

A. LAWRENCE.

Improvement in Rotary-Valves.

No. 126,402.

Patented May 7, 1872.

Fig. 1

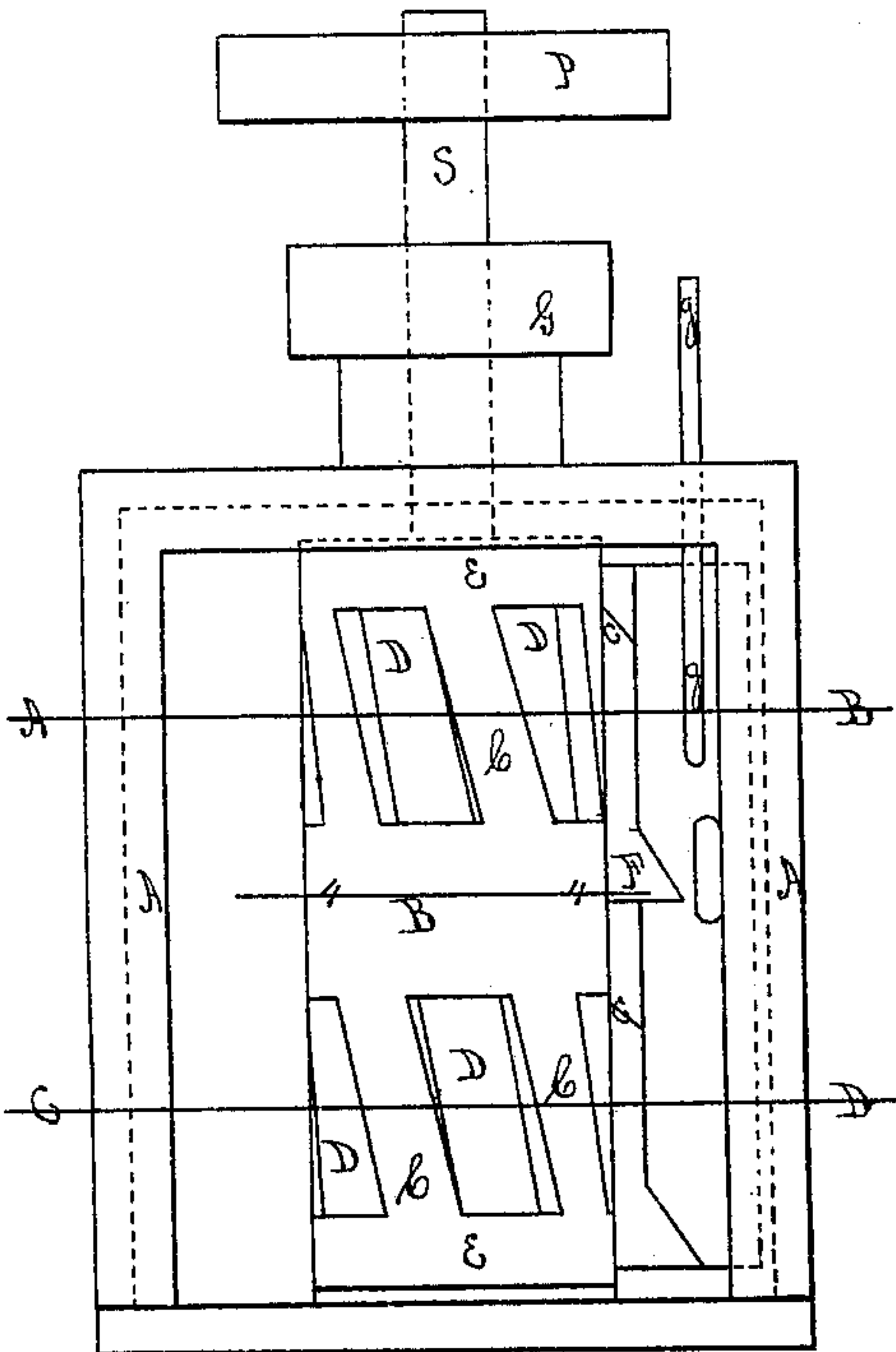


Fig. 2

