

I. L. PULVERMACHER.  
VOLTA ELECTRIC APPARATUS.

No. 177,274.

Patented May 9, 1876

Fig. 1.

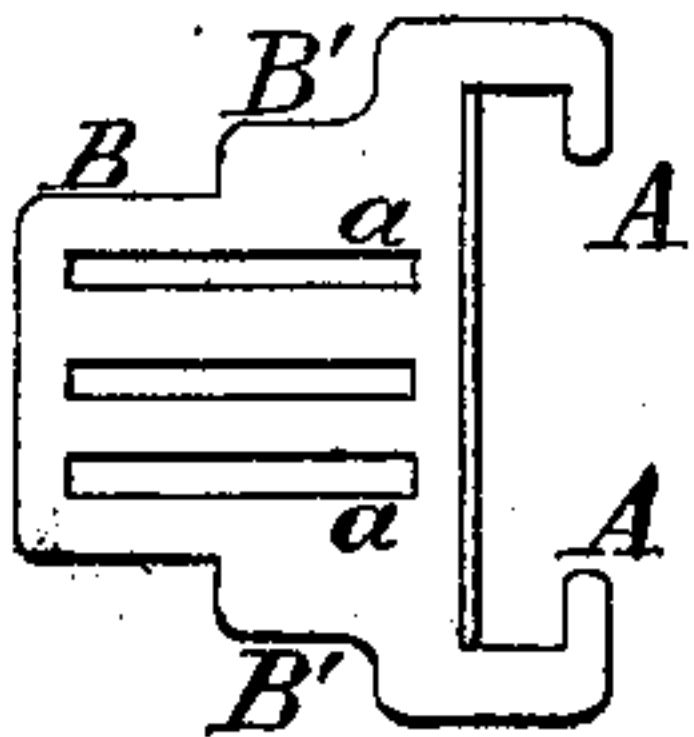


Fig. 2.

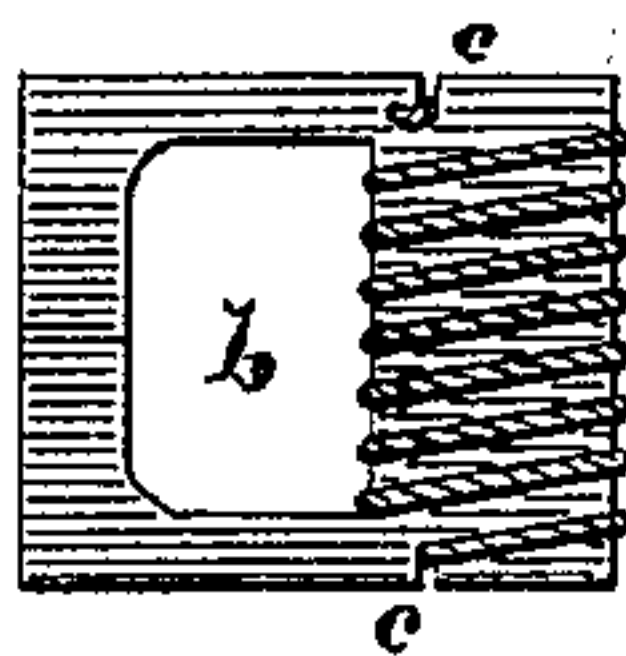


Fig. 3.

