

No. 673,573.

Patented May 7, 1901.

T. BARROW.  
VALVE AND OPERATING MEANS.

(Application filed Oct. 29, 1900.)

(No Model.)

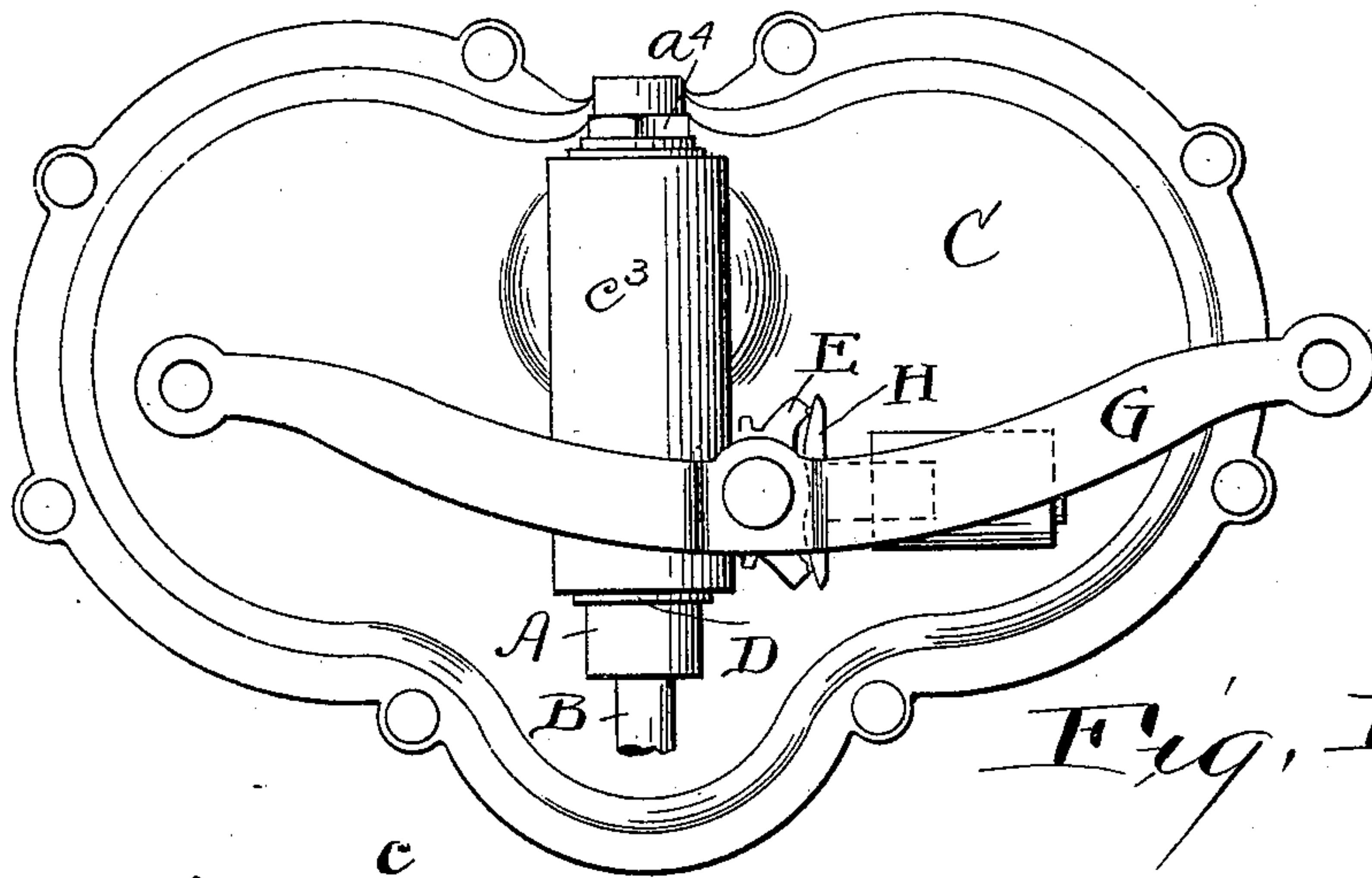