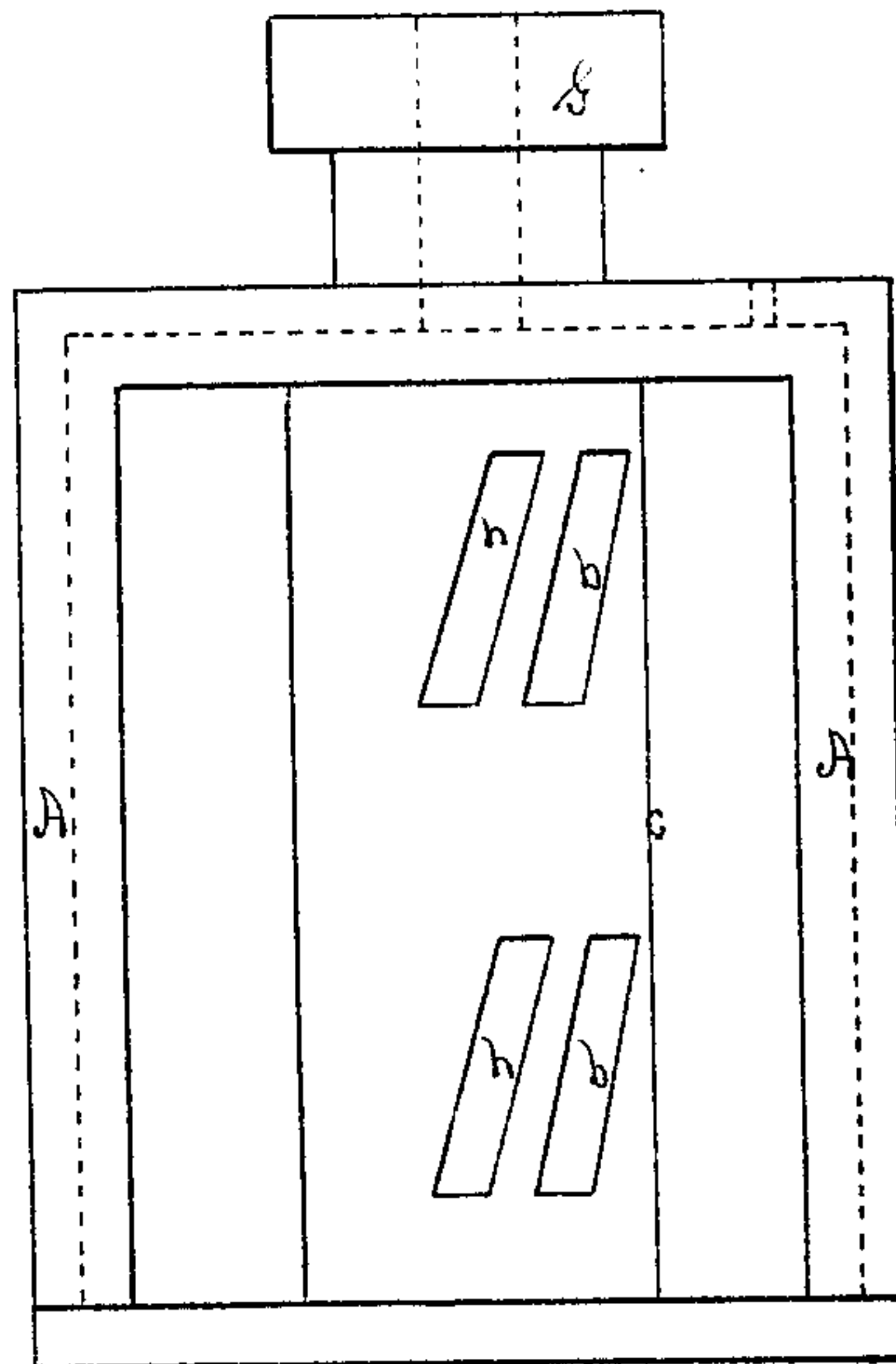


Fig. 3

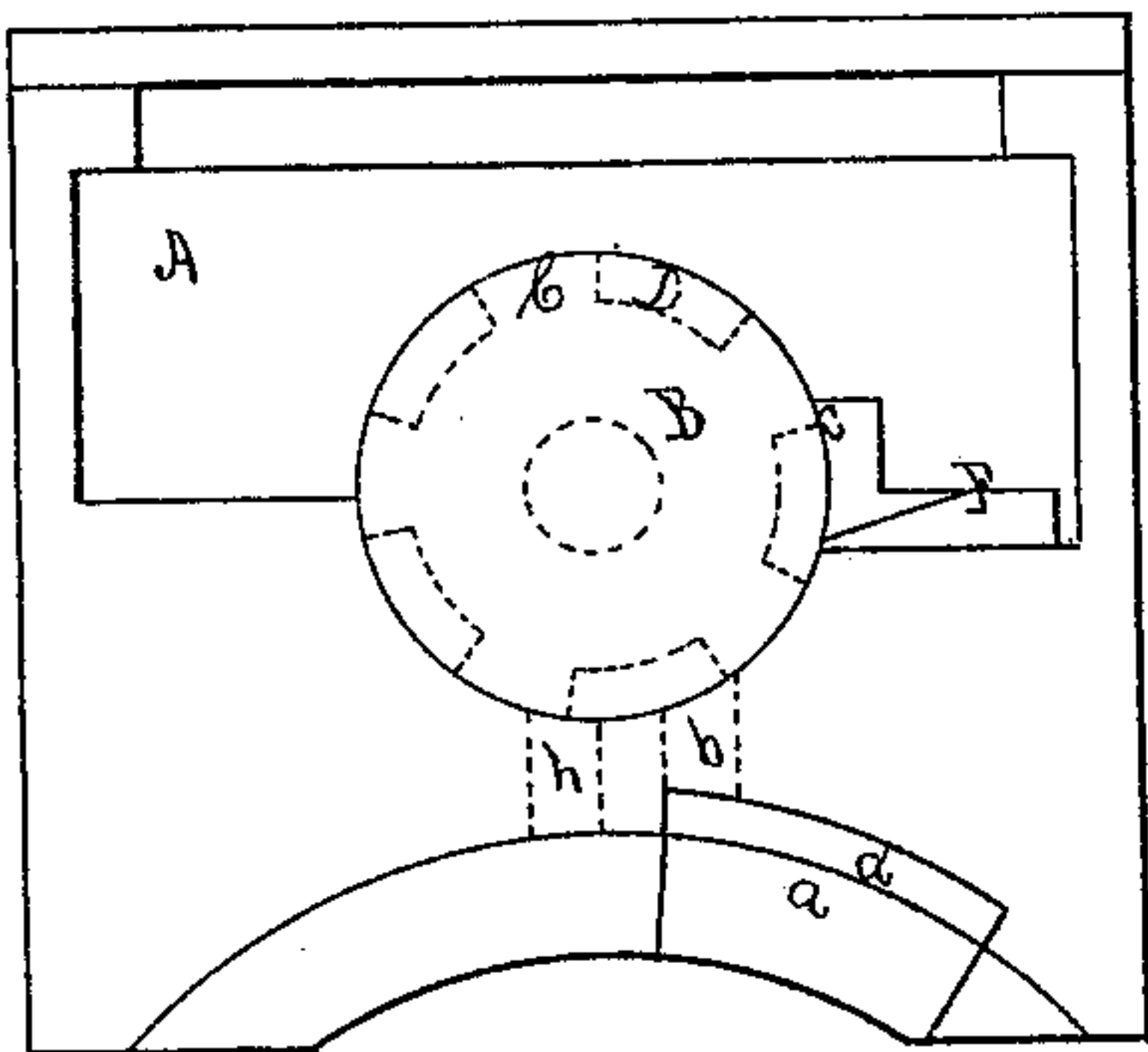


Fig. 4

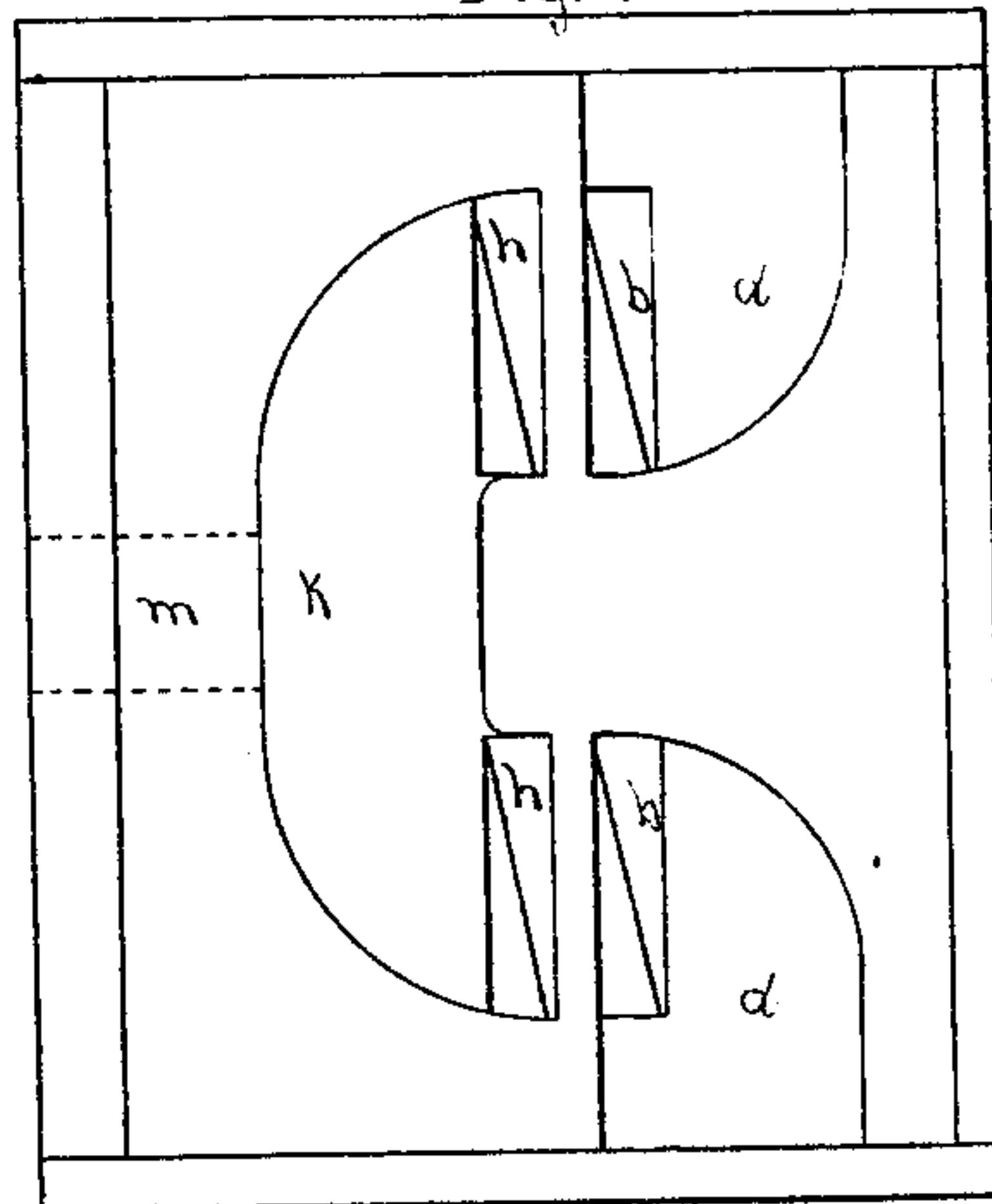