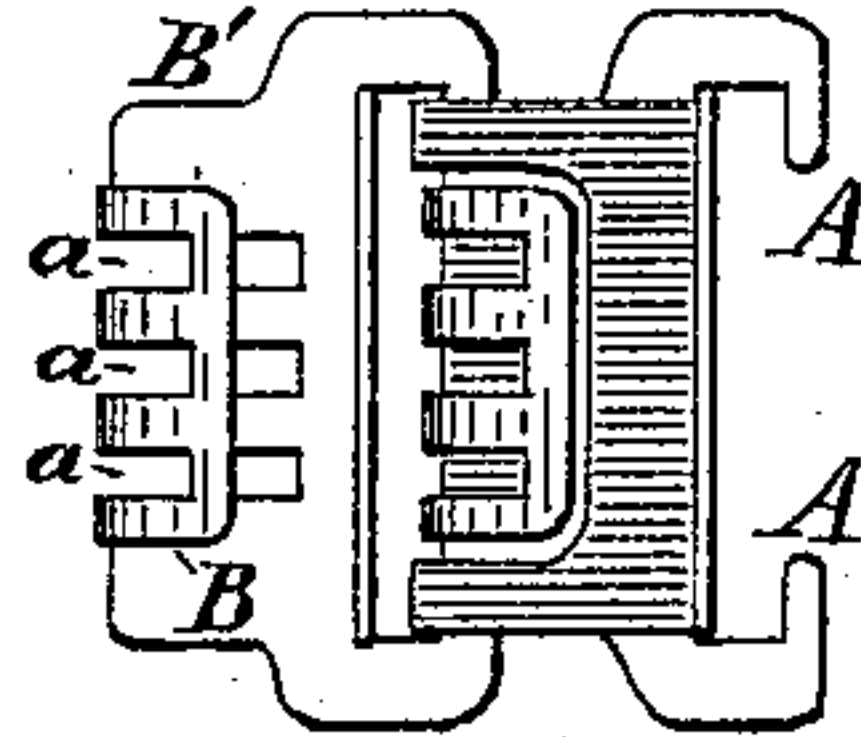


Fig. 4.

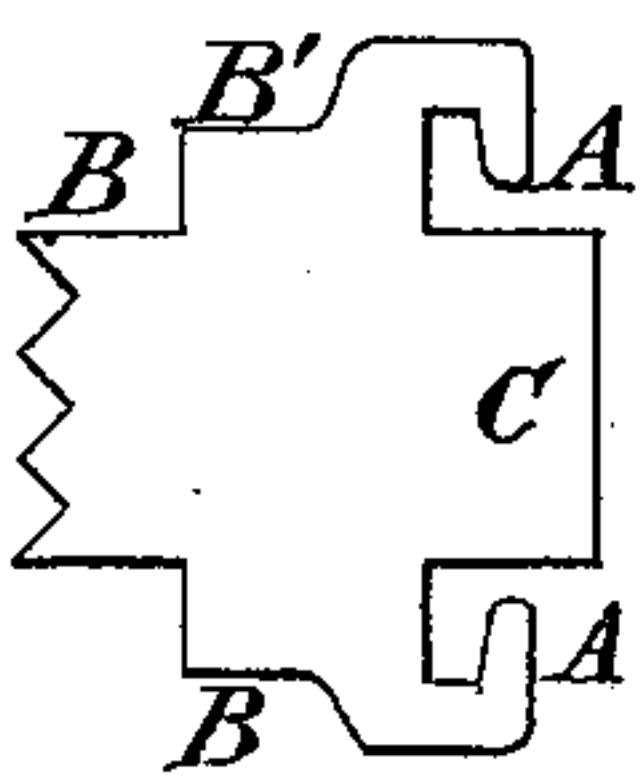


Fig. 5.



Fig. 6.

