

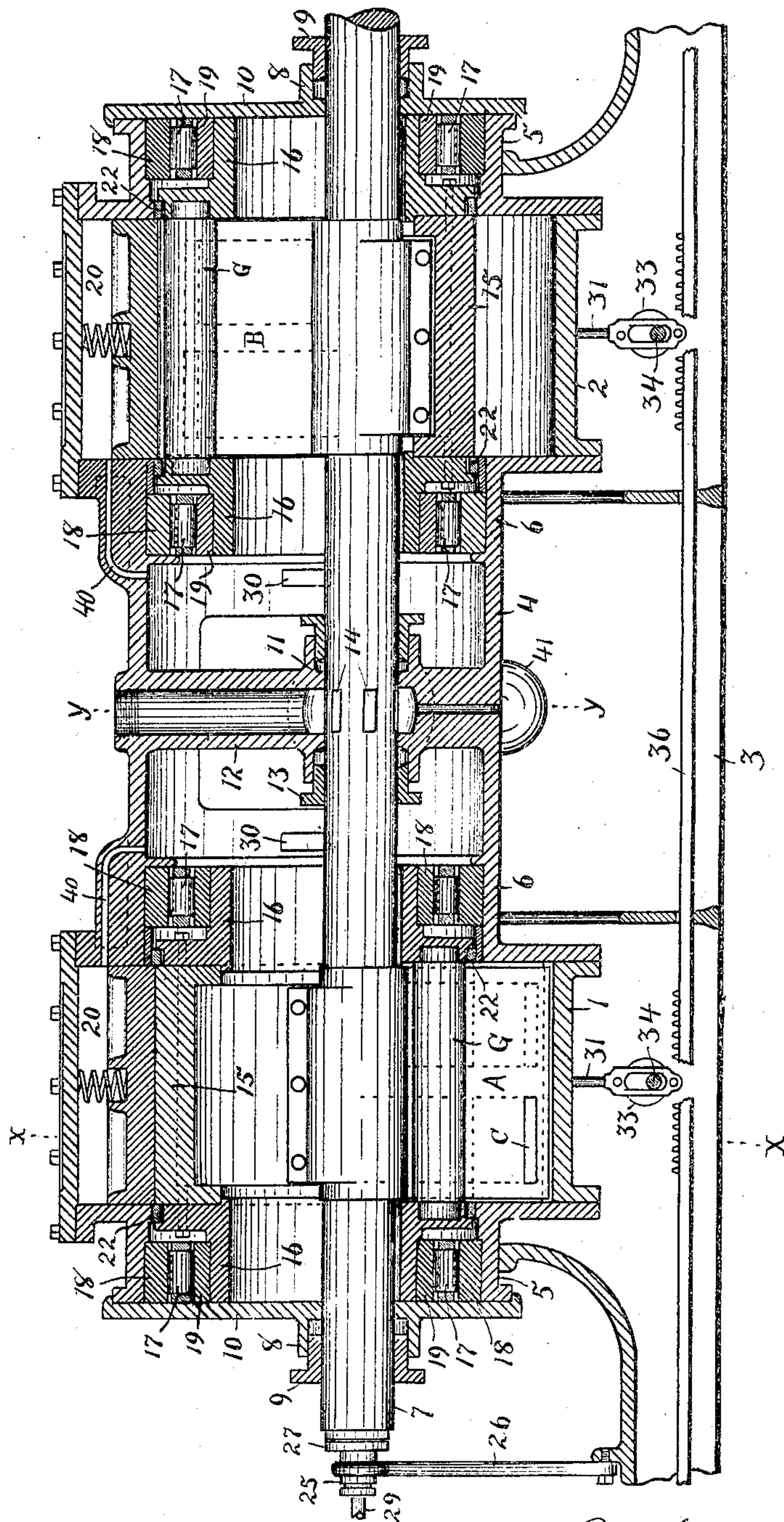
No. 789,774.

PATENTED MAY 16, 1905.

H. B. WALDA.  
ROTARY ENGINE.  
APPLICATION FILED OCT. 30, 1903.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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Fig. 2.