Fig. 5

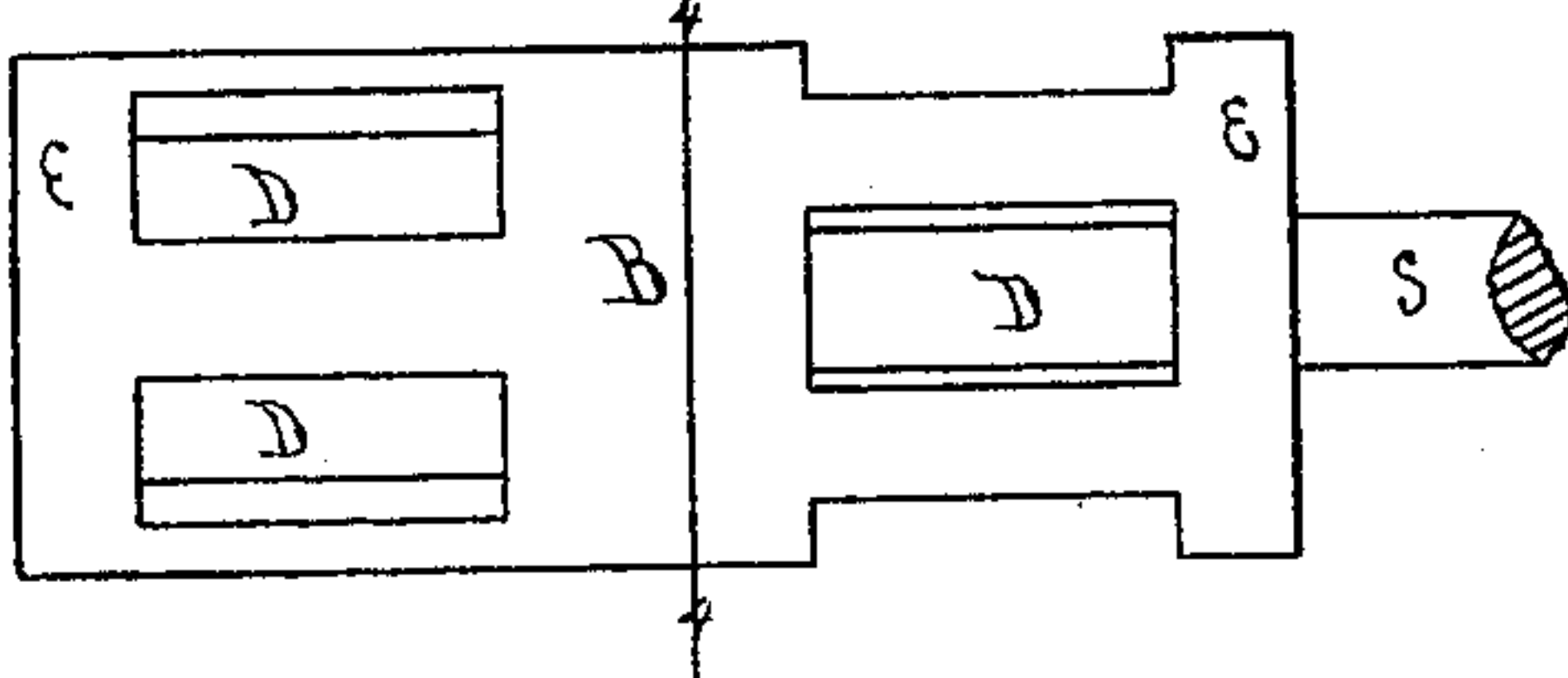
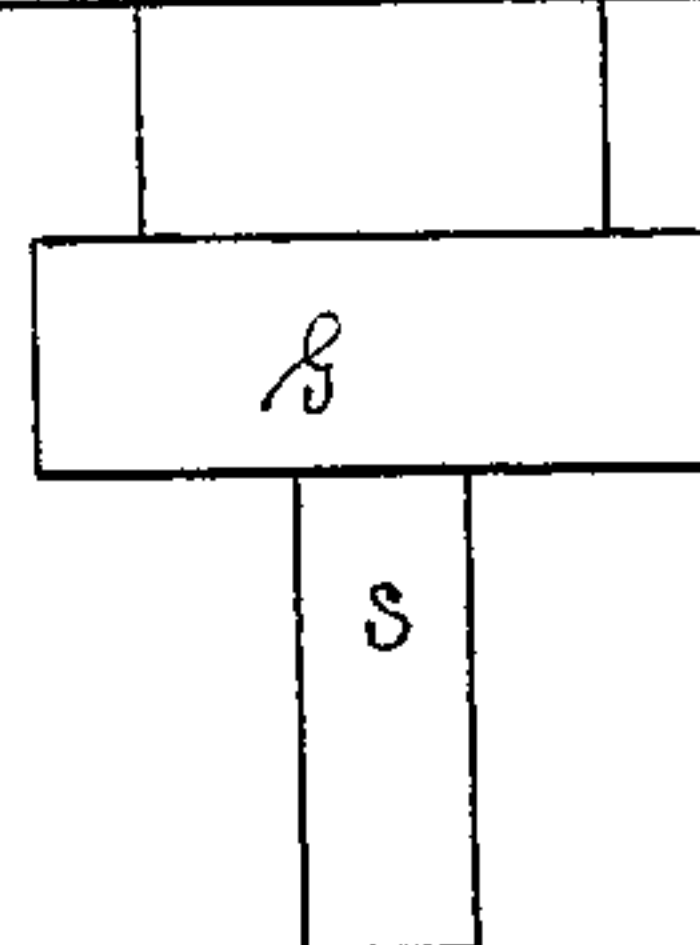
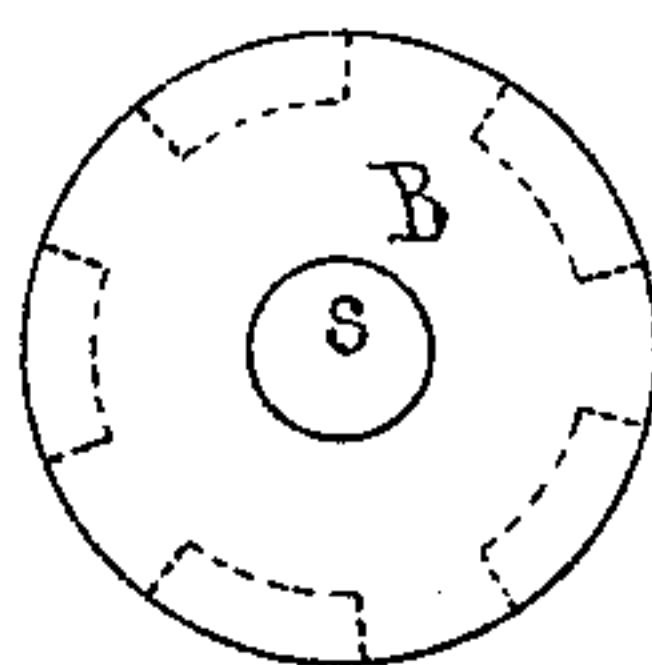


