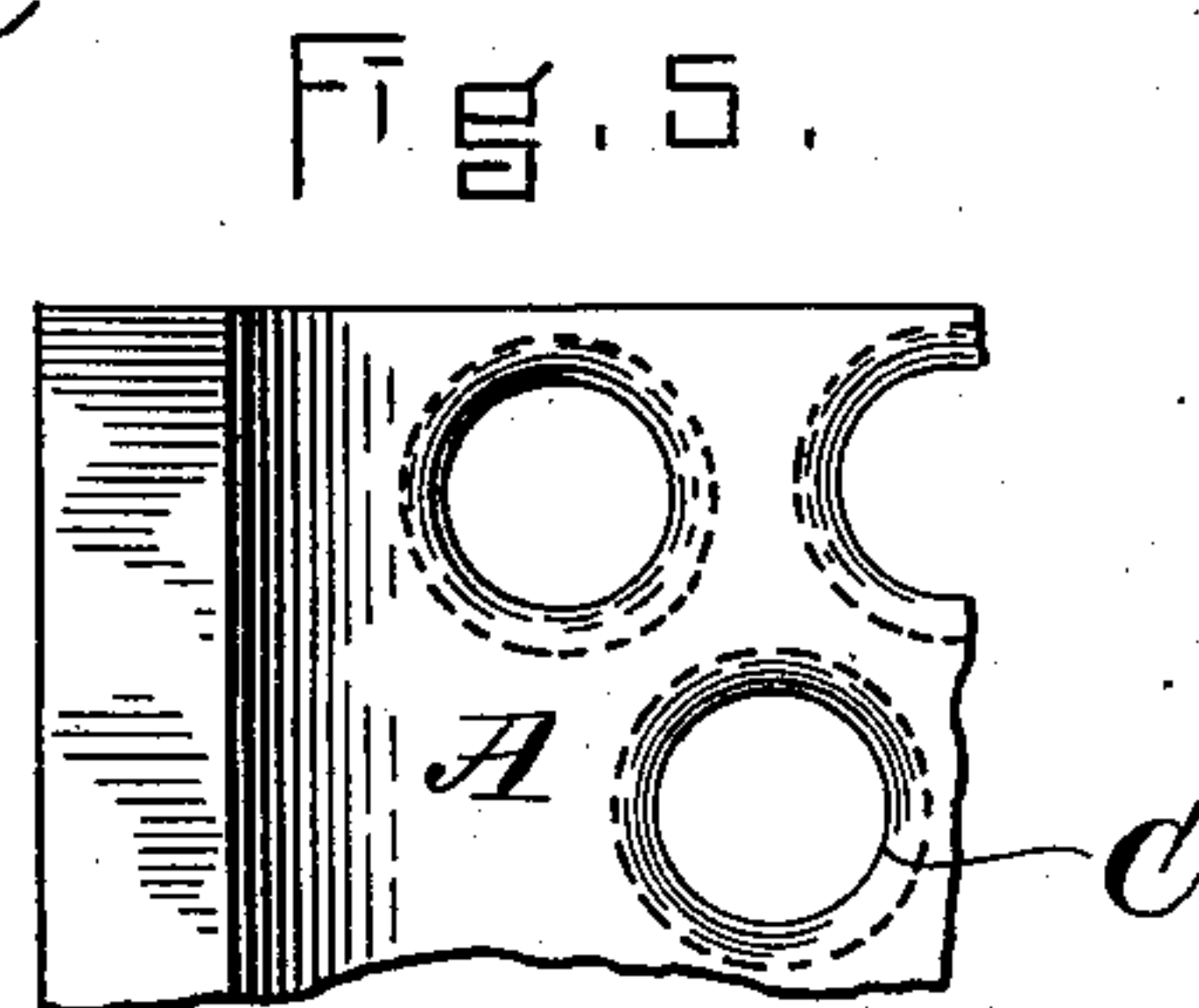
