

J. SCHUMACHER.  
BOTTLE STOPPER.

No. 573,301.

Patented Dec. 15, 1896.

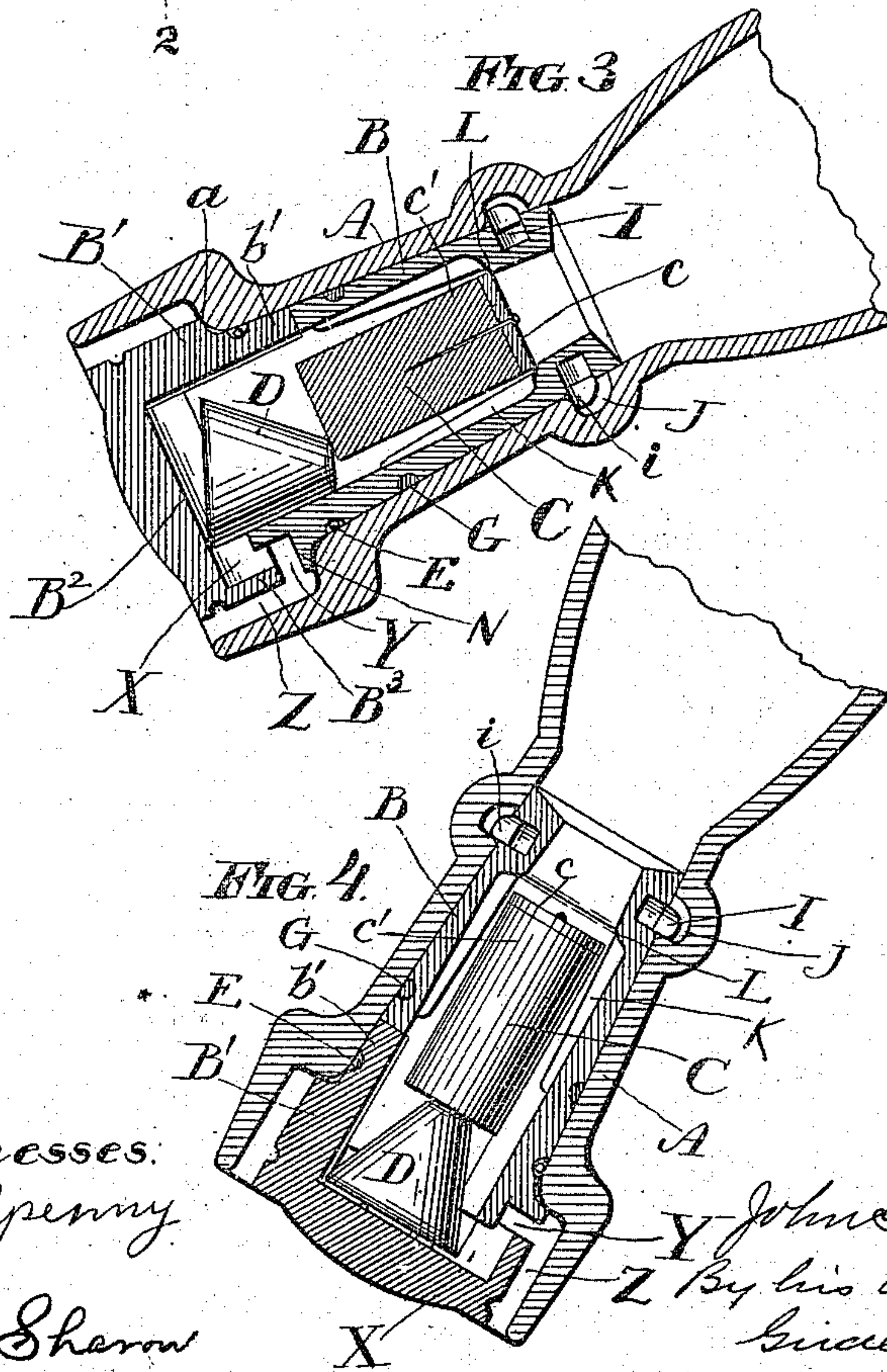
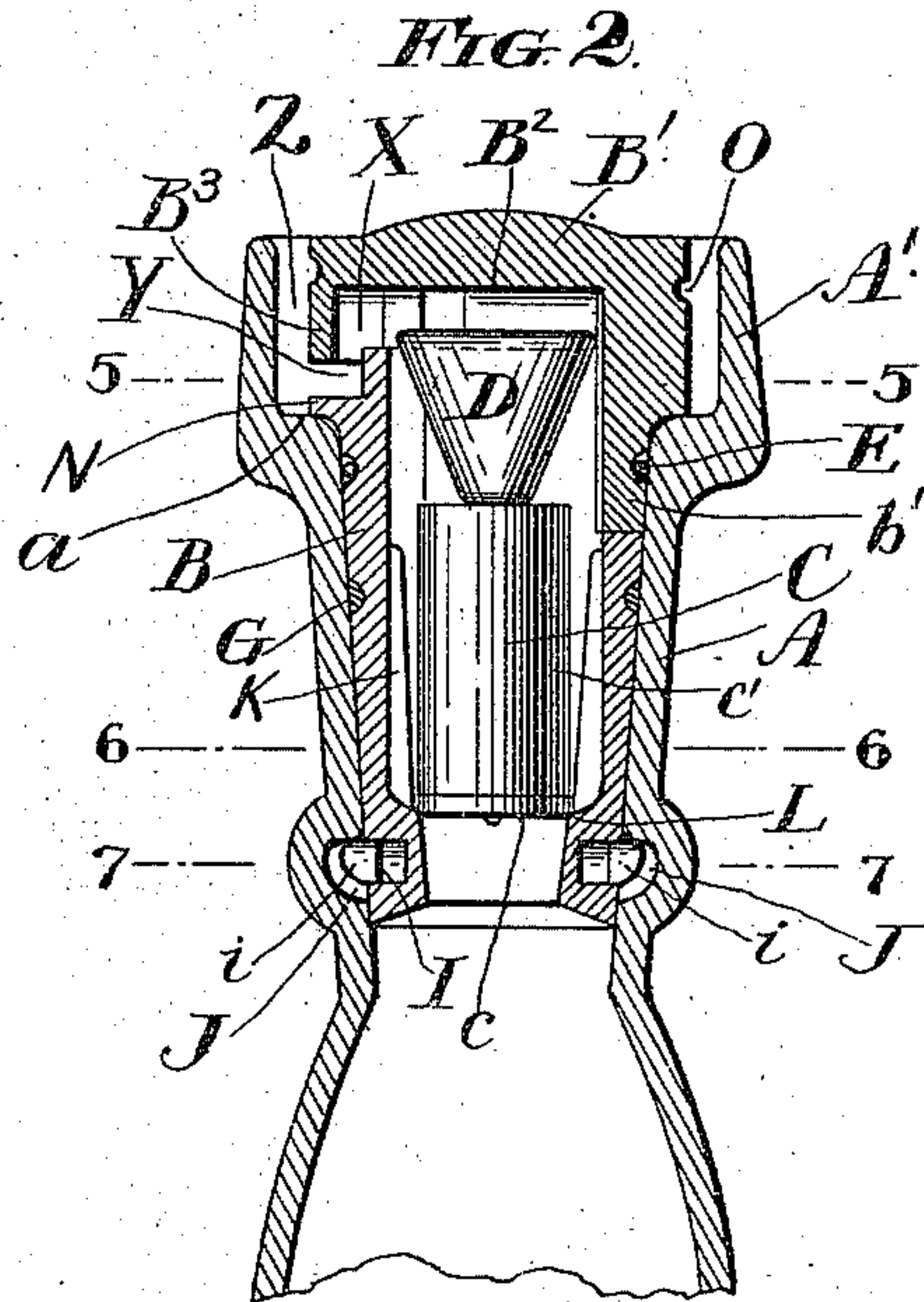
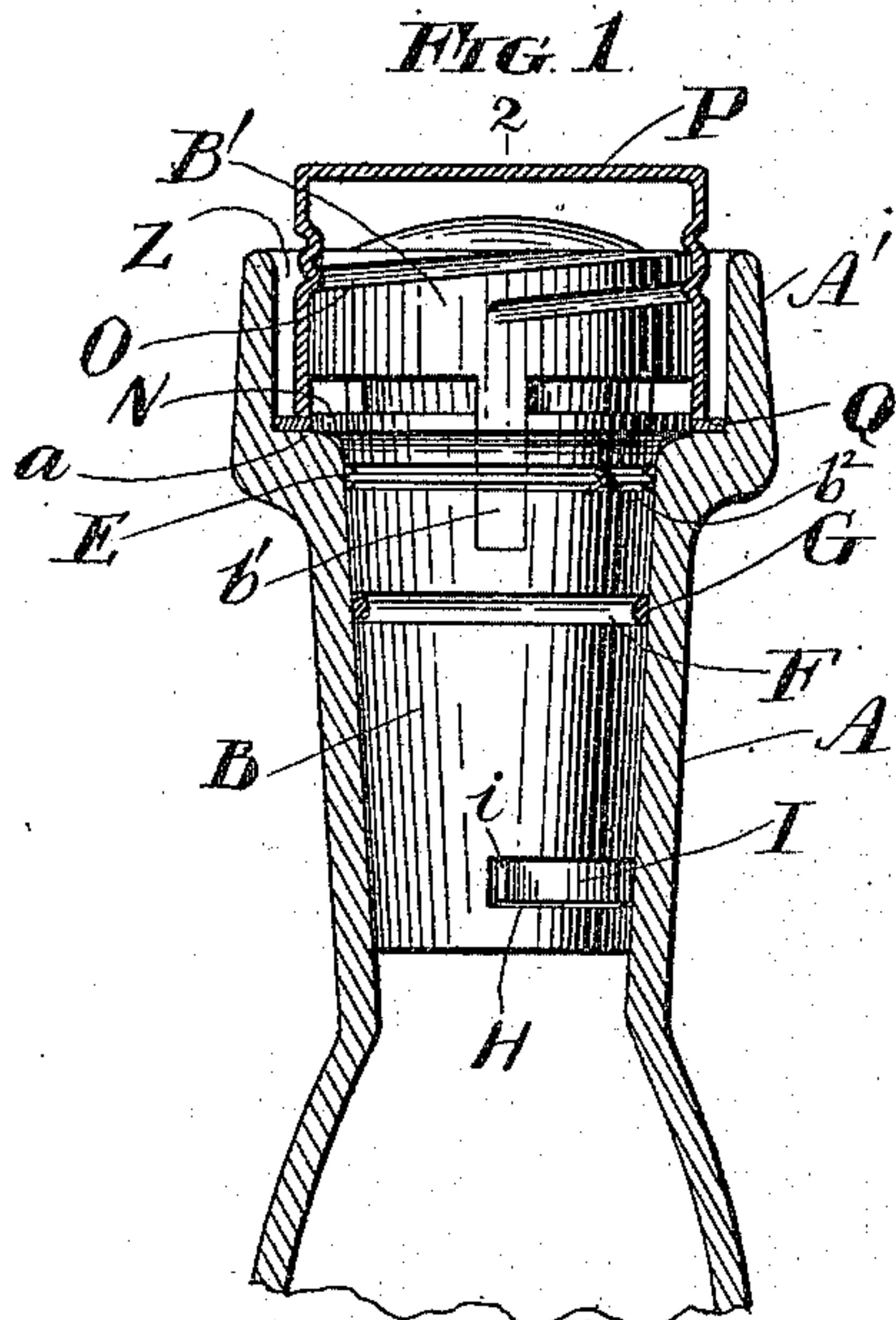
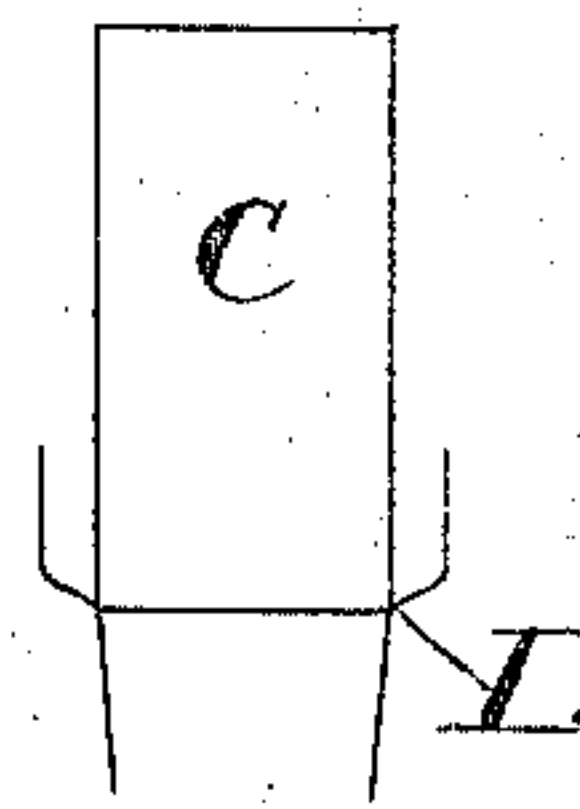