Fig. 6



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Fig. 7

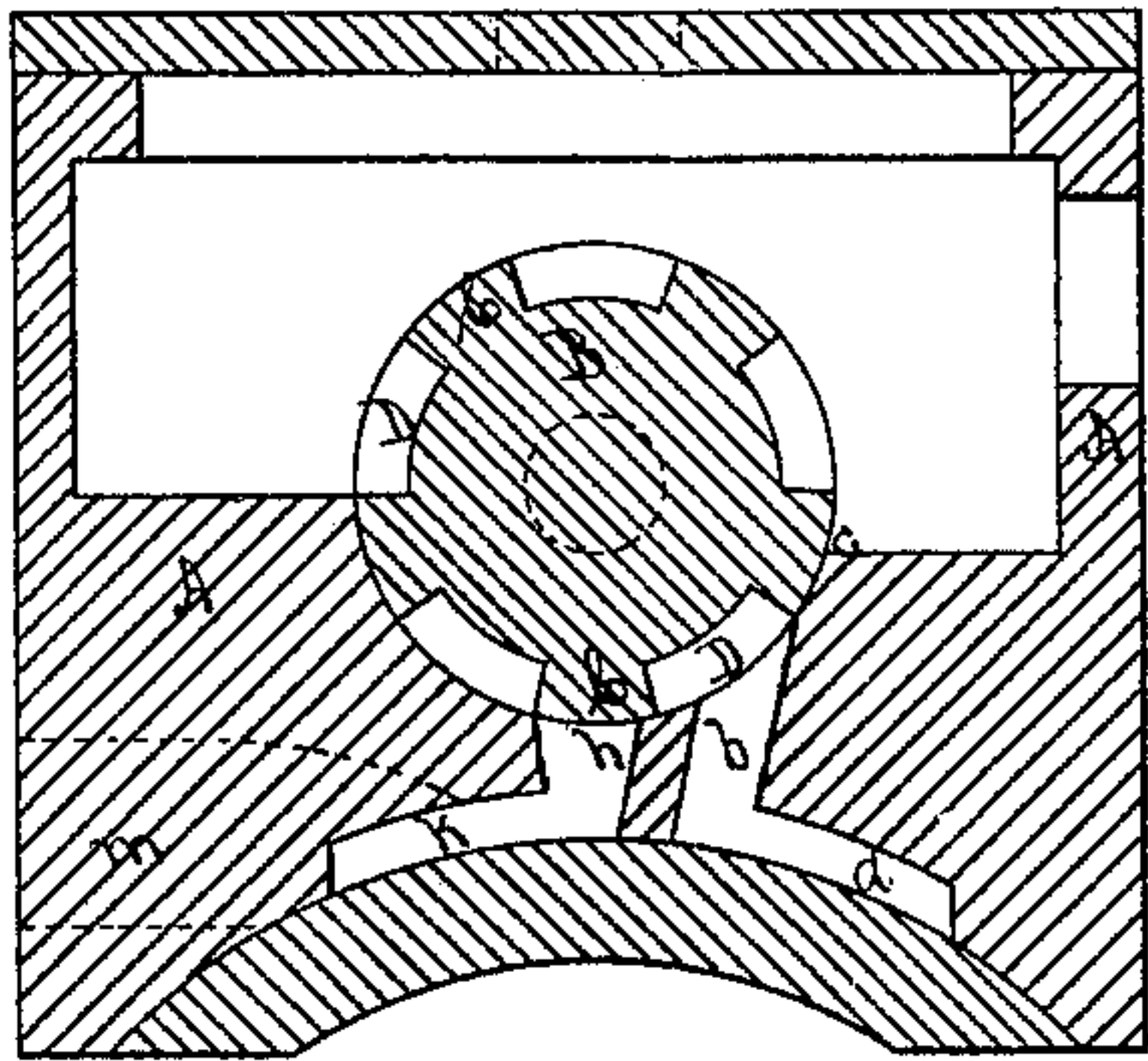


Fig. 8

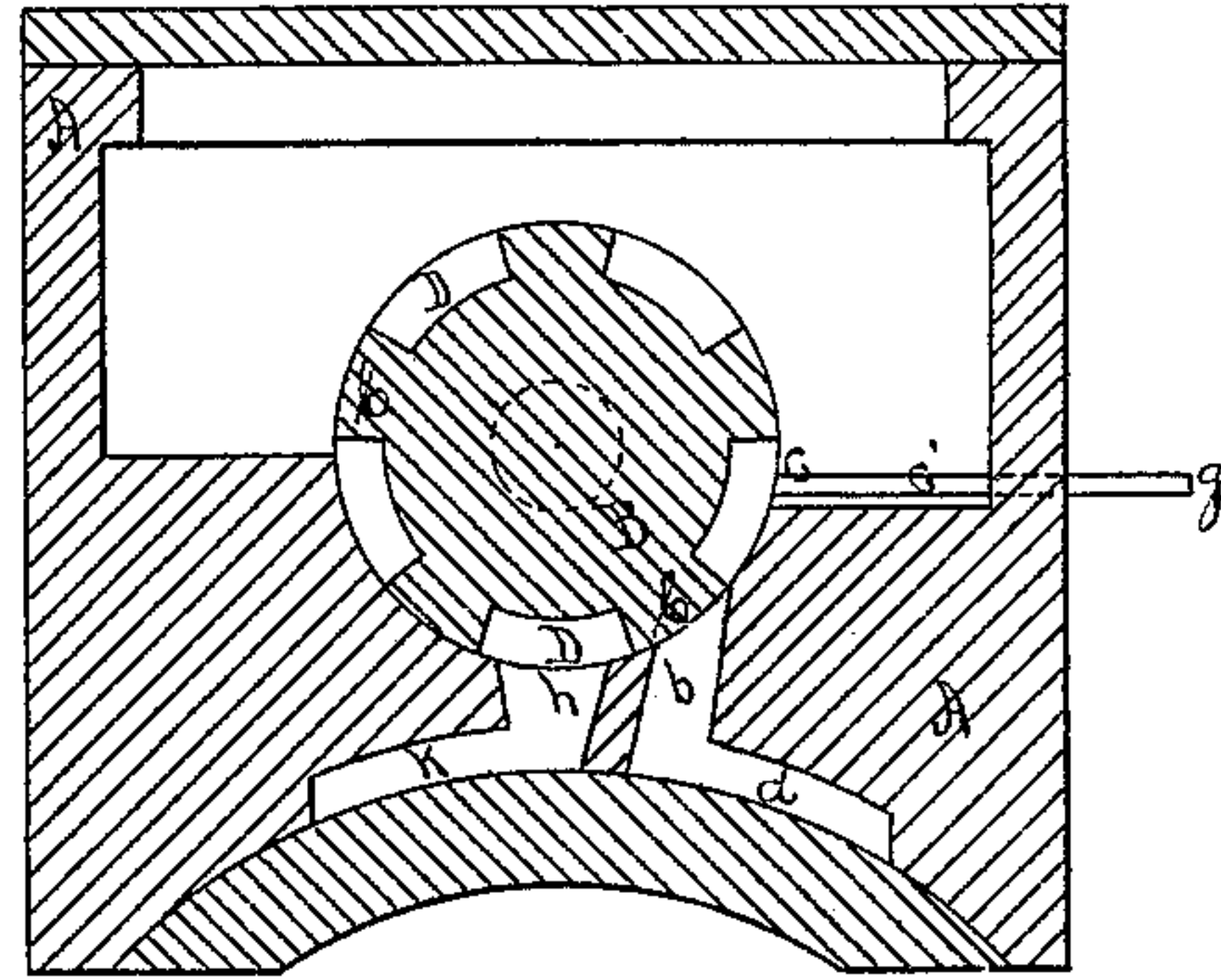