Fig. 1,

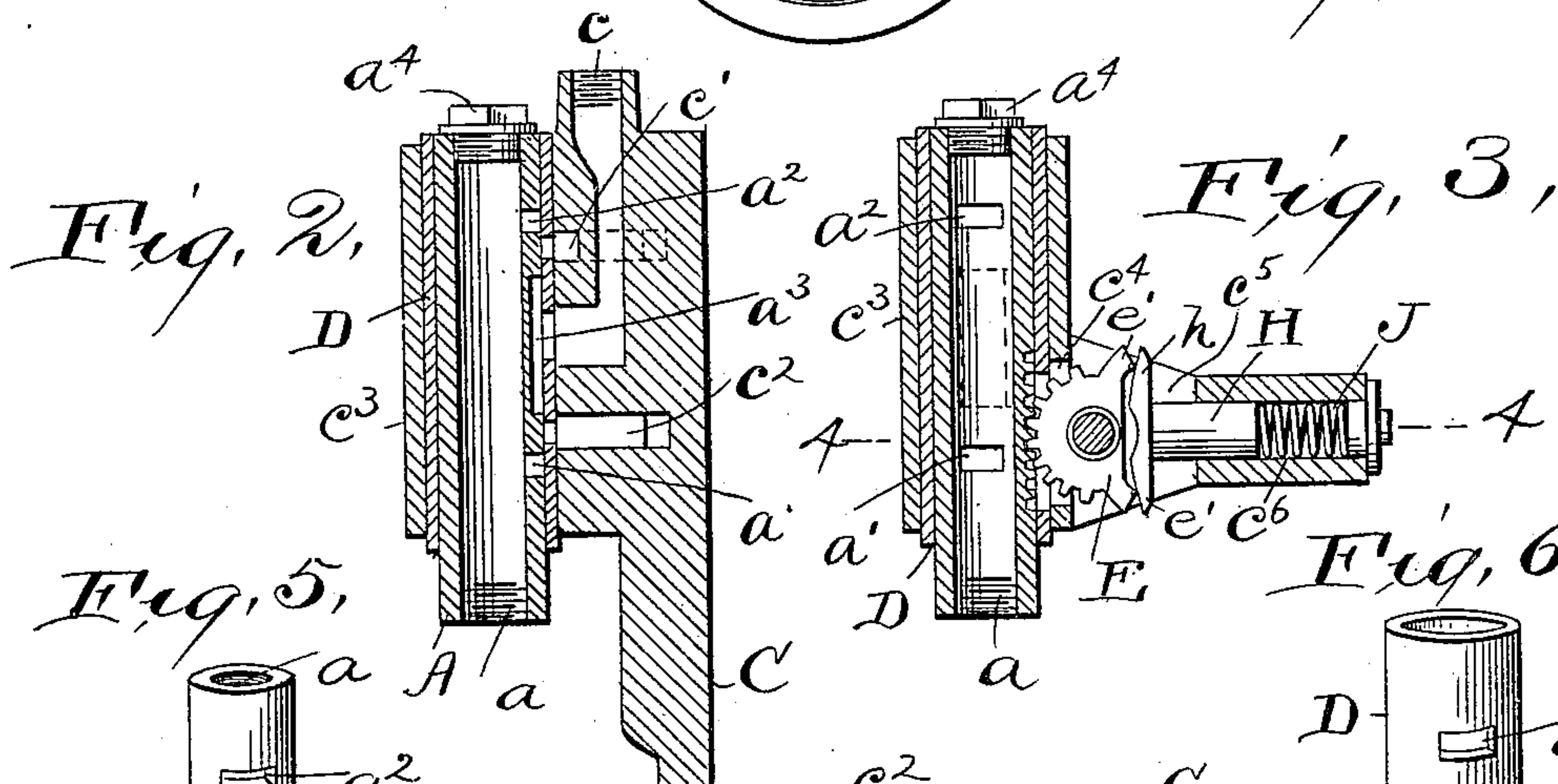


Fig. 2,

Fig. 3,

Fig. 5,

Fig. 6,

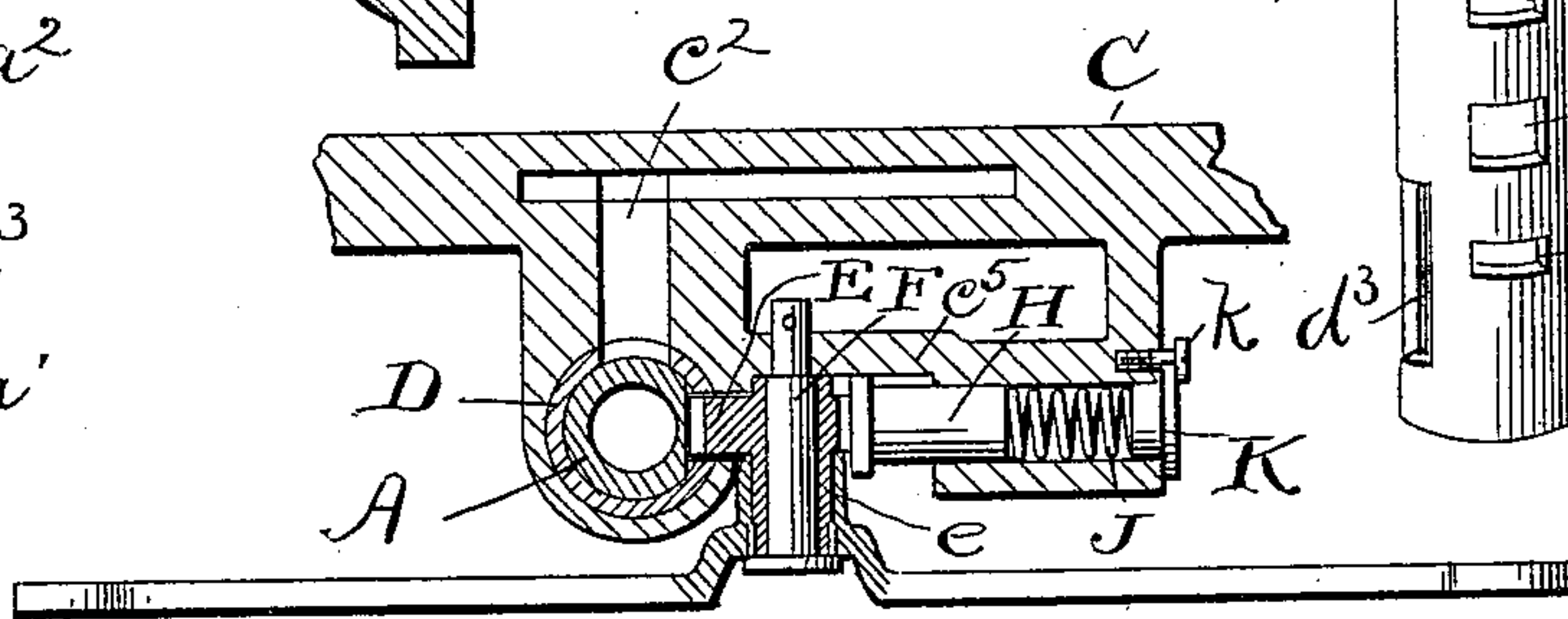