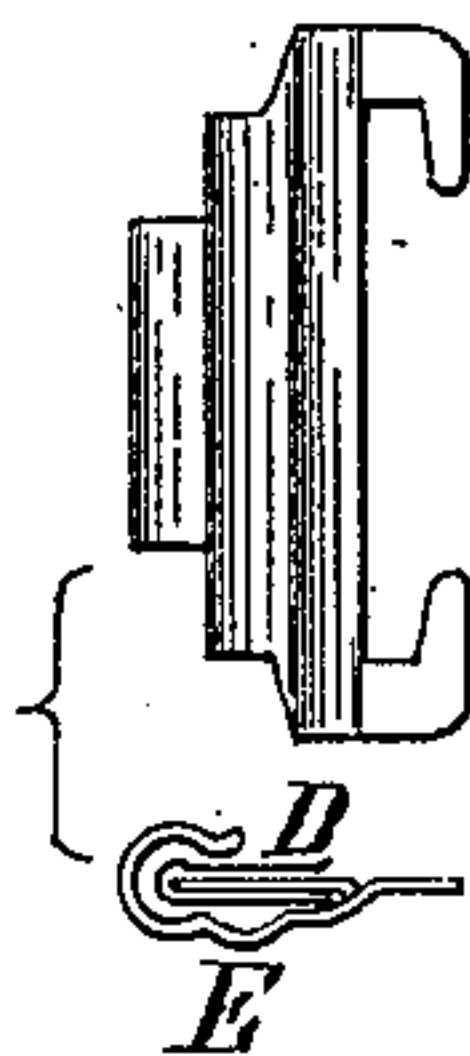


Fig. 7.

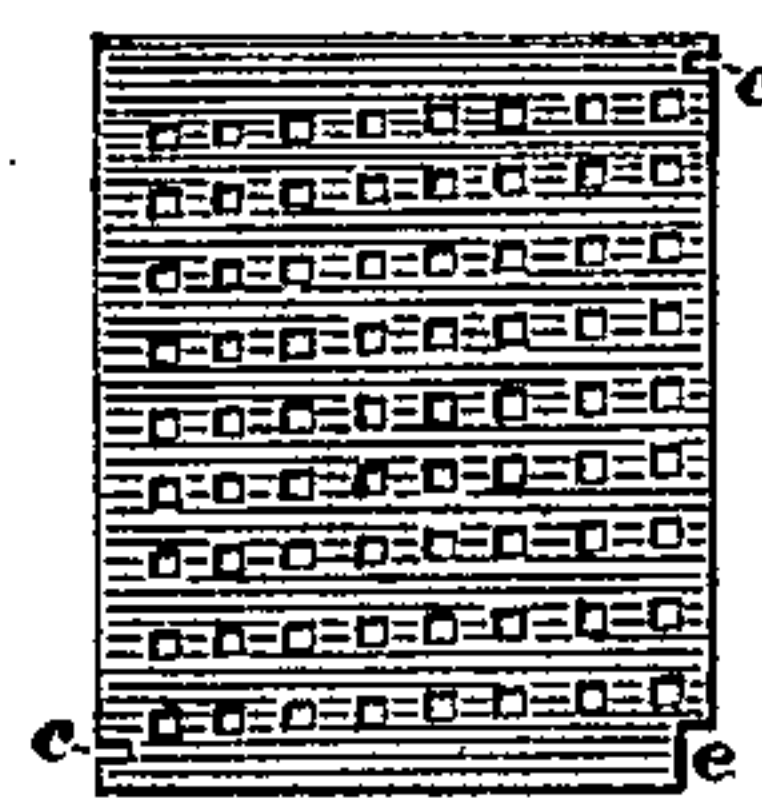


Fig. 8.

Fig. 8.

