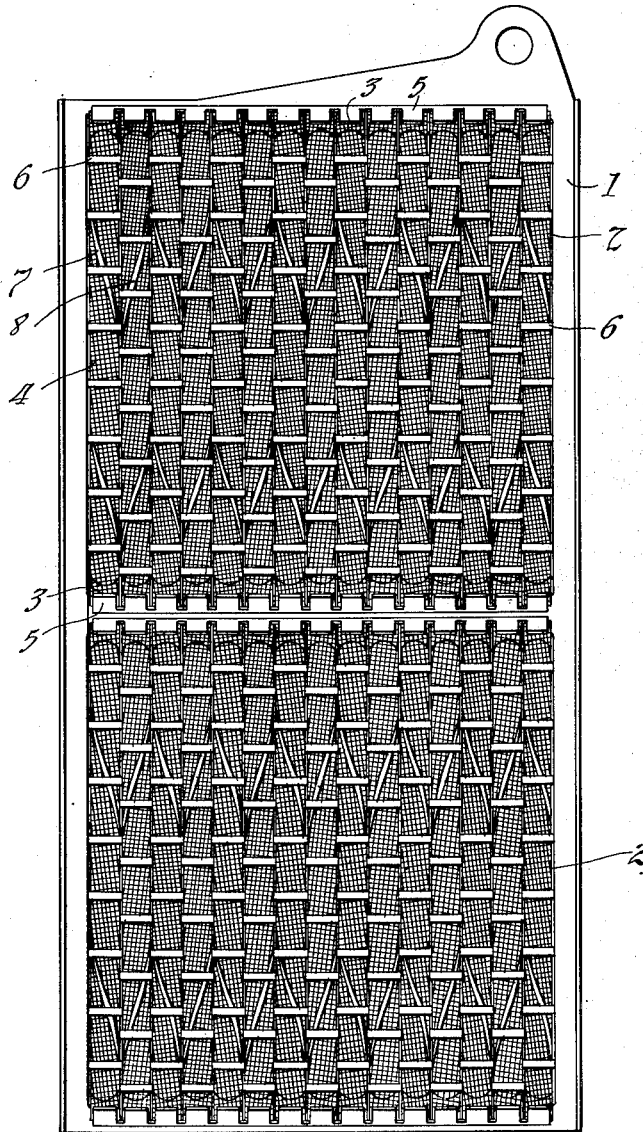


T. A. EDISON.
STORAGE BATTERY.
APPLICATION FILED MAY 24, 1910.

976,792.

Patented Nov. 22, 1910.



Witnesses:
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UNITED STATES PATENT OFFICE.

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STORAGE BATTERY.

976,792.

Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed May 24, 1910. Serial No. 563,044.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Storage Batteries, of which the following is a description.

My invention relates to storage batteries of the type in which a plurality of pockets containing the active material are secured to a conducting plate or grid.

My invention is an improvement on that disclosed in Letters Patent No. 896,812, granted to me August 25, 1908. In this patent is shown a grid having parallel flanges having integral tongues situated in vertical alinement with each other, which tongues are bent over the flattened ends of the tubular pockets containing the active material, the tubular pockets thus being secured side by side to the grid. As disclosed in the said patent, the grid is formed of thin sheet metal such as nickel-plated steel, and the pockets are formed of thin perforated resilient metal of high tensile strength, such as nickel-plated steel, the metal strip of which the tubes are formed being wound spirally, a spiral lap joint thus being formed about each tube. The tubes are filled with active material which has been tamped therein under high pressure. The metal tubing has a constant tendency to unwind because of the expansive pressure of the active material upon the inside of the tubes. In the construction illustrated in my patent referred to, the spiral joints of all the tubes are parallel. I have found that one result of this construction is the setting up of strains and stresses within the supporting grid, which results in warping the same. The spiral tubes, having a tendency to unwind, exert a pressure upon the supporting grid through the integral tongues thereof which support the tubes, and the turning effect being all in the same direction, the tendency of the supporting plate or grid is to warp or buckle as noted.

