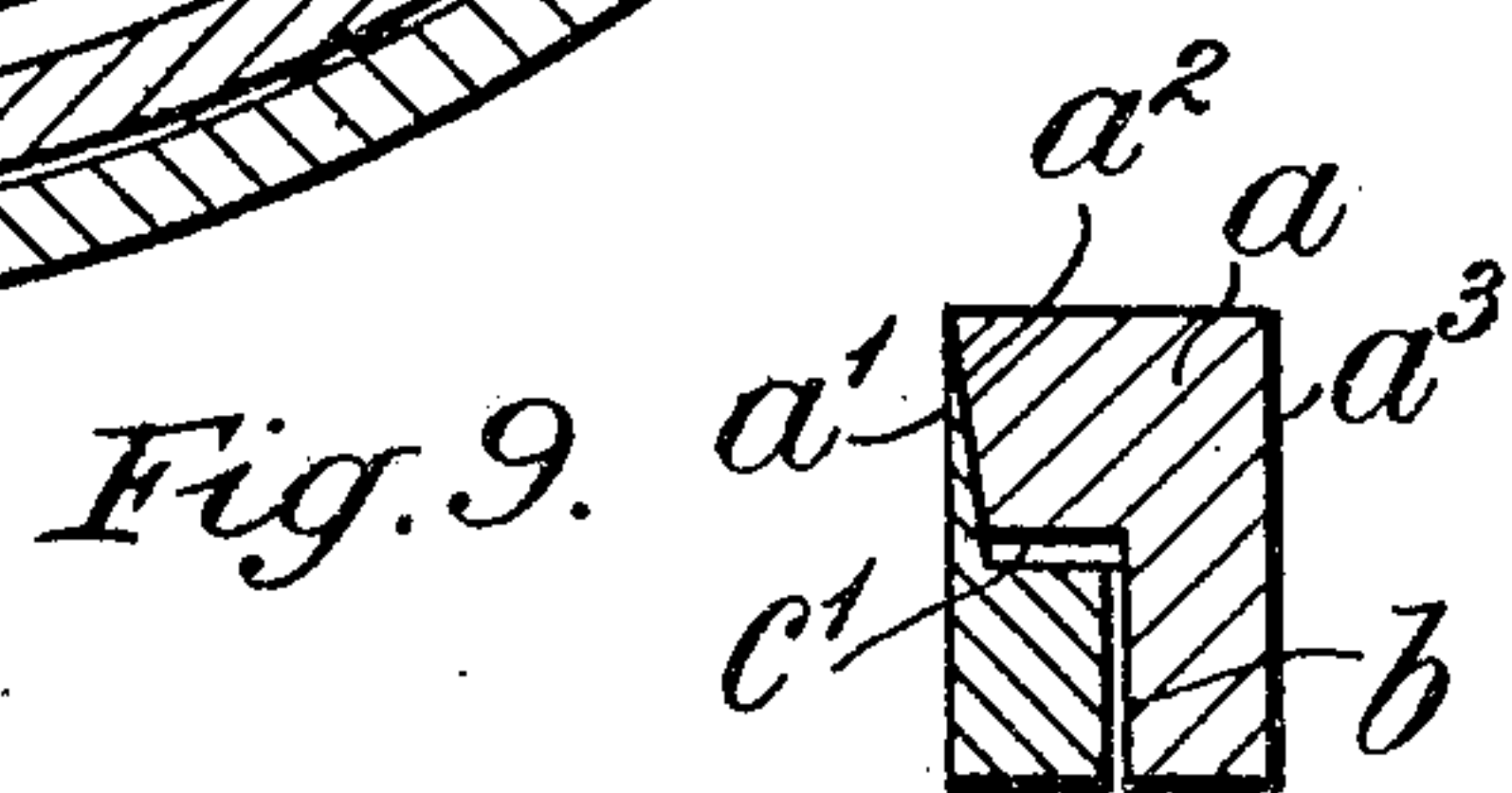
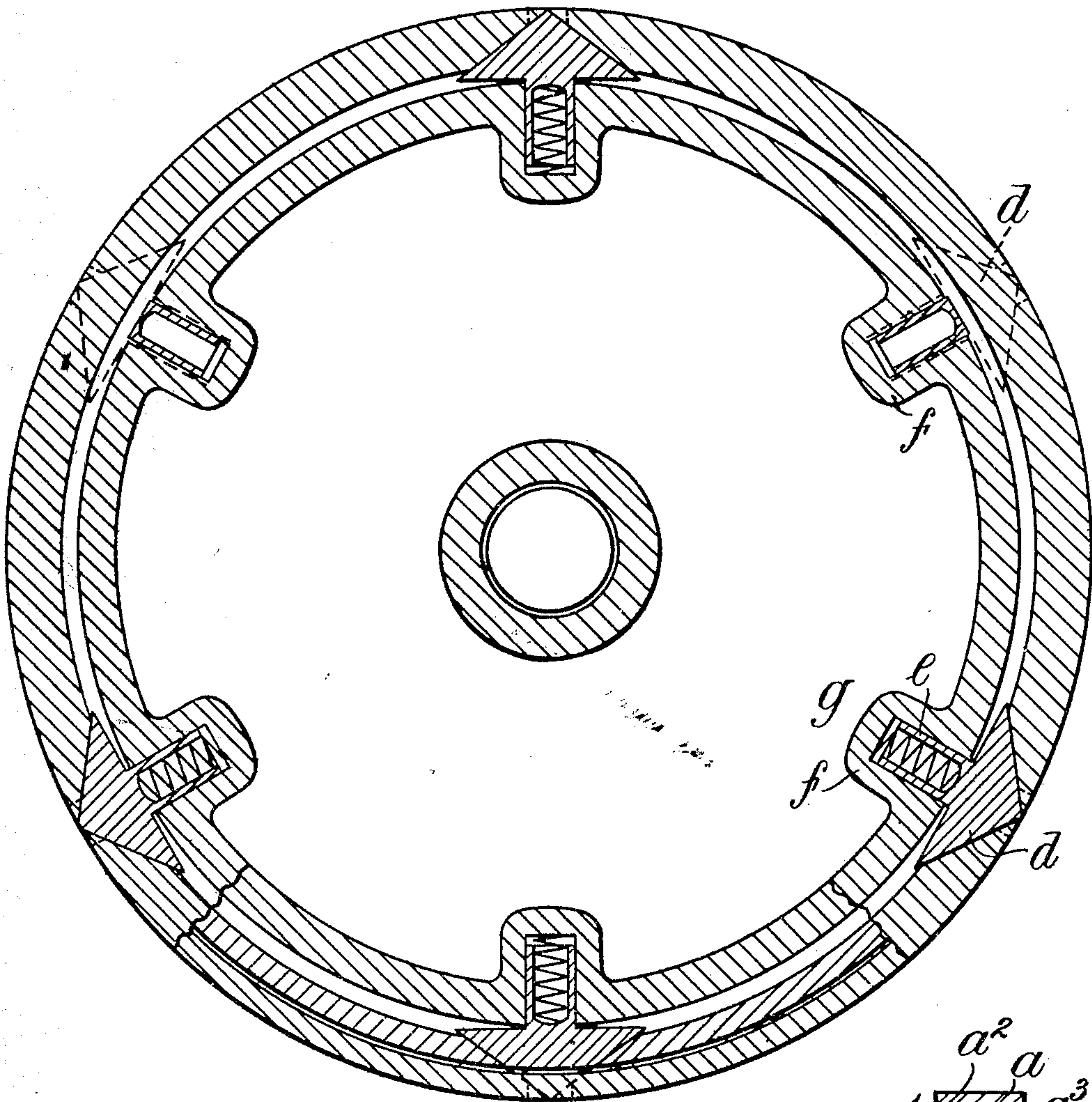


920,237.

R. ALLEN.  
PISTON.  
APPLICATION FILED JULY 13, 1908.

Patented May 4, 1909.  
5 SHEETS—SHEET 1.

