

P. J. WREN & F. T. COMEE.
 APPARATUS FOR VULCANIZING RUBBER BOOTS AND SHOES.
 APPLICATION FILED JAN. 22, 1909.

975,309.

Patented Nov. 8, 1910.

Fig. 1.

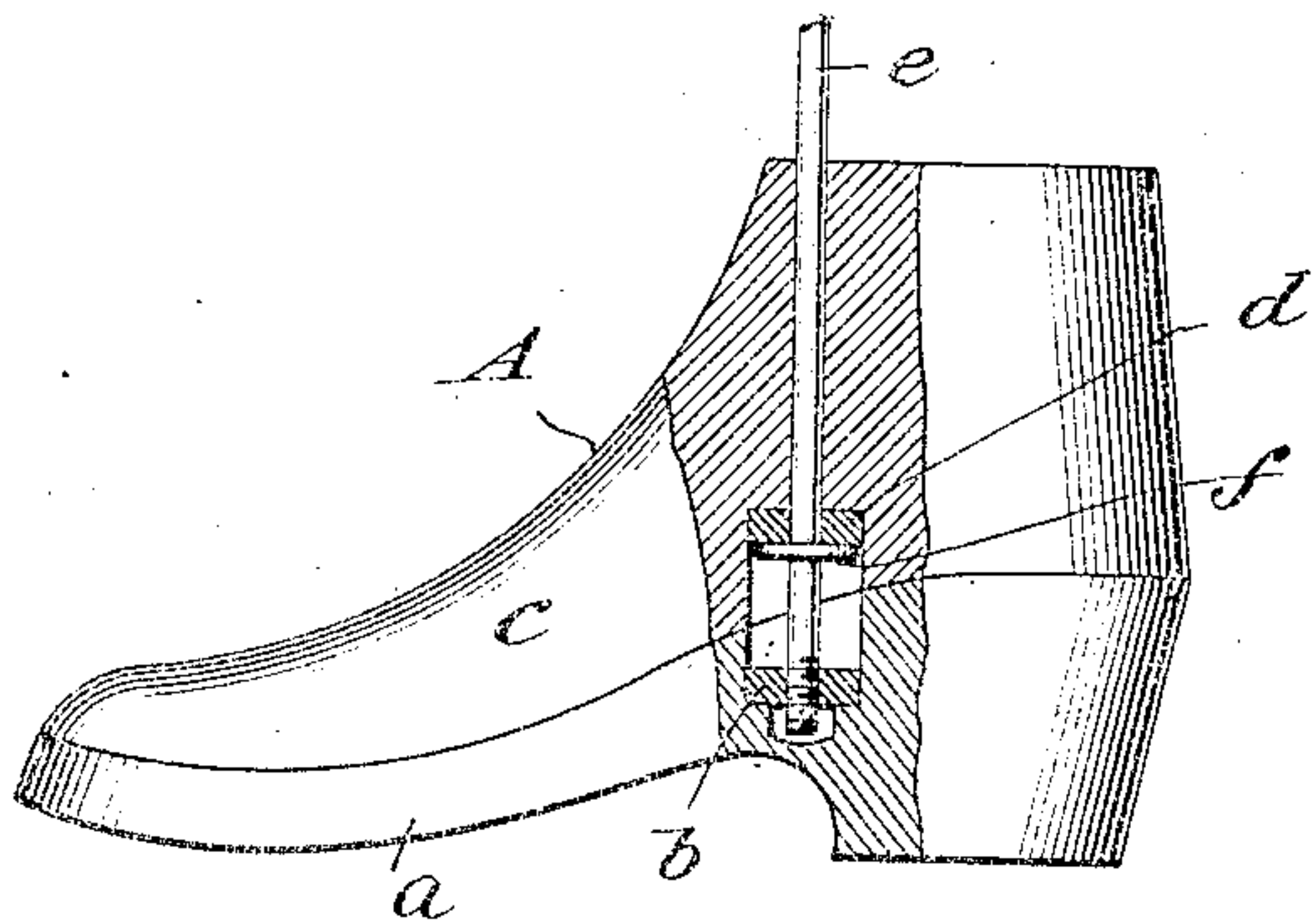


Fig. 2.

