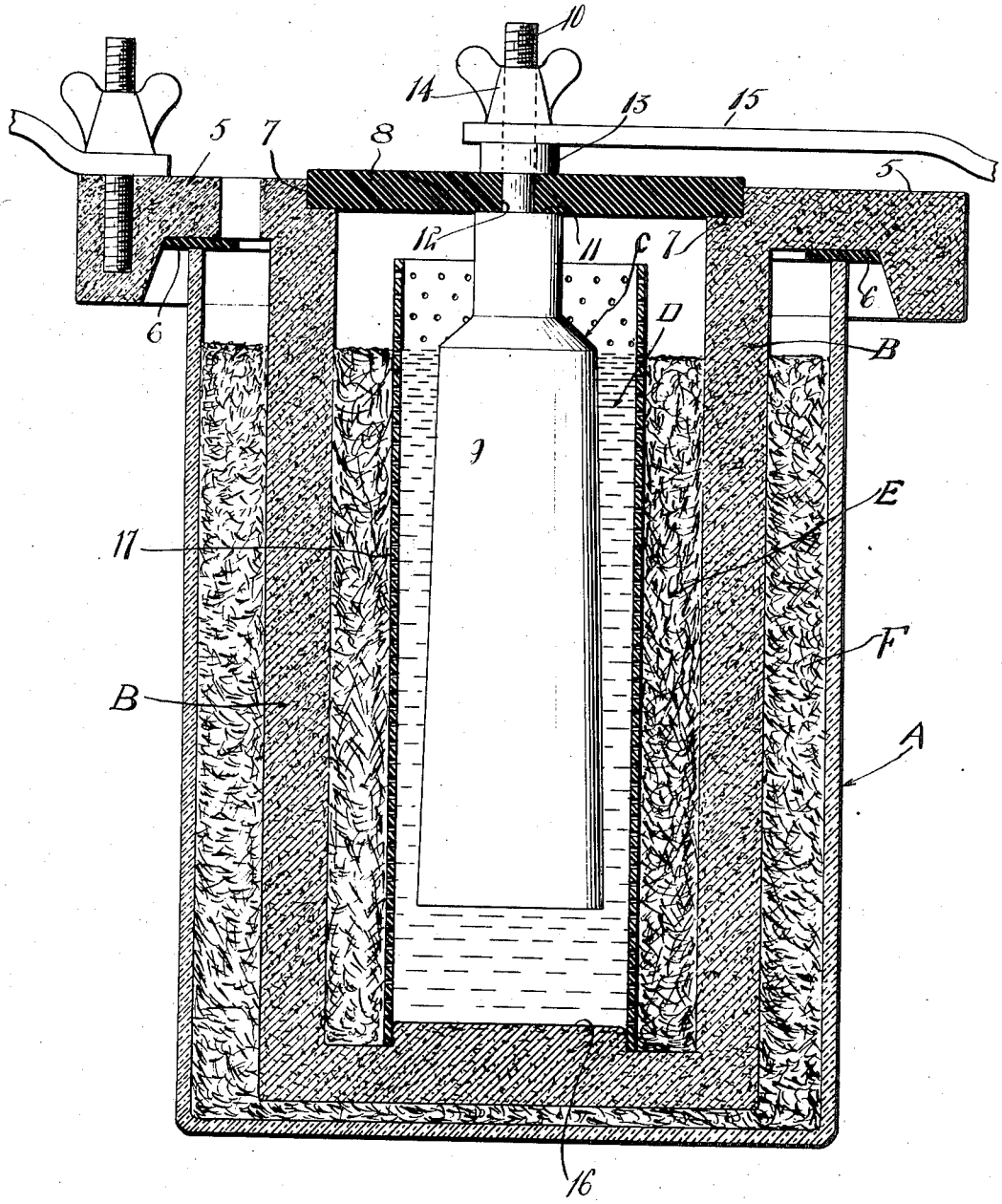
H. A. THOMAS.

ELECTRIC BATTERY CELL.

APPLICATION FILED MAY 17, 1912.

1,090,763. Patented Mar. 17, 1914.