*Fig. 1.*



*Witnesses.*  
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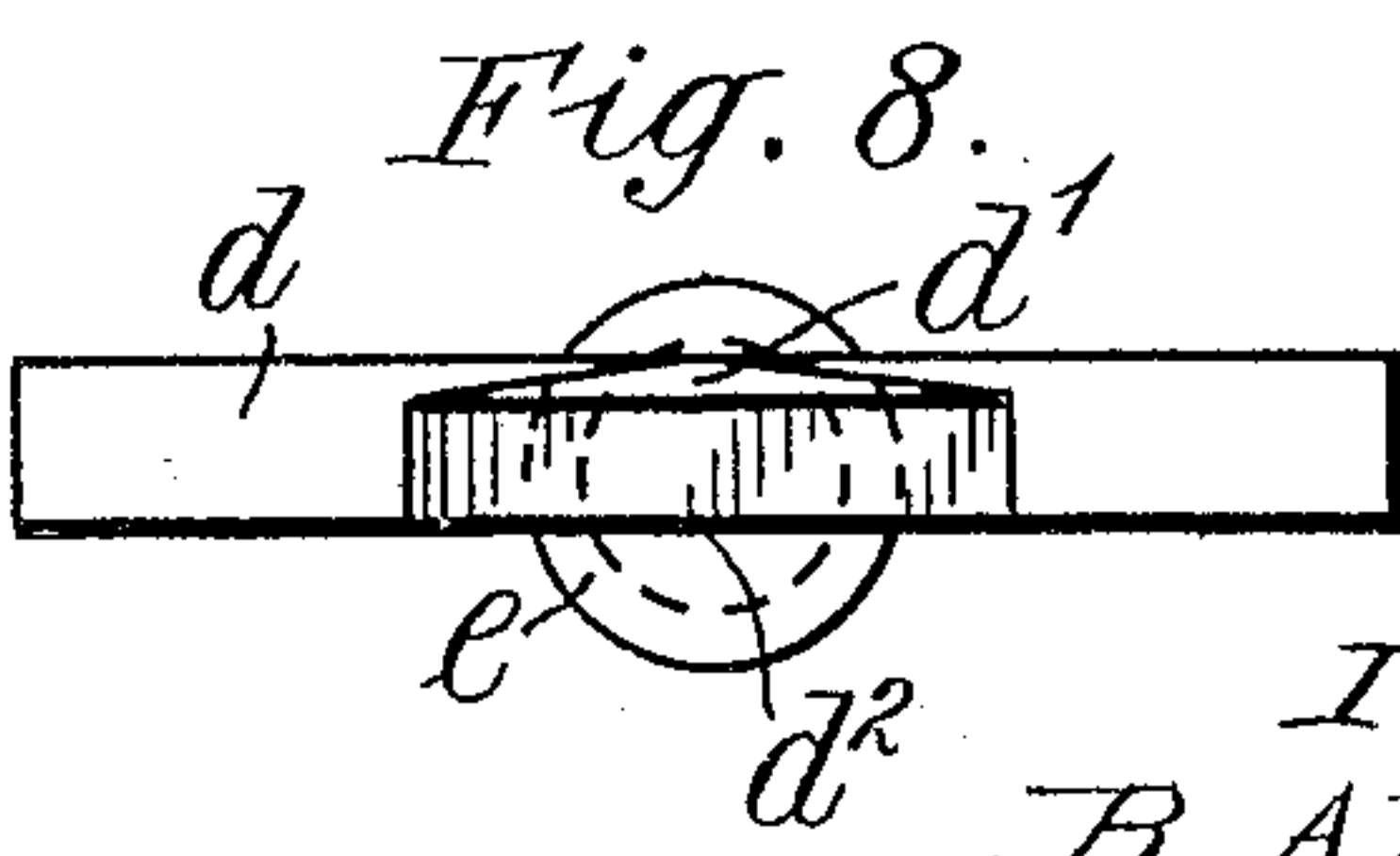
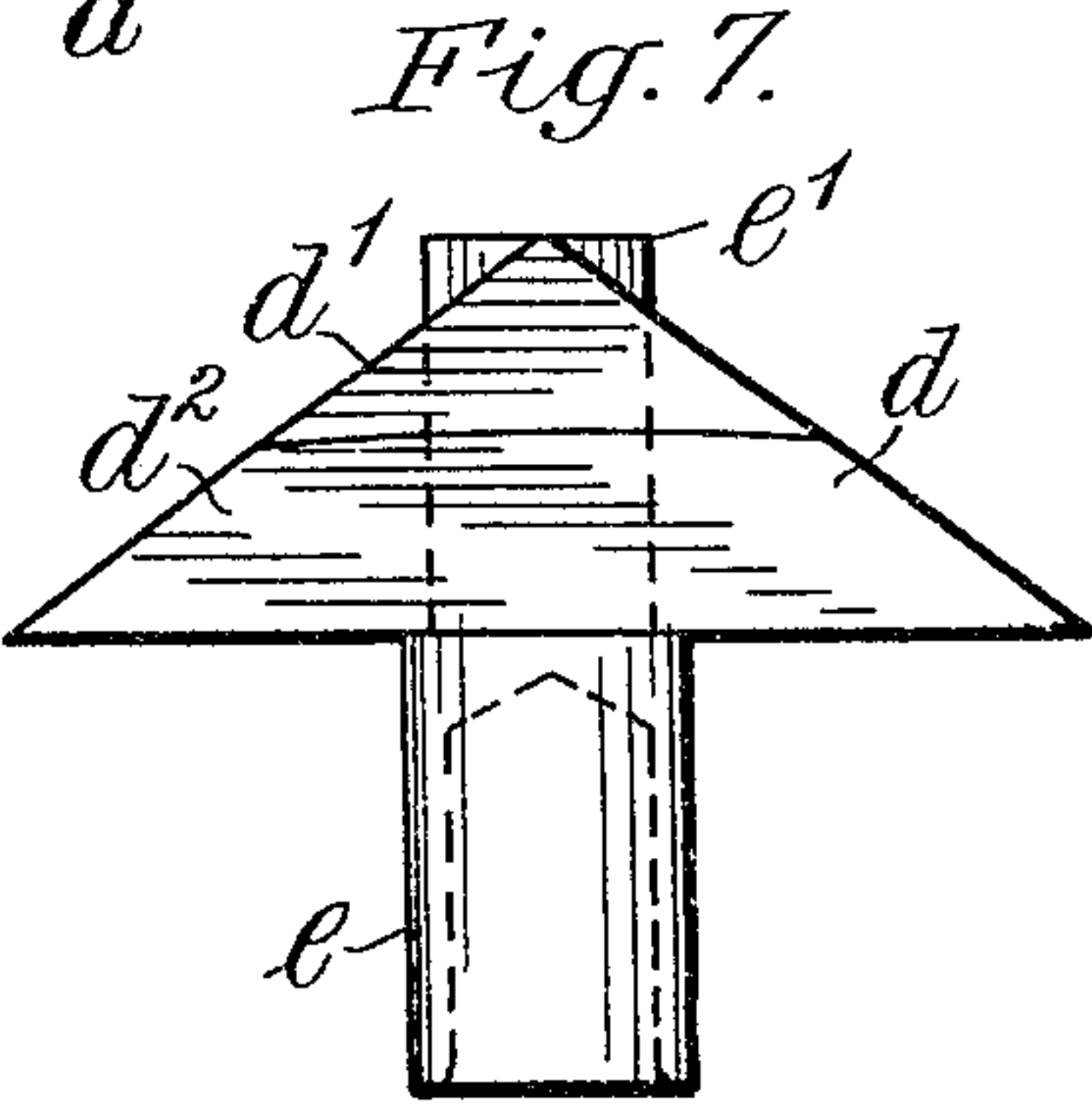
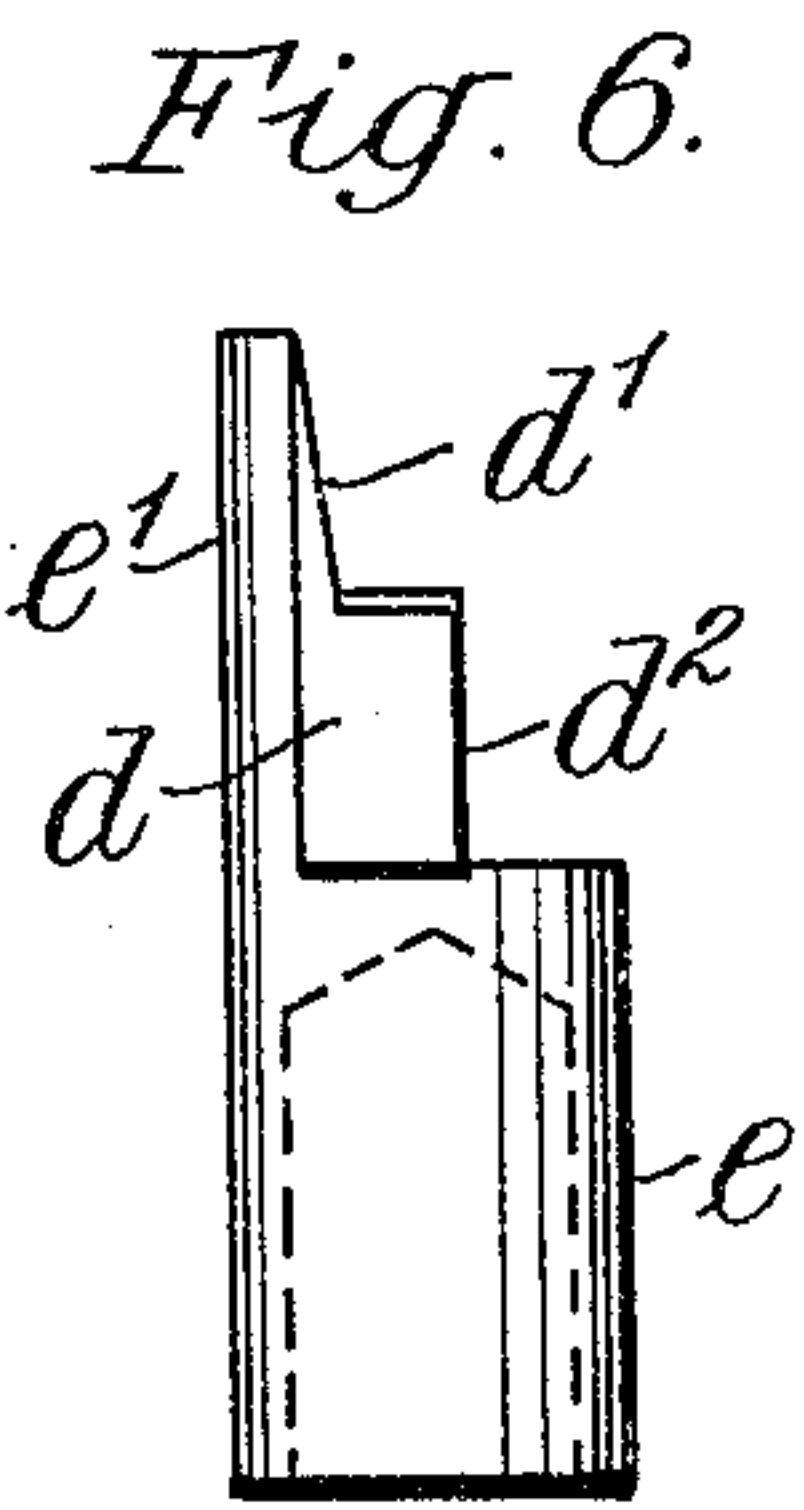
