(No Model.)

# W. LACHLAN.

## CONSTRUCTION OF SECONDARY BATTERIES.

No. 306,405. Patented Oct. 14, 1884.

Fig 1.

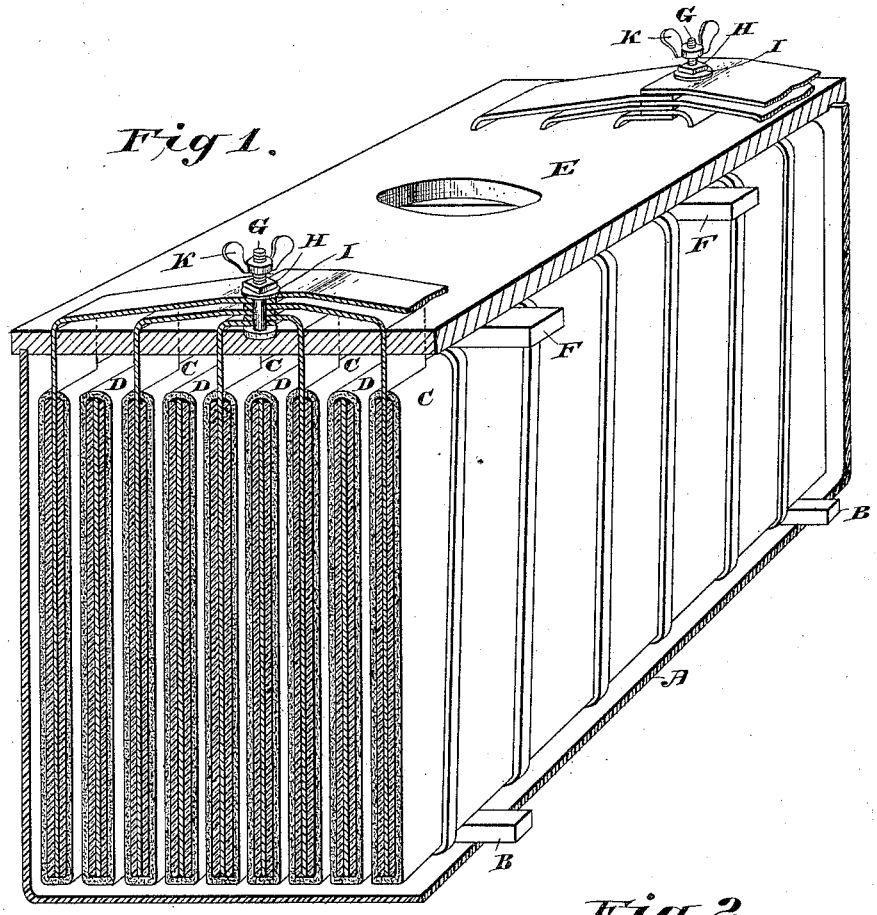
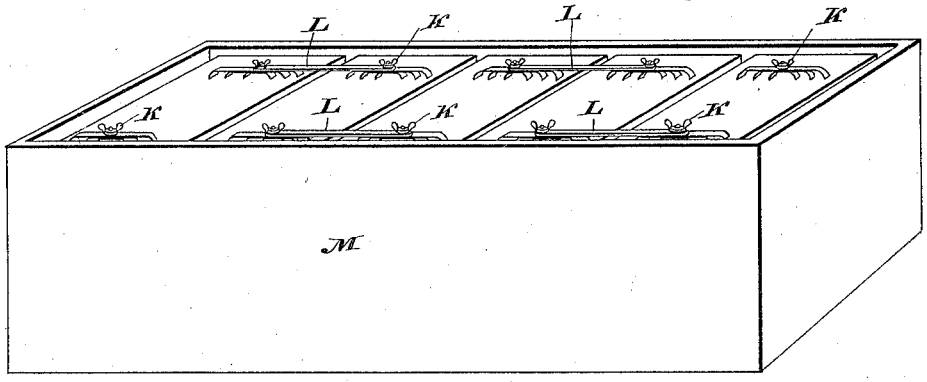



Fig 2.




Attest.
Geo. T. Smallwood Jr.
C. J. Hedrick

Inventor.
William Lachlan
By A. Pollok
his Atty.

# UNITED STATES PATENT OFFICE.

WILLIAM LACHLAN, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND, ASSIGNOR TO JOHN M. PENDLETON, OF NEW YORK, N. Y.

## CONSTRUCTION OF SECONDARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 306,405, dated October 14, 1884.

Application filed March 30, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM LACHLAN, of London, in the county of Middlesex, England, have invented a new and useful Improvement in the Construction of Secondary Batteries, which invention is fully set forth in the following specification.

This invention has reference more particularly to what may be called the mechanical structure of the cells—that is to say, to the form and material of the containing-vessel, the arrangement of the battery-plates therein, the means for connecting together the plates of like name, and the combination of the containing-vessel, cover, battery-plates, and connecting devices. The principal object is to make a cell which shall be durable and acid-proof, and not likely to permit leakage, either of the battery-liquid or of the electricity, and which is well adapted to transportation.

In the accompanying drawings, Figure 1 is a sectional perspective of a cell constructed in accordance with the invention, and Fig. 2 a perspective view of a battery of several cells connected in series and inclosed in a protecting-case.