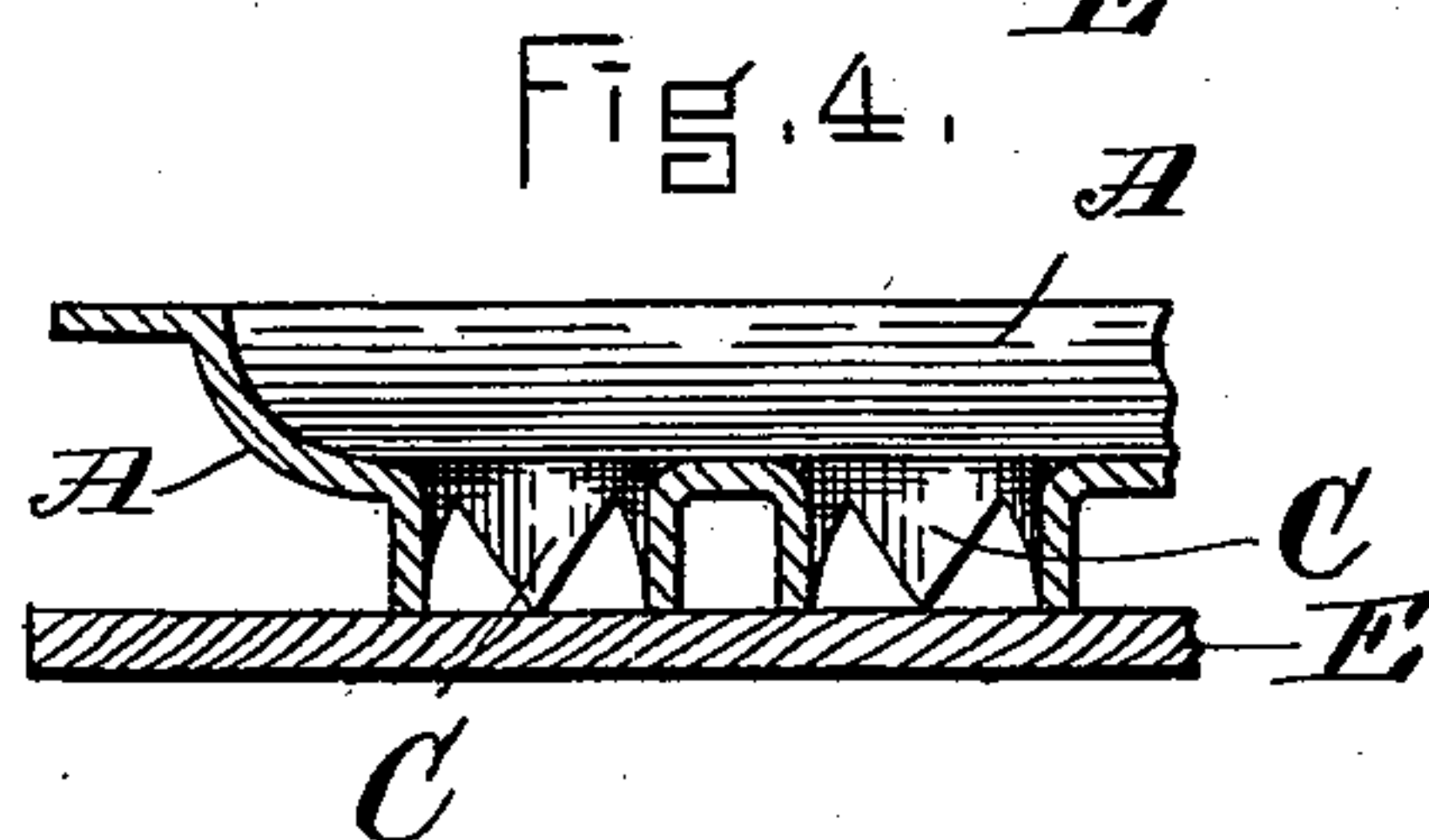
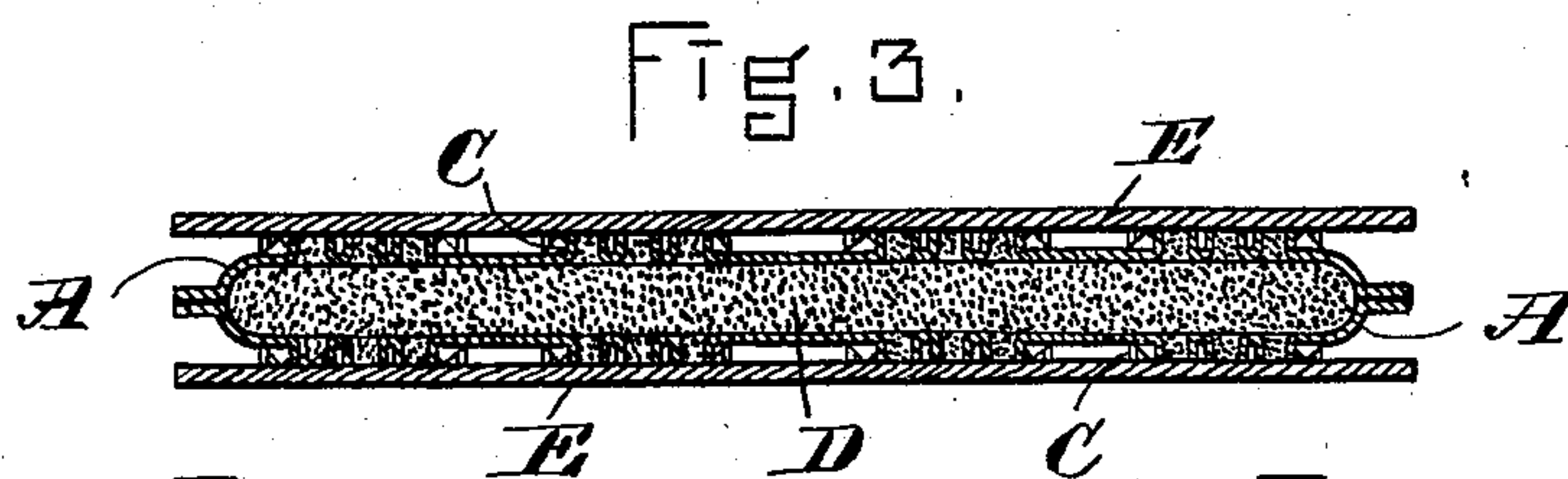