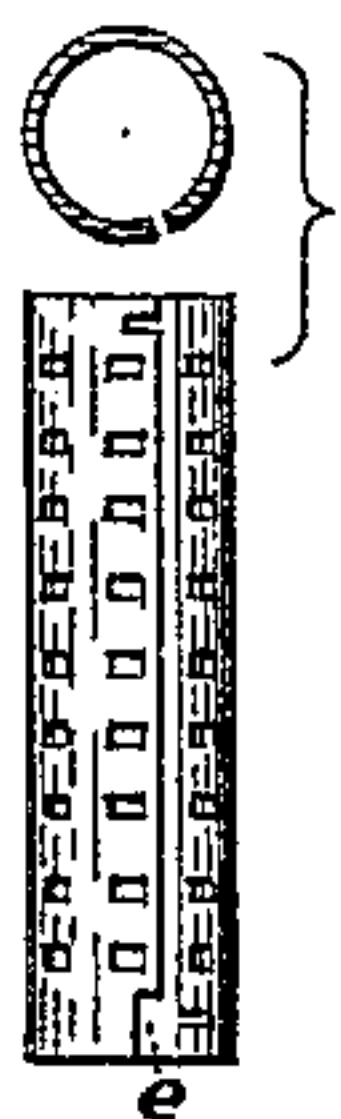
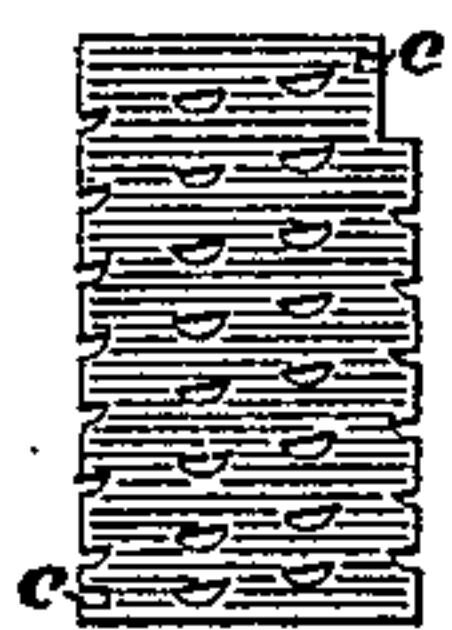
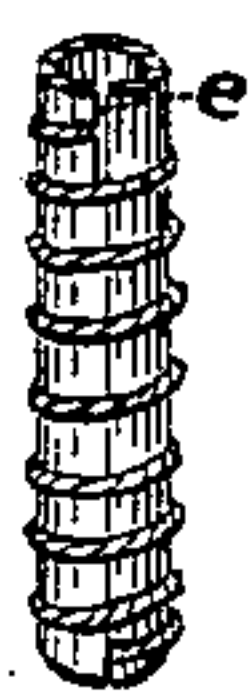


Fig. 10.

Fig. 11.



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Fig. 12.

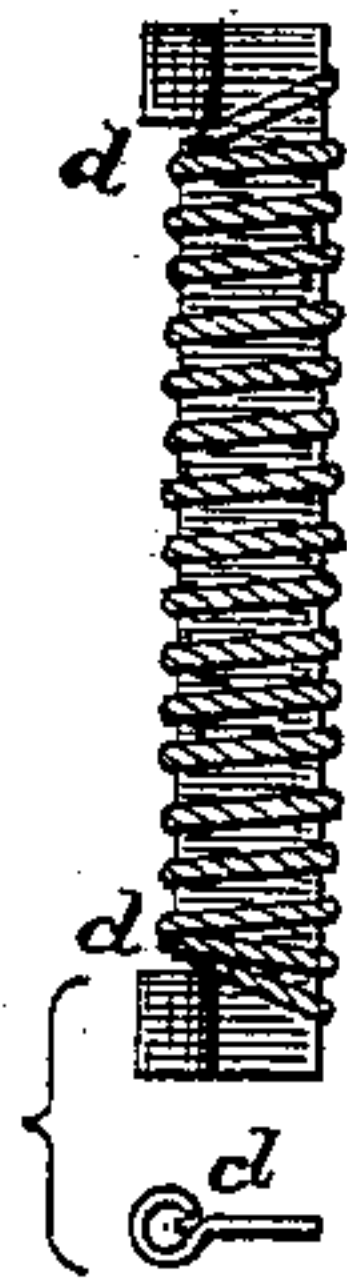


Fig. 13.