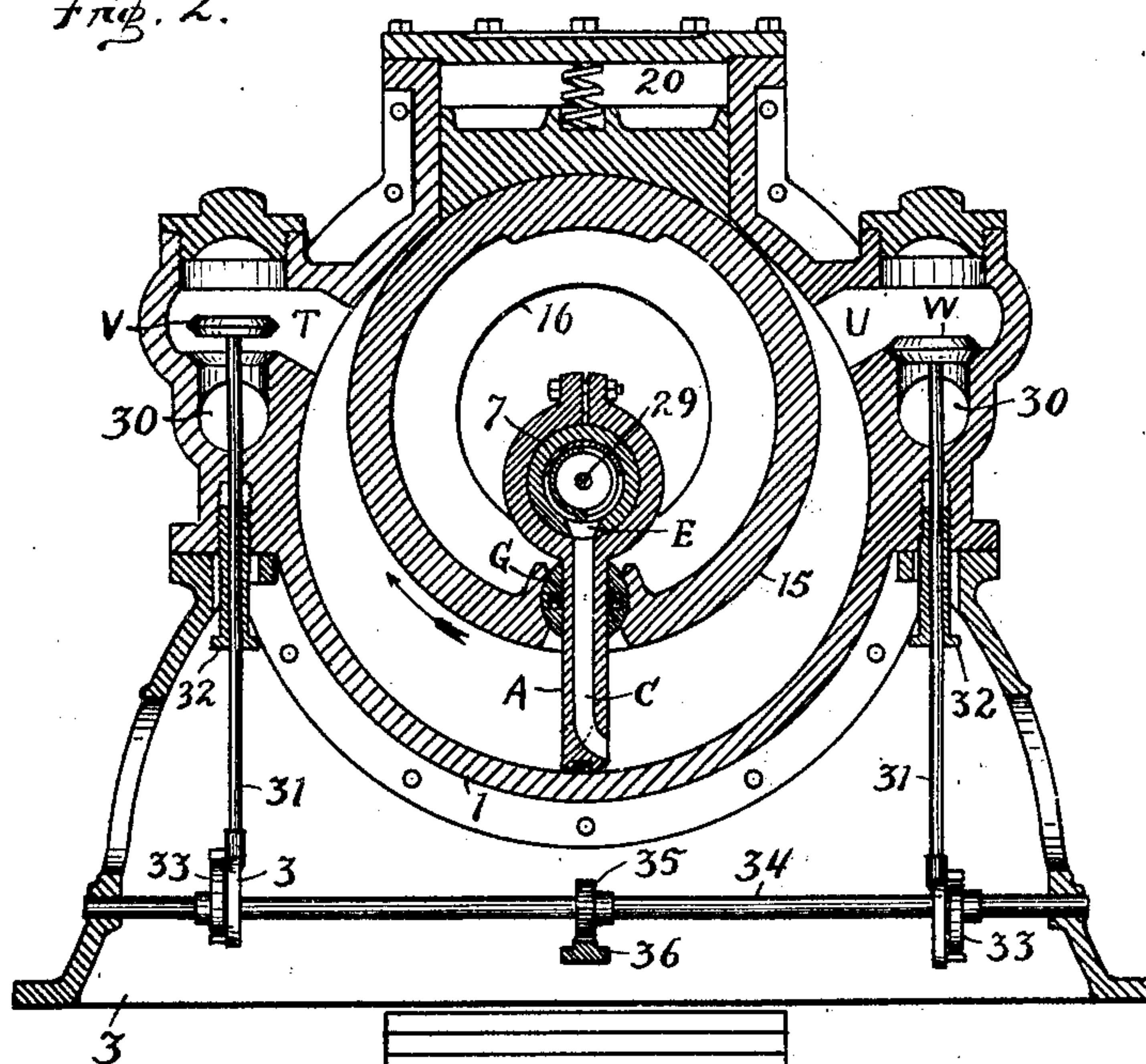
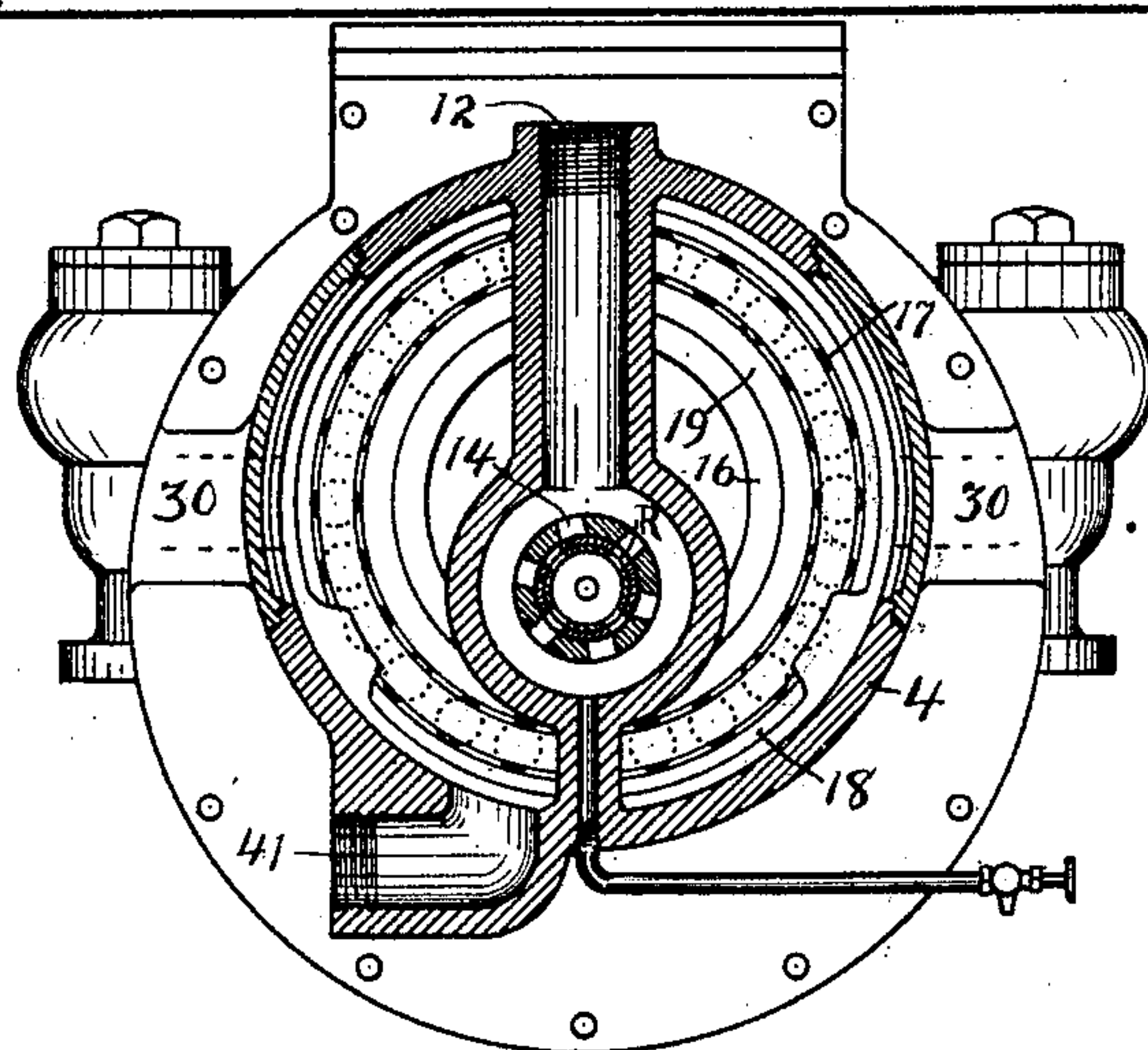