FIG. 4<sup>a</sup>



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FIG. 5.

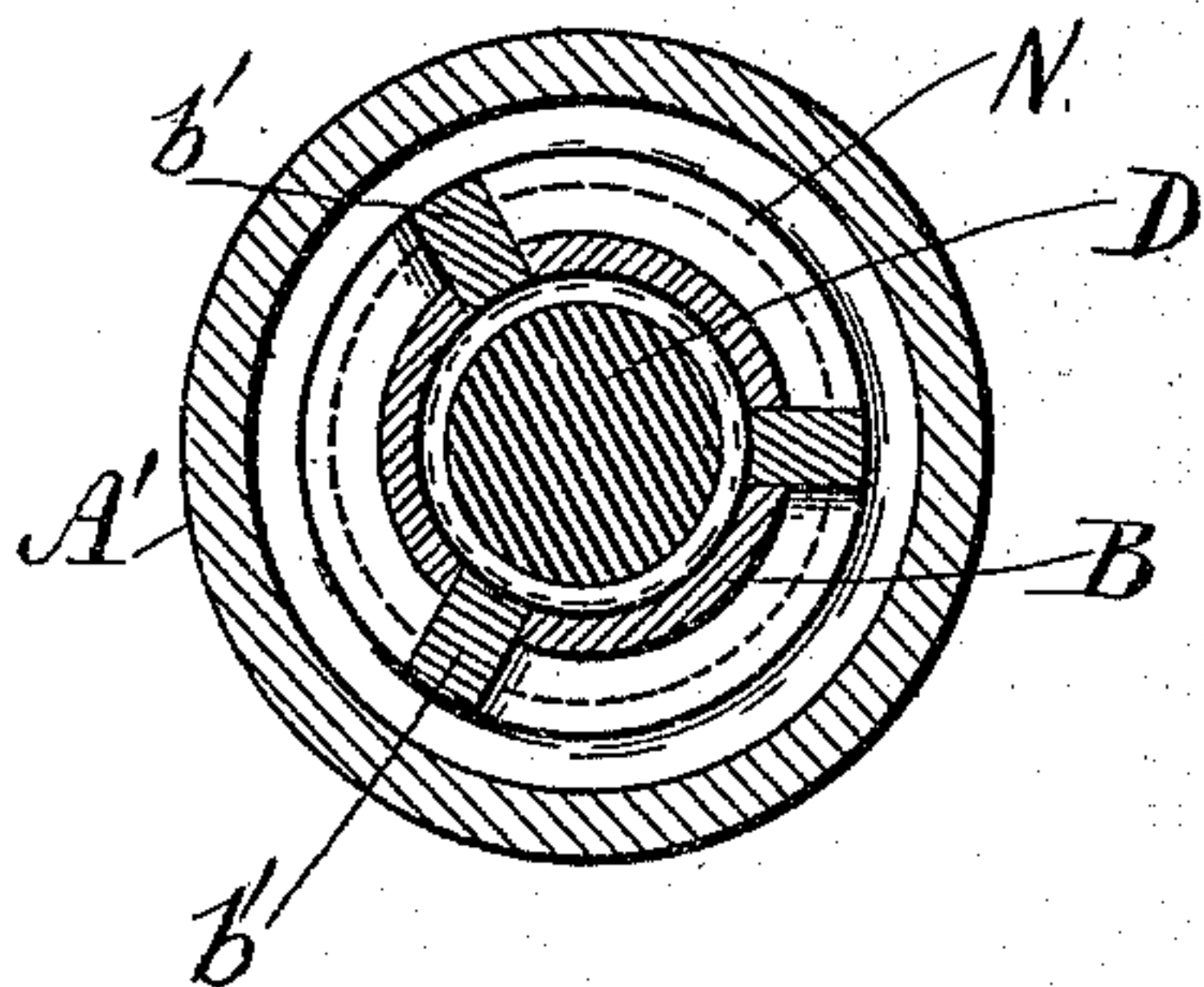


FIG. 6.

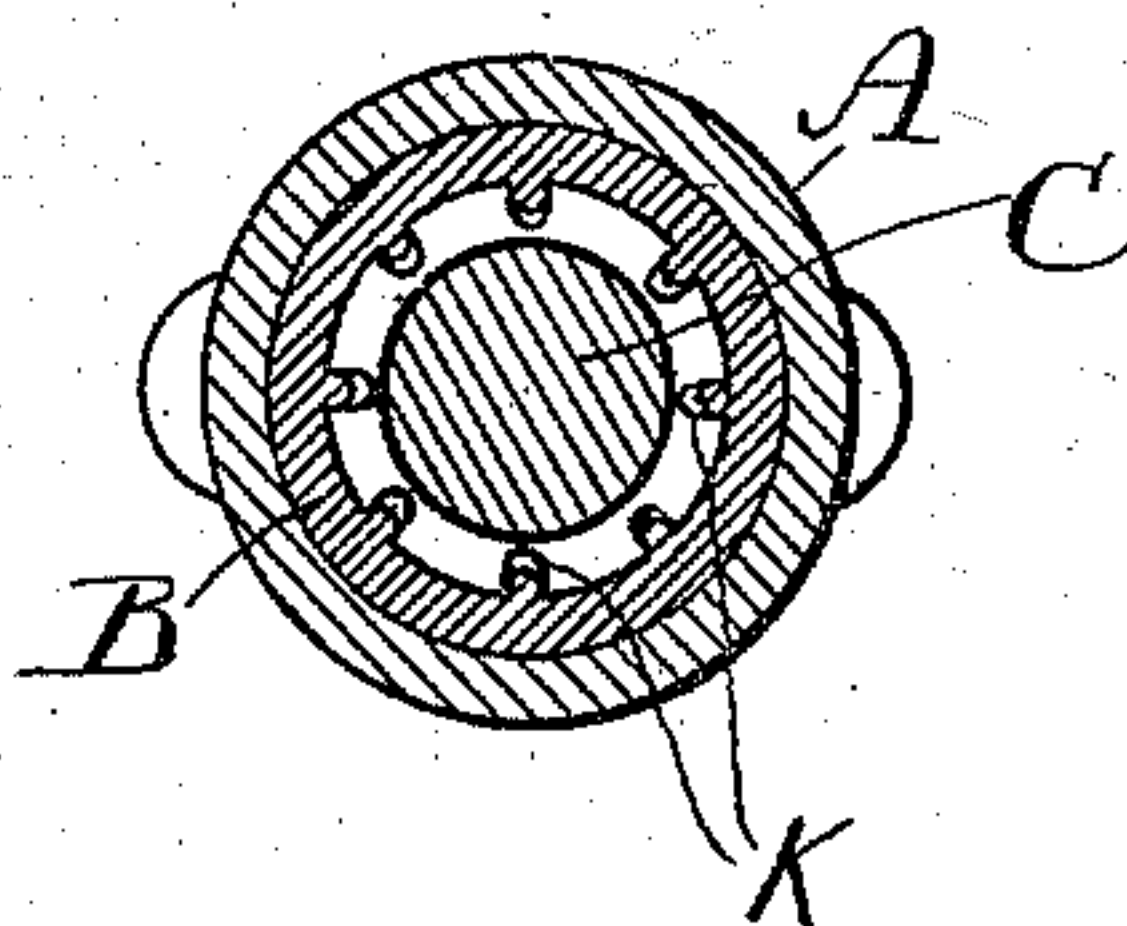


FIG. 7.