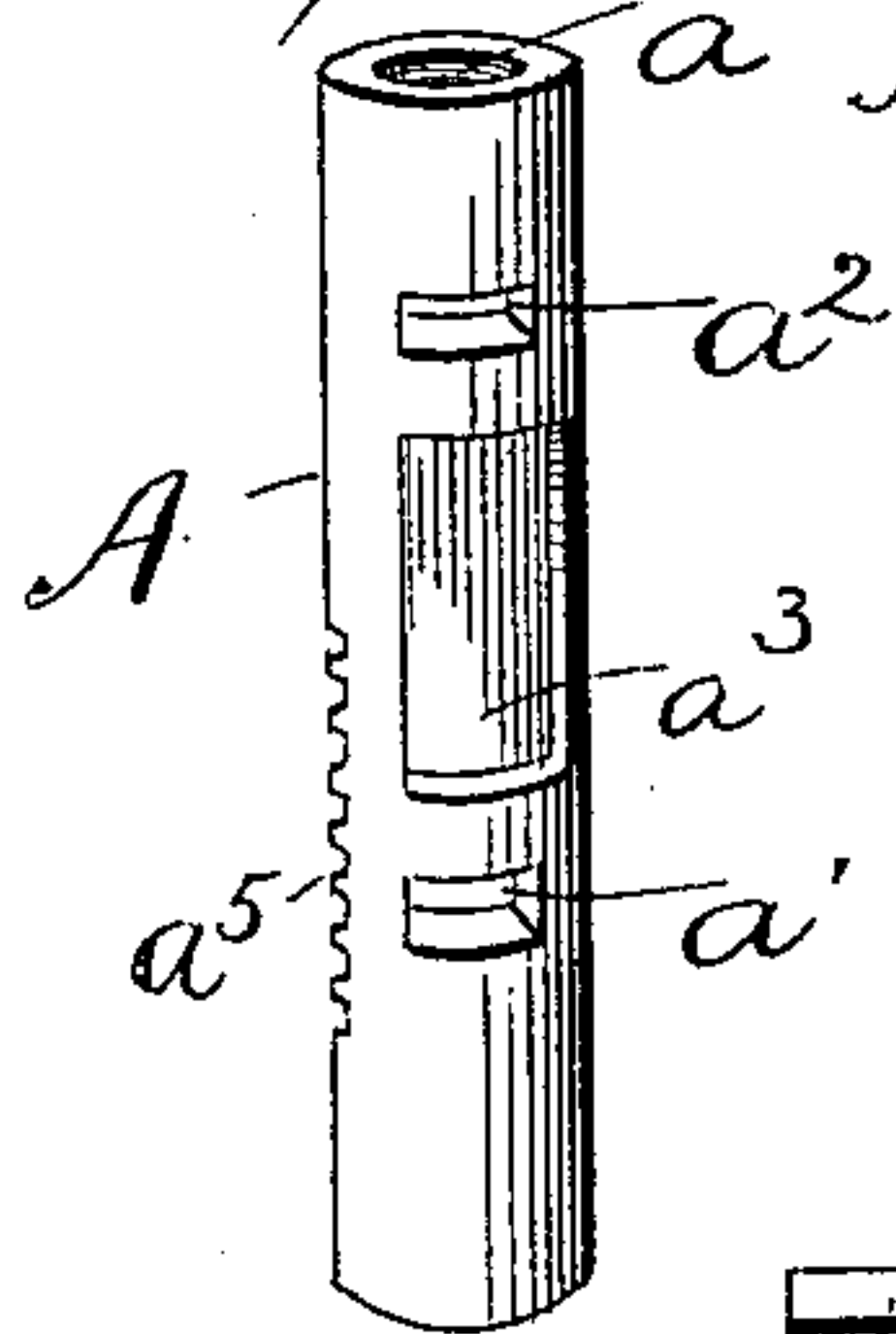


Fig. 4, G

Witnesses.  
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# UNITED STATES PATENT OFFICE.

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## VALVE AND OPERATING MEANS.

SPECIFICATION forming part of Letters Patent No. 673,573, dated May 7, 1901.