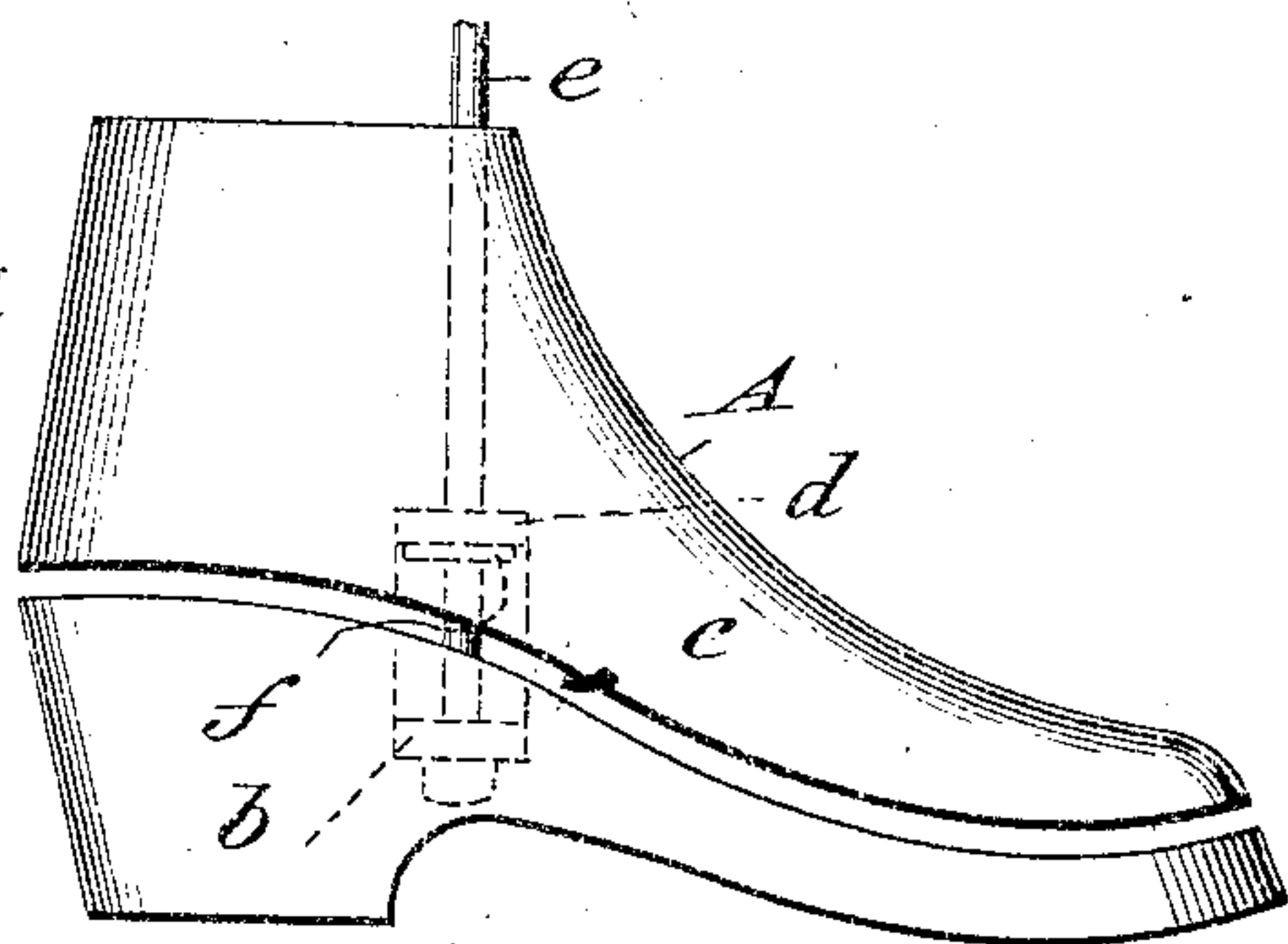


Fig. 3.