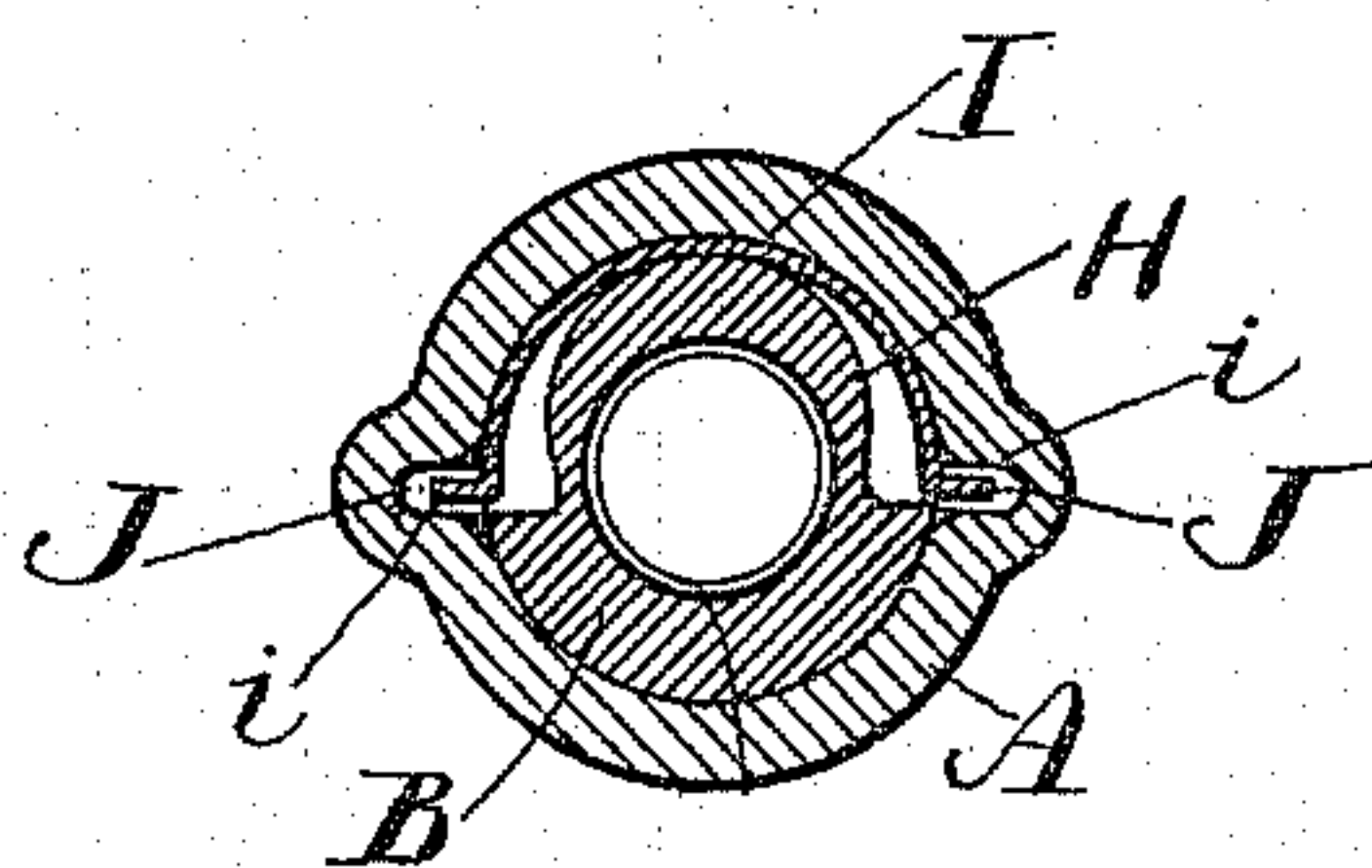


FIG. 8.

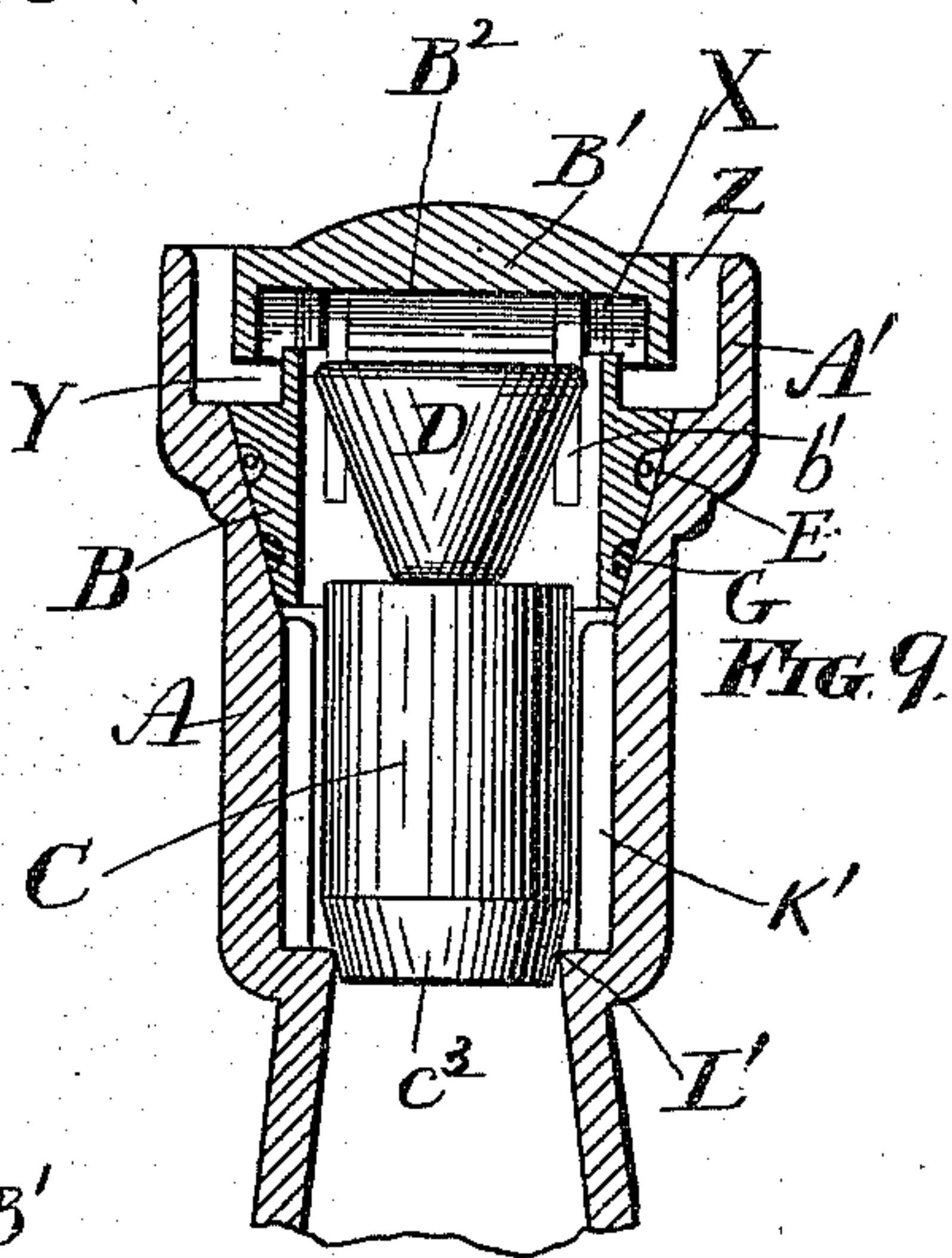
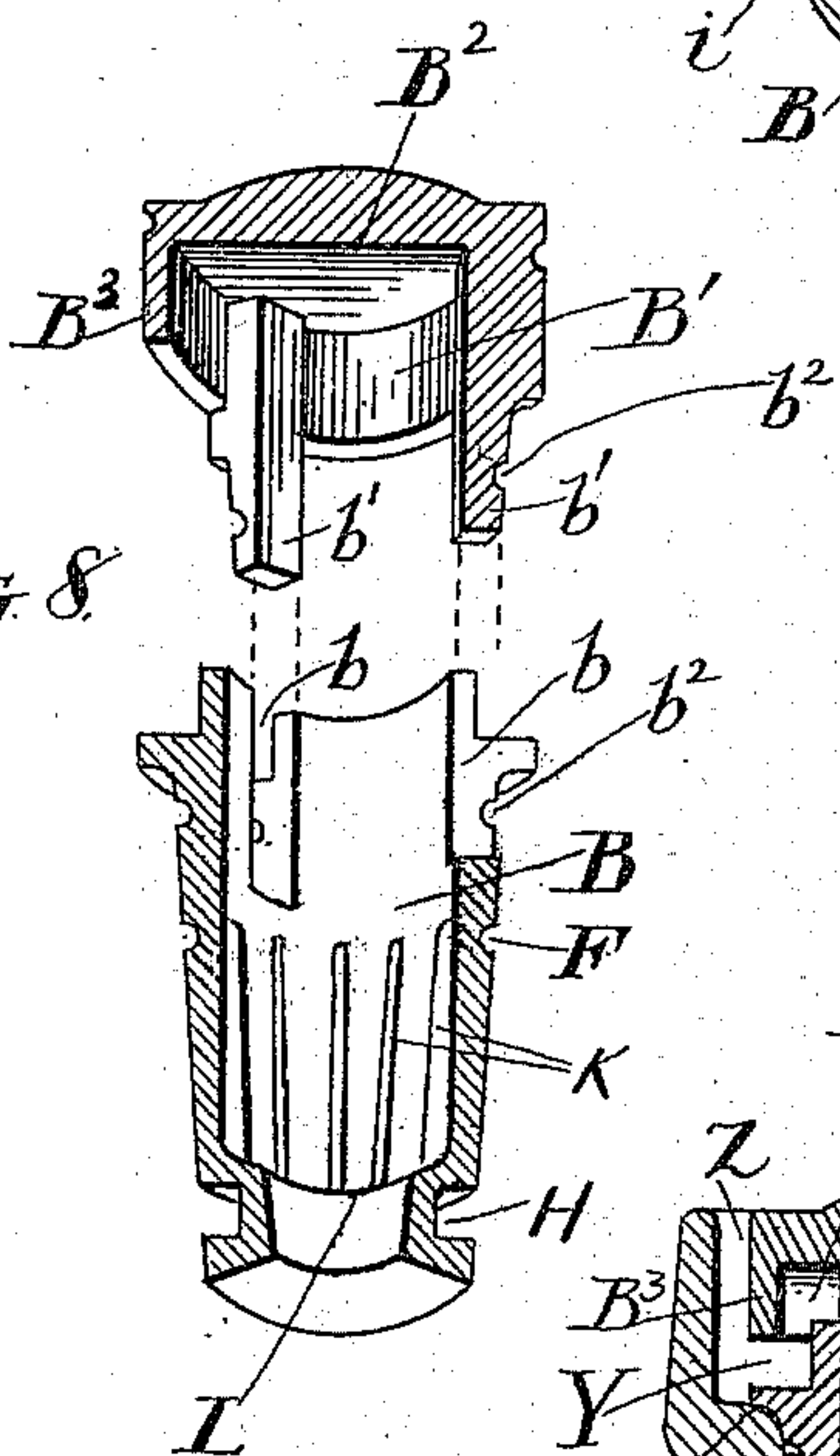
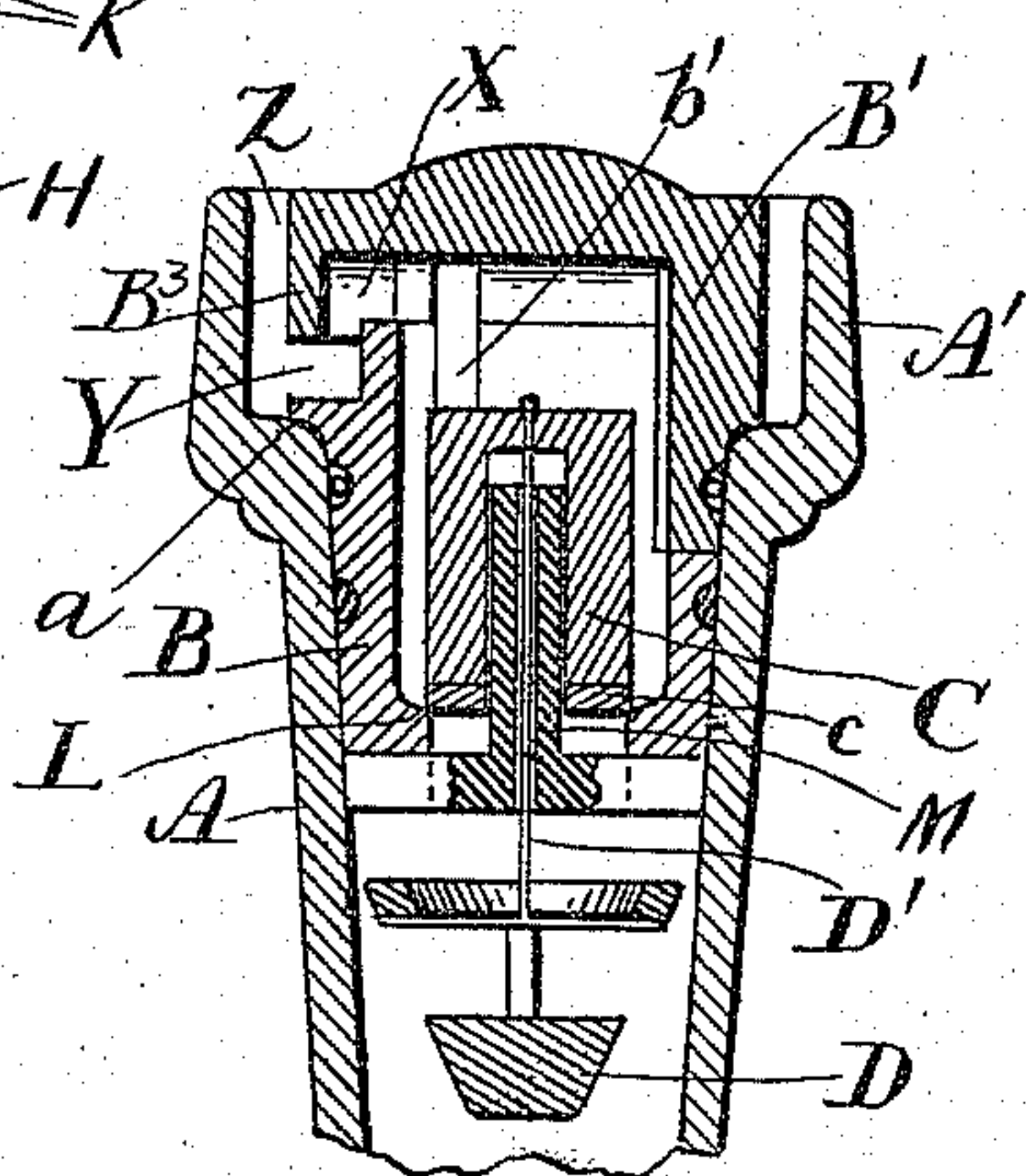