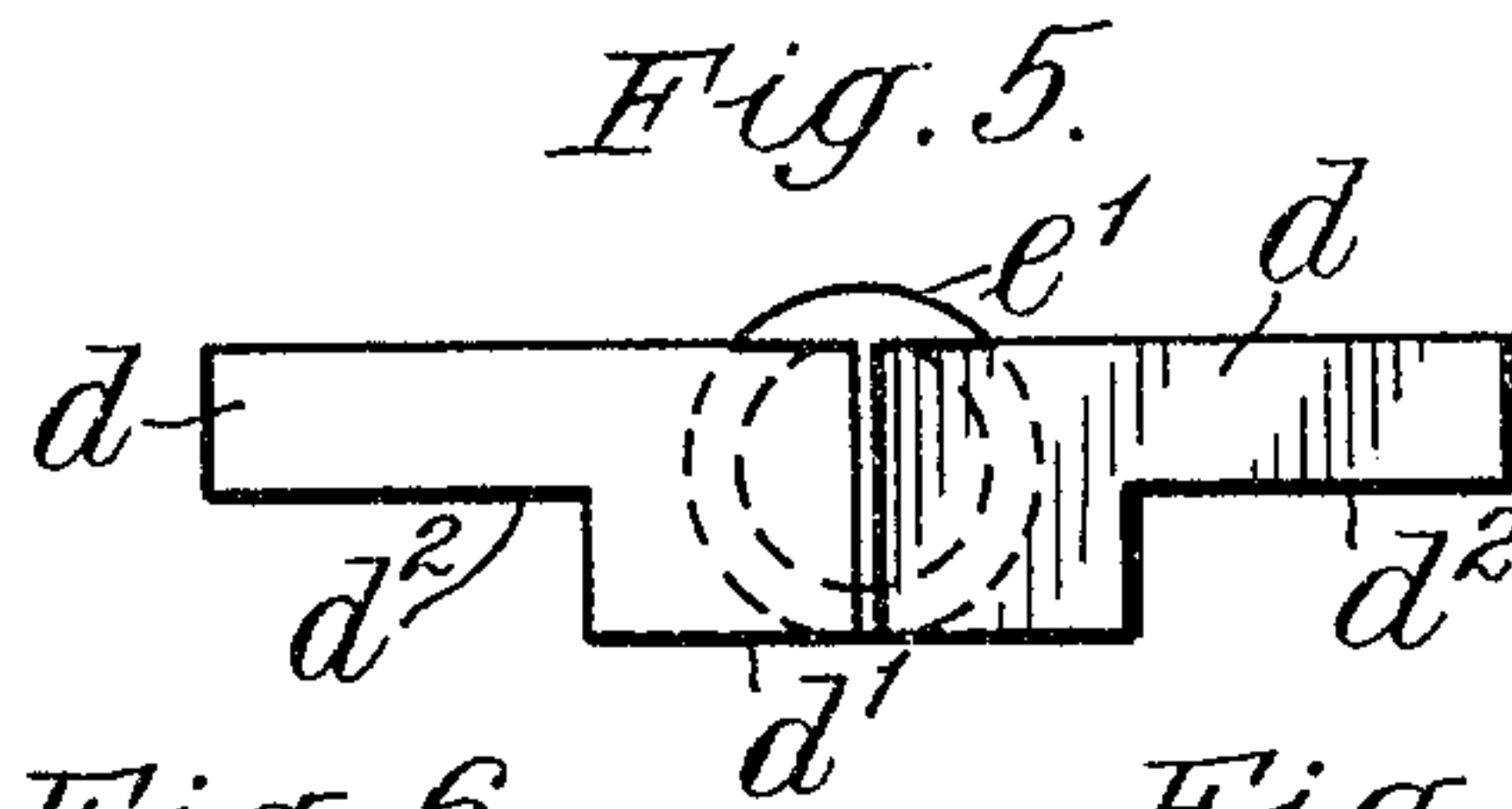
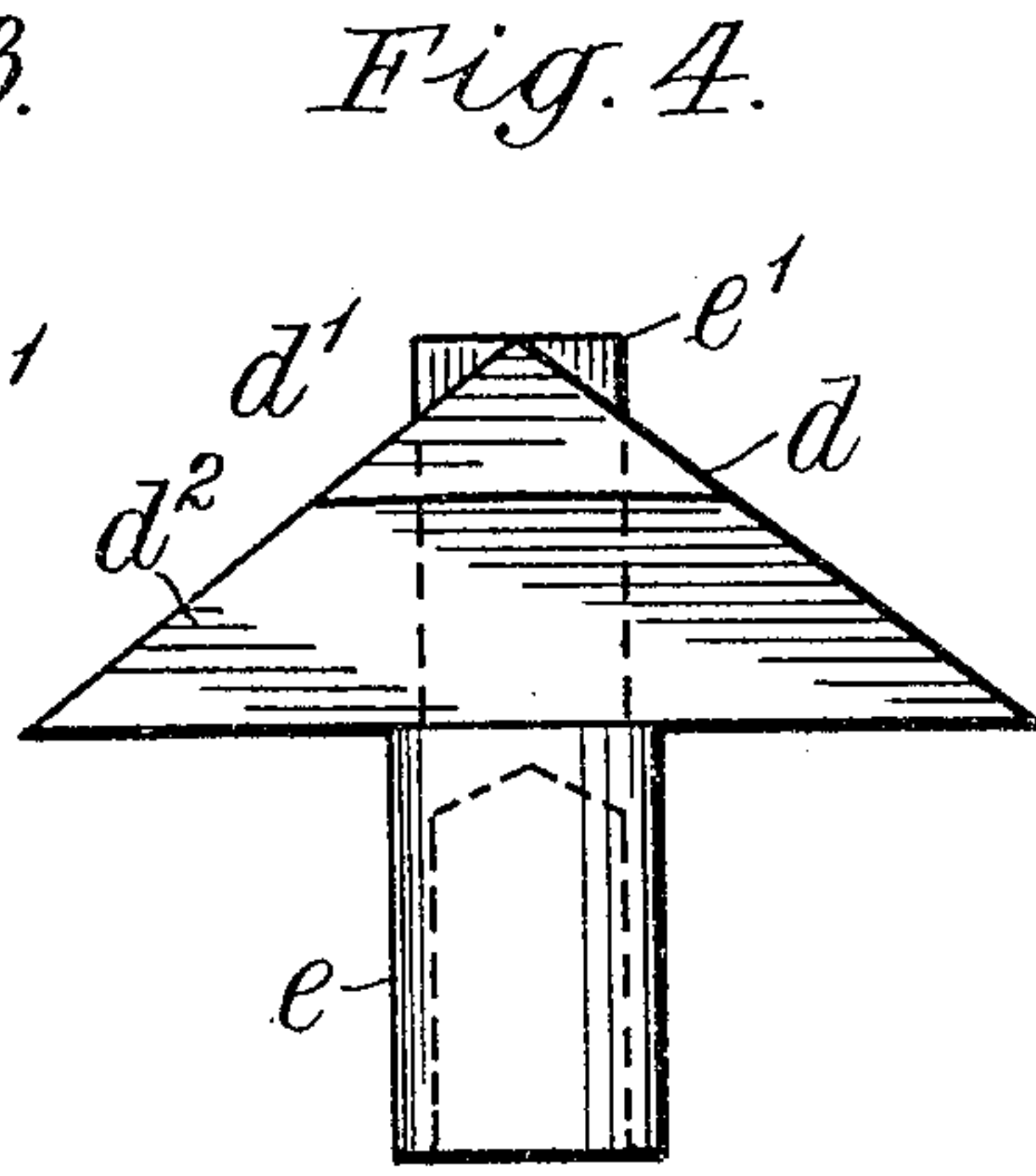
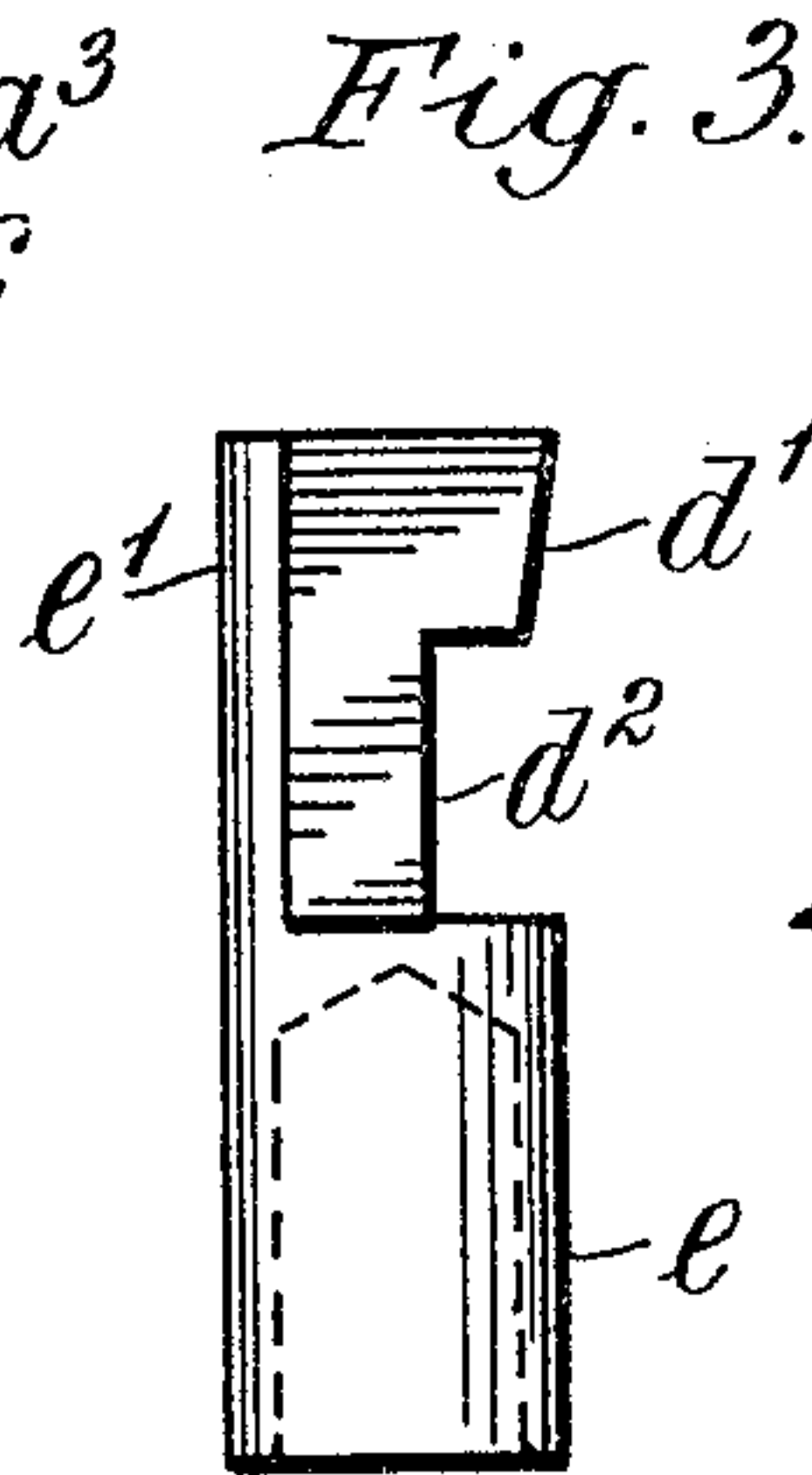
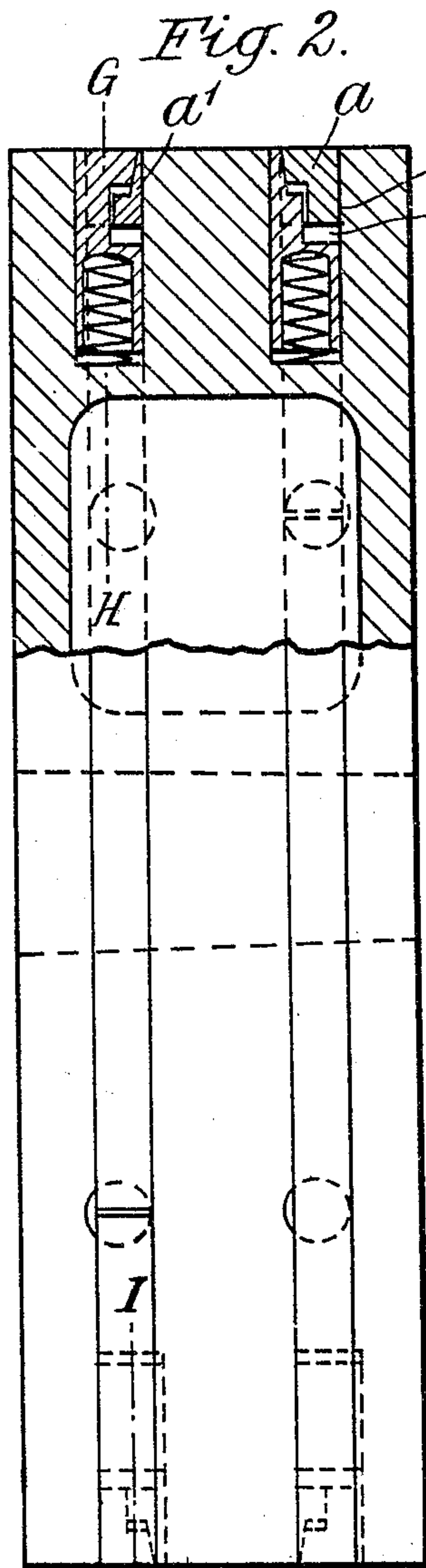
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