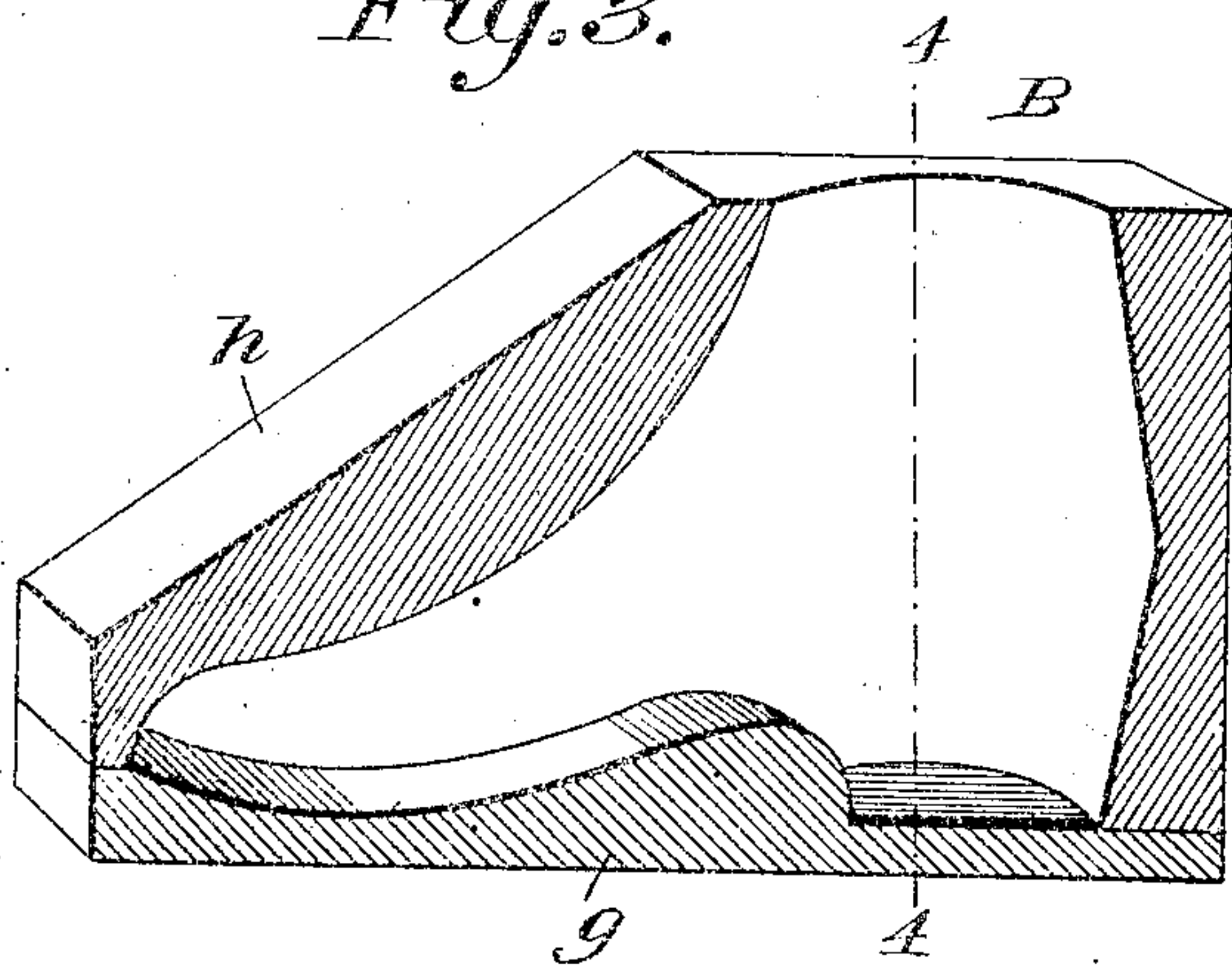


Fig. 4.