FIG. 10.



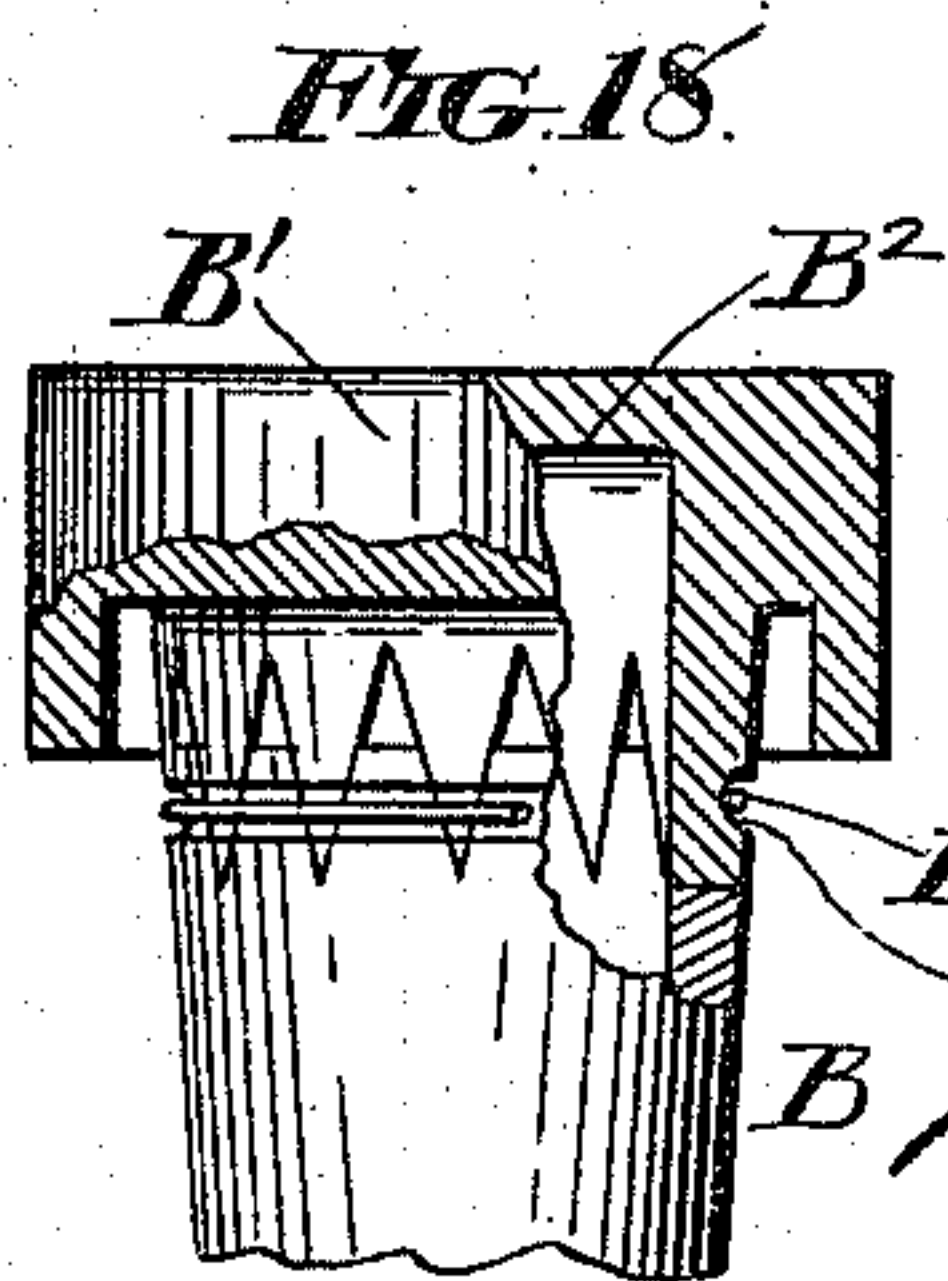
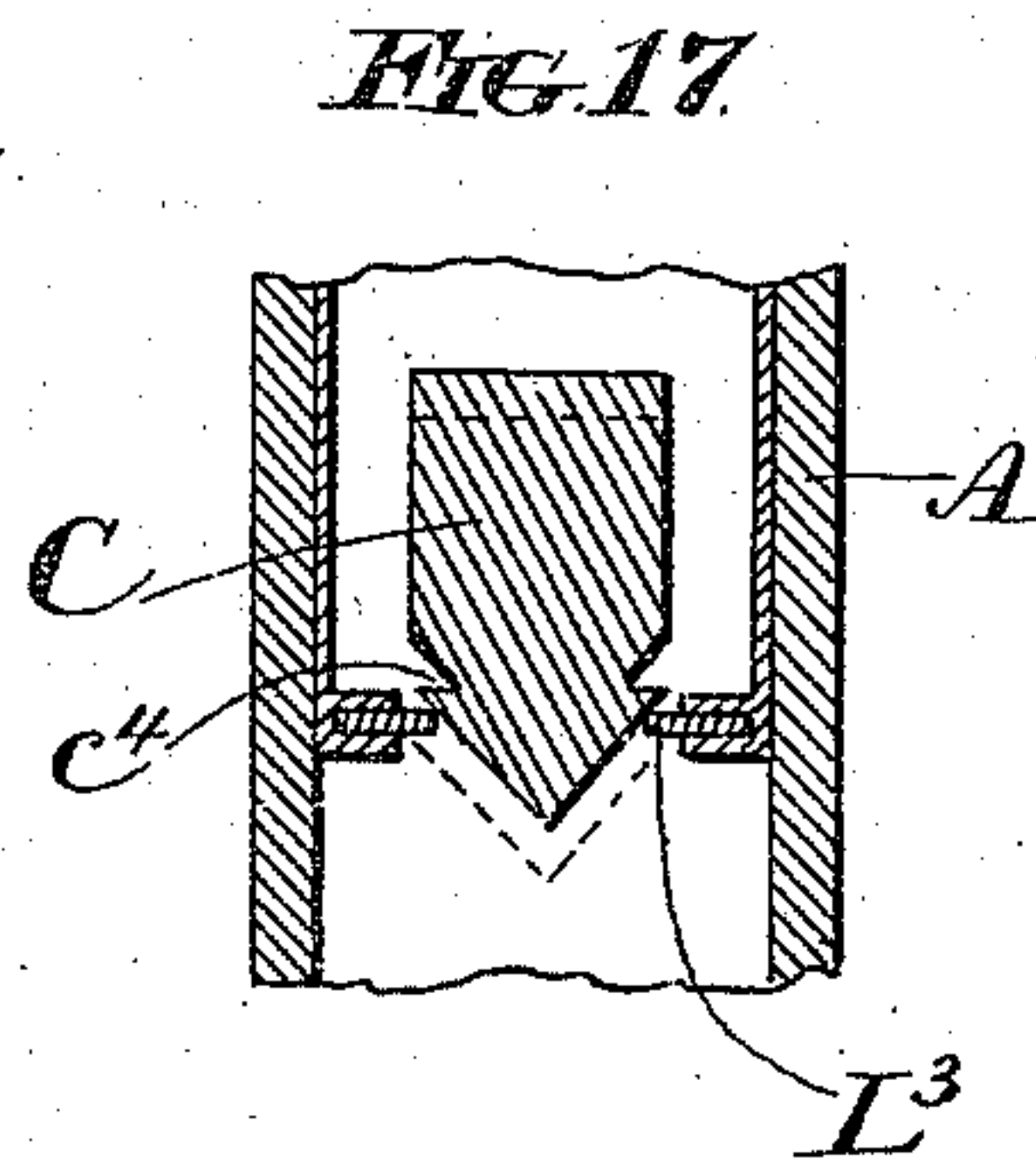
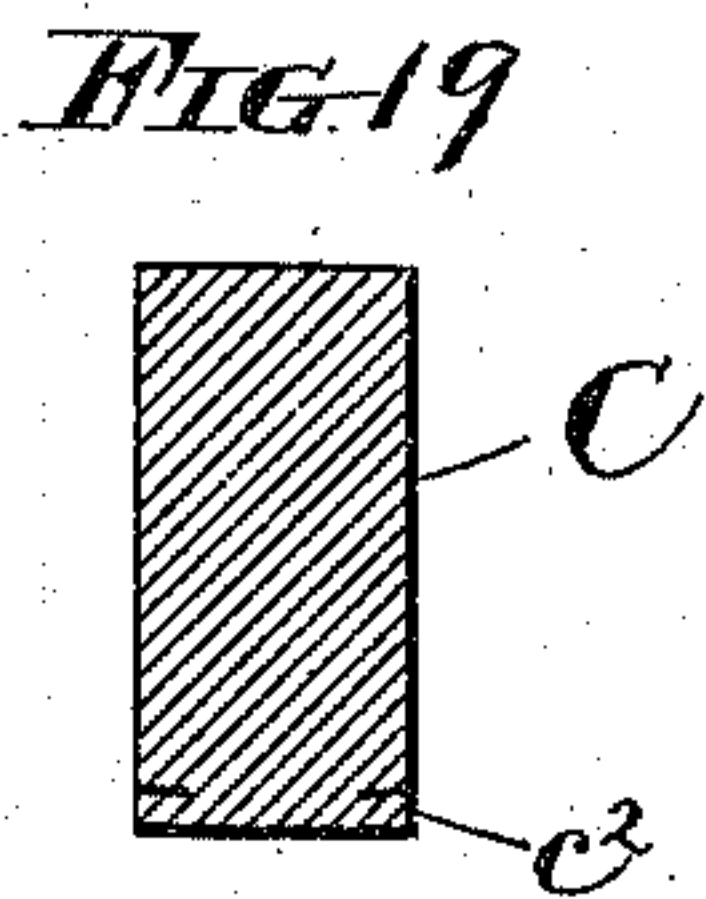