Fig. 3



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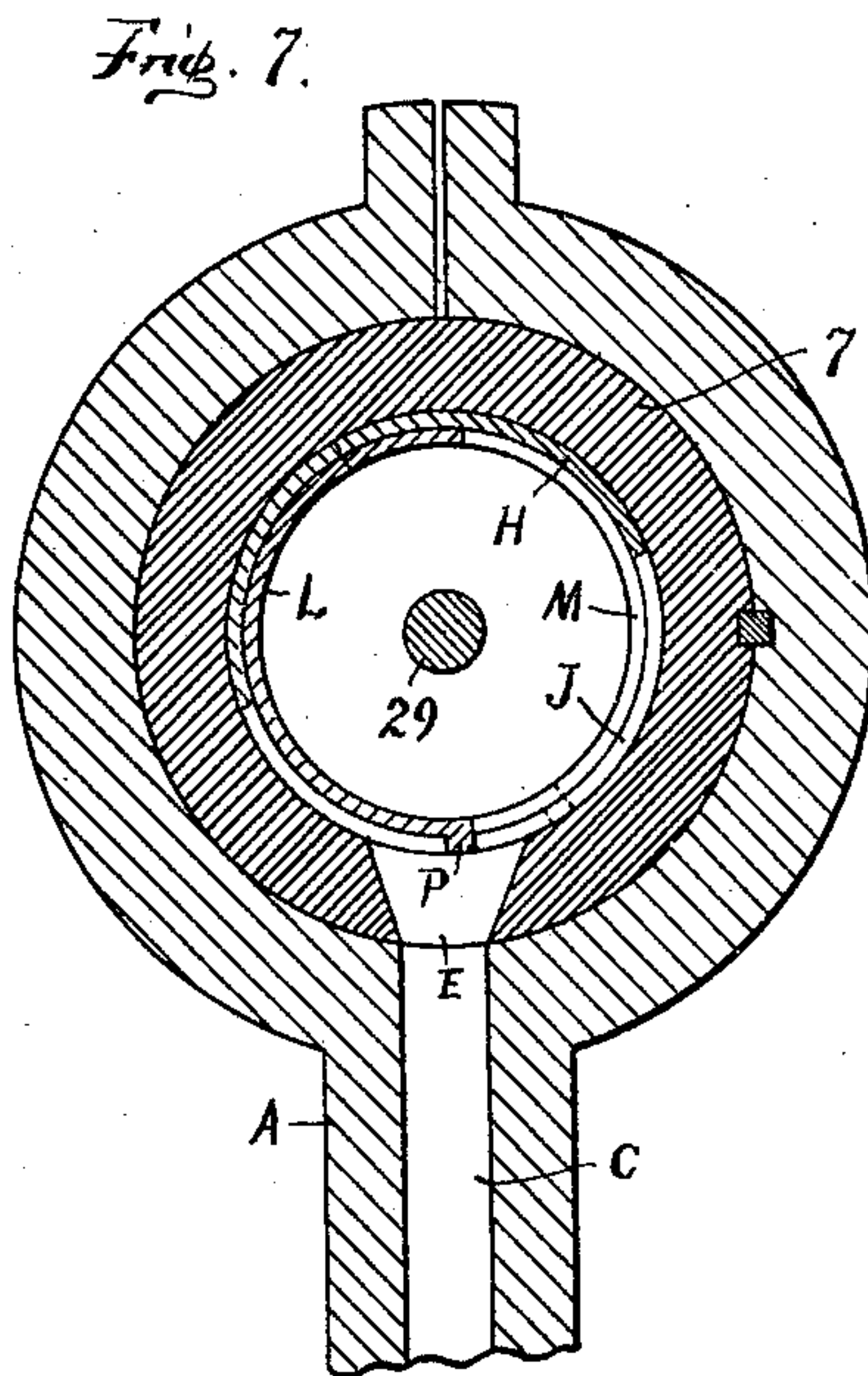