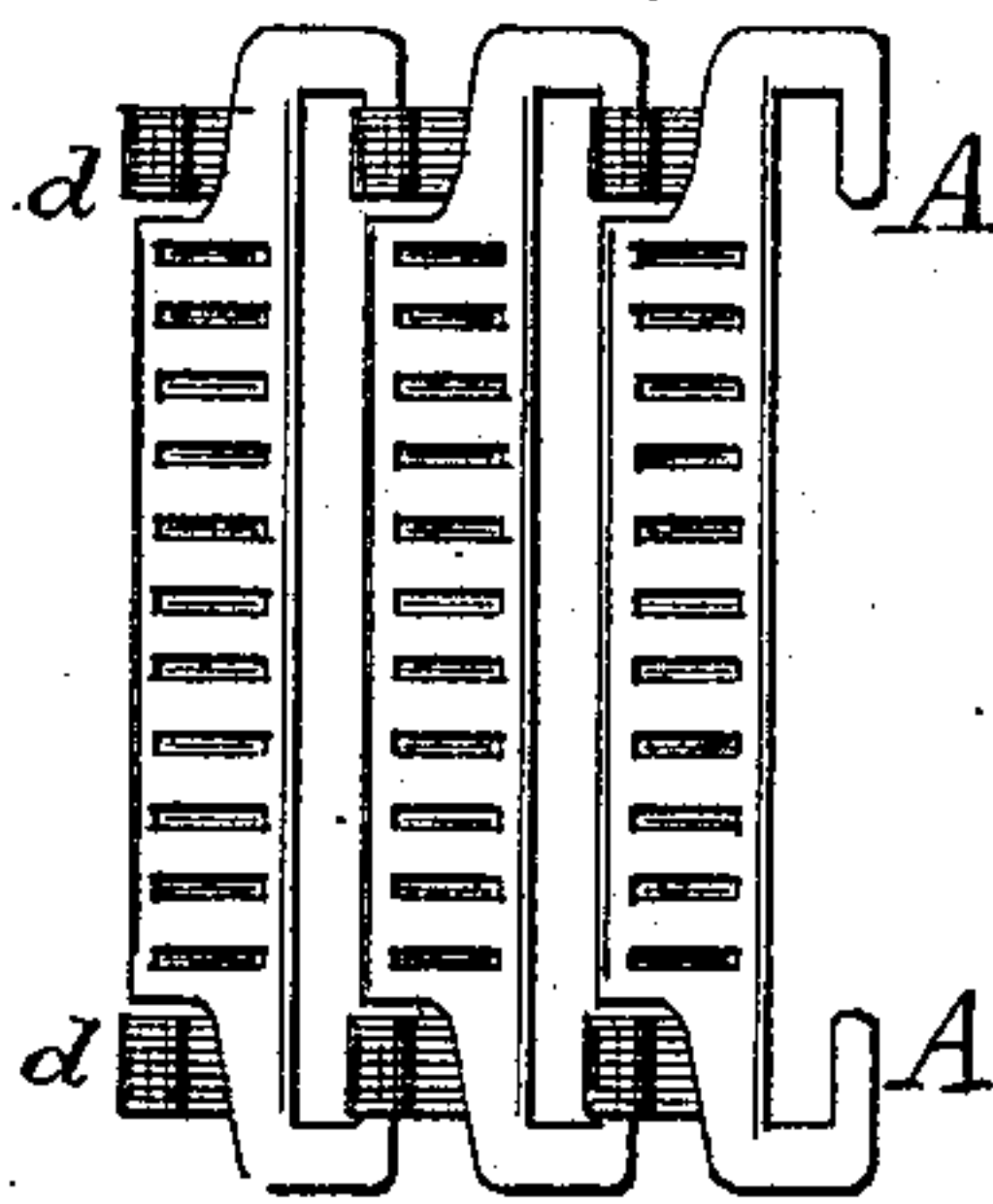


Fig. 14.