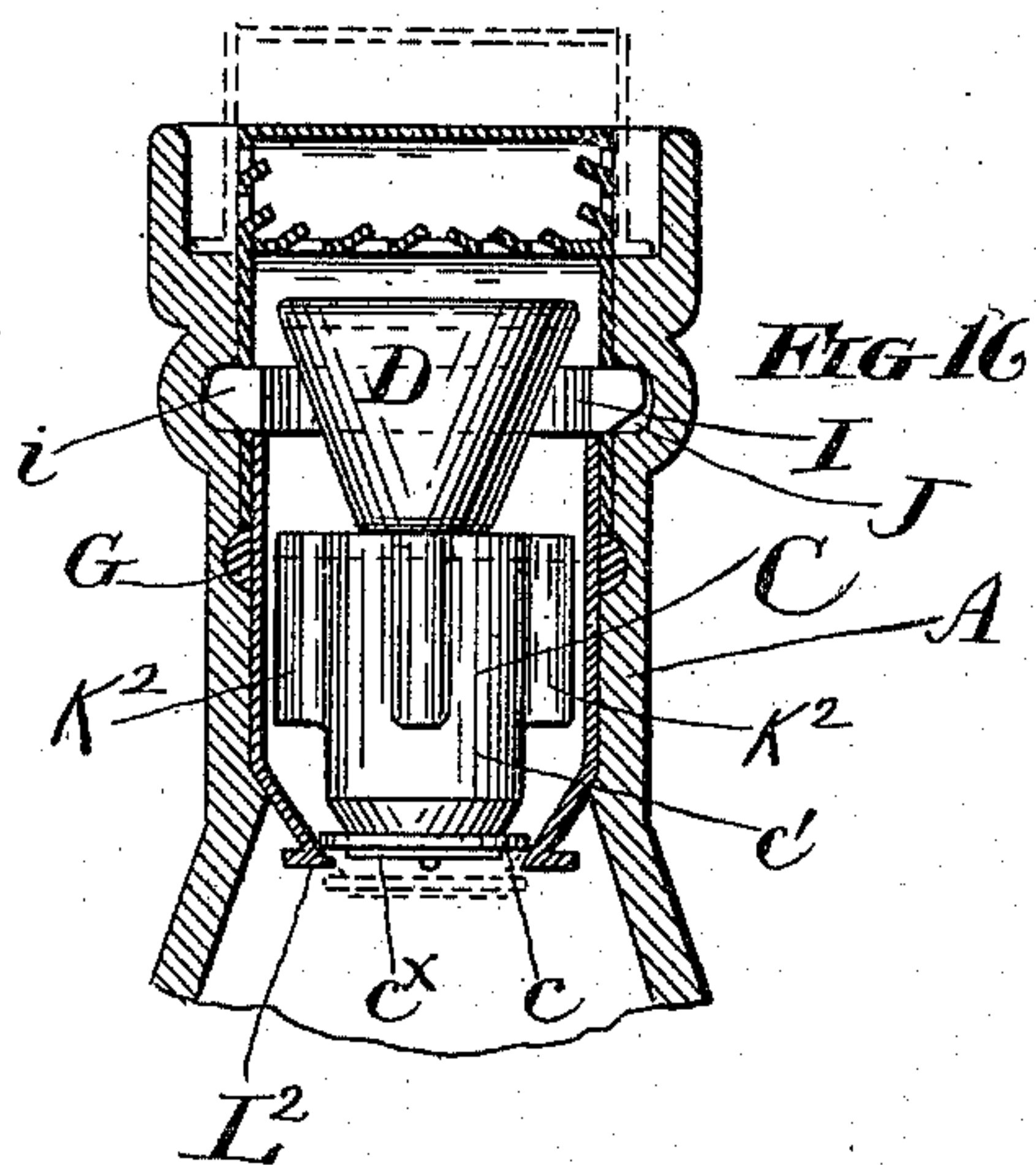
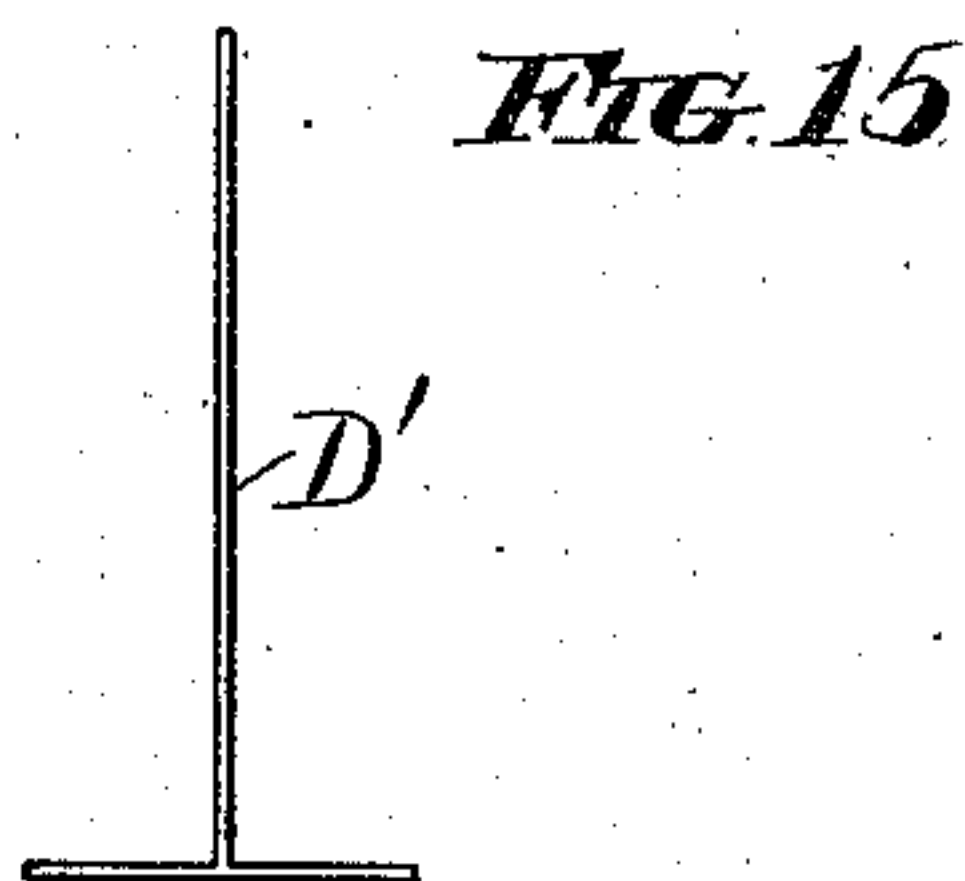
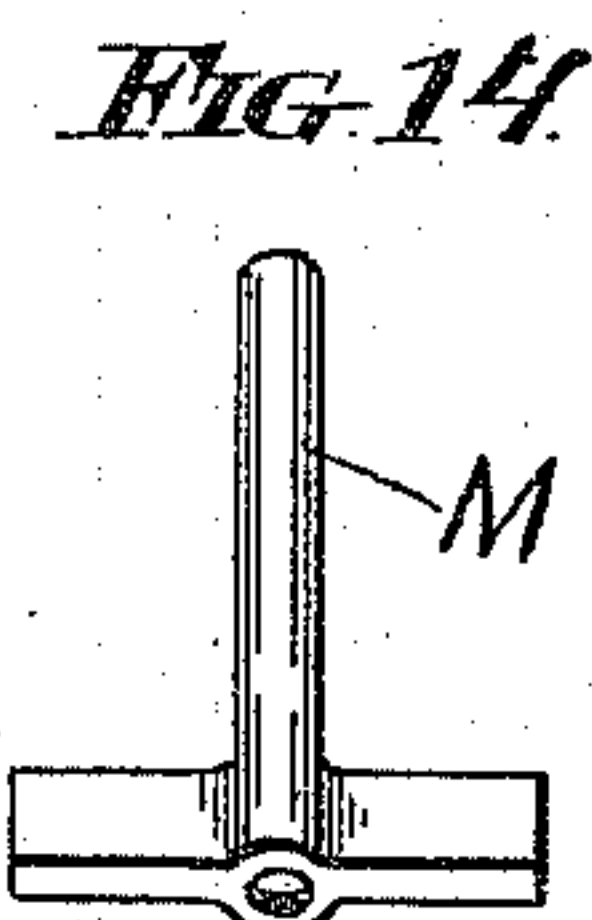
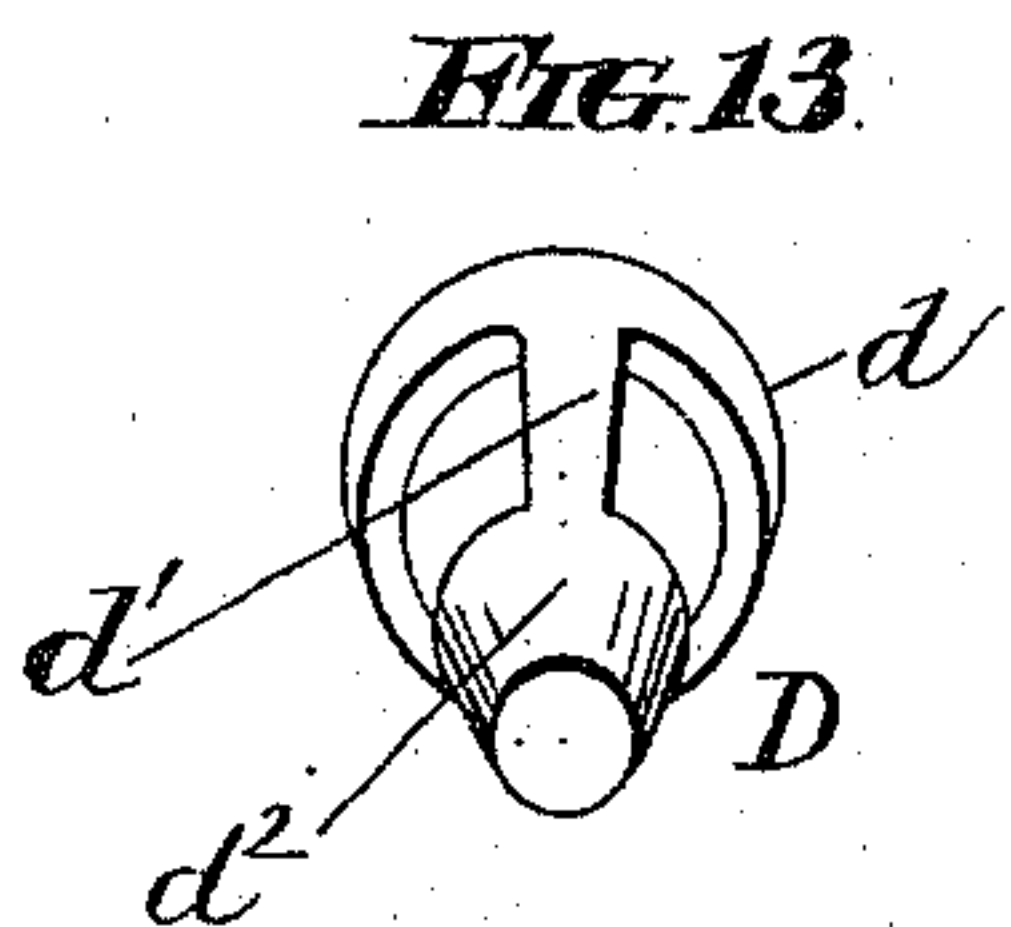
