(No Model.)

G. A. WASHBURN.

STORAGE BATTERY.

No. 602,176. Patented Apr. 12, 1898.

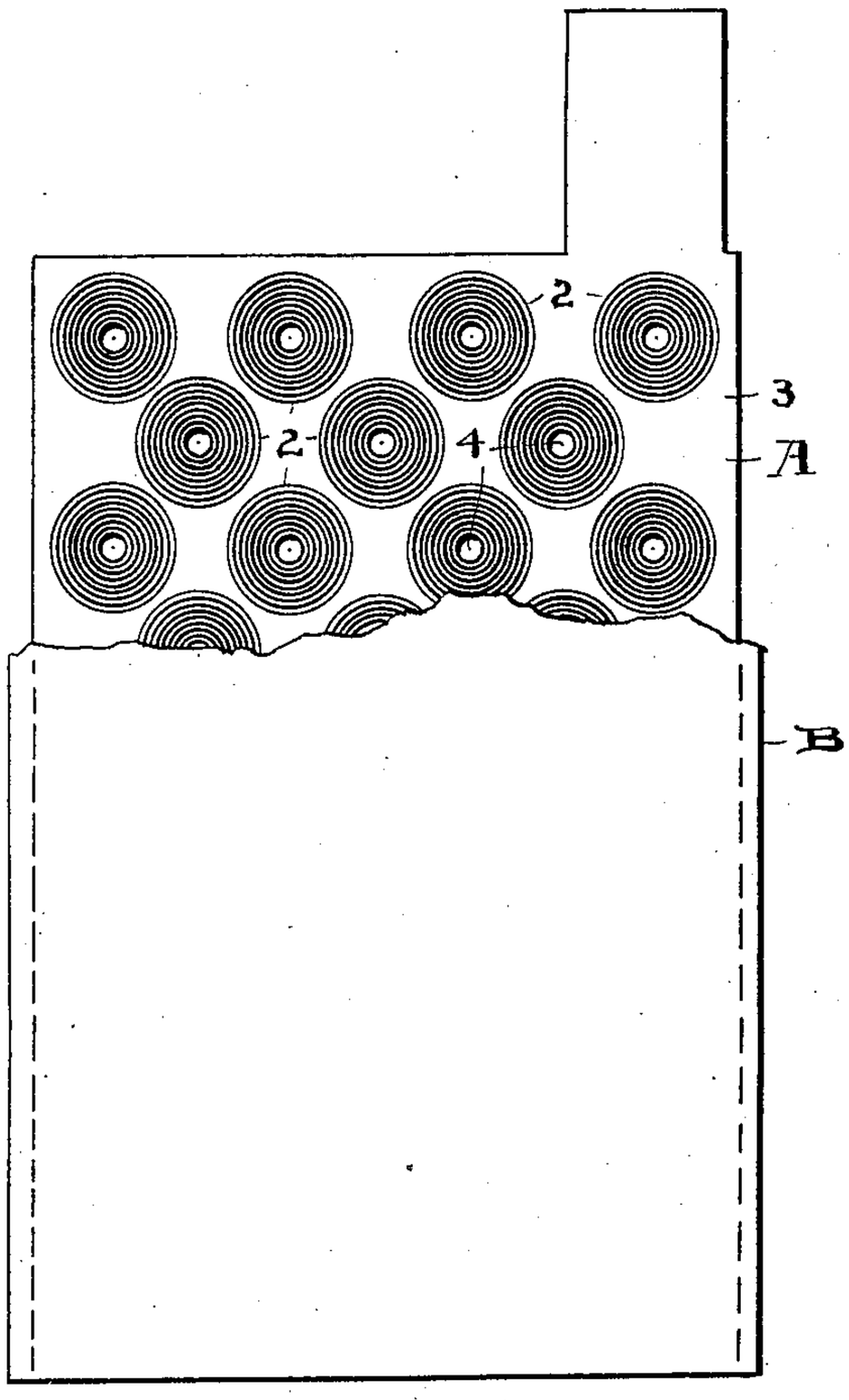


Fig. 1.

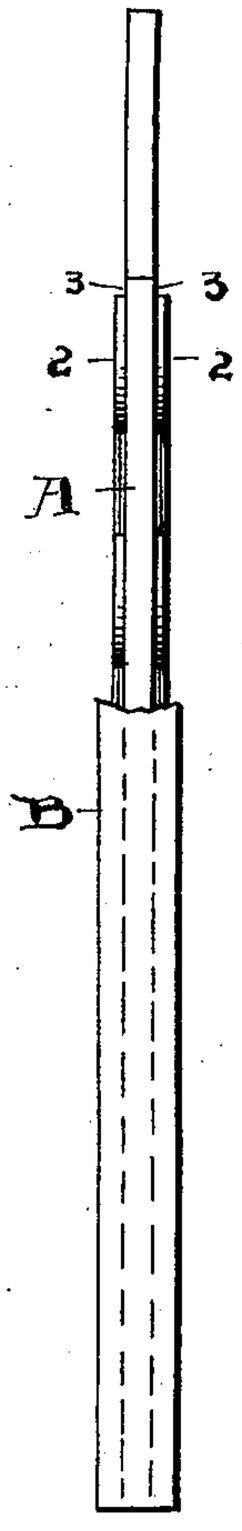
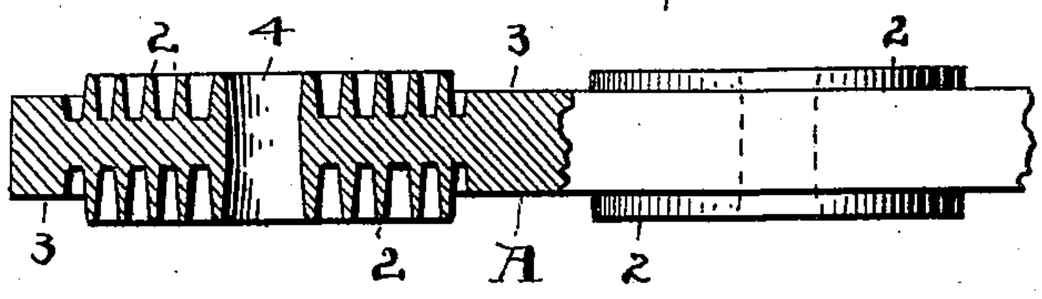