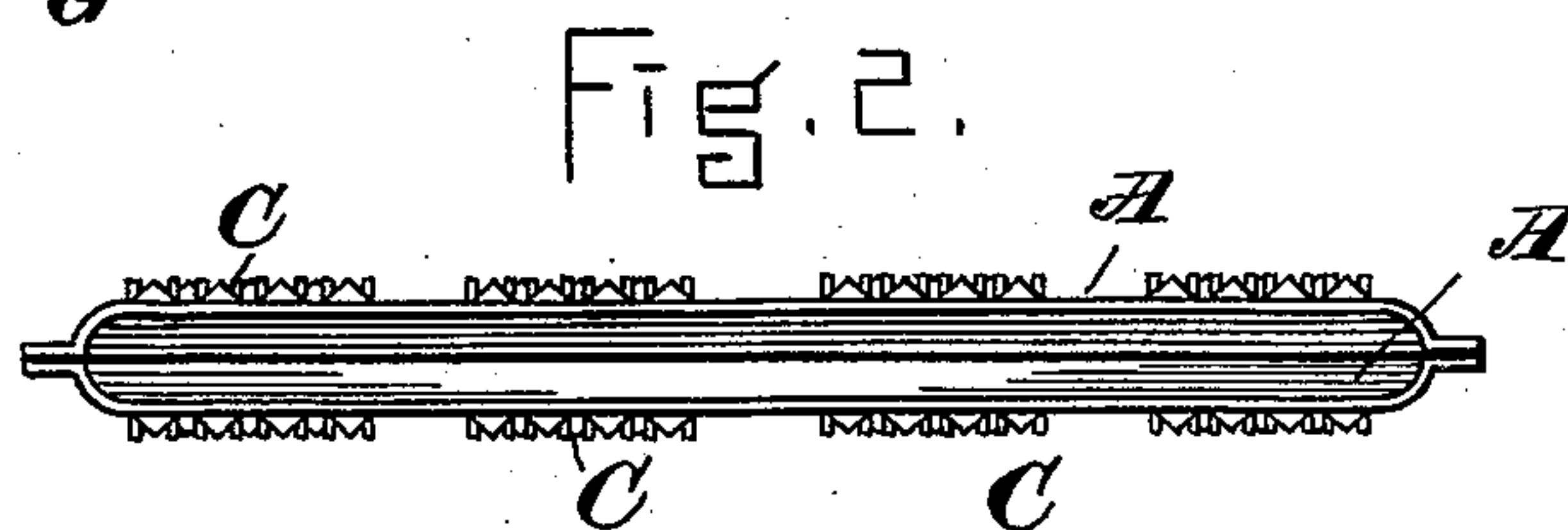