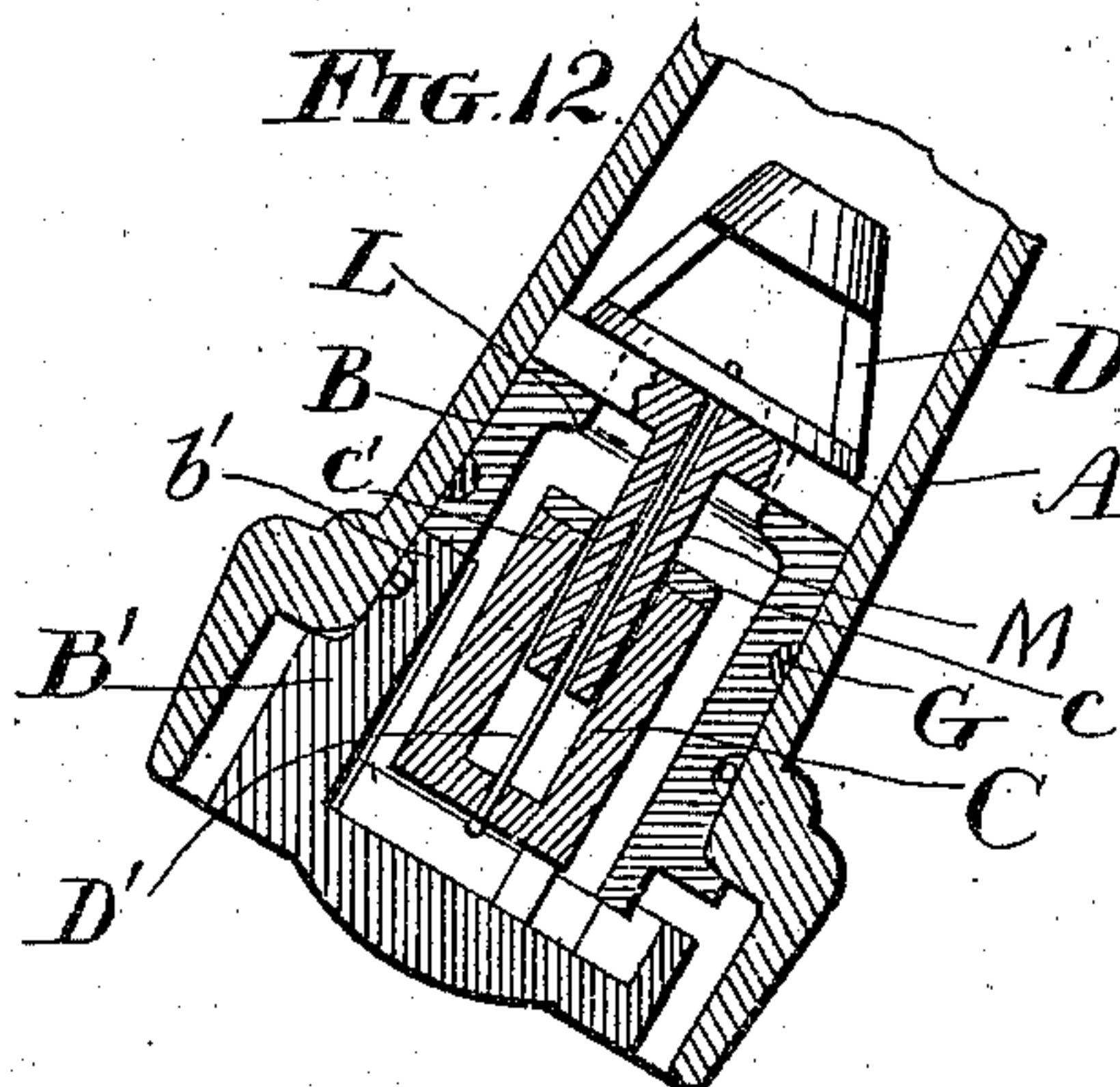
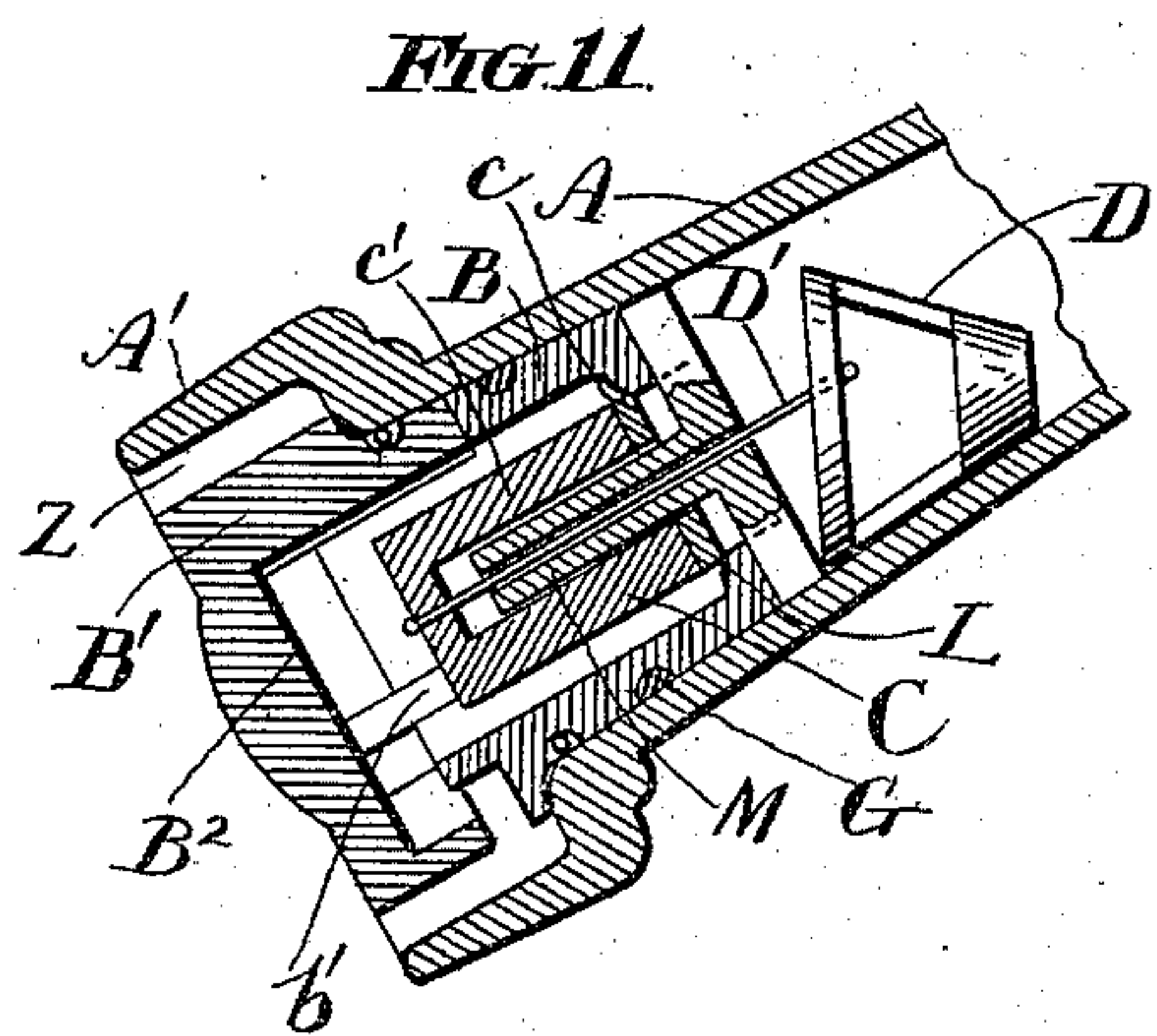
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# UNITED STATES PATENT OFFICE.