Application filed October 29, 1900. Serial No. 34,731. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS BARROW, a subject of the Queen of Great Britain and Ireland, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Reversing-Valves for Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

One of the objects of my invention is to provide a very simple and efficient valve which shall be perfectly balanced, so as not to have excessive pressure on its seat. The valve is particularly adaptable for a reversing-valve, such as may be used for governing pneumatic engines, for example.

A further object of my invention is to provide the valve with efficient means for operating it and for giving it a tendency to return to off position.

The invention comprehends, broadly, a hollow or tubular valve movable with reference to its seat and adapted to have the operating fluid under pressure in communication with its interior, the valve-wall being apertured to coöperate with ports in the seat. More particularly, the invention consists of a reversing-valve made on this principle, there being passages through the valve for controlling the admission and other passages formed by recesses in the outer surface of the valve not extending through it for controlling the exhaust. I find that by placing such valve within a separate tubular bushing and rigidly securing the bushing within an engine-casting I may make the ports more accurately and cheaply. This is another feature of my invention. I have devised a very simple method for operating the valve, consisting of gear-teeth carried by it and a pinion meshing therewith rigid with an actuating-shaft, while rigid with this shaft also is a pair of toes, against which bears the head of a spring-pressed plunger, whereby the shaft, and hence the pinion and hence the valve, is given a tendency to return to a definite intermediate position. These features are also a part of my invention.

This invention may thus be conveniently characterized as consisting of the combina-

tion of parts hereinafter specified, and definitely set out in the claims.

The drawings fully illustrate my invention.

Figure 1 is a front elevation of a suitable plate adapted to carry passages for the operating fluid and having my improved valve and its operating mechanism. The form or destination of the passages through this plate is immaterial to the present invention. The plate for purposes of illustration may be considered a cover-plate for a pair of oscillating engines contained within a casing, such as are shown in the application of Mr. E. Y. Moore, No. 701,118, filed January 4, 1899, for an oscillating engine. Fig. 2 is a vertical central section through the valve and its casing at right angles to Fig. 1, and Fig. 3 is a vertical central section through the valve parallel with Fig. 1. Fig. 4 is a horizontal section through the valve and its casing, being on the line 4 4 of Fig. 3. Fig. 5 is a perspective view of the valve itself, and Fig. 6 a perspective view of the bushing therefor.

As shown, the valve consists of a cylindrical body A, having a hollow interior  $a$ , a pair of openings  $a'$  and  $a^2$ , passing from the interior to the exterior of said valve, and in the exterior of said valve an intermediate recess  $a^3$ , which does not connect with the interior. The valve is most conveniently constructed by being made open at each end and having one end at least plugged. As shown, this is the upper end, which is closed by the plug  $a^4$ .

The valve is in suitable free communication with the operating fluid, which may come to its interior under pressure through a suitable opening placed wherever desired. The drawings illustrate it as coming into the lower end of the valve, and such is a very convenient method when a flexible supply-tube, as B, is employed, allowing sufficient movement of the valve.

By bringing the operating fluid into the interior of the valve the valve becomes balanced, as the pressure is substantially equal in all directions, and there is no grinding of the valve on its seat, as results when the pressure is outside of the valve. The openings  $a'$   $a^2$  through the valve do to a slight extent



reduce the surface on that side, increasing the resultant pressure on the side opposite the seat; but this unbalancing is so small as to be immaterial.

5 The valve is encompassed within a surrounding seat, which has admission and exhaust ports, as will be readily understood. In the position shown in Fig. 2 of the drawings the valve is at the off position, while by  
10 being shifted in one direction it connects one of such ports  $c'$  or  $c^2$  with the exhaust  $c$  and the other with the interior of the valve, and hence with the admission-pipe.

