

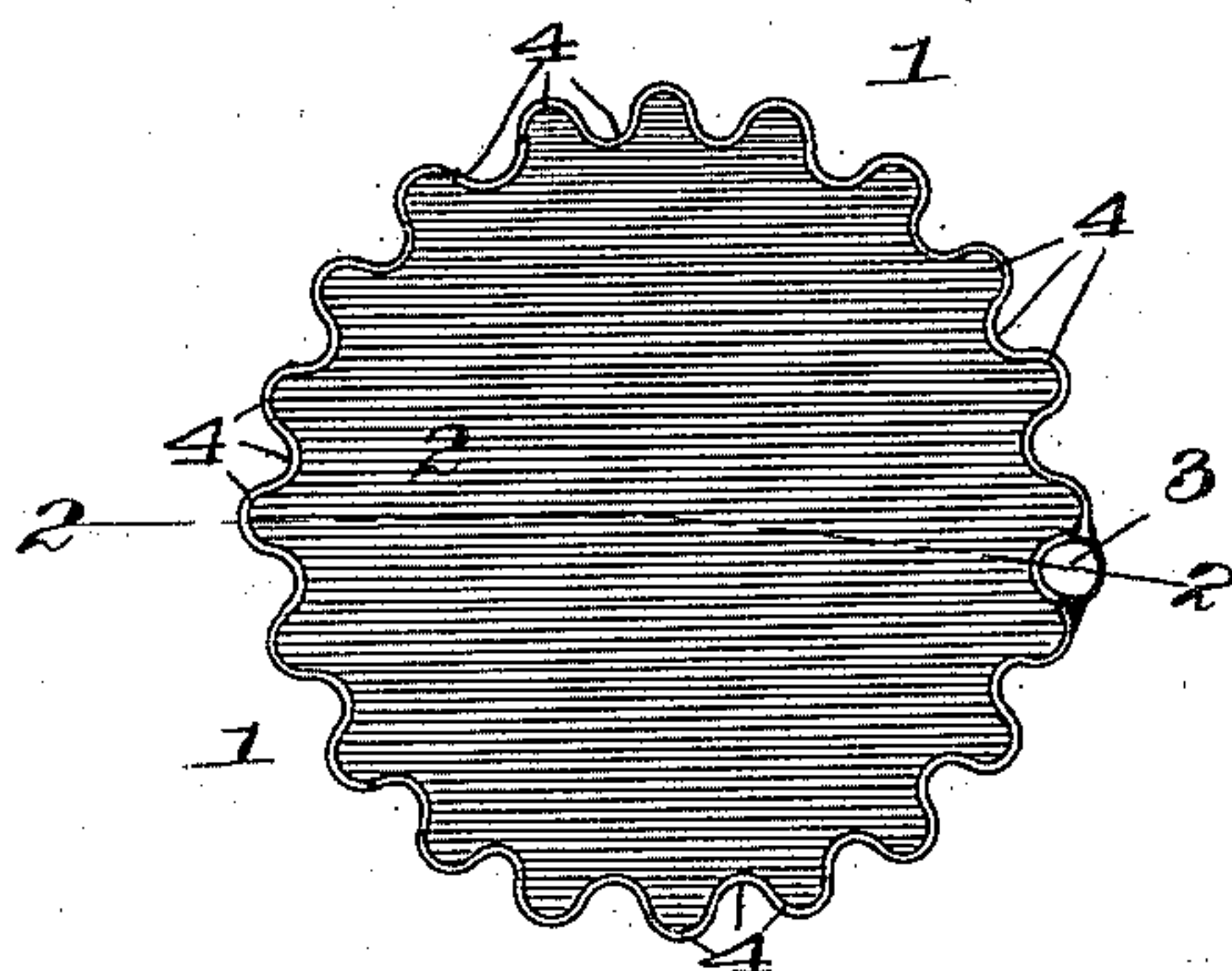
No. 731,422.

PATENTED JUNE 23, 1903.