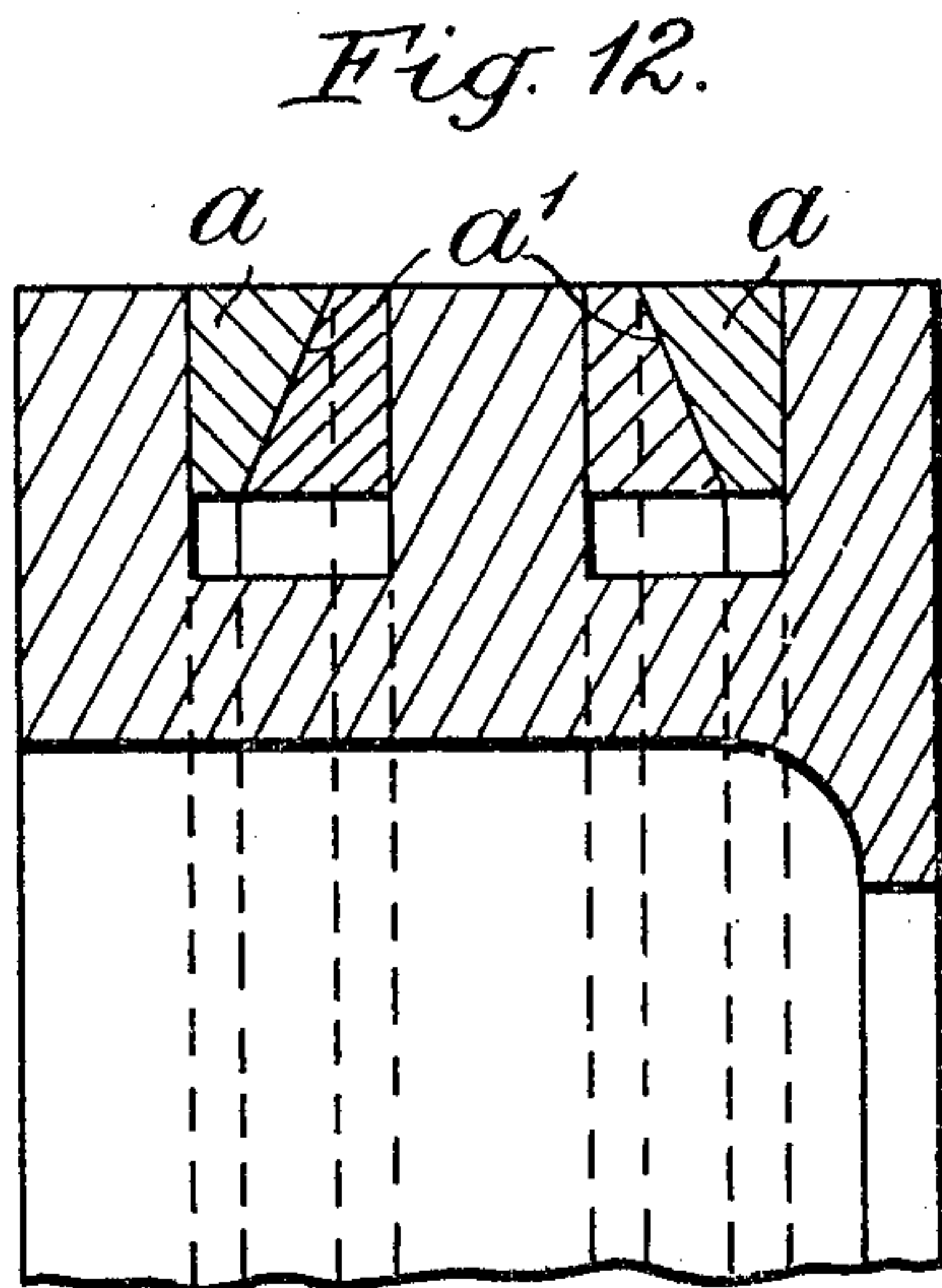
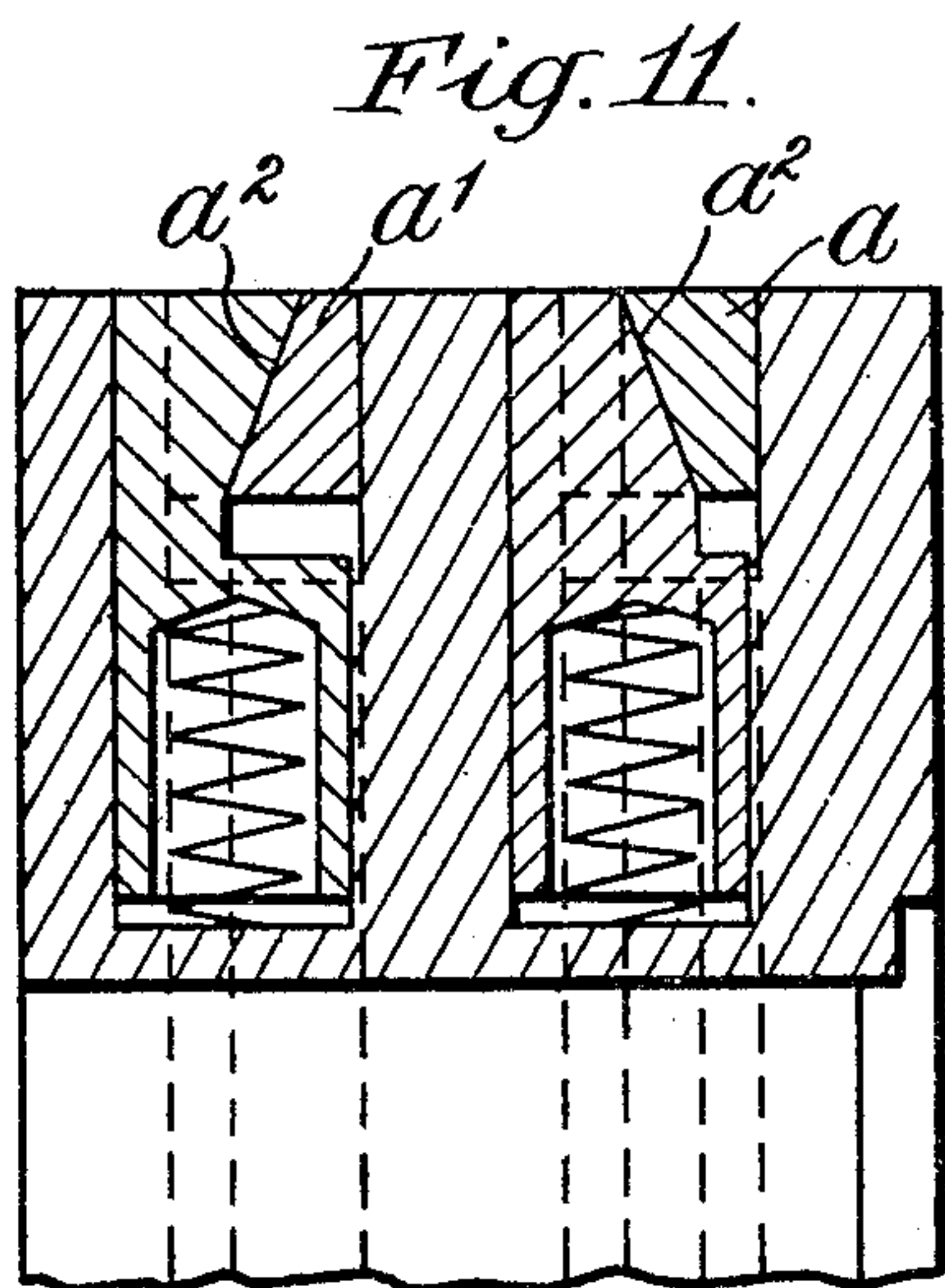
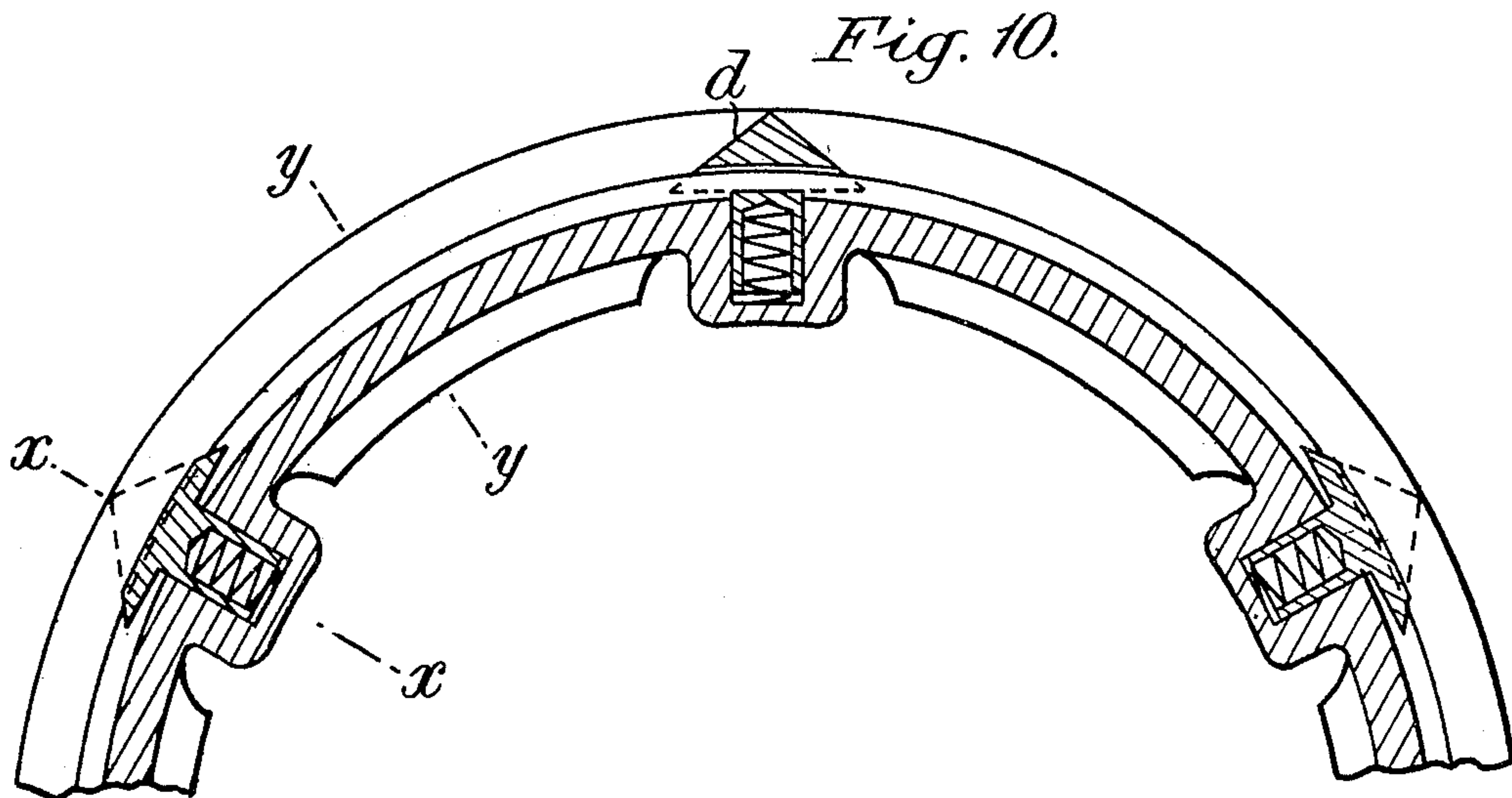
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920,237.