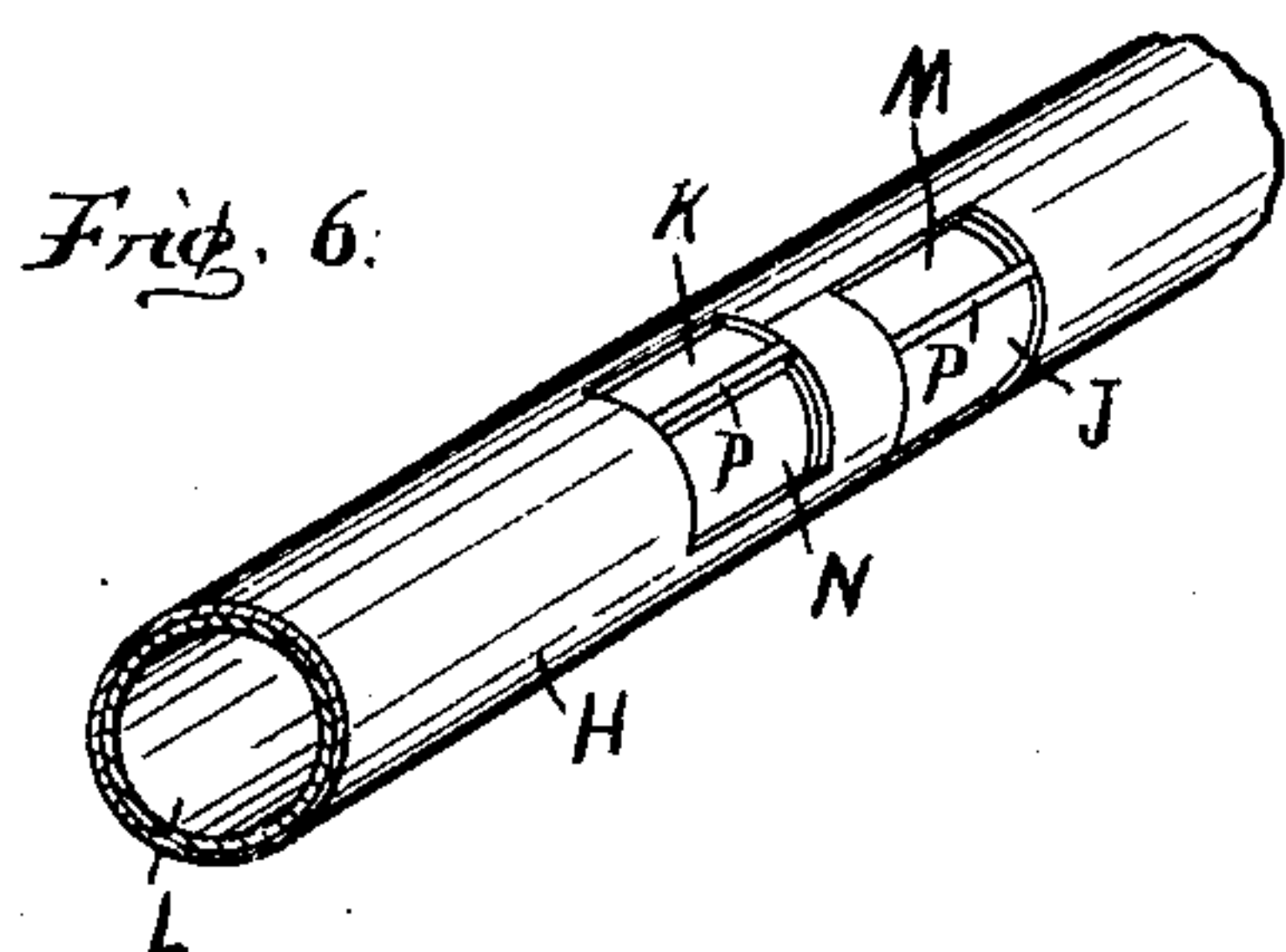
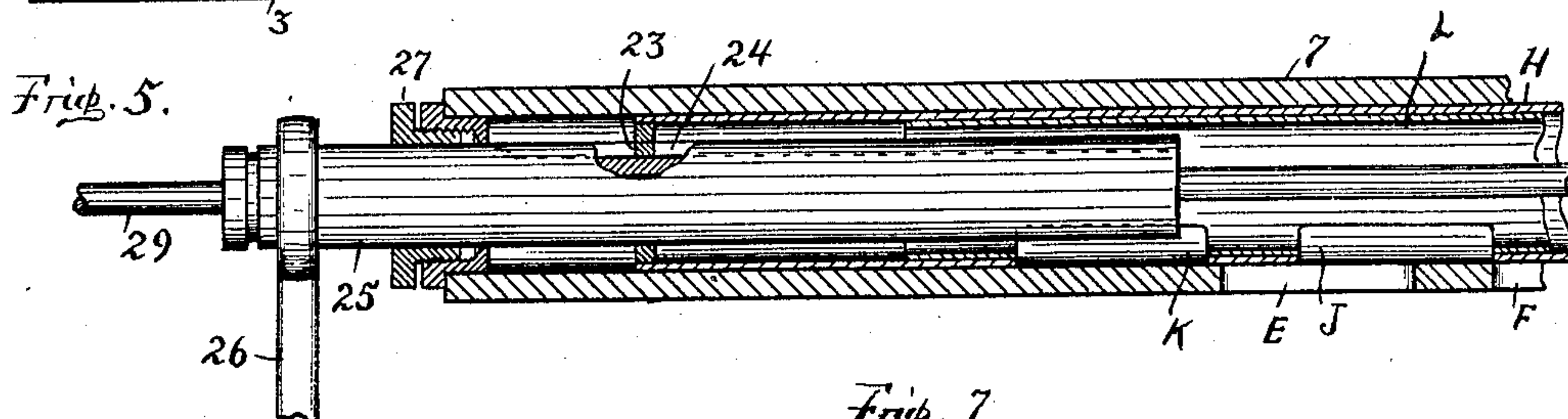