The cover-plate C, with the passages  $c$   $c'$   $c^2$   
15 therein and with the cylindrical boss  $c^3$  for containing the valve, may be conveniently made in the form of a single casting. In doing this, however, it is difficult to machine the ports and it is impracticable to cast them  
20 as accurately as necessary. To overcome this difficulty, I seat within the cylindrical boss  $c^3$  a tubular bushing D, which has the port-openings  $d$   $d'$   $d^2$  machined therein as accurately as desired. This bushing fits the  
25 the boss  $c^3$  tightly and encompasses the valve with the snugness desired. Thus the passages may be cored out only as accurately as convenient in the casting C, and thereafter all that is necessary is to ream out the cylindrical boss  $c^3$  to contain the bushing, which  
30 is of course a very simple operation. Similarly the bushing needs simply to be reamed out in the interior and turned off on the exterior and slotted, which latter can be done  
35 very conveniently from the exterior.

If the valve is movable longitudinally of its seat, which is the form shown herein, it is most economical of space to have the moving mechanism engage the valve at some  
40 point which is within its seat rather than extend the valve for this purpose beyond the seat. I accomplish this as follows:

On one side of the valve one-quarter way around from the position of the openings  $a'$   
45  $a^2$  in the valve I form a rack, preferably by cutting gear-teeth  $a^5$  into the body of the valve. Opposite these teeth I form an opening  $d^3$  through the bushing D and a substantially alined opening  $c^4$  through the cylindrical boss  $c^3$ . Through these openings and  
50 into engagement with the teeth  $a^5$  extends the gear-segment E, which is suitably journaled and provided with means for turning it in one direction or the other, thus shifting  
55 the valve as desired.

A very simple means for journaling and operating the segment is provided by loosely journaling the segment on a stud F, carried by a bracket  $c^5$ , (which may be integral with  
60 the plate C,) and forming on the segment an extended hub  $e$ , around which rigidly takes the hub of an operating-lever G. This construction may be very conveniently installed by first rigidly connecting the operating-lever  
65 and the gear-segment, as stated, and then passing the loose stud F through the hub of the latter and then the bracket  $c^5$  and secur-

ing it by a pin or otherwise on the inner side of the bracket. With such an arrangement as above described a pull on one end or the  
70 other of the lever G will shift the valve A in one direction or the other, controlling the ports accordingly. It is frequently desirable to give the valve a tendency to return to its intermediate or off position, and this I very  
75 simply provide by having a spring-pressed plunger bearing against rubbing surfaces or toes rigid with the segment E on opposite ends of this pivot, one or the other of which  
80 surfaces forces the plunger against its spring whenever the segment is turned from a central position. Such toes are preferably made on the segment itself, being shown at  $e'$   $e''$  in the drawings. Against them bears the T-head  $h$  of the plunger H, which is journaled  
85 in a tubular recess  $c^6$  in the bracket  $c^5$  and is pressed toward the segment by a spring J within the recess and between the end of the plunger and a plug K, closing the recess and held by suitable means, as by the screw  $k$ .  
90 This centering device is very simple and very conveniently installed. With the screw  $k$ , the plug K, and the spring J removed the plunger is simply placed within its seat and the segment E secured in place, and thereafter  
95 the spring is placed behind the plunger and the plug K and screw  $k$  put in position. Whichever way the segment turns it must force the plunger against its spring, and thus the valve is normally held at its off position,  
100 requiring a force of a predetermined amount to release it, dependent upon the strength of the spring J.

Having described my invention, I claim—

1. A casing having a tubular valve-seat  
105 which is open at its opposite ends combined with a tubular valve adapted to occupy said seat and extend beyond either end thereof the ends of said valve being closed to the atmosphere surrounding the seat but there being  
110 means for communicating operating fluid to the interior of the valve, substantially as described.

2. A tubular valve which has a cylindrical exterior and a hollow interior and has a pair  
115 of port-openings leading through its cylindrical wall and an exhaust-recess on the outer side of such wall, combined with a tubular seat therefor which has a pair of admission-ports and an exhaust-port cooperating with  
120 said openings and recess, said valve being closed at at least one end and having the other end also closed to the atmosphere surrounding the casing, there being means for communicating operating fluid to the interior of  
125 the valve, substantially as described.

