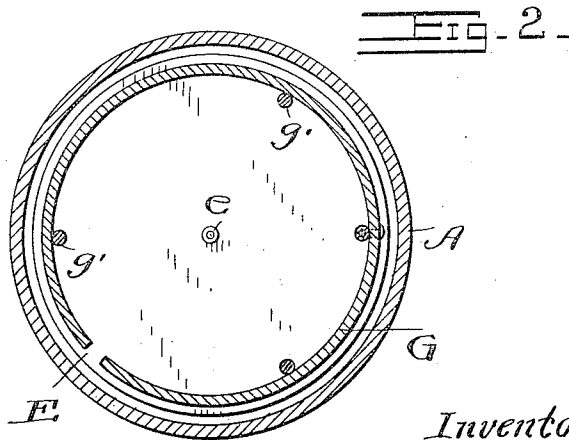
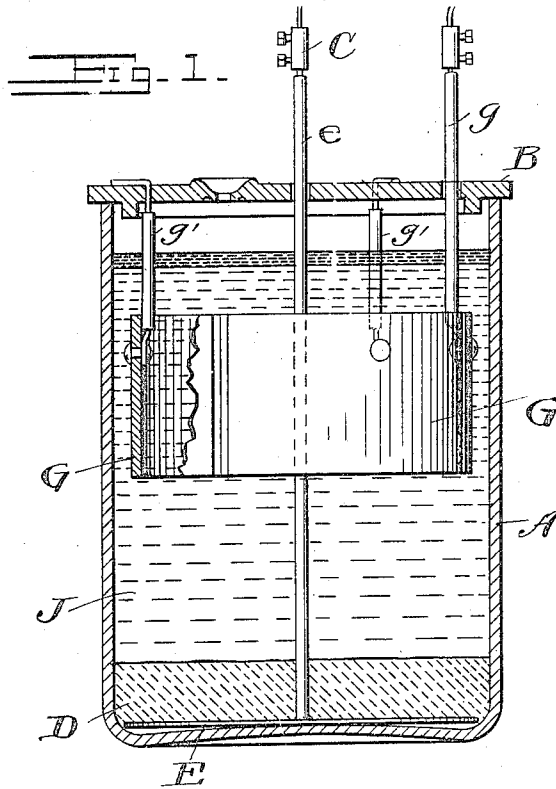


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GALVANIC BATTERY.
APPLICATION FILED AUG. 7, 1909.

1,017,064.

Patented Feb. 13, 1912.



Witnesses.
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UNITED STATES PATENT OFFICE.

EDWARD C. SMITH AND EDWARD L. MARSHALL, OF FREMONT, OHIO, ASSIGNORS TO
NATIONAL CARBON COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF NEW
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GALVANIC BATTERY.

1,017,064.

Specification of Letters Patent.

Patented Feb. 13, 1913.

Application filed August 7, 1909. Serial No. 511,636.

To all whom it may concern:

Be it known that we, EDWARD C. SMITH and EDWARD L. MARSHALL, citizens of the United States, and residents of Fremont, in the county of Sandusky and State of Ohio, have invented a certain new and useful Improvement in Galvanic Batteries, of which the following is a full, clear, and exact description.

This invention relates to a new and simplified form of caustic solution battery especially adapted for track circuits such as are commonly used in connection with automatic block signals, crossing bells and other protective devices and other analogous uses.

The invention consists of a jar, a metal plate resting on and covering the bottom thereof and having an upwardly extended stem, a layer of oxid of copper spread upon said plate, a zinc element suspended in the upper part of said jar, and a solution of caustic soda, potash or the like, in said jar covering the parts specified excepting the upper end of said stem.

In the drawing, Figure 1 is a sectional elevation of a cell embodying the invention; and Fig. 2 is a sectional plan view thereof.

In carrying out this invention we employ a jar A which preferably should be made of glass. A metal plate E is fitted in said jar and rests upon the bottom thereof, and has a centrally placed upwardly extended stem *e* which extends out of the top of the jar, and through the cover B thereof, if a cover be used, said stem being provided with a suitable binding post C. A layer D of black copper oxid either loose or in the form of a compressed cake is placed upon this metal plate; and the zinc element G is suspended by wires *g'* or otherwise either from the sides of the jar or from the cover thereof in the upper part of said jar and at a considerable distance above the layer of the copper oxid. As the cell is used there is formed a soluble sodium or potassium zincate which because of its high specific gravity sinks to the bottom of the jar. This substance, as it increases in quantity and the zinc element becomes immersed therein, diminishes the efficiency of the cell. By placing the zinc element a considerable distance above the layer of oxid, the deleterious ef-

fects of the zincate are obviated and in addition, a cell of high internal resistance is obtained. The electrolyte J is preferably a solution of caustic soda, and its surface is above the upper edge of the zinc element. The zinc element has an upwardly extended stem *g* for the connection of a circuit wire. A layer of paraffin oil is poured on the surface of the solution to prevent its deterioration from the action of the atmosphere.

By the described arrangements of parts we obtain a cell of high internal resistance, so that, when the battery current is shunted, the drain upon the battery is low. It is evident also that the parts of the cell may be taken out of the jar without having to take hold of any of the parts which have been in the caustic solution.

The reduction of the copper oxid begins at the surface of the metal disk E and progresses upwardly throughout the mass, the line between the black oxid and the red copper being marked and distinctly visible through the sides of the glass jar. The elements and the electrolyte are so proportioned that the copper oxid element is exhausted before the zinc element is consumed or the electrolyte is spent. Therefore the one in charge of the batteries, by noting when the vertical surface of the copper oxid (which is visible through the glass jar) has nearly all turned red, may know that the battery is about to become exhausted, and may, therefore, by then renewing the same, prevent the interruption of the service by the failure of the cell to act. This cell is obviously of most simple construction, and few parts, is easily adjusted and requires no special knowledge to keep it in proper condition for action. Moreover, to charge or recharge it does not compel the operator to handle any of the parts which have been covered with the caustic soda solution.

Having described our invention, we claim:—

A primary battery comprising a transparent jar, a metallic plate supported within the jar near the bottom thereof, a conductor attached to said plate, a layer of metallic oxid upon said plate, said oxid being visible through the side walls of the jar,

whereby the color change of the oxid is visible as the cell is used, an electrolyte containing caustic alkali, a zinc element suspended in the electrolyte and spaced a considerable
5 distance above the layer of oxid for the purpose described.

In testimony whereof, we hereunto affix

our signatures in the presence of two witnesses.

EDWARD C. SMITH.

EDWARD L. MARSHALL.

Witnesses:

GEO. W. HAYNES,

F. J. GILBEL.