A is the containing-vessel, of insulating material—to wit, of blown glass. Blown glass is used because it is stronger in proportion to its weight than the cast material. The form is an oblong rectangular figure with the corners and edges rounded, this form having the greatest interior capacity with the smallest liability to chipping or fracture. On the bottom of the vessel are laid the separate insulating-strips B, of glass or other suitable material, which in length equal the width of the containing-vessel, and which are laid across the bottom. On these strips are placed the battery-plates C D, they extending lengthwise of the containing-vessel. As shown, they are constructed of a lead plate (which is or may be perforated) coated with the active material, (red lead or its equivalent,) and enveloped in a felt bag, which is wound with a strip of rubber or gutta-percha to separate it from the adjacent bag. The size and number of the battery-plates are such that they fill the interior of the glass containing-vessel. The shifting of the plates is thus avoided. The rubber strips leave spaces for the escape of the gases, while at the same time they prevent motion of the plates. The cross-strips B raise the plates above the bottom of the containing-vessel, and permit a free circulation of the battery-liquid under the lower edges of the same. The containing-vessel has a cover, E, of insulating material, usually wood, or it may be of vulcanite or other suitable material. Between the cover and the top edges of the battery-plates are cross-strips F, of non-conducting material, (usually wood, and usually fastened to the cover.) Their purpose is to secure a free space above the plates, without, however, allowing them to move vertically. Each of the battery-plates has a tag, which projects out of the felt bag, and by which the plate is connected with the exterior conductors. The plates are so arranged that the tags of all the positive plates will be at one end of the cell, and those of all the negative at the other end. The tags pass through slots in the cover. Those at each end are bent toward the middle longitudinal line of the cover, and, being interleaved, they are clamped together by means of the clamping-screw G between the head of said screw and the nut H. The tags for the outer plates are left longer than the inner ones, as shown. A washer, I, is commonly placed between the nut and the top tag. The screw-nut and washer are preferably made of copper or of gun-metal, brass, or other alloy of copper. Each screw is provided with an additional thumb-nut, K, for connecting the plates with the exterior conductor, L, Fig. 2, which is preferably a flat metal strip of good conductivity. Several cells thus constructed are usually placed in a wooden case, M, Fig. 2, and separated by strips of rubber or other material, to prevent contact between the containing-vessels, and connected in series by the strips L.

Modifications may be made in details without departing from the spirit of the invention. For example, the battery-plates themselves may be of any suitable description.

In place of felt other soft material may be used.

Portions of the invention may be used separately. For example, the general arrange-

ment of the plates could be used with a material other than glass or of other kind of glass.

The blown-glass vessels are best suited for small cells, say ten inches in length. For large cells annealed cast glass may be used with advantage.

The improved connecting means could be used in other cells, and other connecting means could be used in the improved cells, in either case a part only of the invention being employed.

I am aware that heretofore elements or plates of secondary galvanic cells have been packed in containing-vessels of glass and other materials, and have been separated by felt, asbestus-board, or similar porous insulating material; also, that supports have been placed under the lower edges of such plates or elements to raise them above the bottom of the containing-vessel; also, that in secondary cells containing a series of plates or elements arranged so that plates or elements of unlike name alternate, the connection of plates or elements of like name with one another and with the exterior circuit has been made by an arrangement somewhat resembling my own—that is to say, the plates of one name or polarity have tags at one end and those of opposite name or polarity have similar tags at the opposite end of the cell. The tags at each end are then bent over toward the middle and a binding-post is passed through them. This post screws down into a cross-piece of insulating material, and does not consist of a screw-pin projecting upward through the tags and provided with two nuts, as in the present invention. Moreover, in this case the cell has no cover, and consequently the tags do not, as in the present invention, pass through slits therein, so that the cover is interposed between the electric connectors and the battery-liquid.

The improved construction of cell forming the subject of the present invention embodies other differences, as expressed below.

Having now fully described my said invention and the manner of carrying the same into effect, what I claim is—

1. A cell of secondary battery, comprising, in combination, a containing-vessel of glass, a cover to said vessel, a series of vertical plates or elements packed in said vessel, and provided with tags extending through the cover and secured thereto, and insulating-strips arranged transversely across the top and bottom, substantially as described.

2. A cell of secondary battery, comprising a containing-vessel, cover therefor, vertical plates or elements provided with tags projecting through the cover, electrical connectors for making connection with the said tags on the outside of the cover, insulating-strips at the bottom of the containing-vessel, extending transversely under the lower edges of the plates or elements, and strips between the plates or elements for holding them apart, substantially as described.

3. The combination, with the containing-vessel and cover of a cell of secondary battery, of the plates or elements having tags or strips projecting through said cover, and the screw-clamps and binding-posts for connecting the plates of like name with each other and with the exterior conductor, substantially as described.

4. The combination, with the strips or tags attached to or forming part of the battery-plates, of a pin inserted through the strips or tags or plates of like name, a nut on said pin for binding the strips or tags together, and an additional nut for attaching the exterior conductor, substantially as described.

5. A cell of secondary battery, comprising a glass containing-vessel packed with two or more pairs of felt-incased plates separated from each other by insulating-strips, so that liability of injury to the glass of the containing-vessel from its contents is avoided, while free spaces are left for the escape of gases generated in the operation of the battery, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM LACHLAN.

Witnesses:
WILLIAM H. CLARKSON,
JAMES M. SULLIVAN.