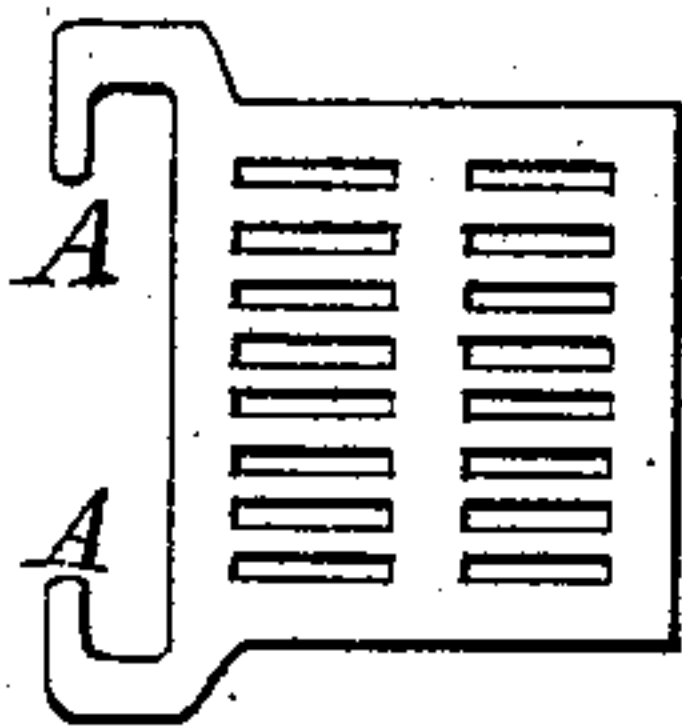


Fig. 15.

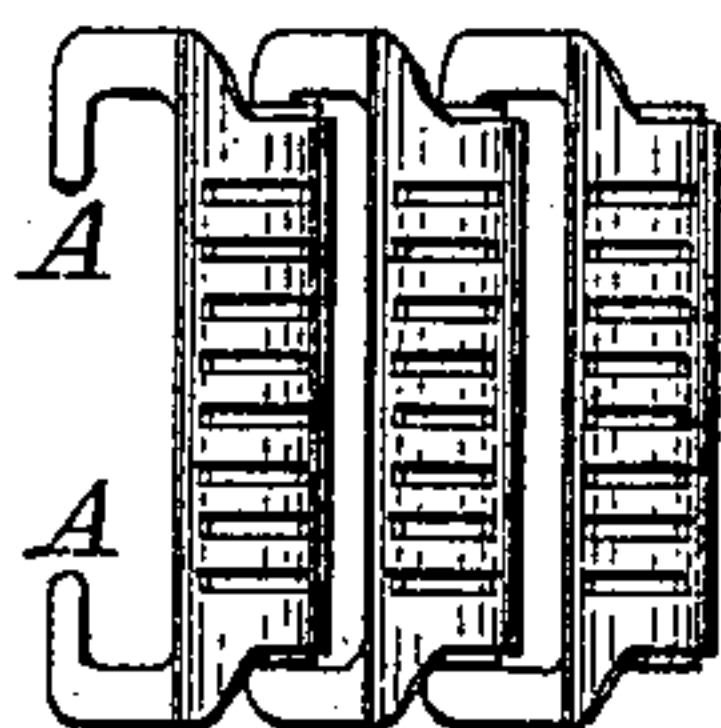


Fig. 16.

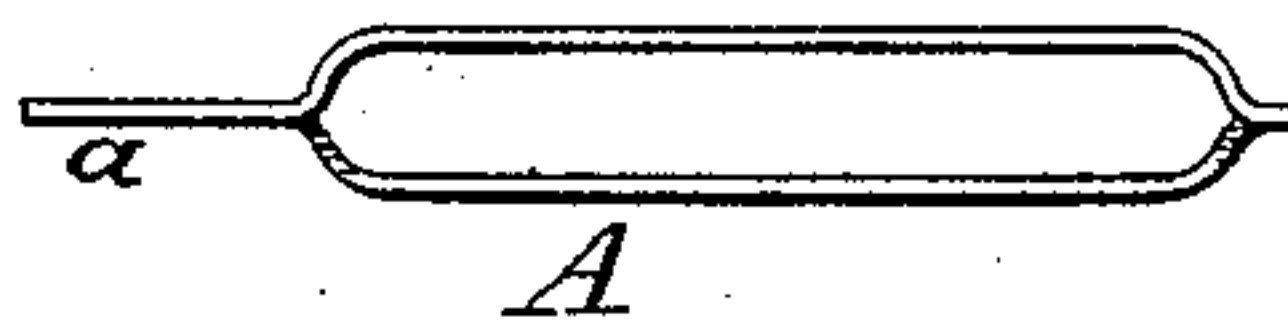


Fig. 18.