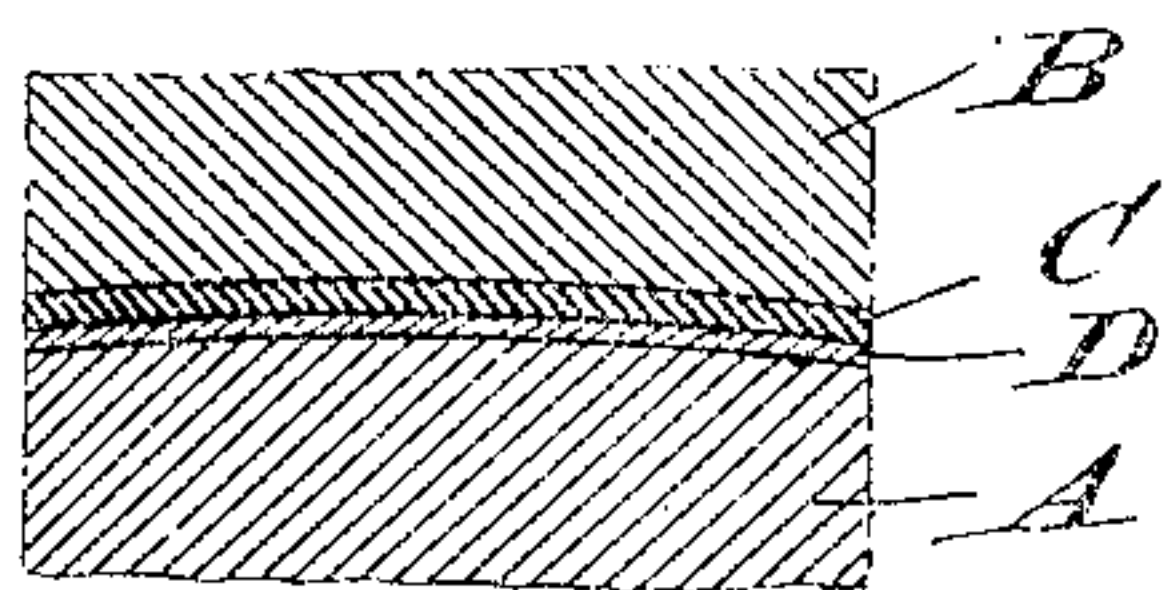
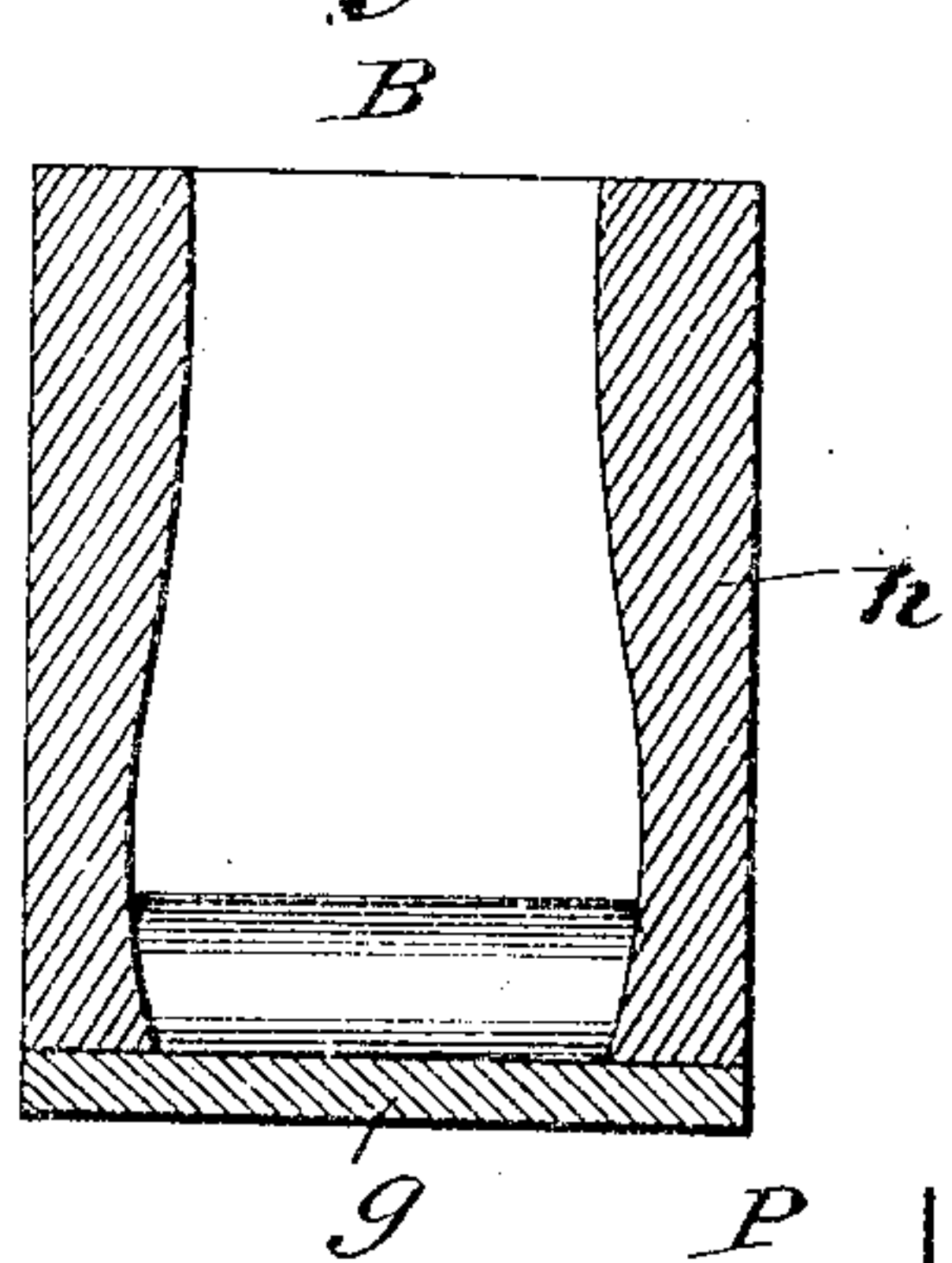