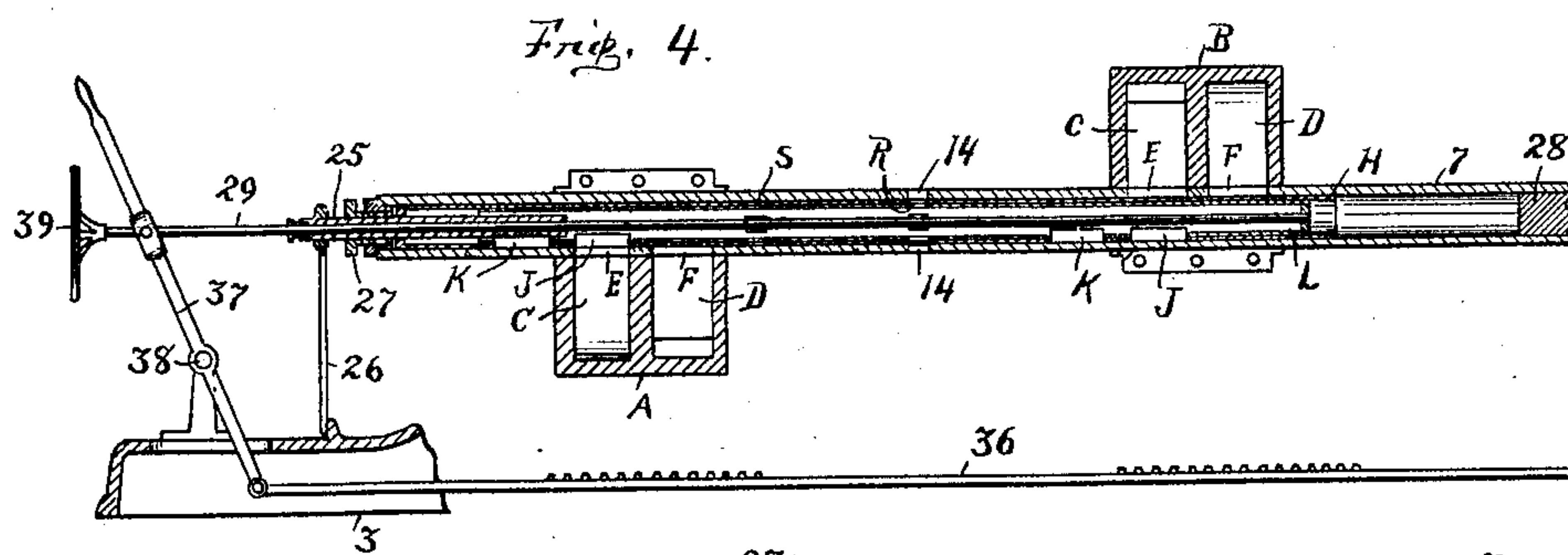
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3 SHEETS—SHEET 3.