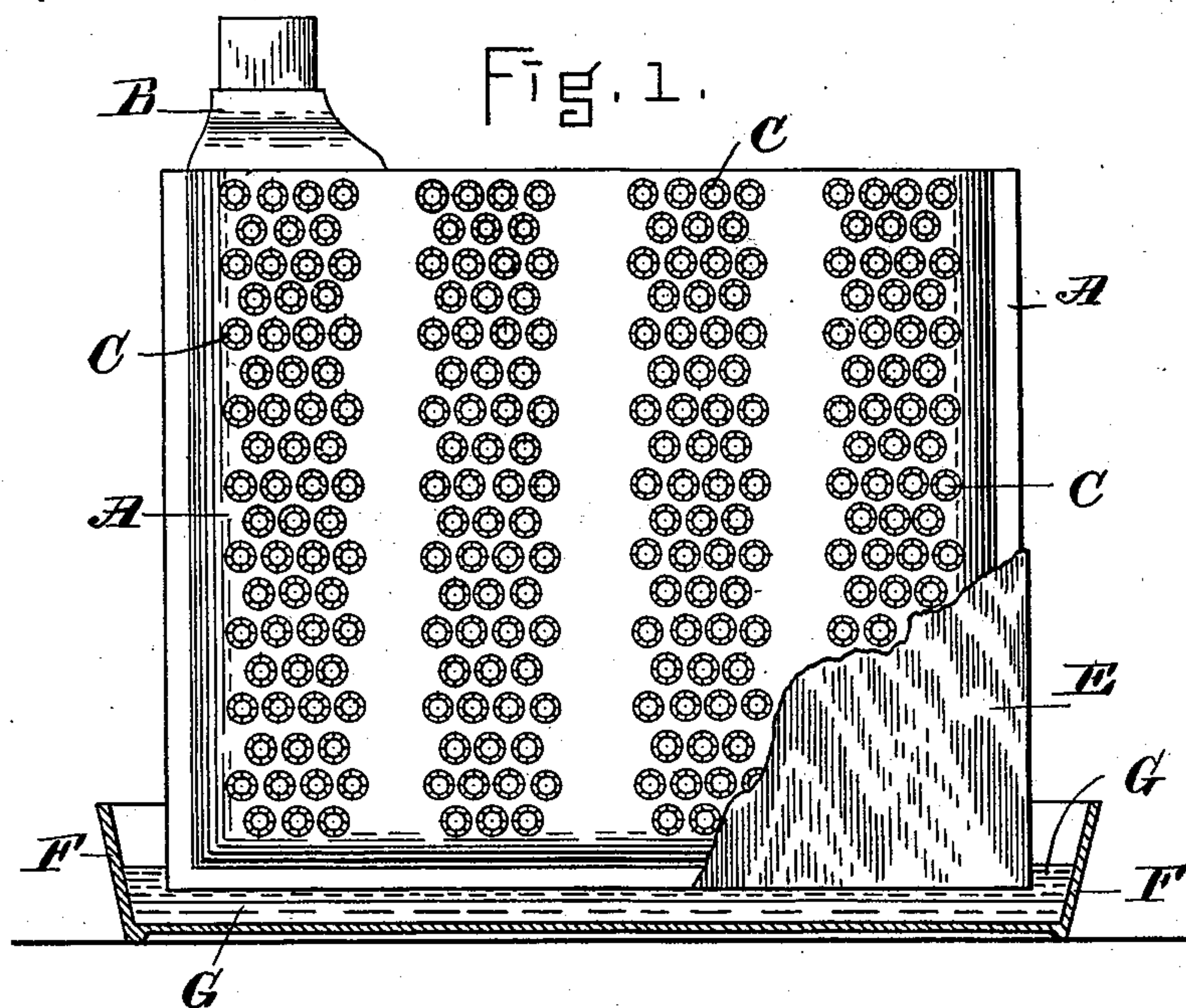