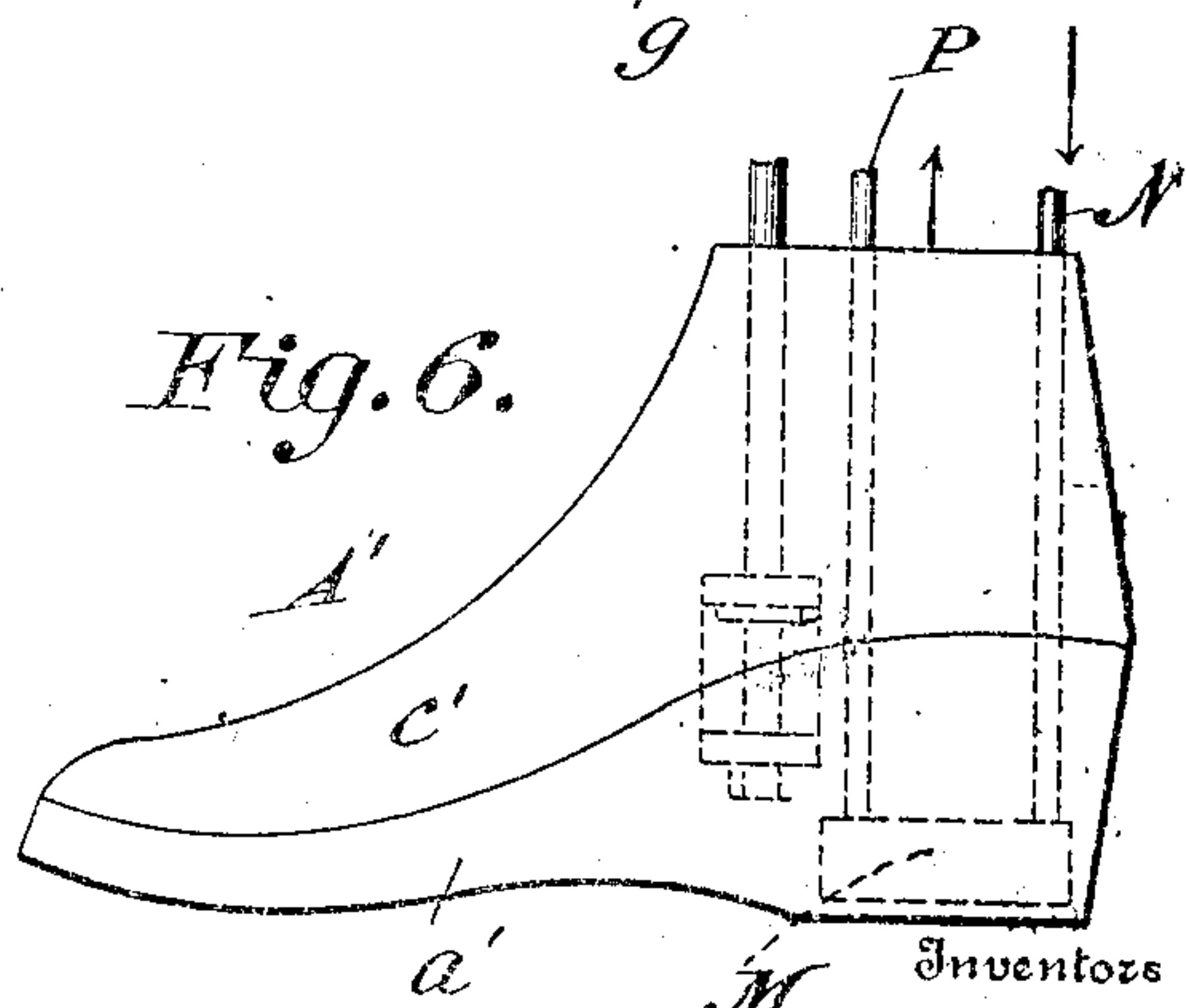