Fig. 2.

Fig. 3.



Attest.

R. B. Moore.
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By H. T. Fisher Atty

UNITED STATES PATENT OFFICE.

GEORGE ARTHUR WASHBURN, OF CLEVELAND, OHIO, ASSIGNOR TO THE OHIO STORAGE BATTERY COMPANY, OF SAME PLACE.

STORAGE BATTERY.

SPECIFICATION forming part of Letters Patent No. 602,176, dated April 12, 1898.

Application filed May 22, 1897. Serial No. 637,712. (No model.)

To all whom it may concern:

Be it known that I, GEORGE ARTHUR WASHBURN, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Storage Batteries; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to storage batteries; and the invention consists in a storage-battery electrode formed from a plate of suitable metal and having its sides covered with a series of substantially ring-shaped elevations raised out of or formed in the plate and arranged in groups of several rings together and an opening centrally through the plate in the center of each group, all substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a plate constructed according to my invention and showing at its top a series of the ring formations which the invention comprises, the larger portion of the said plate being covered with a casing or sheath. Fig. 2 is an edge elevation of Fig. 1 and showing somewhat the measure of elevation of the rings above the surface of the plate from which they are drawn. Fig. 3 is a sectional elevation of a section of a plate embodying my invention and considerably enlarged, so as to show clearly a group of rings on each side of the plate and their relation and relative proportions, as hereinafter more fully described.

Two points are especially sought and accomplished in the present plate—surface and circulation. The invention begins with a perfectly-flat plate of lead or like metal adapted for storage-battery work, and then in order to develop the utmost attainable surface from such a plate along with strength of plate and free lines of travel every way over its surface and the further desirable consideration of intercommunication of the liquid from side to side through the plate at numerous points I construct the plate A with a large number of groups of rings 2 on both its sides. These groups of rings are shown in this instance as raised nearly half their depth above the original surface 3 of the plate, this being done by a suitable tool or a series of like tools constructed to penetrate and throw up the material to the desired shape and height. I might of course form concentric channels or grooves, and thus leave standing the intervening material and produce imitations of my present rings in that way; but they would have much less surface than the raised ring and would leave the plate in a weaker condition, because by raising the rings or ribs I strengthen the plate against buckling. These rings may be thrown up relatively still higher than here shown, and they may be made heavy for a paste-battery or light and thin and comparatively near together for formation by electrolytic action by methods now well known and whereby formation can be quickly accomplished.

It will be noticed also that the groups in this instance have five rings, although fewer or more may be used, and that they are opposite one another on the sides of the plate and that there is a free passage or opening 4 centrally from side to side. This affords a very free circulation of liquid and current through each plate and adds very materially to the efficiency of the battery.

The rings 2 may be cut still deeper than here shown, if desired, and they need not necessarily be exactly round, as shown, but this is the preferred form. The groups are arranged in respect to each other so as to allow standing material around each group, and yet they cover the whole surface of the plate over so closely and hence are so numerous that the actual surface of the plate is multiplied many times, while the strength of the plate is increased.

A positive plate is supposed to be shown in this instance, and this plate is incased or pocketed in an envelop or sheath B of porous flexible material like wool, felt, or other material which will not be injuriously affected by the acid. These sheaths or pockets fit closely and, while they effectually prevent short-circuiting by any possible loosening and dropping of active material, they are so porous as to offer no resistance whatever to the current.

It will be noticed as a peculiarity of this

battery electrode or element that the active material is all contained in the grooves between the rings or walls 2 which separate them and that there is no active material on the surface of the electrode between the groups of concentric rings and grooves.

What I claim as new, and desire to secure by Letters Patent, is—

1. A storage-battery electrode having on each side a series of groups of concentric ring-shaped projections of substantially uniform cross-section one with the other and equally spaced at all points to hold active material between them and standing out above the adjacent surface of the plate, and a hole centrally through each group communicating with the opposite side of the plate, substantially as described.

2. An electrode for storage batteries, consisting of a metallic plate having its surface provided with separate and distinct groups of circular projections, said projections similar in depth and cross-section from edge to base and integral with the plate and equally spaced at all points, active material filling the space between said projections, and the space outside of said projections between the groups being without active material, substantially as described.

Witness my hand to the foregoing specification this 17th day of May, 1897.

GEORGE ARTHUR WASHBURN.

Witnesses:
H. E. MUDRA,
R. B. MOSER.