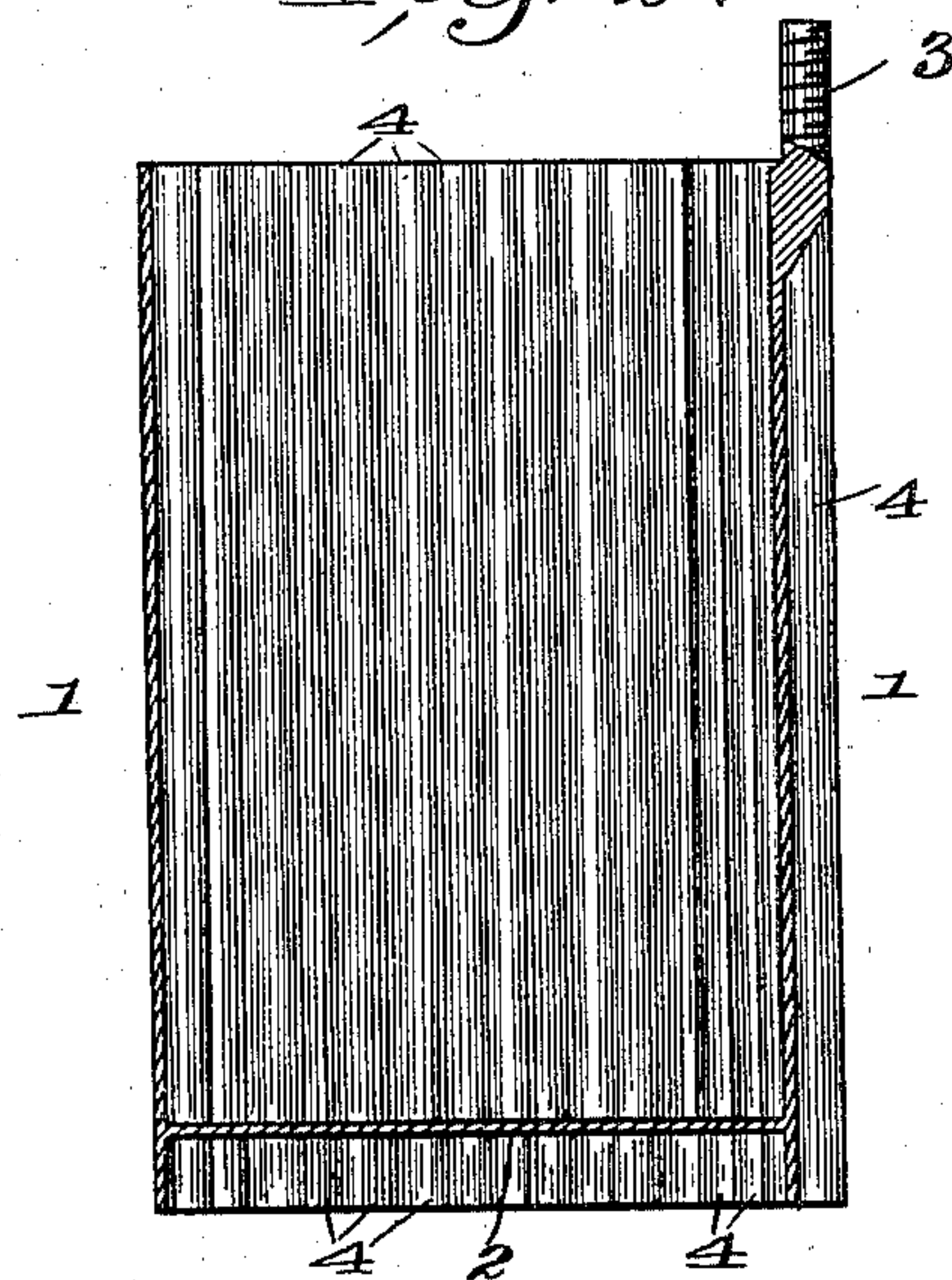
V. G. APPLE.  
ZINC CUP FOR PRIMARY BATTERIES.  
APPLICATION FILED MAR. 23, 1903.

NO MODEL.

*Fig. 1*



*Fig. 2*



*Witnesses:*  
*Ray White*  
*Ray White*

*Inventor:*  
*Vincent G. Apple*

*By J. C. Bain* *Att'y.*



# UNITED STATES PATENT OFFICE.

VINCENT G. APPLE, OF DAYTON, OHIO.

## ZINC CUP FOR PRIMARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 731,422, dated June 23, 1903.

Application filed March 23, 1903. Serial No. 149,064. (No model.)