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Fig. 11<sup>a</sup>.

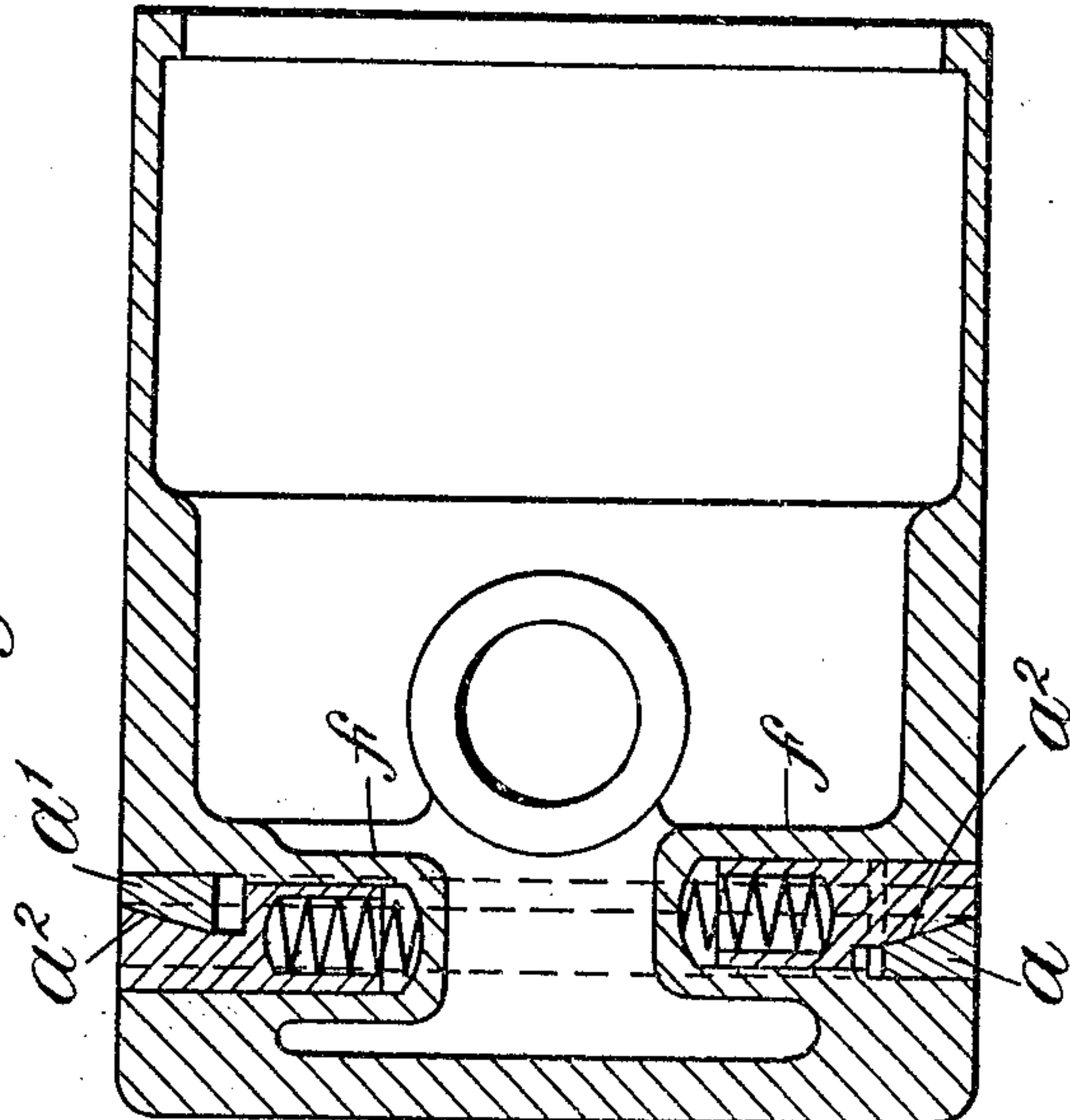
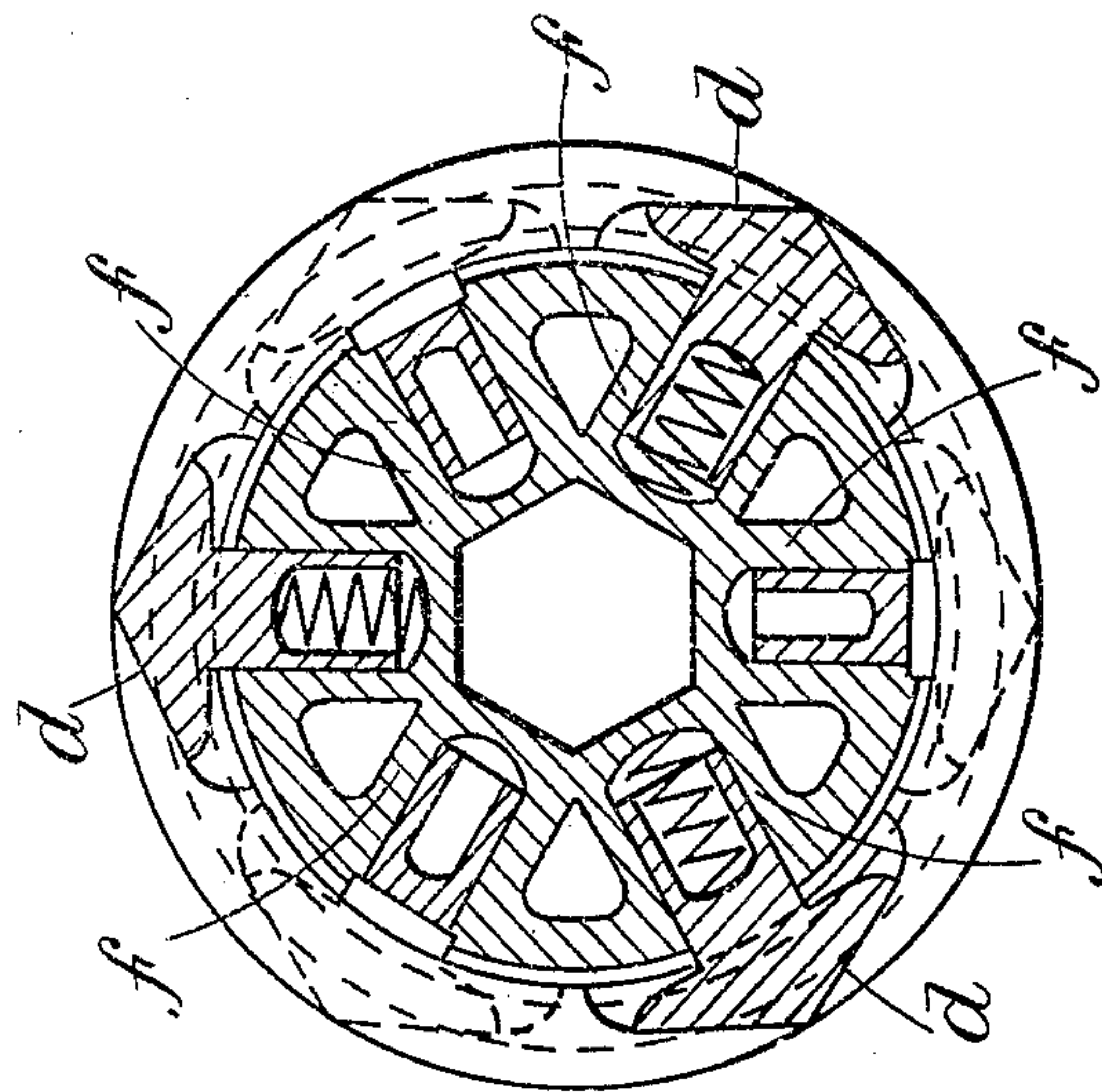