Fig. 9

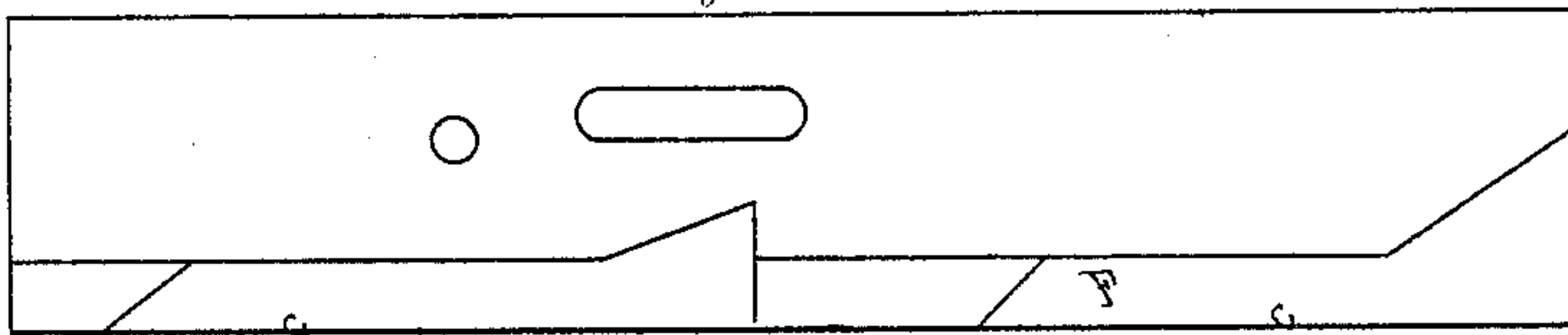


Fig. 10

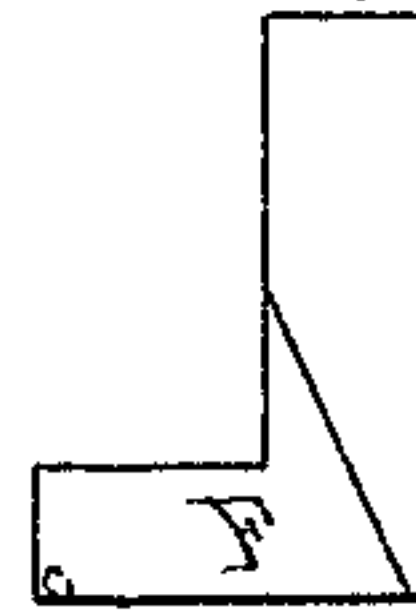


Fig. 11

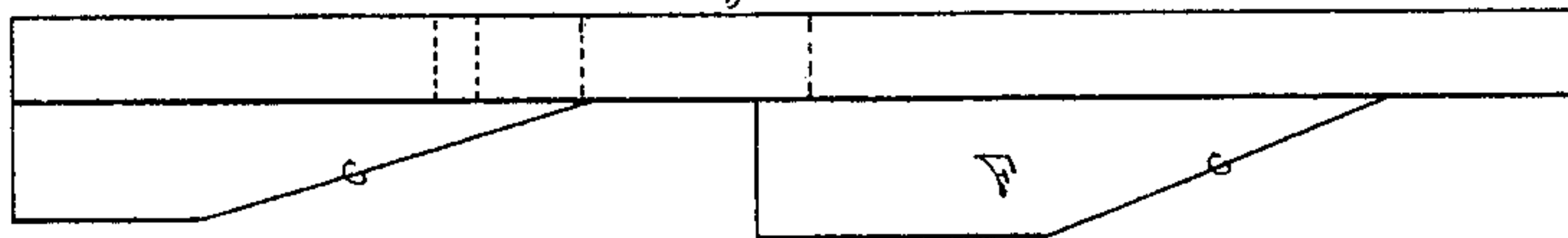