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ELECTRIC-BATTERY CELL.

1,090,763. Specification of Letters Patent. Patented Mar. 17, 1914.

Application filed May 17, 1912. Serial No. 697,948.

To all whom it may concern:

Be it known that I, HARRY A. THOMAS, a citizen of the United States, residing at Springfield, in the county of Sangamon, State of Illinois, have invented certain new and useful Improvements in Electric-Battery Cells; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in electric battery cells, and more particularly to primary cells of the two-fluid type.

The principal object of the invention is to provide a cell of the character described in which the potential will remain constant.

Another object of the invention is to provide a cell for the purpose described in which the working liquid is kept in a constant state of perfection, thereby eliminating any possibility of deterioration and consequently a gradually increasing resistance and diminution of potential.

A further object of the invention is to provide an anode for use in connection with a cell of the type above described, which is formed in a manner and by such composition as to minimize the amount of possible counter-electro-motive force.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawing and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction within the scope of the claims may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing the figure shown is a vertical section through a primary cell constructed in accordance with my invention.

Referring to the drawing, the invention comprises a receptacle A, such as for instance, a glass jar or the like. A cup B which constitutes the cathode is disposed within the receptacle in spaced relation to the wall and bottom thereof, and is supported in such relation by means of a lateral flange 5 which rests upon the top of the receptacle A. This cup or cathode is formed from carbon, and is slightly porous in its formation. A packing ring 6 of rubber or the like is disposed between the receptacle A and the flange 5 of the cup for forming a tight connection therebetween. The upper inner edge of the cup B is rabbeted to form a seat 7 for receiving a closure cap 8 formed of rubber or other suitable sealing material.

An anode C is disposed within the cup or cathode B and in spaced relation thereto. This anode includes a body portion 9 which terminates in an upwardly extending reduced threaded end 10 forming a consequent shoulder 11. The reduced end 10 projects through a concentric opening 12 formed in the cap 8. A washer 13 surrounds the reduced end 10 above the cap, and a winged nut 14 is associated with said end for simultaneously supporting the anode and securing a connecting wire 15 thereto. It will be observed in this connection that the rubber cap 8 not only forms a support for the anode, but also insulates the anode from the cathode, and at the same time hermetically seals the cathode.

Centrally extending upwardly from the bottom of the cathode is a circular projection 16, the diameter thereof being greater than the largest diameter of the anode C. Disposed within the cathode B is a perforated tube 17 which is preferably formed of hard rubber although other suitable material may be employed if desired. The lower end of this tube rests upon the bottom of the cathode B and is disposed around the projection 16, said projection serving as a means to prevent lateral movement of the tube. It will be observed that the tube 17 is disposed intermediate the cathode B and anode C and in spaced relation to both.

Disposed intermediate the anode C and tube 17 is a working liquid which is designated by the reference letter D. This liquid is formed by mixing the following chemicals together: 1 part HCl, 1 part H_2SO_4, 8 parts H_2O. Disposed between the cathode B and the tube 17 is a paste-like substance E which is formed by mixing the following chemicals together: 1 part HCl, 1 part H_2SO_4, 8 parts H_2O, 1 part Na_2SiO_3. Disposed within the receptacle or jar A and exterior of the cathode B is a de-polarizing liquid F of paste-like formation, which is formed from the following chemicals: 1 part HNO_3, 2 parts H_2O, 1 part HCl, 1 part H_2SO_4, 1 part

Na_2SiO_3. After the paste F loses its life, it may be removed by the addition of a mixture of equal parts of sulfuric, hydrochloric and nitric acids and three parts water. A sufficient quantity of this mixture is added to the paste until said paste is thoroughly mixed. This may be done without removing either the anode or cathode, and as a result, renews the life of the cell as if a new paste had been employed.