Fig. 10<sup>a</sup>.



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Fig. 13.

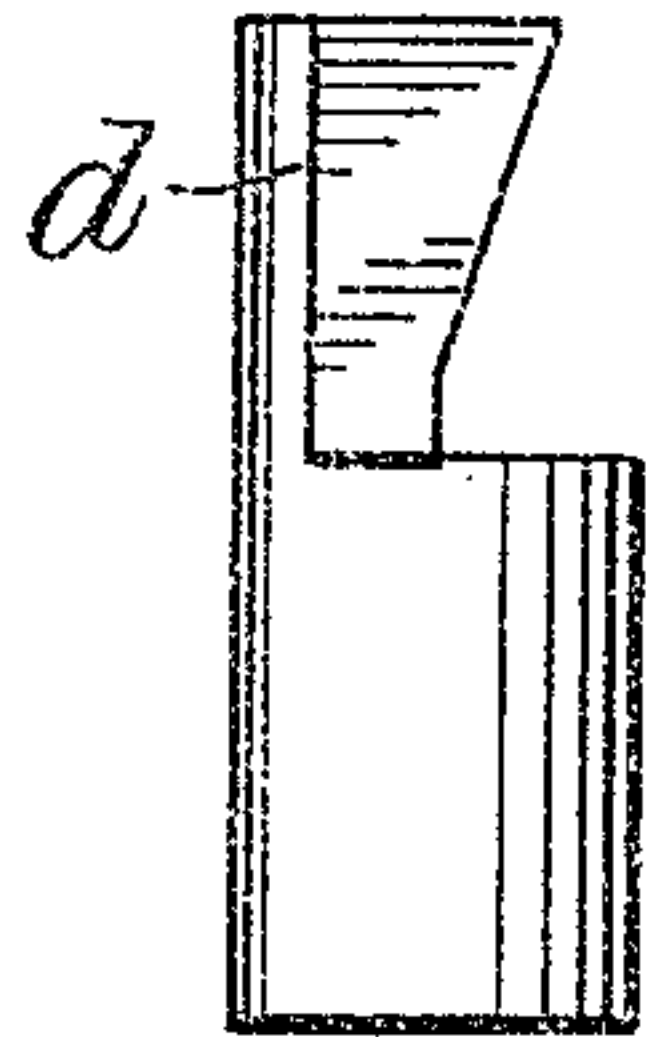


Fig. 14.