*To all whom it may concern:*

Be it known that I, VINCENT G. APPLE, of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Zinc Cups for Primary Electric Cells or Batteries; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to zinc cups for primary electric cells or batteries.

In the manufacture of portable batteries, particularly those known as "dry" batteries, it is common practice to make the containing cup or shell of zinc, so that it constitutes one of the elements of the completed cell. These zinc cups as heretofore manufactured have had many disadvantageous features incident to the mode of construction necessitated by the peculiar properties of the material employed.

It is well-known that zinc cannot be successfully drawn to a thinness sufficient to permit battery-cups to be formed by drawing. It is also well-known that zinc is not well adapted for casting thin articles by the ordinary or gravity process, for the reason that when heated to become sufficiently fluid to flow into a thin sheet some of the zinc volatilizes, forming gas bubbles in the fluid zinc, which appear as blow-holes in the completed casting. Zinc thus cast is accordingly very porous, so that to insure imperviousness to ordinary cast zinc cups they would have to be made so thick that their cost and weight would preclude their commercial use. Zinc cups are therefore now commonly made by rolling the zinc into sheets, bending the sheets into cylindrical form, soldering the meeting edges together, and soldering to one end of the cylinder a bottom and to the other a binding-post. Numerous disadvantages are inherent in a cup thus constructed due to its formation. The rolling of the zinc hardens the surfaces of the sheets more than the interior thereof, producing on the surfaces a glaze, which is highly undesirable. This glaze tends to prevent proper action of the exciting fluid on the zinc, and when the glaze is perforated, permitting the fluid to attack the softer metal beneath, local action is set up

between the strata of different densities. An additional difficulty is presented by the joints when the solder is employed. At such joints two dissimilar metals—the zinc and the solder—are presented to the exciting fluid, so that local action is set up, causing deterioration of the cell and ultimately the destruction of the joint. Again, the soldering is often carelessly done, and leaky joints are the result. It is with a view to overcoming these objections and providing a cell of integral structure without seam or joint, having walls of extreme thinness and uniform density and exposing a maximum of surface to the contained exciting fluid that my invention is designed.

In the drawings, Figures 1 and 2 are respectively a top plan view and a central vertical section of a cell embodying my invention.

1 indicates the zinc wall of the cell, generally cylindrically formed. 2 indicates an integral bottom, and 3 an integral threaded binding-post. These parts are all formed in a single piece of commercial zinc. The cylindrical wall is preferably corrugated or undulated, as indicated at 4. This form of integral cell is made by first subjecting the zinc to heat sufficient to melt it and then forcing the zinc under pneumatic pressure into a mold, so that the zinc forms a compact, integral, homogeneous structure of uniform density. The conditions of temperature and pressure under which the zinc is cast may be varied as found best adapted for the purpose; but I have found it practical to cast the zinc at its melting-point (approximately 420° centigrade) under a pressure of one hundred and twenty-five pounds to the square inch. I do not desire, however, to be understood as limiting myself to such conditions of operation, as other conditions of temperature and pressure may be found effective for the purpose set forth. In zinc thus handled there will be found no flaws or blow-holes, so that the walls of the cups may be made of exceeding thinness, thereby greatly lightening the weight of the completed cell and lessening its bulk for a given capacity.

It will be noted that no material other than zinc is employed in the construction of my cup and that a complete unitary article of



manufacture is produced by the single operation described.

The corrugated form of cup which I prefer to employ also adds to the strength of the structure and enables with a given quantity of material maximum strength to be attained and the maximum of active surface to be presented to the interior of the cup. Further, that it permits the expansion and contraction of the inclosed fluid under the influence of thermic changes without danger to the casing.

Numerous other advantages incident to the use of my invention will occur to those skilled in the art.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. As an article of manufacture, a zinc containing-cup for primary batteries formed in a single piece without seam or joint, of

zinc, cast under pressure while in a molten condition.

2. As an article of manufacture, a zinc containing-cup for primary batteries having a thin cylindrical wall, a bottom and a threaded binding-post, all formed in a single piece of zinc, cast under pressure while in a molten condition.

3. As an article of manufacture, a zinc containing-cup for primary batteries having a thin cylindrical corrugated wall, a bottom, and a threaded binding-post, all formed in one integral piece.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VINCENT G. APPLE.

In presence of—

B. B. APPLE,

L. M. ARNOLD.