JOHN SCHUMACHER, OF CHICAGO, ILLINOIS.

## BOTTLE-STOPPER.

SPECIFICATION forming part of Letters Patent No. 573,301, dated December 15, 1896.

Application filed June 8, 1895. Serial No. 552,097. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN SCHUMACHER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bottle-Stoppers, of which the following is a specification.

The present invention relates to that class of stoppers that are intended to permit the escape of liquid from, but prevent the introduction of liquid into, the bottle. There are many stoppers that effectually prevent the introduction of liquid into the bottle while the bottle is allowed to remain at rest, but it has been more difficult to provide a stopper that will prevent it when the neck of the bottle is filled with liquid and the bottle is "chucked," or, in other words, given an end-wise jiggling or jerking movement, the bottle meanwhile being held in such position that if it were not for the presence of the stopper liquid could flow into it by gravity.

The principal object of the present invention is to provide a stopper of such construction that it cannot be circumvented by any such manipulation, and in accomplishing this object I make use of a valve, a valve-seat, and a weight, all so constructed and arranged with relation to each other that if the bottle is chucked, as above described, the weight in rebounding will operate to drive or force the valve into the opening around which the valve-seat is formed, the valve-seat and the engaging surface of the valve being so shaped and of such material that the valve will be locked or stuck fast, after the manner of a plug. I am aware that a valve, a valve-seat, and a weight have been combined in many ways for the purpose of preventing the fraudulent refilling of bottles, but, so far as I am aware, I am the first to so construct these parts that the valve partakes of the nature of a plug which is driven into one of the discharge-passages by the action of the weight when the bottle is chucked, and I desire to have it understood that in its broadest aspect my invention is not limited to a valve and valve-seat constructed of any particular material or of any particular shape, but on the contrary comprehends these devices, however constructed, provided they will operate in the manner above indicated. Generically

considered, the present invention is not limited to a weight of any particular construction or to a weight located in any particular position with relation to the valve, so long as it is so constructed and located that it will produce the described result.

Another object of the invention is to provide a baffle of such construction that after passing the valve-seat the course of the liquid is never inward, (toward the axis of the neck of the bottle.)

Another object of the invention is to provide, for stoppers of this class, means whereby the baffle may be secured in place more securely and more conveniently than by any other means with which I am familiar.

Another object of the invention is to provide a stopper of this class which is simpler, cheaper, and more certain in its action than such stoppers as heretofore constructed.

Another object of the invention is to provide a simple, cheap, and efficient means for securing the stopper in place in the neck of the bottle. Other objects will appear hereinafter.

To these ends the invention consists in the features of novelty that are particularly pointed out in the claims, and in order that it may be fully understood I will describe it with reference to the accompanying drawings, which are made a part hereof, and in which—

Figure 1 is a vertical section of the neck of a bottle and a side elevation of the improved stopper in its preferred form in place therein, the cap for closing the bottle when stored or in transit being shown in vertical section. Figs. 2, 3, and 4 are vertical sections thereof with the cap removed, the parts being shown by these figures, respectively, first, in the positions that they occupy while the bottle is in upright position; secondly, the positions that they occupy when the bottle is tipped and before it has reached the pouring position; thirdly, the positions that they occupy after it has reached the pouring position. Fig. 4<sup>a</sup> is a diagram showing the exact relations of the surfaces of the valve and valve-seat in the preferred form of the invention. Figs. 5, 6, and 7 are horizontal sections on the lines 5 5, 6 6, and 7 7, respectively, Fig. 2. Fig. 8 is a perspective view of one-half of the parts herein referred to collectively as the "cage,"



the parts of said cage being shown separated. Fig. 9 is a vertical section of the neck of a bottle and of a stopper of slightly-modified form embodying some features of the invention. Figs. 10, 11, and 12 are vertical sections of the neck of a bottle and of a stopper of still another form embodying some features of the invention, the parts being shown in these figures, respectively, first, in the positions that they occupy when the bottle is in upright position; secondly, the positions that they occupy when the bottle is tipped, but before it has reached the pouring position, and, thirdly, the positions that they occupy after the pouring position has been reached. Figs. 13, 14, and 15 are views showing in detail parts of the stopper shown in Figs. 10, 11, and 12. Fig. 16 is a vertical section of the neck of a bottle and of a stopper of still another form embodying some features of the invention. Fig. 17 is a vertical section of a portion of the neck of a bottle and portions of a stopper of still another form embodying some features of the invention under still another modification. Fig. 18 is a sectional elevation of a portion of a cage of modified form embodying one feature of the invention. Fig. 19 is a section of a valve of modified form.

Considering first the preferred form of the invention, (illustrated in Figs. 1 to 8, inclusive,) A represents the neck of the bottle; B, B', parts herein collectively referred to as the "cage;" C, the valve, which is buoyant, and D the weight by which the position of the valve is controlled until the bottle is tipped to the pouring position. The cage is made up of two parts B B', the latter of which is properly termed the "baffle." The part B is provided at its upper end with slots  $b$  and the baffle with tongues  $b'$ , corresponding with and adapted to enter and fill the slots, as shown more clearly in Figs. 1 and 5. The part B and the tongues  $b'$  are provided with external depressions  $b^2$ , so located that when the tongues are in place in the slots the depressions will coincide and result in a circumferential groove in which fits a wire E, whose ends are suitably secured together, and by this means the baffle is securely bound to the part B. Below this groove the part B is provided with a second circumferential groove F, in which fits a gasket G, of rubber or other suitable material, the object of which is to prevent the leakage of liquid past the cage.

Near its bottom the cage is provided with a groove H, which preferably embraces about half of its circumference and is deepest at its extremities, being at its mid-length of only sufficient depth to receive a semicircular sheet-metal spring I, whose extremities  $i$  project outward radially and are adapted to occupy depressions J, formed in the interior of the neck of the bottle. The object in making the groove of greater depth at its extremities is to permit the ends of the spring to be pressed inward toward each other a sufficient

distance to allow the extremities of the projections  $i$  to come within the circumference of the part B in order to permit the cage to be inserted in the neck of the bottle while the spring I is in place in the groove, and to facilitate this insertion I prefer to bevel off the under sides of the projections  $i$ , as shown more clearly in Fig. 2. The tension of the spring is such that it has a normal tendency to maintain the shape shown in Fig. 7, so that although the ends are forced together by the act of inserting it in the neck of the bottle, yet when it has reached the proper position its elasticity will cause it to resume the shape shown and force the projections  $i$  out into the depressions J, and thus forever prevent the removal of the cage, the two parts of which are of course bound together by the wire E before being inserted. In practice it is proposed to make the cage of glass and to make the part B of such thickness that should the neck of the bottle be broken off with a view to removing the stopper and placing it in a new bottle the cage will be broken also.

Upon its interior the cage is provided with a number of ribs K, whose surfaces converge downward, whereby they are enabled to guide the valve C in its downward movement and cause its working face to properly seat upon the valve-seat L. In the preferred form of the invention the valve is made of two pieces  $c$  and  $c'$ , secured together by a pin or other suitable means, the former of which is preferably selected cork and the latter cork of a coarser nature. In order to get the best results, it is necessary that the working face of the valve be of material of a fine texture, which has the property of elasticity, and the best material for the purpose is selected cork. If desired, of course the whole valve may be made of one piece of selected cork, as shown in Fig. 19, for example, and its operation would be the same, but the cost of the stopper would be very materially increased. It is for an economical reason, therefore, that I prefer to construct the valve of two pieces. Whether the valve is of two pieces or of one its working surface should be carried by a flexible lip, and this may be provided either by using the thin disk of elastic material or by providing a single piece of cork with a circumferential cut so located that it results in a flexible lip  $c^2$ , as shown in Fig. 19. I do not, however, claim to be the first to construct a valve of a body portion  $c'$  and a disk, such as  $c$ , secured to it and constituting or carrying the working surface of the valve, and on the other hand the present invention, in its broadest aspect, is not limited to a valve of this particular construction. In the preferred form of the device the valve has cylindrical sides, and its lower end occupies a plane perpendicular to them, so that when cut axially its sides and lower end will be seen to follow lines that meet at right angles, and the valve-seat is of such construction and of such diameter that the working surface of the valve



is at the extremity of the angle formed by these surfaces, the diameter and downward taper of the valve-seat being such that a blow upon the top of the valve will force it into the opening of the valve-seat after the manner of a plug, whereby it is locked.

I am aware that it has been proposed to construct a stopper with a valve of substantially the same shape as the one herein shown and described and with a valve-seat whose working surface occupies a plane that is parallel with the plane of the under side of the valve, so that the valve rests flat upon the valve-seat. I am aware also that it has been proposed to use a valve having a tapering working surface in combination with a valve-seat which is complementary to it, also that it has been proposed to use a valve having a convex working surface and a valve-seat that is complementary to it, but I am not aware that it has ever been proposed to so construct these parts that a sudden abnormal pressure upon the valve will cause it to become locked in the flaring portion of the valve-seat and thereby prevent the flow of liquid.

The expression "means for locking the valve" as used in this specification does not include weights and other devices by which the valve is simply held upon its seat until the bottle is tipped to a pouring position, whereupon the valve is permitted to leave its seat, but it is intended to point out and specify the feature or features by which the valve is locked in seated position and is held so locked even after the bottle reaches and passes the pouring position, and since I am positively the first to provide a stopper having a valve that locks in this way I desire to have it understood that in its broadest aspect my invention is not limited to any particular means for doing it. The specific embodiment of this locking means, which I prefer over all others, because of its simplicity and effectiveness, is that shown in Figs. 2, 3, 4, 4<sup>a</sup>, 8, 10, 11, and 12, where the valve-seat L is shown as formed with a downward contraction and with a slight convex curvature at the exact point where the working surface of the valve normally engages it, the diameter of the valve and valve-seat being equal at their point of normal engagement and the contraction of the valve-seat below this point being very gradual. The object in making the valve-seat slightly rounded at the point where the valve normally engages it is to prevent the valve from being locked by normal pressure, or, in other words, by the combined weight of the valve itself and the weight D and the impact caused by ordinary handling of the goods. If it were not for this possibility of the valve locking when it is desired that it shall remain unlocked, the valve-seat might be of conical form, with a very slight taper. Such a valve-seat will lock the valve, the objection to it being that it will lock it too easily.