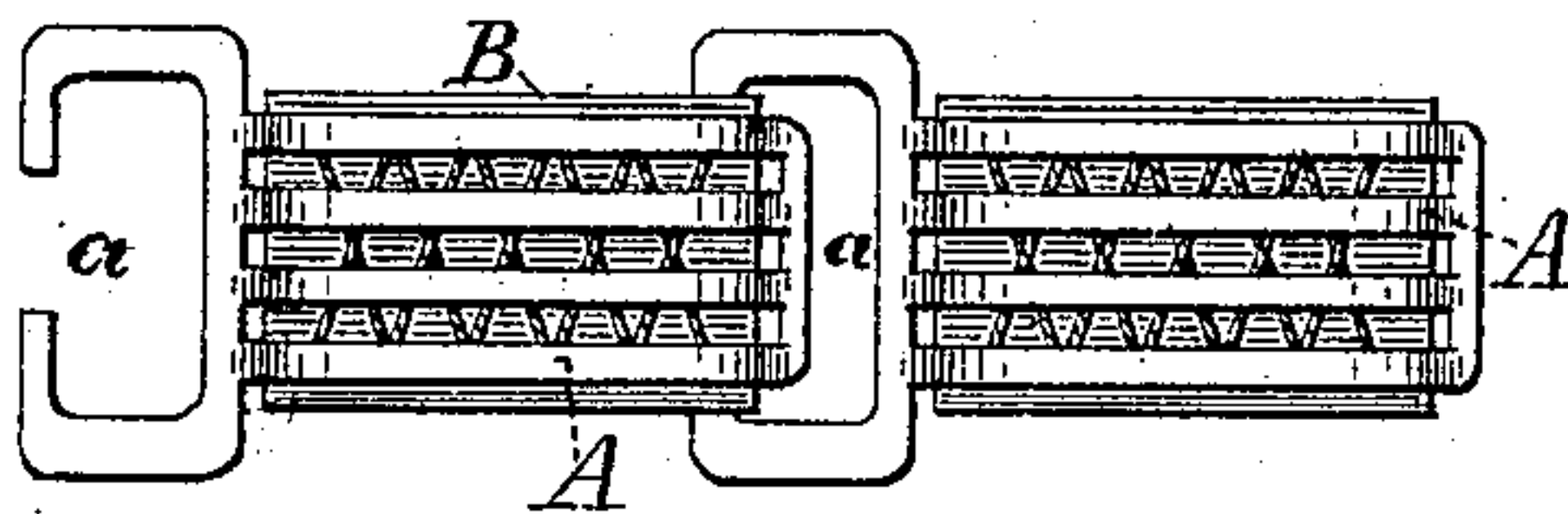


Fig. 17.



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# UNITED STATES PATENT OFFICE.

ISAAC L. PULVERMACHER, OF LONDON, ENGLAND, ASSIGNOR TO JOHN EDWARD HETHERINGTON, OF CINCINNATI, OHIO.

## IMPROVEMENT IN VOLTA-ELECTRIC APPARATUS.

Specification forming part of Letters Patent No. **177,274**, dated May 9, 1876; application filed March 14, 1876.

*To all whom it may concern:*

Be it known that I, ISAAC LOUIS PULVERMACHER, of London, England, have invented certain Improvements in Volta-Electric Appliances, of which the following is a specification:

This invention has for its object the construction of volta-galvanic elements, and their arrangement to form batteries; and it consists, essentially, in the peculiar construction and arrangement in connection with each other of the said elements, as will be hereinafter described.

Referring to the drawings, Figure 1 shows a copper plate, provided with prongs A A, a tongue, B, shoulders B' B', and slots *a a*. Fig. 2 shows a zinc plate, partly covered by a wrapping of thread, and perforated or punched out at *b*, to receive the tongue B of the copper plate, Fig. 1. This tongue is bent or folded inward, as in Fig. 3, and the zinc plate is folded or bent across the middle; the thread-wrapped portion of the latter is then inserted into the fold of the copper plate. The other or unwrapped portion of the zinc takes a position around the tongue B of the copper, but not in contact therewith. Thus arranged, the two plates form a perfect link or element. To form a chain or belt the prongs A A of the copper are caused to engage or hook into the fold of the zinc at top and bottom, to form an articulation of the copper of one element with the zinc of the adjoining element, as clearly shown in Fig. 3. Thus a chain of elements, voltaically combined, can be made of any length for the purpose intended. Fig. 4 shows a copper plate of slightly-modified construction, provided with a tongue, C, on the front edge, between the prongs, which can be bent back nearly flat upon the body of the plate, and the tongue B forward nearly flat upon the tongue C. A zinc plate, constructed as in Fig. 5, partly wrapped with thread, or with some fibrous tissue or fabric, is then folded and inserted in the copper. The tongue B of the copper may be serrated, and the inner margin of the aperture *b* in the zinc correspondingly toothed, so that they mutually engage when joined together, but do not touch metallically. The tongue C of the copper may