**WITNESSES:**

B. J. Lose.  
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# UNITED STATES PATENT OFFICE.

HENRY B. WALDA, OF FORT WAYNE, INDIANA, ASSIGNOR OF ONE-HALF  
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## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 789,774, dated May 16, 1905.

Application filed October 30, 1903. Serial No. 179,187.

*To all whom it may concern:*

Be it known that I, HENRY B. WALDA, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Rotary Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it ap-  
 10 pertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in rotary engines; and the objects thereof are, first, to utilize the exhaust-steam for the purpose of distributing its contained lubricant to more or less of the moving parts of the engine; second, to provide an automatic cut-  
 20 off, so as to utilize the expansiveness of the live steam, and, third, to provide a simple reversing mechanism.

I accomplish my objects by the construction illustrated in the accompanying drawings, in  
 25 which—

Figure 1 is a longitudinal elevation of the engine, partly in central section. Fig. 2 is a transverse section on the line *xx* of Fig. 1. Fig. 3 is a similar view on the line *yy* of Fig. 1. Fig. 4 is a detail view showing a vertical longitudinal section of the driving-shaft, piston-heads, reversing and cut-off mechanism. Fig. 5 is a similar view of a part of Fig. 4 on an enlarged scale. Fig. 6 is a detail in per-  
 30 spective, showing the cut-off ports; and Fig. 7 is a detail, on an enlarged scale, showing a transverse section of the driving-shaft and piston-head on the line *xx* of Fig. 1.

Similar characters of reference indicate corresponding parts throughout the several views, and, referring now to the same, 1 and 2 are cylinders mounted upon a base 3 and having a common axial center. 4 is an exhaust-box interposed between said cylinders.  
 45 Each cylinder has horizontal flanges 5 and 6 extending, respectively, from the outer and inner ends, and the said exhaust-box is a continuation of the said flanges 6. All of said flanges range upon a common axial center

which lies in a plane above the axial center 50 of said cylinders. A driving-shaft 7 is mounted in line with the axial center of said cylinders and rests in bearings 8, which are arranged in the heads 10, the latter being fixed upon the outer flanges of said cylinders. The  
 55 said bearings are provided with stuffing-boxes 9. The said shaft has also a central bearing 11 in the feed-pipe 12, through which it passes, and stuffing-boxes 13 are arranged in connection therewith. The said feed-pipe ranges  
 60 within the exhaust-box and communicates constantly with the interior of the shaft 7 through ports 14, which are made in the latter at points coincident with the former. The live steam in the feed-pipe is prevented  
 65 from entering directly therefrom into the exhaust-box by means of said stuffing-boxes 13.

15 represents revoluble drums arranged, respectively, within the cylinders 1 and 2 and range in line with the axial centers of said  
 70 flanges 5 and 6. The said drums have end flanges 16, which range in the said flanges 5 and 6 and are each supported by an annular series of rollers 17. Tread-rings 18 are fixed within the flanges 5 and 6, and similar tread-  
 75 rings 19 are arranged externally upon the flanges 16 in the same vertical plane with the former rings, and said rollers are interposed between the respective tread-rings. Thus it will be understood the drums 15 rotate with-  
 80 in the cylinders upon a center eccentric to the axial center of the latter.

At the tops of the cylinders 1 and 2 are cases 20, which communicate, respectively, therewith and contain each an abutment-block 21,  
 85 which rest, respectively, upon the drums 15. The said abutments prevent the live steam from passing over said drums from one side of the cylinders to the other. Packing-rings  
 90 22 are arranged between the drums and flanges 5 and 6 to prevent the escape of live steam from within the cylinders through their ends.

The piston-heads A and B are rigidly mounted at their inner ends upon the driving-shaft 7 and range, respectively, within the cylinders  
 95 1 and 2. Each piston-head has two ports C and D, which open upon the opposite faces thereof near the outer ends. The inner ends



of said ports communicate with the interior of the driving-shaft through openings E and F. Oscillating packing members G are arranged longitudinally in the sides of the drums 15, and the piston-heads extend from within said drums into said cylinders through said packing members, the latter serving to prevent live steam from escaping from within the cylinders into said drums.