Fig. 12

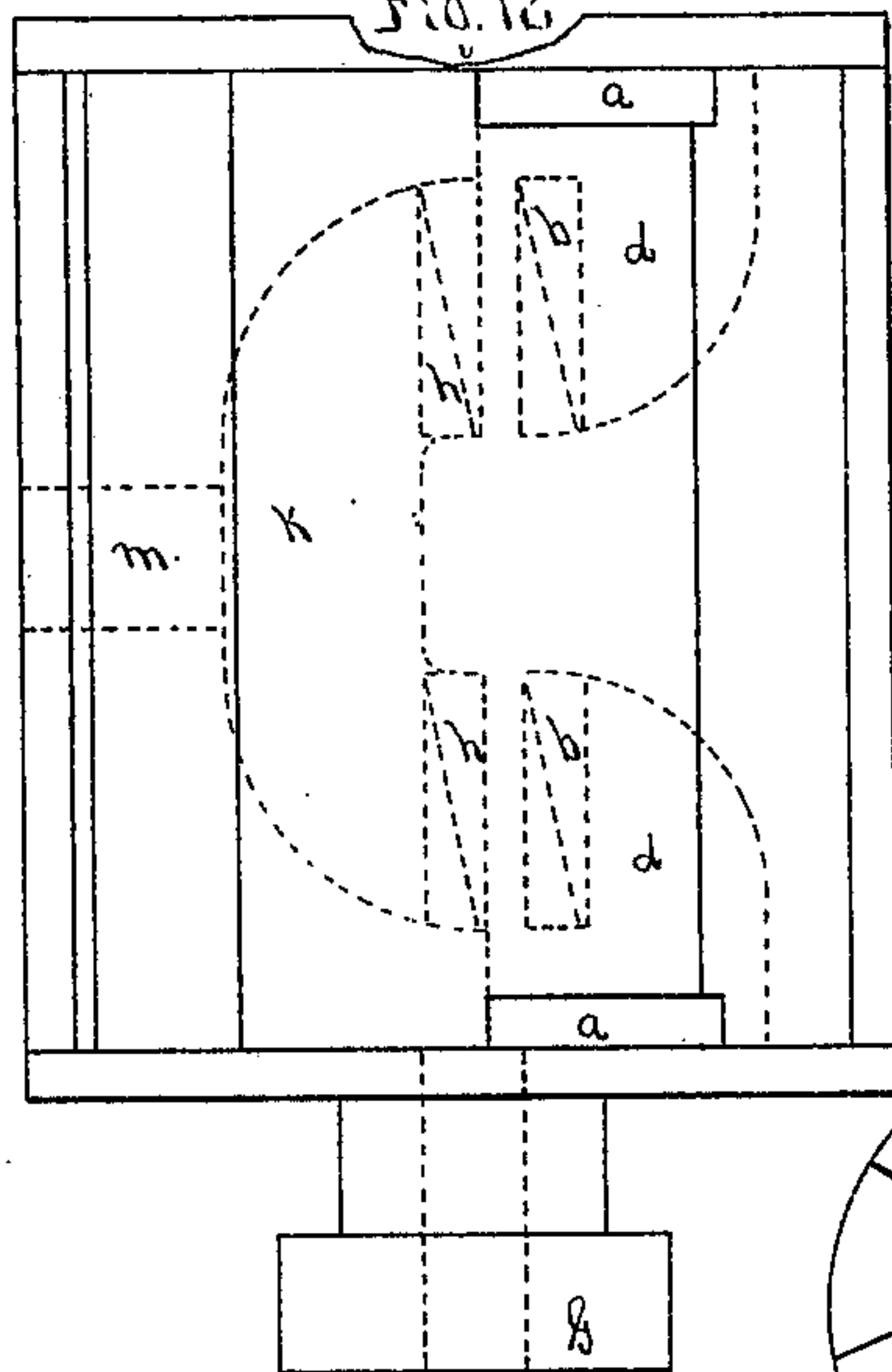


Fig. 13

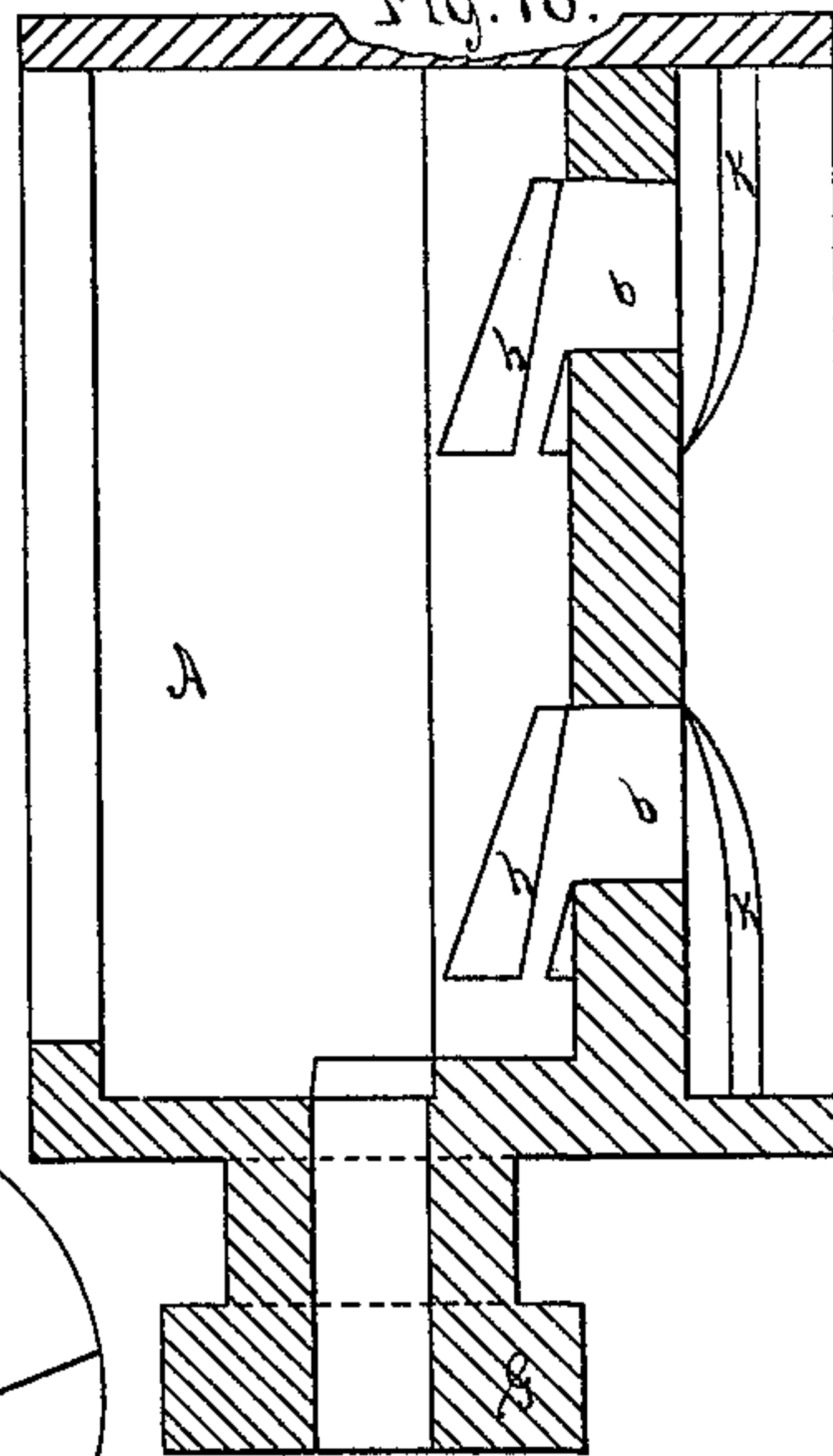
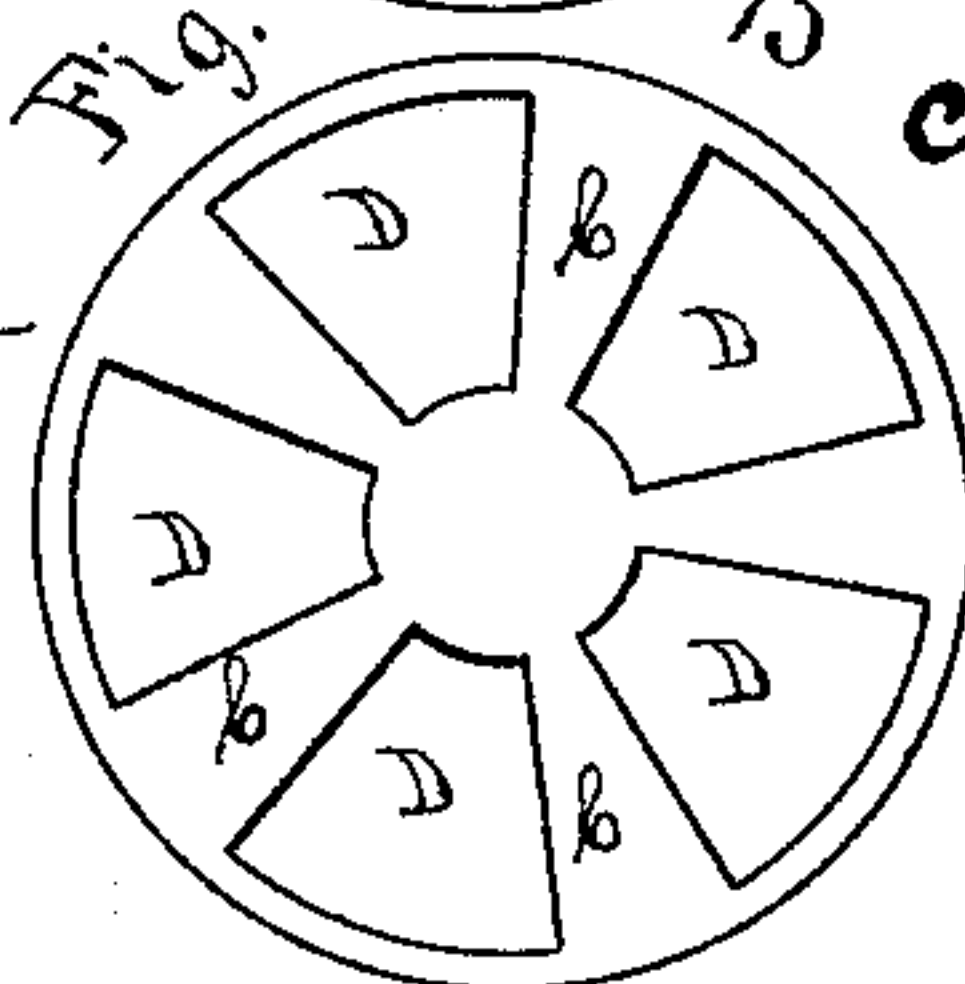