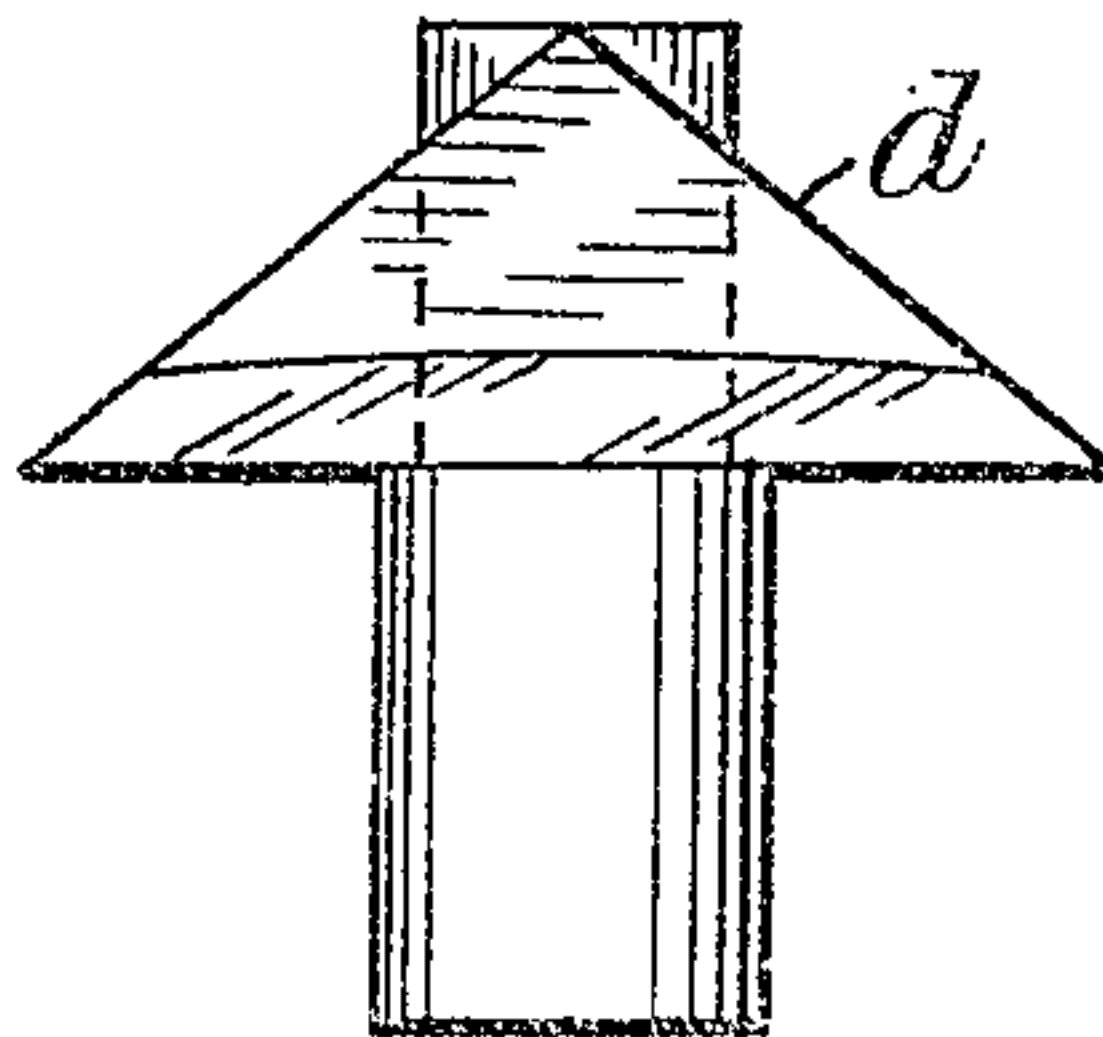


Fig. 15.

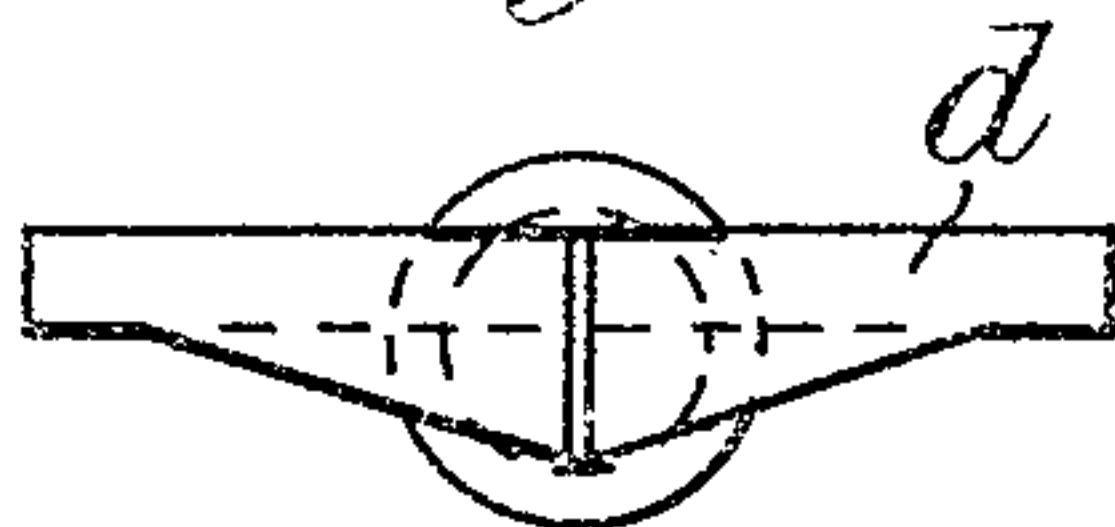


Fig. 16.

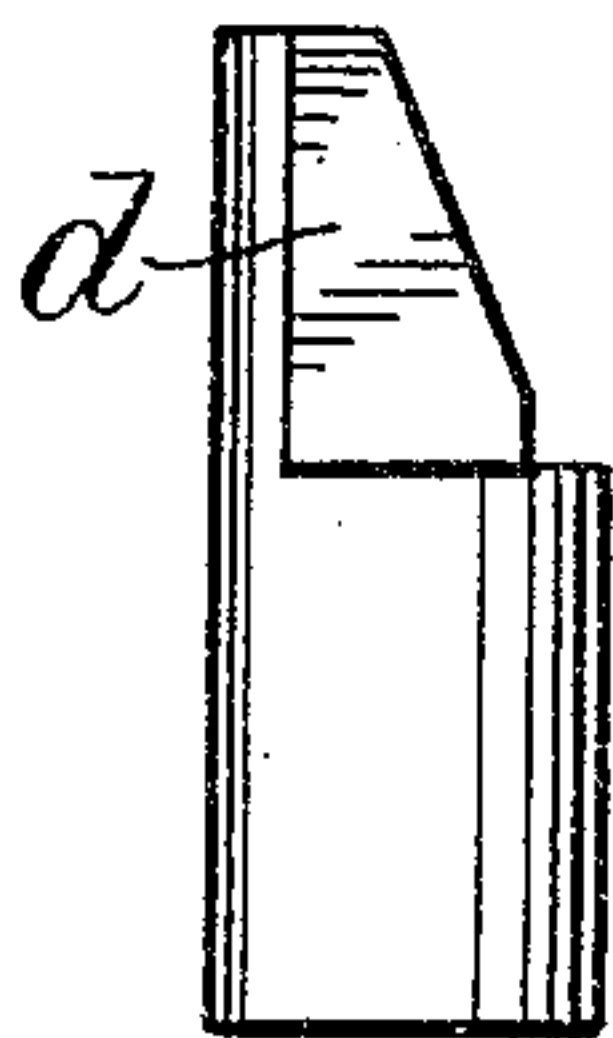


Fig. 17.

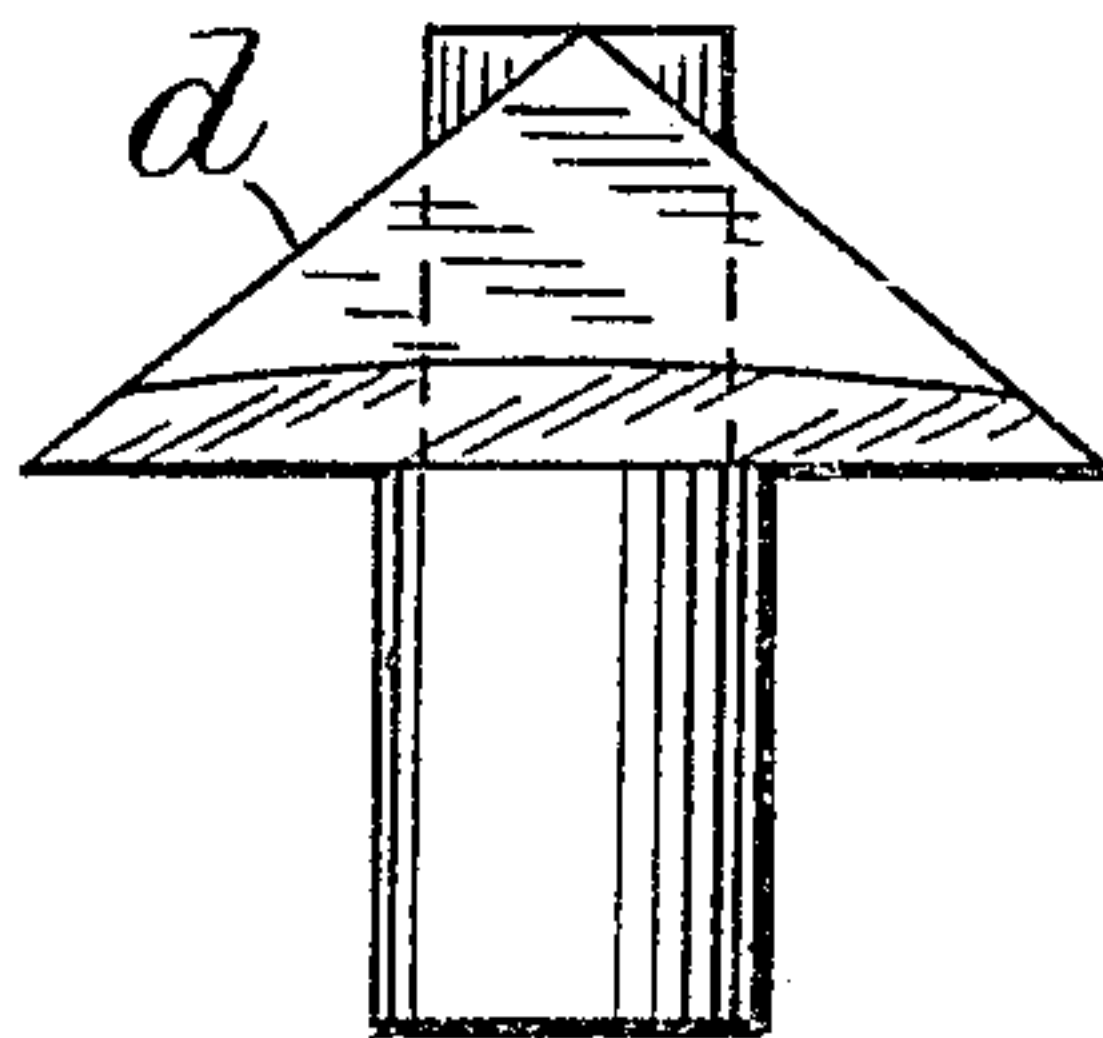
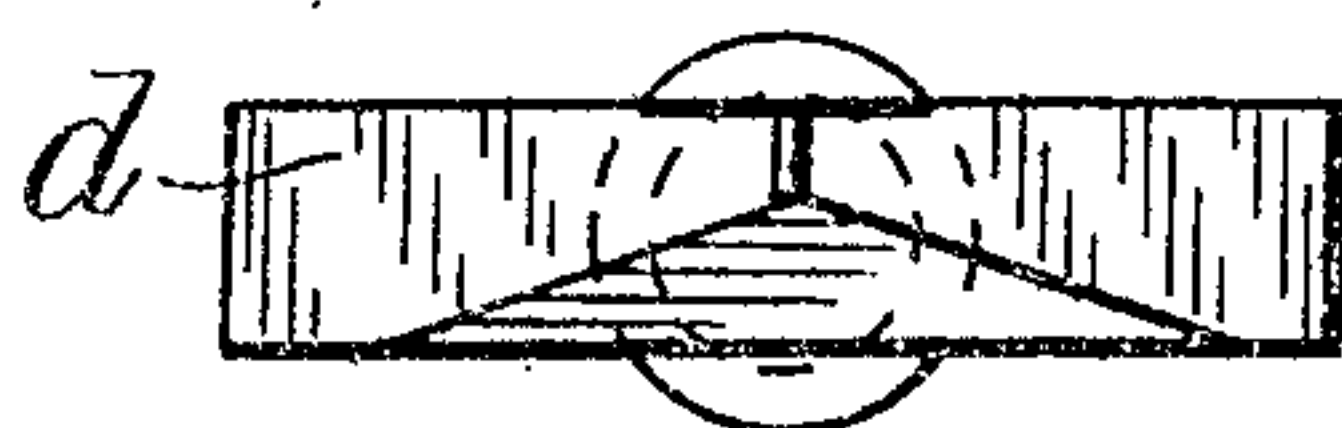