A longitudinally-adjustable tube H is arranged within the shaft 7 and has ports J and K, which are adapted to severally communicate, respectively, with the openings E and F in the shaft 7 when said tube is accordingly adjusted, and thereby admit steam from within the shaft 7 through the corresponding ports C or D of the piston-heads and into the cylinders on one side or the other of said piston-heads, as the case may be. Thus said piston-heads will be driven thereby accordingly in the corresponding direction.

Example: When the port J registers with the opening E, the steam will pass from within the shaft 7 into the cylinder through port C of the piston-head, and thereby the latter will be driven in the direction indicated by the arrow shown in Fig. 2, and when port K registers with the opening F the steam will pass through port D into the cylinder and drive the piston-head in the direction opposite to that in the former instance. The tube H is held from rotating by means of a key 23, which is fixed at the end of said tube and extends into a keyway 24, made in the sleeve 25, the latter ranging through the end of the shaft 7 and having an anchored arm 26, attached at its outer end to prevent it from turning. A stuffing-box 27 is provided at the end of said shaft to prevent the escape of steam therefrom, and a plug 28 is fixed in the opposite end of the shaft for the same purpose.

The cut-off tube L ranges within the tube H and has ports M and N, which correspond in relative position with the ports J and K, respectively, in the tube H. The said tube L is rotatively adjustable in the tube H, and each of its said ports has an outwardly-projecting lip P, which ranges in the ports J and K, the tops thereof being flush with the outer surface of the tube H. The said lips range longitudinally from one end of the respective ports to the other, and the lip of port M is at the opposite side of said port respecting that of port N, so that when the tube L is turned within the tube H the port J will be closed by the tube L when the ports N and K register, and vice versa. Thus it will appear that steam from within the shaft 7 will be admitted through the mean openings of the ports J M and K N during the travel of the openings E and F, respectively, thereover, and that the duration may be varied by turning the tube L, which increases or decreases the mean openings of the said ports. It will also appear that because of the projection of the lips P

into the ports of the tube H the latter will necessarily be moved longitudinally as the tube L is likewise moved. However, the tube H may move longitudinally only, while the tube L may be turned as well as be moved with the former tube. The tube L is actuated by means of a rod 29, which enters the shaft 7 through the sleeve 25 and extends through the tube L to its end, where it is rigidly connected therewith. As the said rod is turned or oscillated the tube L is likewise moved thereby. The tubes H and L are also provided with openings R and S, which are severally adapted to be alined with the ports 14, according to the adjustment of said tubes, and thus admit the live steam directly from the feed-pipe 12 into the tube L, from whence it is led into the cylinders through the respective ports and openings, as hereinbefore described.

T and U are exhaust-ports arranged upon opposite sides of the cylinders 1 and 2, and V and W are valves arranged in connection therewith to close or open their respective outlets. Ducts 30 lead from said valves and open into the exhaust-box 4. The said valves have stems 31, which lead downward through suitable stuffing-boxes 32 and have connections with eccentrics 33, which are mounted upon transverse shafts 34. The said eccentrics are fixed upon said shafts in such relative position that when the valves W are closed the valves V will be opened, and vice versa. Pinions 35 are fixed upon said shafts, and a rack-bar 36 is arranged in engagement therewith, whereby said shafts and valves may be actuated.

It is necessary that the valves W be closed and the valves V be opened when the engine is driven in the direction of the arrow, and when the engine is reversed their relative positions must also be reversed, and it is obviously necessary also to shift the tubes H and L in reversing the engine. To conveniently and simultaneously adjust the said valves and tubes, a lever 37 is fulcrumed, as at 38, and is connected at its upper portion with the rod 29 and at its lower portion with the rack-bar 36. Thus by a single movement of the lever 37 the reversal of the engine is effected.

A hand-wheel 39 is fixed upon the end of the rod 29, by which the latter may be turned, and thus adjust the lips P in the ports of the tube H, which will cause the steam to be cut off at an earlier or later period, the cut-off taking place when the opening E or F passes the said lips. Thus when the steam is so cut off the piston will be driven by the expansive force of the steam contained in the cylinders until the pistons reach the exhaust-ports.

The space within the drums 15 and about the rollers 17 becomes filled with the exhaust-steam from the exhaust-box 4, and thereby the interior of the engine is kept at a suitable high temperature, which aids in retard-



ing condensation of live steam and also serves to distribute the lubricant which is carried from the cylinders by the exhaust-steam.

