

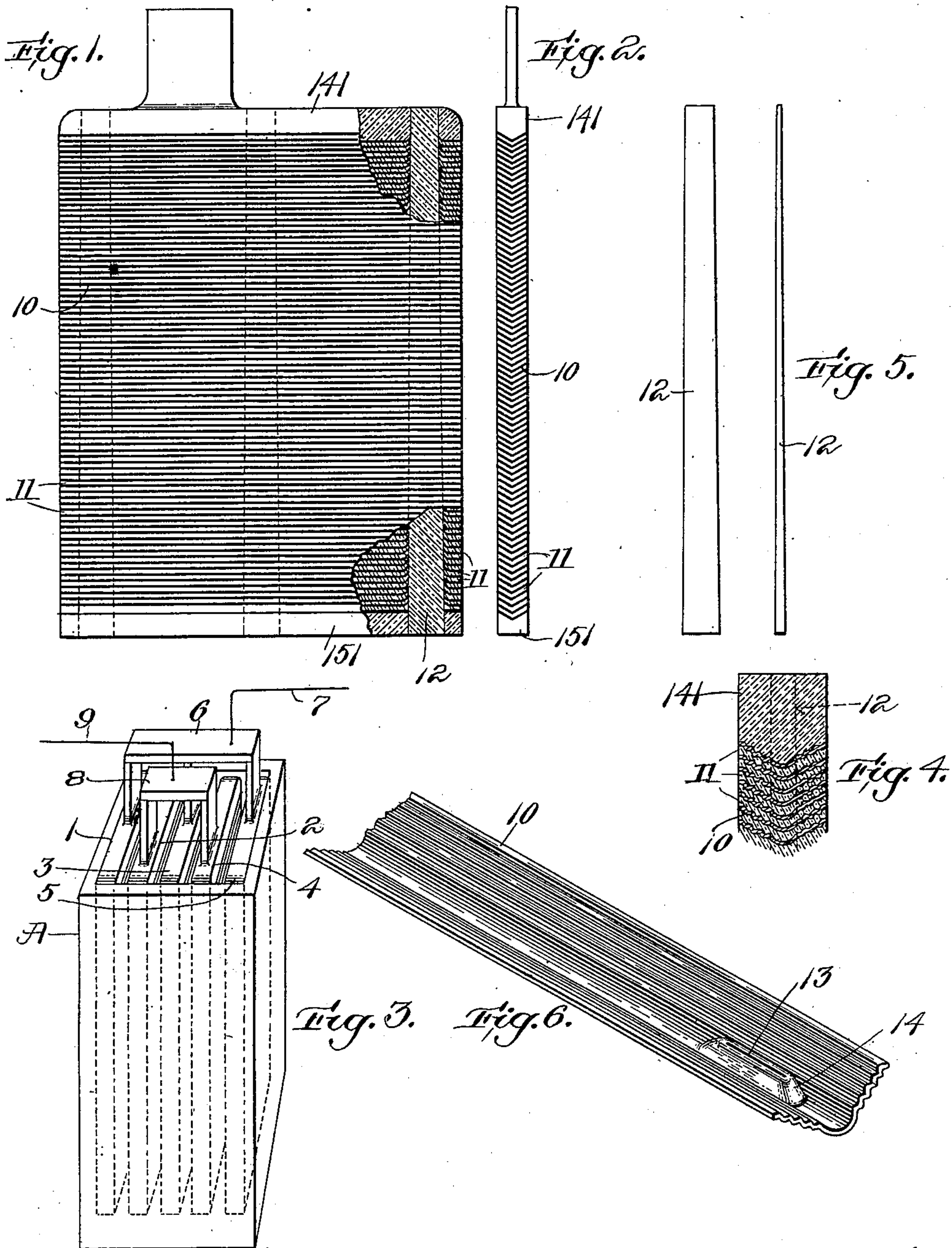
No. 700,666.

Patented May 20, 1902.

L. W. LOMBARD.  
STORAGE BATTERY.

(Application filed Mar. 1, 1901.)

(No Model.)



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## STORAGE BATTERY.

SPECIFICATION forming part of Letters Patent No. 700,666, dated May 20, 1902.

Application filed March 1, 1901. Serial No. 49,447. (No model.)

*To all whom it may concern:*

Be it known that I, LEVI W. LOMBARD, a citizen of the United States, residing at Boston, in the county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Storage Batteries, of which the following is a specification, reference being had therein to the accompanying drawings.

In the said drawings, Figure 1 shows in side elevation, partly broken away, a storage-battery plate embodying the invention. Fig. 2 is an edge view thereof. Fig. 3 represents a battery containing plates on the order of that embodying my invention. Fig. 4 is a sectional view, on an enlarged scale, of portion of a battery-plate. Fig. 5 shows views of one of the supporting-rods of a battery-plate, the said rod being formed in accordance with one feature of the invention. Fig. 6 shows in perspective portion of a battery-plate strip made in conformity with one feature of the invention.