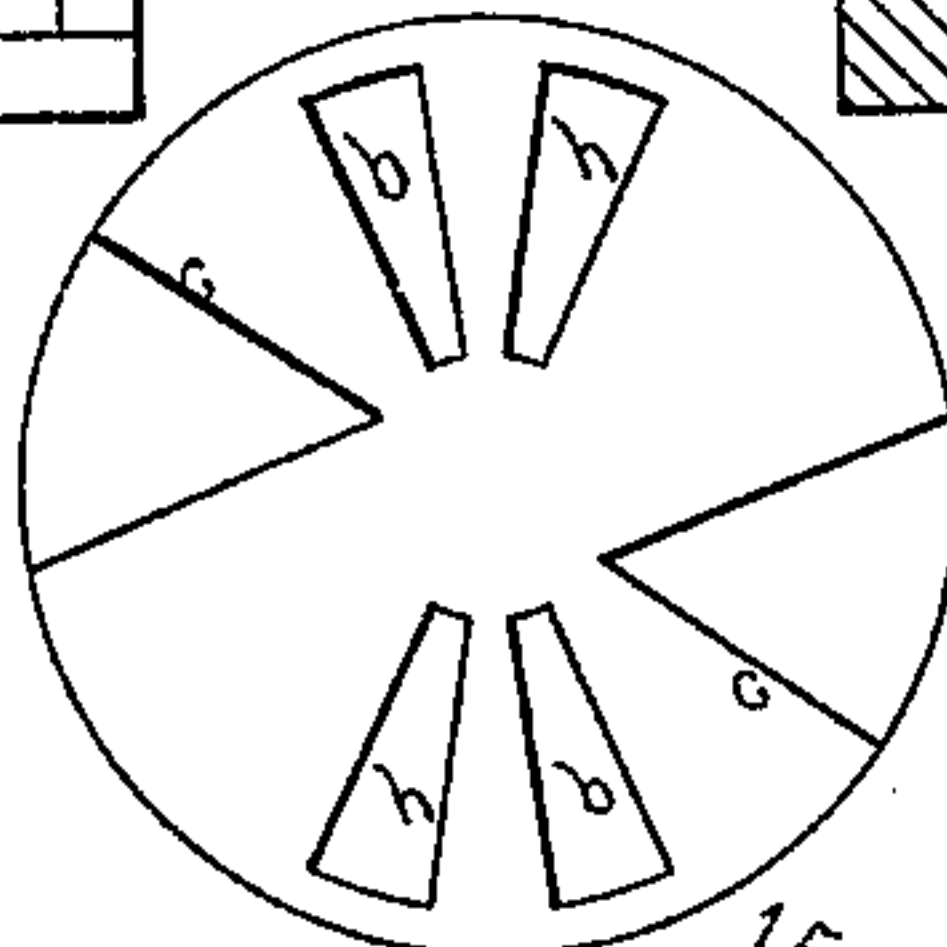


Fig. 14



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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN ROTARY VALVES.