In the drawings I have shown an engine having two cylinders, two drums, two piston-heads, one in each cylinder and both operating a common driving-shaft. In this instance the piston-heads are fixed upon said shaft at one hundred and eighty degrees respecting one another, so that while one piston-head is drawn into its drum, and is therefore inactive (which occurs when said piston-heads range uppermost) as the same passes beneath and adjacent to the abutment-block, the other piston-head will range from the drum into its cylinder and will therefore be active, in that the force of the live steam in said cylinder will be exerted upon its face and cause the same to drive the shaft. It will be understood, however, that an engine may be built embodying this invention which may have the one cylinder and its appurtenants instead of the two cylinders, as here set forth.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, two cylinders arranged upon a common axial center; an exhaust-box interposed between said cylinders and communicating therewith; horizontal flanges extending from the ends of said cylinders and ranging with their axial center above that of said cylinders; rotatable drums mounted in said cylinders and supported centrally within said flanges; heads upon the outermost of said flanges; a hollow shaft mounted in line with the axial center of said cylinders and extending through said drums and heads; oscillating packing members in the sides of said drums; piston-heads fixed upon said shaft within the drums, respectively, and extending through said packing members into said cylinders; exhaust-ports leading from said cylinders and communicating with said exhaust-box; ports in said piston-heads opening near the outer ends thereof and at their inner ends communicating with said shaft.

2. In a rotary engine, a horizontal cylinder; a case in the top thereof; horizontal flanges ranging from the ends of the cylinder upon an axial center above that of said cylinder; a drum having end flanges, the former ranging within the cylinder and the latter extending into the flanges of said cylinder; rollers interposed between the flanges of said cylinder and drum; an oscillating packing member arranged in the side of said drum; an abutment-block within said case and resting upon the top of said drum; heads fixed upon the ends of the flanges of said cylinder; a hollow shaft mounted in line with the axial center of said cylinder and ranging through said drum and heads; a piston-head fixed upon said shaft and extending through said packing member; a port lead-

ing from near the outer end of said piston and communicating at its inner end with said shaft.

3. In a rotary engine, two cylinders arranged upon a common axial center; an exhaust-box interposed between said cylinders and communicating therewith; rotatable drums mounted within said cylinders, respectively; and exhaust-ports leading from said cylinders and communicating with said exhaust-box.

4. In a rotary engine, two cylinders arranged upon a common axial center; rotatable drums arranged within said cylinders; an exhaust-box interposed between said cylinders; exhaust-ports leading from said cylinders and communicating with said exhaust-box; a feed-pipe extending into said exhaust-box; a hollow shaft extending through said drums, exhaust-box and feed-pipe; means of communication between said feed-pipe and shaft; piston-heads fixed upon said shaft and extending through said drums into said cylinders; and ports in said piston-heads communicating with said shaft and leading into said cylinders.

5. In a rotary engine, a horizontal cylinder; a rotatable drum mounted eccentrically therein; a hollow shaft mounted in line with the axial center of the cylinder and extending through said drum; a piston-head fixed upon said shaft and extending through said drum into said cylinder; two ports in said piston-head communicating at their inner ends with said shaft and opening at their outer ends respectively upon the opposite faces of said piston-head; a tube arranged within said shaft and being adapted to be longitudinally adjustable therein; ports in said tube adapted to register severally with the ports in said piston-head when said tube is accordingly adjusted; exhaust-ports arranged upon the opposite sides of said cylinder; and means to severally close or open said exhaust-ports.

6. In a rotary engine, a cylinder; an exhaust-port leading from the side thereof; a rotatable drum mounted within said cylinder; a hollow shaft ranging through said drum; a piston-head fixed upon said shaft and extending through said drum into said cylinder; a port communicating at its inner end with said shaft and opening at its outer end into said cylinder; an oscillatable tube arranged in said shaft; an opening in said tube adapted to communicate with said port in said piston-head during the passage thereover of said port when said piston-head is rotated; and means to adjust said tube.

7. In a rotary engine, a cylinder; exhaust-ports leading from the opposite sides thereof; means to severally close said exhaust-ports; a rotatable drum mounted within said cylinder; a rotatable hollow shaft ranging through said drum; a piston-head fixed upon said shaft and extending through said drum into said cylinder; two ports communicating at



their inner ends with said shaft, their outer  
ends opening upon the opposite faces of said  
piston-head respectively; a longitudinally-ad-  
justable tube H ranging in said shaft; two  
5 ports in said tube adapted to severally regis-  
ter with the ports in said piston-head when  
the tube is accordingly adjusted; an oscillat-  
able tube L arranged in said tube H; open-  
ings in said tube L corresponding with the  
10 ports in said tube H, and being adapted to  
register therewith when the tube L is accord-

ingly adjusted; lips P fixed upon the tube L  
at points along one side each of its said open-  
ings and extending into the corresponding  
ports of said tube H; and means to adjust said  
15 tubes.

In testimony whereof I affix my signature in  
presence of two witnesses.

HENRY B. WALDA.

Witnesses:

W. G. BURNS,  
C. H. ZIMMER.