The anode C is formed by taking pure zinc shavings and dipping them into a solution of two parts HCl (hydrochloric acid) and seven parts water. The shavings are then further cleansed with a solution of bicarbonate of soda in water. The zinc is then mixed with mercury, bismuth and platinum in proportions as follows: Zn. 92%, Bi. ¾ of 1%, Pt. ¼ of 1%, Hg. 7%. This mixture is then ground until it forms a stiff paste, after which the mixture is molded into the shape shown in the drawing or to any other suitable shape as may be desired. It will be observed that the mercury is employed for amalgamating the zinc and the bismuth and platinum for hardening the same. By forming the anode C as above described, all tendency of local action will be greatly diminished as will be readily understood.

By sealing the cell and employing the paste E instead of liquid, a cell has been provided that can be used on vehicles and the like.

In this form of cell there is a tendency of the paste to gather around the anode C and this tends to insulate the fluid from the metal and consequently shortens the life of the cell. In order, therefore, to eliminate this objection there is provided a perforated hard rubber tube 17 which is spaced equidistant from the anode. It will thus be observed that by means of the perforated tube 17 all tendency of the paste to gather around the anode C is prevented, and as a result, greatly prolongs the life of the cell.

The addition of bismuth and platinum gives an increased density and hardness to the anode without appreciably decreasing the quantity of zinc desired to be used in any desired size anode and prevents the electrolyte, solid or exciting fluid, from consuming the anode unevenly and unequally, as is frequently the case when nothing but mercury is added to the zinc. When sufficient quantity of mercury is added to the zinc to prevent too hasty action of the electrolyte upon the zinc and to prevent uneven consumption and pitting of the anode, the quantity of zinc in the anode is proportionately and appreciably less and to such an extent is it less that the life of the anode is greatly reduced and the quantity of electrical energy which it will give off so small that the cell is impracticable for any purposes where a larger flow or output of amperage is needed and where needed for a considerable length of time. The bismuth and platinum also prevent the pitting of the zinc mercury anode which so often occurs in the use of an electrolyte of high acid strength, unless a large amount of mercury be used.

I have found that by making the anode as stated herein that it is not only a satisfactory and practical one for purposes where low amperage is desired, but that with the bismuth and platinum added to the mercury and zinc it becomes a very satisfactory and useful anode where high amperage is desired in generating electricity sufficient for lighting purposes in dwellings and other buildings, such as barns, carriage houses and the like, usually found on farms and at and about the homes of the people who live in towns and villages where individual electric lighting plants are needed and used, and I have used anodes made of mercury and zinc with the bismuth and platinum added for the purpose of generating electricity chemically by the use of an electrolyte in the electric battery cell, in the residences and dwellings of people who live upon farms and in towns and villages and the anode made of zinc, mercury, bismuth and platinum as herein described produces sufficiently high amperage and for sufficient length of time as to make a cell a practical and useful one for lighting purposes and without the bismuth and platinum added, a sufficiently high amperage cannot be maintained for a sufficient length of time to make the primary cell practical and useful for lighting purposes.

It will thus readily appear that the necessity of using a large proportion of mercury is obviated by using bismuth and platinum and thereby permitting use of greater quantity of zinc in the anode which affords greater zinc surface for the action of the electrolyte, exciting fluid or solid, thus and thereby increasing the amperage and sustaining it for much longer period of time.

What is claimed is:

1. An electric battery including an anode of zinc, bismuth, mercury and platinum, a suitable cathode and an electrolyte including hydrochloric acid, sulfuric acid, sodium silicate and water.

2. An electric battery including an anode of zinc, bismuth, mercury and platinum, a suitable cathode and an electrolyte including one part of hydrochloric acid, one part sodium silicate and eight parts water.

3. An electric battery including an anode of zinc, bismuth, mercury and platinum, a suitable cathode, an electrolyte including hydrochloric acid, sulfuric acid, sodium silicate and water, and a depolarizing liquid

comprising hydrochloric acid, sodium silicate, nitric acid and water.

4. An anode for primary cells comprising zinc, bismuth, mercury and platinum.

5. An anode for primary cells comprising 92% zinc shavings, $\frac{3}{4}$ of 1% bismuth, $\frac{1}{4}$ of 1% platinum and 7% mercury.

In testimony whereof, I affix my signature, in presence of two witnesses.

HARRY A. THOMAS.

Witnesses:
LOGAN HAY,
EVA C. STERN.