Fig. 5.

Fig. 6.



Witnesses

Phil E. Barnes
 W. E. Dealy

By

P. J. Wren &
 F. T. Comee.
 James J. Shubert
 Attorney

UNITED STATES PATENT OFFICE.

PATRICK J. WREN AND FREDERICK T. COMEE, OF WOONSOCKET, RHODE ISLAND.

APPARATUS FOR VULCANIZING RUBBER BOOTS AND SHOES.

975,309.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, PATRICK J. WREN and FREDERICK T. COMEE, citizens of the United States, residing at Woonsocket, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Apparatus for Vulcanizing Rubber Boots and Shoes, of which the following is a specification.

Our invention has to do with the vulcanization of rubber shoes and the like, more particularly rubber shoes and analogous articles such as have linings of textile material; and it consists in an apparatus for successfully and expeditiously bringing such vulcanization about, as hereinafter described and claimed.

In the drawings, accompanying and forming part of this specification: Figure 1 is a view, partly in elevation and partly in section, of what we will hereinafter term the last-member of an apparatus constructed in accordance with our invention. Fig. 2 is a side elevation of the last-member, showing the same in its expanded state. Fig. 3 is a longitudinal, vertical section of what we will hereinafter denominate the mold-member of the apparatus. Fig. 4 is a transverse section taken in the plane indicated by the line 4—4 of Fig. 3. Fig. 5 is a view showing a portion of the last-member and a portion of the mold-member, together with a portion of a rubber shoe and the textile lining thereof interposed between the last-member and the mold-member. Fig. 6 is a side elevation of a modified last-member hereinafter referred to in detail.

Referring by letter to the said drawings, and more particularly to Figs. 1 to 5 thereof: A is the last-member of the apparatus comprised in our invention.

B is the mold-member of the apparatus.