be cut so as to be folded back, and then looped round the edge of the body of the plate, and a folded zinc of the proper shape to fit inserted. This is shown in Fig. 6. The ends of the thread with which the zinc plate is wrapped may be pinched in nicks *c c* in the plate, as shown in Figs. 2 and 5, thus dispensing with knots and preserving surface regularity. The thread may be wound in distant spiral form, as shown. To better preserve the regularity of the thread spirals the zincs may be perforated in oblique or spiral lines, as shown in Figs. 7, 8, and 9, so that when the plate is inserted into the folded copper, or, as it may be, rolled into a cylindrical form, as in Fig. 9, portions of the thread become lodged in the holes, Fig. 10, and retain the distance spirals thereby. The threads might also be woven through the holes, or sewed through while the zinc is yet in strips, so that when the strips are cut up into element-plates and folded or rolled, the thread appears as in Fig. 11. The zinc plates may also have loops or eyes *d d* formed on their ends, as in Fig. 12, for the prongs of the copper plates to take into, as in Fig. 13. When the zinc plates are formed into cylinders, as in Figs. 9, 10, 11, and 12, the copper plates that embrace them may be constructed as in Fig. 14, so that when they are formed into cylinders, as in Fig. 15, the prongs A A will engage or hook into the zinc cylinder inside. The zincs may be slotted at the ends, as at *e e* in Fig. 10, to permit the passage of the prongs on the copper; and after a lodgment has been effected the zincs can be turned partially around. The adjoining elements are thus loosely but firmly articulated with each other, the prongs and the zinc being thereby put into contact to establish voltaic connection. The copper plates for these zincs may be of rectangular, square, or other shapes, so that they may be arranged in various forms to produce electricity of intensity or electricity of tension. The thread wrapping or fibrous material around the zinc is intended to absorb and retain the exciting liquid, and to prevent metallic contact between zinc and copper.

In Figs. 16, 17, and 18 I have shown a modification of the above. Fig. 16 shows a copper strip or plate, A, the body of which is



slitted longitudinally and the alternate strips bent outwardly on the same side, so as to embrace a thread-wrapped zinc plate, B, bent or folded, as in Fig. 17, to fit the embracing copper. The latter is provided with open eyes or hooks *a a*, to engage the zinc of the adjoining element. The complete element, as thus constructed, is clearly shown in Fig. 18.

I have already obtained a patent for the within-described invention in Great Britain, which patent bears date November 16, 1874, No. 3,937.

I claim—

1. The copper plate forming the negative element, constructed with prongs A A, slots *a a*, and tongue B, substantially as shown and described, and adapted to be folded or rolled into tubular form, as set forth.

2. The zinc plate forming the positive ele-

ment, constructed and perforated, substantially as shown and described, and wrapped with thread or other suitable fibrous material or tissue, as an absorbent for the exciting fluid, and adapted to be folded or rolled, so as to be inserted into the copper element, as set forth.

3. The combination of a zinc plate, as shown in Fig. 2, provided with nicks *c c*, to receive and hold a thread, with a thread wound spirally thereon, and fastened by swaging or punching into the said nicks, as set forth.

In witness whereof I have hereunto set my name in the presence of two witnesses.

ISAAC LOUIS PULVERMACHER.

Witnesses :

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E. EDMONDS,

166 Fleet Street, London.