(No Model.)

E. P. USHER.
STORAGE BATTERY.

No. 509,269.

Patented Nov. 21, 1893.



WITNESSES.

R. Henry Marsh.
L. F. Bridge.

INVENTOR.

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UNITED STATES PATENT OFFICE.

EDWARD P. USHER, OF GRAFTON, MASSACHUSETTS, ASSIGNOR TO THE HOPE-DALE ELECTRIC COMPANY OF WEST VIRGINIA, OF WEST VIRGINIA.

STORAGE-BATTERY.

SPECIFICATION forming part of Letters Patent No. 509,269, dated November 21, 1893.

Application filed January 23, 1893. Serial No. 459,476. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. USHER, of Grafton, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Storage-Batteries, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to the accumulator plates of storage batteries, and it consists in plates having the peculiar construction shown and described, and in the combination therewith of separators in external contact therewith.

My improved plate is peculiar in that it is a hollow flattened shell of metallic lead or the like perforated in its sides with outwardly projecting burrs at each perforation, and a filling of active material inclosed within such shell. The burred perforations are preferably grouped in vertical columns, with plain unperforated spaces between such groups, these plain vertical spaces forming open wells in which the liquid may rise between the exterior of the plate and the wooden separator used with and interposed between the plates. Each plate is made up of two sheets of lead perforated by punching from one side to cause the burrs to protrude on the opposite face, the edges of the lead sheets being bent in the direction of the smooth inner face of the plate and joined marginally when put together to form the hollow shell. The plate so formed is or may be open at top to receive a filling of active material in powdered form, such material being kept from escaping through the perforations by means of wooden separators held in close contact with the sides of the plate, and all fixed in permanent position by a shallow bed of cement or gum adapted to harden around the lower edges of the plates and separators. The several plates have the usual connecting lugs and cross-bar by which they are joined in a series.

In the drawings, Figure 1 is a side elevation of one of my improved plates, with a portion of one of the separators in front of it, the view showing, also, a vertical section of the pan and gum setting in which the parts

are embedded. Fig. 2 is a top view of the open, perforated shell, and Fig. 3 a horizontal section through the filled shell and the adjacent separators. Fig. 4 is an enlarged sectional detail of shell and separator, and Fig. 5 an enlarged view of part of the shell seen from the inside.

A represents a hollow shell of thin lead or other conducting metal provided with the usual connecting lug B. The sides of this shell are flattened and finely perforated, the walls of the perforations being caused to protrude outwardly and form burrs C, due to the punching of the holes by a pointed instrument applied to the other surface of the sheet before the shell is formed. These hollow shells are formed of two sheets of the perforated conducting metal brought together at their edges and soldered or otherwise joined marginally, leaving the top open and an interior cavity, as in Fig. 2, to receive a filling D, Fig. 3 of material to become active. This material I apply as a dry power, either loosely or in the form of a tablet or tablets, wrapped in perforated lead foil or the like, and introduced vertically through the open top, the foil being speedily disintegrated when the plates are formed. To prevent the loose powder from escaping through the burred perforations I may coat the exterior of the shell with a thick mucilage which temporarily closes the openings.

E E are thin porous separators of kiln-dried wood or equivalent non-conducting substance placed in close contact with the several shells, their interposition between the alternate plates preventing short-circuiting through any dropping of the active material. The lower edges of the separators and plates or shells rest in a bed of quick-hardening gum, G, contained in a shallow vessel F, as seen in Fig. 1, a preliminary coating being allowed to first harden to support the plates above the bottom of the pan. The embedding mass then holds the parts in proper position.

I prefer to group the perforations in vertical columns, leaving open, unperforated spaces between them, about as indicated in the drawings. Through these open spaces

the liquid may rise freely, so that the circulation is improved by the arrangement stated.

I claim as my invention—

- 5 1. The described battery plate, formed of a hollow shell of conducting metal perforated in its sides with outwardly-projecting burrs at each perforation, and a filling of material to become active inclosed between such perforated walls, substantially as set forth.
- 10 2. The described battery-plate, formed of a hollow shell of sheet lead, joined at bottom and edges, perforated in its sides with outwardly-projecting burrs at each perforation, such burred perforations being grouped, vertically,
- 15 and alternating with plain externally smooth spaces, such shell having a filling of material to become active inclosed within it, substantially as set forth.

3. In a storage battery, a hollow metallic shell having in its sides a multiplicity of small 20 perforations each having outwardly extending burrs as described, with narrow plain or unperforated spaces forming vertical wells and an inclosed filling of material to become active, in combination with non-conducting 25 separators, interposed between and in close contact with the successive plates, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of 30 two subscribing witnesses, on this 21st day of January, A. D. 1893.

EDWARD P. USHER.

Witnesses:

A. H. SPENCER,
THOMAS J. KENNY.