Fig. 18.



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# UNITED STATES PATENT OFFICE.

ROBERT ALLEN, OF CAVERSHAM, ENGLAND.

## PISTON.

No. 920,237.

Specification of Letters Patent.

Patented May 4, 1909.

Application filed July 13, 1908. Serial No. 443,321.

*To all whom it may concern:*

Be it known that I, ROBERT ALLEN, a subject of the King of Great Britain and Ireland, residing at Oakdene, Kidmore Road, Caversham, Oxfordshire, England, have invented certain new and useful Improvements in Pistons, of which the following is a specification.

My invention relates to pistons of the type having metallic packing rings formed in two or more parts or segments which are forced outward or expanded against the cylinder by radial chokes, gluts or wedge blocks which choke the joints between the contiguous ends of the segmental packing members. As heretofore constructed such packing consisted of a ring of square or rectangular section which although very efficient in many respects was incapable of fulfilling all requirements of a perfect piston packing under the varying conditions of working, inasmuch as no effective provision was made for counteracting steam pressure on the perimeter of the ring, the expanding wedges or chokes being only intended to exert sufficient outward pressure on the rings to insure a tight packing against the cylinder wall under normal conditions of working. Further the rings were liable to become steam packed through steam passing down the side of the packing ring groove in the piston head and underneath the ring.

The object of my invention is to prevent the packing rings from being forced inward by steam or other pressure acting thereon in the opposite direction to their expanding wedges or chokes, as for instance when the rings are used on piston valves and become exposed to the steam on their peripheral surfaces when passing over ports; also at the same time to maintain the ring tightly pressed against that side of the groove nearest the pressure side of the piston, or against both sides where required and to interpose an effectual barrier at the joint which shall not uncover by wear.

My invention provides an efficient packing for the pistons of steam engines, internal combustion engines, or compressors being equally effective whether working with steam, gases, air or liquids.

In the accompanying drawings Figure 1 is a sectional end elevation of a piston constructed according to this invention, the upper half section being taken along the line

G. H. and the lower half along the line I. J. Fig. 2. Fig. 2 is a sectional side elevation of the piston, Figs. 3 to 5 are elevations at right angles and plan respectively of a choke or wedge piece for expanding the packing ring, Figs. 6 to 8 are similar views to Figs. 3 to 5 of a choke or wedge for expanding the complementary wedging or packing ring: Fig. 9 is a transverse section of the packing, Fig. 10 is a sectional end elevation of part of a piston showing a slightly modified form of packing; Figs. 11 and 12 are transverse sections through the piston taken respectively at  $x-x$  and  $y-y$  Fig. 10; Figs. 10<sup>a</sup> and 11<sup>a</sup> are similar views to Figs. 10 and 11 showing the application of the improved packing to the piston of an internal combustion engine. Figs. 13 to 15 are elevations at right angles and plan respectively of the choke or wedge employed to expand one half of the packing and Figs. 16 to 18 are similar views of the wedge for expanding the other or complementary half of the packing.

In a practical form of my invention as applied to packing rings of piston valves, shown in Figs. 1 to 9 which valves would usually be double ended, one of the side faces of each segment or half  $a$  forming the ring is beveled or inclined from the outer edge inward and under-cut to form a space  $b$  for the reception of a complementary wedging and locking ring  $a'$  which replaces the cut away portion of the packing ring  $a$  and fills the groove  $c$ , with the exception of a small space  $c'$  which is left between the rings  $a$   $a'$  to allow adjusting for wear Fig. 9.

Both the packing ring  $a$  and its complementary wedging and locking ring  $a'$  are formed in two or more parts or segments and expanded by wedges or chokes  $d$  interposed between the ends of the segments. As shown each ring is divided into three segments, the wedges  $d$  of one packing ring being disposed intermediate the wedges of the adjacent ring, as illustrated in Fig. 1. The wedges  $d$  are cut away at  $d'$   $d^2$  and otherwise shaped to conform to the sections of the segments on which they act and are formed with hollow stems  $e$  which are inserted in radial pockets  $f$  in the piston head, and are pressed outward by helical springs  $g$  located in the hollow stems  $e$ , or the springs may be applied to the chokes in any other suitable manner. The stems  $e$  of the wedges are cylindrical and a segment  $e'$  forming a continuation of the



stem *e* extends up to the top of the wedge *d*, and insures a thorough closure at the joint.

It will be seen that the packing ring *a* and its locking ring *a'* have a wedging action one upon the other which keeps the packing ring tightly pressed against the side of the groove *c* in the piston head. This wedging action however does not prevent the ring from expanding; but by forming the beveled or wedging surfaces *a*<sup>2</sup> so that they make a sufficiently slight angle with the side faces *a*<sup>3</sup> of the rings, the reaction between the wedging surfaces *a*<sup>2</sup> is arranged to bear such a relation to the pressure at the side faces *a*<sup>3</sup> of the ring that the packing ring *a* is automatically locked by the wedge ring *a'* and prevented from being pressed inward by the steam pressure when the outer face of the ring is exposed to such pressure when passing over ports or the like. It will be seen that the exposed outer edge of the wedge ring is made as thin as possible so that there is practically no inward pressure exerted by the steam on the edge of this ring.

Where the packing rings are not liable to be exposed to the direct pressure of fluids on their outer faces the inclination of the wedging surfaces between the two co-acting rings is only required to be such that the main ring is kept up against the adjacent side of its groove irrespective of the direction in which the piston is traveling. Thus the wedge ring may take a very simple form. A packing of this type is shown in Figs. 10 to 18. The two sets of ring segments *a a'* have co-acting wedge surfaces *a*<sup>2</sup>, and are expanded by wedges *d* shaped to conform to the section of their respective packing ring segments.

In internal combustion engines wherein considerable heating of the piston occurs, I preferably arrange the pockets *f* for the expanding wedges *d* in such a manner that air can circulate freely around the pockets as shown in Figs. 10<sup>a</sup> and 11<sup>a</sup> and exercise a cooling action thereon.

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

1. A piston packing comprising a segmental packing ring seated in the groove of the piston, a segmental wedging and locking ring, said ring having cooperating inclined meeting edges adapted to force the side edges of the packing laterally against the walls of the piston groove when acted upon by external pressure, and a series of spring pressed wedges to expand the packing rings radially against the cylinder.

2. In combination with a piston provided with an annular groove and a series of radially and inwardly extending pockets at the inner wall of its groove, a packing comprising segmental wedging or locking rings seated in the groove, and a series of expanding wedges for expanding the packing sections radially, said wedges having hollow stems to seat in the pockets of the piston, and coil springs arranged in the stems of the wedges with their inner ends seating in the pockets.

3. In combination with a piston provided with an annular groove and a series of radially and inwardly extending pockets at the inner wall of its groove, a packing comprising segmental wedging or locking rings seated in the groove, a series of expanded wedges for expanding the packing sections radially, said wedges having hollow stems to seat in the pockets of the piston, and coil springs arranged in the stems of the wedges with their inner ends seating in the pockets, each of the wedges having a wedge shaped portion extending to the outer edge of the packing and forming a section thereof and which provides a closure at the joints of the packing ring sections.

In testimony whereof I have affixed my signature, in presence of two witnesses.

ROBERT ALLEN.

Witnesses:

H. D. JAMISON,  
A. NUTTING.