With a stopper constructed as shown in the figures last aforesaid, if any attempt be made

to refill the bottle by chucking it the rebound of the weight D, striking upon the top of the valve, will cause its delicate working surface to be compressed into the valve-seat and there locked until sufficient pressure is exerted upon its under side to dislodge it. Actual practice has shown that a repetition of the same movement that locked it will not dislodge it, but on the contrary the second and successive rebounds of the weight will tend to drive it farther and farther in, so that if this be persisted in the valve will become locked so tightly that it will be impossible to remove the contents of the bottle without breaking it.

In the form of the invention shown in Fig. 9, instead of arranging the contraction, to which this locking of the valve is due, upon the valve-seat it is arranged upon the valve, as shown at  $c^3$ , and instead of forming the valve-seat and the guiding-ribs upon the interior of the cage they are formed directly upon the bottle itself, as shown at L' and K', respectively. While a valve and valve-seat constructed as shown in this figure will operate successfully, still they have the disadvantage that by reason of the constant engagement of the valve-seat with the slightly-tapering portion  $c^3$  of the valve the normal pressure of the valve upon its seat, due to ordinary handling, may cause the valve to lock in the same manner as it would if the valve-seat were formed with a continuous unbroken gradual taper extending above and below the point upon which the valve normally rests, as above described.

In the form of the invention shown in Fig. 16 the valve does not differ from that shown in Figs. 2, 3, and 4, excepting that the flexible disk  $c$  is of larger diameter than the body portion  $c'$  of the valve, so that its margin projects in the form of a lip, and upon its lower side is arranged a metallic disk  $c^x$ , the object of which is to sustain the disk  $c$  and prevent its margin from being deflected downward by any pressure that can be brought upon it while in use. In this form of the invention the valve-seat  $L^2$  is formed upon the interior of a sheet-metal cage and is of conical shape, contracting downward. The construction and arrangement of these parts are such that normally they occupy the positions shown in full lines, but if the bottle is chucked, as above described, the impact of the weight upon the top of the valve will cause the delicate outer marginal lip of the disk to be deflected to a sufficient extent to pass through the opening of the valve-seat and below it, after which its elasticity will cause it to resume its normal plane, as indicated by dotted lines. When this condition is brought about, the valve is locked and will forever prevent the escape of liquid from or the entrance of liquid into the bottle until broken. This valve will not lock under normal conditions because of the abruptness of the valve-seat. If its taper were more gradual, (nearly cylindrical,) it would.



In all of the above-described forms of the invention the valve-seat is made of unyielding material, either glass or metal, and the working surface of the valve is of an elastic material, but in the form of the invention shown in Fig. 17 these conditions are exactly reversed. Here the valve-seat  $L^3$  is formed on a flexible ring; (cork, rubber, or other suitable material,) and the valve may be of any desired material. Its working surface is shown as being conical, and above its working surface it is provided with a contraction  $c^4$ , into which the margin of the valve-seat enters if the valve be forced downward to the position indicated by dotted lines. In all of these several forms of the invention the valve and valve-seat are of such shape and material and are so related to each other and to the weight that if the bottle be chucked the impact of the weight upon the valve will cause it to be locked and thereby prevent the flow of liquid.

In the form shown in Figs. 1 to 12, inclusive, the lock is not a permanent one, (or at least will not be unless the chucking be persisted in,) and when locked, if the bottle is inverted and struck on the bottom or shaken endwise, the force of the liquid acting upon the bottom of the valve will dislodge it, but in the form shown in Figs. 16 and 17 the valve becomes permanently locked by an attempt to circumvent it in the manner described and can never be dislodged without breaking either the bottle or the stopper.

In the preferred form of the invention the weight is of frusto-conical shape and is arranged within the cage above the valve. Its larger end (which is arranged uppermost) is nearly equal in diameter to the diameter of the interior of the cage, so that any considerable lateral movement is prevented, and its other dimensions are such that when it is resting on its side, as shown in Fig. 3, it will span the space between the ceiling  $B^2$  of the cage and the top of the valve and hold the valve seated.

I am aware that it has been proposed to arrange a tumbling weight above the valve and do not claim such, broadly, as my invention, but so far as I am aware it has never been proposed to construct this weight in the form of a frustum, and actual practice has demonstrated this to be the most efficient shape for the reason that the center of gravity is so disposed that the weight will fall away and liberate the valve as soon as and not before the desired pouring angle is reached. A weight thus constructed and arranged is not, however, essential to the locking operations above described, and in Figs. 10 to 15, inclusive, I have shown a locking-valve in which the weight is located below the valve-seat and is suspended from the valve through the medium of a hanger  $D'$ , which passes upward through a hollow post  $M$ , which occupies an opening  $C'$ , formed for it in the valve, whereby the valve is guided in its up-and-down movement. A more particular description

of the stopper shown in these figures is not necessary in this specification, since its details in construction are made the subject of another application for patent, filed the 8th day of June, 1895, Serial No. 552,098. This stopper is illustrated in this application simply to show that the broad invention here described and claimed is not limited to a weight of any particular construction or location or to any particular means for guiding the valve in its movement. For accomplishing this latter result still another means, namely, ribs  $K^2$ , formed on the valve itself, is shown in Fig. 16.

The neck of the bottle is provided with an enlargement  $A'$ , resulting in an internal shoulder  $a$ , and over this shoulder projects a flange  $N$ , formed on the exterior of the baffle and serving as a means for preventing the introduction of a cutting-tool between the baffle and the neck of the bottle for the purpose of removing the stopper. The tongues  $b'$  are of such length that between the ceiling  $B^2$  and the upper extremity of the part  $B$  there is left a sufficient space for the free egress of liquid and ingress of air, and from the ceiling projects downward a flange  $B^3$  of greater diameter than the upper extremity of the part  $B$  and of less diameter than the internal diameter of the enlarged portion  $A'$  of the neck, the arrangement being such as to form a tortuous passage  $X Y Z$ , through which the liquid may flow. So far as I am aware I am the first to so construct a stopper of the class described that the course of the liquid after passing the valve-seat is always outward, (away from the center of the neck of the bottle.)

The exterior of the baffle  $B'$  is provided with spiral threads for engaging corresponding threads of a metallic cap  $P$ , which may be screwed down until it is brought to bear upon a gasket  $Q$ , of cork, rubber, or other suitable material, arranged upon the shoulder  $a$ . By the use of a cap of this sort I am enabled to dispense with the cork, which is customarily arranged above a stopper of this description.

In Fig. 18 I have shown a cage which differs from that shown in Figs. 1 to 8, inclusive, only in that the tongues of the baffle  $B'$  have converging instead of parallel sides, or, in other words, are V-shaped. One of the features of the present invention consists in forming the baffle and the part to which it is secured with overlapping portions provided with a peripheral groove and a band fitting in said groove, and it is immaterial what may be the shape of said overlapping portions.

I do not claim as my invention the combination of a valve-seat having a slight downward contraction, a valve having a working surface resting upon the valve-seat, means for centering the valve upon the seat, and means for compressing the valve in the valve-seat and locking it when subjected to abnormal pressure.

Having thus described my invention, the



following is what I claim as new therein and desire to secure by Letters Patent:

1. In a stopper the combination of a valve-seat, a valve, means operating automatically when the bottle is chucked for locking the valve in seated position and holding it seated as against similar subsequent manipulations, and means preventing access to said locking means, substantially as set forth.
2. In a stopper the combination of a valve-seat, a valve, means operating automatically when the bottle is chucked for exerting a slight abnormal pressure upon the valve whereby it is locked in the valve-seat and held locked as against similar subsequent manipulations, and means preventing access to said locking means, substantially as set forth.
3. In a stopper, the combination of a valve-seat, a valve, a weight for holding the valve normally seated, said weight being arranged so that when the bottle is tipped past pouring position its influence upon the valve is removed, and when the bottle is chucked it exerts an abnormal pressure upon the valve, means operating automatically for locking the valve seated when it is subjected to such abnormal pressure and holding it seated as against similar subsequent manipulations, and means preventing access to said locking means, substantially as set forth.
4. In a stopper the combination of a valve-seat, and valve, one of which is tapered and one of which has an elastic working surface, said valve and valve-seat being normally in engagement with each other, and a weight for holding the valve normally seated, said weight being so arranged that when the bottle is tipped past pouring position, its influence upon the valve will be removed, and when the bottle is chucked it will exert an abnormal pressure upon the valve, the relative areas of the working surfaces of the valve and valve-seat being such that the abnormal pressure thus exerted by the weight upon the valve causes it to be locked in the valve-seat and held so locked as against subsequent similar manipulations, substantially as set forth.
5. In a stopper the combination of a valve-seat, a valve, a weight resting normally upon the top of the valve, and means for locking the valve seated when it is subjected to an abnormal impact by the weight, substantially as set forth.
6. In a stopper the combination of a valve and valve-seat having locking features that lock the valve seated when subjected to a slight abnormal pressure, a weight holding the valve normally seated, said weight being so arranged that when the bottle is inverted its influence upon the valve is removed, and

when the bottle is chucked it exerts an abnormal pressure upon the valve whereby it becomes locked in the valve-seat and held so locked as against similar subsequent manipulations, substantially as set forth.

7. In a stopper the combination of a valve-seat having a downward contraction, a valve having an elastic working surface resting upon the valve-seat, and a weight for holding the valve normally seated, the relative areas of the working surfaces of the valve and valve-seat being such that an abnormal impact of the weight upon the valve causes its working surface to be compressed and locked in the valve-seat, substantially as set forth.

8. In a stopper the combination of a valve-seat having a convex portion and a tapering portion whose surfaces merge, a valve having a working surface resting upon the convex portion of the valve-seat and of slightly greater area than the upper end of the tapering portion, the working surface of the valve being made of elastic material, and a weight for holding the valve normally seated, the construction and arrangement of the parts being such that abnormal pressure upon the valve will compress its working surface and lock it in the valve-seat, substantially as set forth.

9. In a stopper the combination of a valve-seat, a valve, a frusto-conical weight arranged above the valve, and a cage containing said valve and weight, the dimensions of the parts being such that when the bottle is tipped the weight may rest with its side flat against the side of the cage, and when in this position will have contact with the ceiling of the cage and with the top of the valve and the bottom of the valve will have contact with its seat, substantially as set forth.

10. In a bottle-stopper the combination of a valve, a cage formed of two parts having overlapping portions, a circumferential groove formed in said overlapping portions, a band in said groove securing said overlapping portions together, the groove being of sufficient depth to receive the band and prevent its projecting beyond the outer surface of the cage substantially as set forth.

11. In a stopper, the combination of a valve, a cage formed in two parts having on their meeting ends complementary tongues and grooves, the outer surfaces of the tongues of both parts being flush and provided with a circumferential groove and a band in said groove securing the parts together, substantially as set forth.

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