C is a rubber shoe arranged on the last-member and between said last-member and the mold-member, Fig. 5, for vulcanization, and D is the textile lining of the shoe.

The last-member A comprises a lower section *a* in which is fixed a nut *b*, an upper section *c* in which is fixed a bearing and guide plate *d*, and an adjusting rod *e* extending loosely through the upper section *c* and plate *d* and threaded into the nut *b* and having an enlargement or shoulder *f* disposed below the plate *d*. By turning the rod *f* in one direction one of the sections is positively moved away from the other to expand or

enlarge the last-member, Fig. 2, and by turning said rod in the opposite direction, the one section is moved toward the other member to contract the last-member, Fig. 1.

The mold-member B comprises a base section *g*, and two side sections *h* superposed on the base section and arranged at opposite sides of the longitudinal median line of the mold-member.

In practicing our invention the rubber shoe may have its different parts joined together on an ordinary last, and then may be removed from that last and transferred to the expansible last-member A for vulcanization, or else the different parts of the shoe may be joined together on the expansible last-member A while the same is in a contracted state as shown in Fig. 1. After the rubber shoe and its lining, when a lining is employed, are placed on the contracted last-member, as stated, the said last-member and shoe and shoe lining are placed in the mold-member, and the mold-member is closed in the conventional manner or in any other manner consonant with the purpose of our invention. The rod *e* is thereupon manipulated to expand the last-member A, when, as will be readily understood, the shoe and its lining will be positively and unyieldingly pressed from the inside thereof against the immovable inner side of the mold-member. Then after the vulcanization of the rubber or equivalent material C is accomplished, the last-member A is contracted and the completed shoe is taken with the last-member from the mold-member, or the last member may be removed without contraction thereof.

It will be gathered from the foregoing that as a result of the coöperation of a last-member and a mold-member possessed of the qualifications stated the parts of the shoe will be firmly united and the outer side of the shoe will be firmly pressed against the inner surface of the mold; also, that bunches or lumps inside the stock are removed and uneven thicknesses equalized by the absolutely rigid or steady and unyielding pressure, and the production of a well finished and perfect shoe will be assured. It is materially advantageous, however, that both the lower section *a* and the upper section *c* of the last-member A extend throughout the length of said member, and that said sections *a* and *c* be shaped, as shown. This will be understood when it is noted that incl-

dental to separation of the members *a* and *c* all parts of the rubber shoe are subjected to pressure between the last-member and the mold member.

5 It is well known to those skilled in the art that rubber shoes and boots are at the present time almost universally made upon wooden or metal-lasts and are vulcanized by being placed in large ovens or heaters. This
10 mode of manufacture, however, has been found deficient and objectionable because of the time required, six to eight hours, to accomplish the vulcanization. It has been known for some time that the vulcanization
15 of a boot or shoe of rubber or equivalent material can be accomplished in a mold in a brief period, approximately six to eight minutes, and we are aware that an apparatus has been devised with a view of utilizing
20 such knowledge, the said apparatus comprising a solid, non-expansile last, and the necessary pressure being obtained upon the outside of the shoe by the closing of the mold as distinguished from our mode of providing the pressure from within the mold.
25 The method including the imposition of pressure against the shoe from the outside thereof was found unsatisfactory and inadequate, for the reason that the constantly varying thickness of the parts comprised in rubber boots and shoes and the close conformity of size and shape between the surface of the last and the inner surface of the mold caused sometimes a deficiency and
30 sometimes a surplus of stock resulting in imperfect productions, in the one case from lack of stock, and in the other from the pressure incidental to closing of the mold causing a flowage and escape of the surplus rubber with a consequent displacement of or injury to some of the parts of the shoe. This movement of stock made it impossible to include in the shoes linings of cotton or
35 woolen fabrics which are positively demanded by the consuming public, and consequently the old method stated, notwithstanding the expedition with which it could be practiced, was abandoned after a long trial and a considerable outlay of money.
40 In making a rubber shoe with the fore part closed, or making any other rubber article that is closed at all points except at one end, there must be pressure in all directions around the shoe or article, which can be obtained only by pressure caused by closing
45 the mold wholly around the shoe on a rigid last, the inner surfaces of the mold pressing against the outer surfaces of the shoe as in the objectionable and deficient process just set forth, or by closing the mold and then positively and unyieldingly pressing the shoe or article that is closed at all points except at one end from the inside thereof outwardly and directly against the unyielding
50 inner surface of the closed mold.
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60
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In the practice of our invention, the last-member and the mold-member should be of such proportional sizes that the last-member with the shoe on it can be placed in the mold-member and the mold-member be
70 closed before the last-member is expanded to subject the shoe to pressure from within the same, and consequently there will be practically no opportunity for flowage of stock from the mold and no liability of the lining
75 or other parts being casually displaced while the last member and the shoe thereon are within the mold member.

