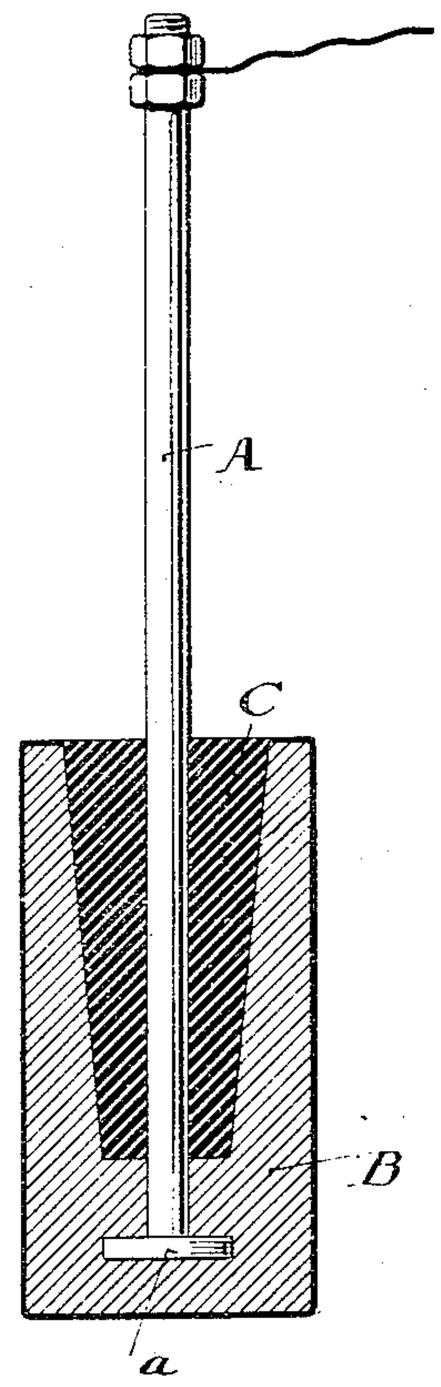
No. 618,043. Patented Jan. 17, 1899.

J. D. DARLING.

ZINC ELECTRODE.

(Application filed Aug. 17, 1898.)

(No Model.)



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JAMES D. DARLING, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE HARRISON BROS. & COMPANY, INCORPORATED, OF SAME PLACE.

ZINC ELECTRODE.

SPECIFICATION forming part of Letters Patent No. 618,043, dated January 17, 1899.

Application filed August 17, 1898. Serial No. 688,764. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES D. DARLING, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Zinc Electrodes, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates to an improved construction of a zinc electrode whereby it is made self-amalgamating.

An electrode constructed according to my invention will present during its entire lifetime an evenly-amalgamated surface to the electrolyte.

The necessity of the even and thorough amalgamation of the surface of a zinc electrode is well known. In all battery practice in which amalgamated zinc electrodes are employed a difficulty has always been experienced and recognized as resulting from the tendency of the amalgamated vertical surface of the zinc plate to "weep"—that is, the mercury tends to gravitate to the bottom of the zinc and to fall off. As a result more or less of the zinc is exposed free from amalgamation, local action ensues, and the plate is soon eaten up. The usual remedy for this has been to periodically withdraw the zinc plate from the battery and reamalgamate it. This of course necessitates trouble and attention. A groove or pocket formed in the zinc electrode containing liquid mercury has been employed in the endeavor to overcome this difficulty; but in this case the diffusion takes place too rapidly and the mercury is soon used up. Besides, the mercury is likely to spill out of its groove.

By the use of my invention the difficulty to which I have referred is overcome, and a zinc electrode constructed in accordance therewith is self-amalgamating and will maintain itself with an even film of amalgam throughout its entire life.

An electrode embodying my invention is illustrated in the accompanying drawing, in which A is a vertical copper rod having a binding-post at its upper extremity suitable for forming the positive pole of a primary battery. The lower end of this rod is expanded to form a horizontal disk *a*. Surrounding the lower end of the copper rod a cup-shaped zinc cylinder B is cast, the disk of the copper rod being embedded centrally in the bottom of the cup and the rod itself passing up centrally through the hollow of the same. The entire hollow of the cup is filled or packed with a mass of solid zinc amalgam.

I have found that ordinary zinc amalgam made by melting zinc with mercury is not well adapted to this purpose by reason of the impurities contained in the zinc, and I therefore prefer to use a zinc amalgam prepared by subjecting to electrolysis a solution of a zinc salt—say sulfate of zinc—using a cathode of mercury and as anode a zinc plate contained in a bag or other porous receptacle, which will hold back the insoluble impurities contained in the zinc. In this way pure zinc is deposited in the mercury and an amalgam produced which when melted shows no free mercury. By the use of this pure amalgam I avoid all tendency to local action.

When an electrode such as has been described is inserted in an acid electrolyte and constituted the primary pole of a battery, it will be found that the first attack of the electrolyte is upon the amalgam C by reason of its being more electropositive than the zinc. As the result of this initial attack upon the amalgam a certain amount of zinc is consumed, liberating a corresponding quantity of free mercury from the amalgam. The mercury thus liberated diffuses itself over the entire sides and bottom of the zinc cup, forming an amalgam thereon. Thereafter the electrolytic action proceeds over the entire amalgamated surface of the zinc in the usual way, except that by reason of my invention the amalgamation is maintained constantly over the entire surface.

The action seems to be as follows: Whenever by reason of weeping or any other cause the zinc of the cup or any considerable portion of it becomes denuded of its amalgam, an excess of the electrolytic attack will be thrown upon the amalgam occupying the hollow of the cup, with the result of liberating free mercury, which immediately diffuses itself over the denuded zinc surface, reamalgamating it. This

action is continuous, and even after the zinc cup has been reduced to a mere shell its surface is maintained constantly and evenly amalgamated. I have given a theory of the action of my electrode which I believe to be true; but I desire it to be understood that my invention is in no wise dependent upon the correctness of this theory.

The exact shape of the electrode may be considerably varied, and when I speak of a "cup-shaped" electrode I mean any zinc electrode which has within it a hollow or cavity capable of holding within itself a mass of amalgam the mercury of which is free to diffuse itself over the rest of the surface of the zinc. It is of course desirable that the shape of the cup shall be such as to establish an economic proportion between the amount of amalgam contained within its hollow and the mass of zinc. The quantity of amalgam should be sufficient to continue to amalgamate the zinc surface until the entire destruction of the walls of the zinc cup; but any wasteful excess of amalgam over this quantity should be avoided. The drawing illustrates approximately the proportion and shape which I have found desirable.

Having thus described my invention, I claim—

1. The combination of a cup-shaped zinc electrode, with a mass of solid zinc amalgam contained therein, substantially as described.

2. In an electrode, the combination of a conducting-rod; a zinc cup supported thereby; and a mass of solid zinc amalgam contained within the cup, substantially as described.

JAMES D. DARLING.

Witnesses:
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