The invention has reference to storage batteries of that class containing one or more plates built up of a number of strips of lead or the like, with their spaces filled with active material. Fig. 3 shows a battery comprising a cell A, containing a series of plates 1 2 3 4 5, the alternate plates 1 3 5 being connected together by means of a horizontal strip 6, having a conducting-wire 7 connected thereto, and the intermediate plates 2 and 4 being in similar manner connected together by a second strip 8, having a conducting-wire 9 connected thereto.

In Figs. 1, 2, 4, and 6, 10 10 are the strips composing one of the plates aforesaid, and 11, Figs. 1, 2, and 4, is the active material.

It has been proposed heretofore to form a plate such as aforesaid by making slits or slots through the strips 10 10 and stringing them upon rods 12 12 of suitable cross-section. The rods 12 12 serve not only as a means of tying the strips together in the series, but are utilized as a means of placing the series of strips in electrical communication with the conductors. In connection with plates of this character and construction difficulty has been experienced in establishing and maintaining perfect contact and electrical com-

munication between the rods and the strips. In consequence of the softness of the material of which the strips are composed (usually lead) the slot or slit through the same enlarges as the rod is forced through the slot or slit and as the strip is passed downward lengthwise of the rod. As a result the fit between the strips and the rods is destroyed more or less, and it may happen that a given strip fails to make contact with the rods or at the best may contact only slightly and very imperfectly therewith. Looseness of fit of the strips upon the rods also renders the plate more or less lacking in stiffness—that is to say, more or less yielding and loose-jointed.

The aims of the present invention are, first, to improve the general construction of the plate; second, to insure better contact between each strip and the rods; third, to produce a stiffer and firmer plate.

In the first place I form the rods 12 12 upon which the strips are strung tapering in the direction of the length thereof—that is to say, I gradually increase the size of each rod from one end thereof toward the other in both width and thickness. The end of the rod on which the strips are strung first is the smaller and the end toward which the strips are pressed in forcing them home is the larger. With the use of a rod of uniform size or diameter the gradual enlargement of the hole in the strip results in the imperfect fit and lack of contact to which reference has been made above. With a tapering rod the strip continues to fit tightly against the exterior of the rod as the strip slides down the latter.

In the second place I do not remove any of the material of the strip at the place where the latter is to fit upon the rod 12. I merely slit the strip, as indicated at 13, Fig. 6. Consequently when the end of the rod 12 is forced into the slit it can enter the latter only by spreading apart the sides of the slit, thereby a perfect and continual contact of the sides of the slit with a rod is insured, especially when the rod is tapered, as already described.

In the third place in forming the strip I press up a portion of the metal thereof so as to form a kind of prominent boss 14, Fig. 6, and the slit aforesaid is formed through this boss. The portions of this boss at opposite



sides of the slit form converging lips to press against the opposite sides of the rod. On the reverse side of the strip an indentation occurs where the boss is formed. (See Fig. 1.) The boss of one strip enters the indentation of the next, filling the latter, as indicated in Fig. 1. This causes the sides of the boss to be compressed more closely still upon the central rod. At the same time the boss serves as a spacing projection to hold the strips at uniform distances apart, so as to produce the intermediate spaces which receive the active material.

In the improved plate there is perfect contact between the strips and the rod. The strips do not wear loose, either in being strung upon the rod or afterward during the employment of the plate. The strips are perfectly and uniformly spaced and the plate is well braced throughout and firm.

Figs. 1 and 2 show the plate as having applied thereto a head-bar or top bar 141 and a bottom bar 151, which are secured to the upper and lower ends, respectively, of the rods 12 12.

What I claim is—

1. In a storage-battery plate, in combination, the series of strips 10, 10, of conducting material, slitted for the reception of the

supporting-rods, supporting-rods, also of conducting material tapering lengthwise, fitting within the slits of the said strips, and making contact with the edges of the slits, substantially as described.

2. In a storage-battery plate, in combination, the series of strips 10, 10, of conducting material having raised slitted bosses, with the boss of one strip fitting within the corresponding indentation of the next adjacent strip, and supporting-rods of conducting material passing through the slits, substantially as described.

3. In a storage-battery plate, in combination, the series of strips 10, 10, of conducting material having raised slitted bosses, with the boss of one strip fitting within the corresponding indentation of the next adjacent strip, and supporting-rods, of conducting material tapering lengthwise, passing through the slits in the strips, and making contact with the edges of said slits, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

LEVI W. LOMBARD.

Witnesses:

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