The modified last-member *A'* of Fig. 6 is preferably, though not necessarily, similar
80 to the last-member *A* of Figs. 1, 2 and 5, in that it has two sections *a'* and *c*, and similar means for separating the said sections. Said last-member *A'*, however, is adapted for a specific purpose and is peculiar in that
85 it is provided adjacent its under side with a heating chamber *M*, and in that it embodies conduits *N* and *P* for conducting steam or any other suitable heating agent to and from the chamber *M*. The said chamber *M*
90 may be of the proportional size illustrated in Fig. 6, or may extend practically throughout the length of the last-member, as occasion demands, and it is designed for use when the shoe or boot to be vulcanized
95 has a solid heel and a heavy sole; such heel and sole being much thicker than the remainder of the shoe or boot, and requiring in consequence more heat to assure vulcanization thereof uniform with the compara-
100 tively thin remainder of the shoe or boot. From this it follows that a last embodying the chamber *M* and its appurtenances may be formed in one piece and used to advantage in the hereinbefore described old proc-
105 ess of vulcanizing boots and shoes in those cases where the boots or shoes have either a thick heel or a thick sole or both; also, that when boots or shoes having either thick heels or soles or both are to be vulcanized in
110 accordance with our invention, it is of advantage to employ the chamber *M* and its appurtenances in the expansible last-member.

We are well aware that lasts comprising
115 sections and mechanical means for moving the sections to expand the lasts are old. We are also aware that it is old in the manufacture of rubber shoes to support the article to be finished and vulcanized upon a "flexi-
120 ble" last within a finishing mold, while expanding the last by internal air-pressure; the "flexible" last mentioned being a bag last or more properly a form made from a woven or knitted fabric, coated with a vul-
125 canized rubber compound, with a stiffening material, of a similar compound, extending a short distance from the sole. Such a bag last or form is in no sense a rigid last and cannot give rise to a rigid unyielding pres-
130

sure, and is essentially elastic. Extra vul-
canization is injurious to vulcanized rubber,
and, therefore, in practice, bag lasts or
forms, such as described, were ruined by a
5 few vulcanizations. The process was also
found unsuccessful because air or any other
fluid under pressure gives only a yielding
pressure and hence is not adapted to remove
bunches or lumps inside the stock or equal-
10 ize uneven thicknesses. We make no claim
to anything in common with the said prior
inventions, but

What we claim and desire to secure by
Letters-Patent, is:

15 An apparatus for the purpose described,
comprising a sectional mold, of rigid or un-
yielding material, the interior of which cor-
responds in contour to the outer side of a
boot or shoe, and a last member comprising

sections of rigid or unyielding material, 20
each extending throughout its length and
separable bodily throughout its length from
the other section; said sections together cor-
responding in contour to and being slightly
smaller than the interior of the sectional 25
mold, and mechanical means extending be-
yond the mold for positively and unyield-
ingly separating the last section and thereby
expanding the last member within the mold.

In testimony whereof we have hereunto 30
set our hands in presence of two subscribing
witnesses.

PATRICK J. WREN.
FREDERICK T. COMEE.

Witnesses:

GEORGE W. PICKARD,
ARTHUR F. BALLOU.