Specification forming part of Letters Patent No. 126,402, dated May 7, 1872.

*To all whom it may concern:*

Be it known that I, ALVIN LAWRENCE, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Valves for Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1 represents a plan of the valve and the adjustable cut-off as applied to the steam-chest, the cover thereof having been removed to show the position of the parts. Fig. 2 represents a plan of the valve-seat and the interior of the steam-chest after the valve has been removed, showing both the steam and the exhaust ports. Fig. 3 represents a cross-section of the steam-chest outside of the end of the valve. Fig. 4 represents the under side of the steam-chest on the line of the curved outer surface of the steam-cylinder, showing the construction and arrangement of the steam and exhaust ports and passages. Fig. 5 represents a modification of the valve, the **D**'s and lands being straight instead of spiral, as in Fig. 1. Fig. 6 is an end elevation of Fig. 5. Figs. 7 and 8 represent each a cross-section of the valve, the seat, the steam-chest, and the cylinder, respectively, on the lines A B and C D of Fig. 1, showing in 7 the valve in position for the steam to be working expansively, this having been cut off at a preceding point in the rotary action of the valve, and in 8 showing the exhaust closed and the valve nearly ready to admit steam to the other end of the cylinder. Figs. 9, 10, and 11 represent different elevations of the adjustable cut-off slide detached, and enlarged to twice the size of the same parts seen in Figs. 1 and 3. Fig. 12 represents a plan of a portion of the interior of the steam-cylinder opposite or covered by the steam-chest, showing the admission-ports at each end of the cylinder, and also the steam and exhaust passages in dotted lines. Fig. 13 represents a central longitudinal section of Fig. 12. Figs. 14 and 15 represent certain modifications embodying my invention.

This invention has for its object to furnish a simple, cheap, and very efficient valve, that will cut off the admission of steam, or the steam admitted to the cylinder, at any required point of the stroke, without interfering in the least

degree with the time of opening and closing the exhaust-ports, which is the principal difficulty attending the use of the common slide-valve; and this invention has for its object to furnish an adjustable cut-off, in combination with the valve and steam-admission ports, whereby the time of cutting off steam may be changed or varied to suit the occasion—that is to say, when the working-engine is cutting off steam at half-stroke, by a suitable movement of the adjustable cut-off slide or gauge the valve will cut off steam to the cylinder earlier or later, or at one-quarter stroke, or at three-eighths stroke, or at any other point of the stroke desired—all of which gives the connected engine the capacity to work steam more expansively than the slide-valve.

In connection with the improved valve, the seating of the valve and the steam-admission and exhaust-ports and passages are constructed with special reference to the construction of the valve, and so that each part is adapted to operate in connection with the other or others, as hereinafter described.

To construct, apply, and use my said improvements, the steam-cylinder is made in the usual way, and provided with steam-ports *a* at each end thereof, and to the side of this steam-cylinder, and covering the ports *a*, I apply the steam-chest A, suitably fitted and packed, and secured to the cylinder or cast in one therewith. That side of the steam-chest next to the cylinder contains the admission-ports *b* and steam-passages *d*, leading from the ports *b* to the ports *a* in the ends of the cylinder, and also exhaust-ports *h*, and an exhaust steam-way, K, leading to the pipe or outlet *m* at one side of the chest. Above the ports *b* and *h* the semicircular valve-seat is formed in the side of the chest, and the cylindrical valve B is closely fitted to the seating above the ports.

The cylindrical valve is constructed with sunken **D**'s or cavities D, and bands or full cylindrical surfaces C between the full central portion and the full ends or heads E, and the **D**'s are intended to be about twice the width of the lands, and the distance from the cut-off *c* to the steam-ports *b* on the valve-seat less than the width of each **D**, and this last-named seat-space is widened or narrowed by a movable cut-off slide, F, arranged within the steam-



chest and close to the surface of the valve, so that by moving the adjustable cut-off slide the inclined surfaces or cut-off edges *c* will either narrow or widen the seat-space between the cut-off and the admission-ports, and cause the valve to cut off earlier or later, or at a different point of the stroke; or if preferred the cut-off may be made permanent when constructing the steam-chest, and so as to cut off the steam at any given point of the stroke; or such cut-off may be composed of one or a series of plates, *c'*, as shown in Fig. 8, and the time of cutting off steam regulated by removing one or more of said plates, or by reapplying one or more of them.

When this valve is constructed, as shown in Fig. 1, with the **D**'s and lands spirally, this brings the **D**'s at one end of the valve sufficiently forward or ahead of those at the opposite end to allow the admission of steam alternately to opposite ports *b* and to opposite ends of the cylinder, and also to allow the steam to exhaust from one end of the cylinder while taking steam at the other end.

The same effect or result is produced by a valve constructed with straight parallel **D**'s and lands or faces *C*, as shown in Fig. 5; but in this modification of the valve the **D**'s in one end of the valve must be opposite or in line with the faces *C* at the opposite end, so that when such last-named valve rotates the opposite **D**'s and faces will alternately expose and cover the opposite admission and exhaust ports, and allow the admission and exhaust of steam alternately at opposite ends of the cylinder, as with the spiral **D**-valve, before described, the valve shown in Fig. 5 being considered an obvious substitute for that shown in the other figures.

When the straight **D**-valve is used the cut-off may be a fixed or permanent cut-off or removable plates *c'*, which may be made to slide up to or back from the face of the valve either singly or severally, and thus narrow or widen

the seat-space between the cut-off point and the admission-ports *b*, and thereby regulate or determine the time or the periods of cutting off steam at any desired point of the stroke of the piston.

In constructing my improved valve I sometimes divide it transversely at the center—say on the line 4 4—and run a spindle through the two parts, or a hollow spindle through one part and a solid spindle through the other part, and this allows the two divided parts to be adjusted relatively with each other, so as to bring the **D**'s and lands in one part any distance forward of those in the other part; or the two parts may be operated separately by separate spindles.

Rotary motion is imparted to the valve by a ratchet, or gear, or pulley, *P*, on the stem *S*, which is made steam-tight by an ordinary stuffing-box, *G*. The cut-off slide *F* may be operated to adjust it by a rod, *g*, passing through the end of the steam-chest. The ports *b* and passages *d*, and end-ports *a*, constitute the steam-admission ports, and the ports *h*, and passage *K*, and outlet *m* constitute the exhaust-ports, or the operative steam-exhausting outlets.

I claim as my invention—

1. In combination with the valve and its seat, and ports constructed as described, a fixed or adjustable cut-off, *c*, arranged as and for the purpose set forth.

2. A cylindrical or circular valve, constructed as described, with **D**'s or cavities, and lands or faces, and operating in connection with a corresponding seat having a cut-off and ports to admit and exhaust steam by the continuous or intermittent rotary motion of the valve, as set forth.

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Witnesses:

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