The object of my present invention is to overcome this defect. I accomplish this by winding the tubes in opposite directions, as by forming half of them with a right-hand spiral joint and the other half with a left-hand spiral joint and mounting the tubes of the grid alternately, that is, first a

tube of one spiral, then a tube of the opposite spiral, then a tube of the first spiral, and so on. This results in equalizing the strains upon the grid, due to the turning moments of the tubes, so that as a result the grid as a whole is not warped or buckled, but remains straight and true.

Attention is hereby directed to the accompanying drawing, forming part of this specification and disclosing one form of my invention, and illustrating in side elevation a storage battery grid in which a plurality of tubular pockets of alternately right and left handed spiral joints are secured.

The grid consists of a plate 1 of thin sheet metal, such as nickel-plated steel stamped to form one or more pockets or openings 2 of rectangular form, the upper and lower edges of the same being formed with flanges 5 having integral tongues 3 situated in vertical alinement with each other and corresponding in number to the pockets 4 which are mounted side by side with their ends clamped in position by the tongues 3, as described in my Patent No. 896,812 above referred to. The pockets shown are in the form of tubes of perforated metal filled with active material, which in the case of my battery as now manufactured, consists of nickel hydrate mixed with flakes of metallic nickel. This active material is tamped down under great pressure and constantly exerts pressure against the inside of the tubes tending to unwind the same. The tubes preferably have seamless nickeled steel rings 6 mounted upon the same in staggered relation as shown. These rings fit snugly upon the tubes and are firmly held in position by the expansion of the tubes, this construction being referred to in my Patent No. 880,978, granted March 3, 1908. The spiral lap joints of the tubes are shown extending parallel to each other in one direction in the case of the odd numbered tubes, as shown at 7, and extending parallel to each other in the opposite direction in all the even numbered tubes, as shown at 8. The strains imparted to the grid by the tendency of all the odd numbered tubes to unwind are therefore in one direction, and of all the even numbered tubes in the opposite direction, whereby the strains are equalized and the tendency of the grid to become warped is overcome.

Having now described my invention, what

I claim and desire to protect by Letters Patent is as follows:

- 5 1. In a storage battery, in combination, a supporting plate, a plurality of perforated tubes mounted side by side upon said plate, said tubes being formed of ribbons of resilient metal, spirally wound, the spiral winding of said tubes as mounted being alternately right and left handed, said tubes 10 containing highly compressed active material under a constant tendency to expand, and means carried by said plate for supporting said tubes, substantially as described.
- 15 2. In a storage battery, in combination, a supporting plate, a plurality of perforated tubes mounted side by side upon said plate, said tubes being formed of thin, resilient metal wound in tubular form and the edges joined, the said tubes as mounted being alternately wound in opposite directions, said tubes containing highly compressed active material under a constant tendency to expand, and means carried by said plate for supporting said tubes, substantially as described. 25
- 30 3. In a storage battery, in combination, a supporting plate, tongues integral therewith arranged in two parallel rows, a plurality of perforated tubes mounted side by side upon said plate with their ends secured by said

tongues, said tubes being formed of thin, spirally wound resilient metal, the spiral winding of said tubes as mounted being alternately right and left handed, said tubes containing highly compressed active material under a constant tendency to expand, substantially as described. 35

4. In a storage battery, in combination, a supporting plate, having parallel flanges integral therewith, a plurality of parallel tubular pockets with flattened ends, said pockets being mounted side by side on said plate with their ends secured by said flanges, said pockets being formed of ribbons of resilient thin metal, spirally wound in tubular form and the edges joined, the spiral joints in said tubes extending in one direction in the odd numbered tubes and in the opposite direction in the even numbered tubes, as mounted, said tubes containing highly compressed active material under a constant tendency to expand, substantially as described. 40 45 50

This specification signed and witnessed this 19th day of May 1910.

THOS. A. EDISON.

Witnesses:

DYER SMITH,
JOHN M. CANFIELD