3. In combination with a hollow movable valve having ports through its wall, a seat having ports cooperating therewith, and a movable pipe connected directly to said valve and  
130 adapted to supply operating fluid thereto, substantially as described.

4. In combination, a hollow slide-valve having ports through its wall, a seat having ports



coöperating therewith, a flexible admission-pipe connected directly to said valve, and means for normally holding said valve in mid-position, substantially as described.

5 5. A casing having a tubular valve-seat open at at least one end, there being ports formed in the wall of said casing, combined with a tubular valve occupying said seat and having coöperating ports through its wall,  
10 one end of said valve being closed and the other end of the valve extending beyond and through the said open end of the seat and being adapted to have an admission-pipe secured to it, substantially as described.

15 6. The combination with a casing providing a hollow cylindrical valve-seat with ports terminating thereat, of a tubular valve adapted to occupy said seat, said valve being constructed of a tube plugged at one end and carrying screw-threads at its other end for the attachment of an admission-pipe, said valve having suitable port-openings, substantially as described.

25 7. The combination of a tubular valve having a hollow interior and an opening for communicating to said interior from the exterior and port-openings, a bushing embracing said valve and having port-openings through it coöperating with the valve, and a casing snugly embracing said bushing and having ports continuing those of the bushing, substantially as described.

30 8. A cover-plate and a valve-box made in one integral casting, said box having a cylindrical recess with admission and exhaust ports leading therefrom, combined with a tubular cylindrical bushing occupying said recess and having ports more or less nearly alining with those of the casting, and a tubular valve occupying said bushing, substantially as described.

45 9. The combination of a tubular valve, an embracing-seat therefor, a rack carried by said valve, there being an opening through the surrounding seat opposite said rack, a gear occupying said opening and engaging said teeth, and means for operating said gear, substantially as described.

50 10. The combination with a casing having a tubular recess and admission and exhaust passages terminating therein, a tubular valve within said recess for controlling said passages, said valve being adapted to receive the operating fluid into its interior and having a pair of admission-ports extending through its wall, and a recess on its exterior for governing the exhaust, said valve carrying a rack, there being an opening through the casing opposite said rack, an oscillatable gear carried

by said casing and extending through the opening therein into engagement with the teeth, and means for oscillating said gear, substantially as described.

11. The combination with a valve, a pivoted oscillatable member engaging the same and adapted to shift it, engageable surfaces rigid with said member on opposite sides of its pivot, a plunger engaging said surfaces, and a spring pressing said plunger toward the same, substantially as described.

12. The combination with a valve, a pivoted oscillatable member engaging the same and adapted to shift it, a pair of separated toes rigid with said member on opposite sides of its pivot, a plunger having a T-head engaging said toes, and a spring passing said plunger toward said toes, substantially as described.

13. The combination with a longitudinally-shiftable valve carrying a toothed rack, of a suitably-journaled gear-segment engaging said rack, and carrying a pair of rubbing-toes on opposite sides of its pivot, combined with a plunger having a T-head engaging said toes, and a spring pressing said plunger in such direction, substantially as described.

14. The combination of a casing having a cylindrical recess and having ports terminating therein, a cylindrical tubular valve within said casing arranged to shift longitudinally to govern said ports, a longitudinal rack formed within the exterior surface of the cylindrical valve, a suitably-journaled gear extending through an opening in the casing and engaging such rack, whereby the engagement of the gear prevents the valve turning and the oscillation of the gear may shift the valve, substantially as described.

15. The combination of a casing having a tubular recess and passages terminating in said recess, a longitudinally-shiftable valve occupying said recess, a longitudinal rack carried by said valve, a gear-segment engaging said rack, said gear-segment being pivoted by a stud carried by said casing, a plunger journaled in a tubular recess at right angles to the tubular recess occupied by the valve, said plunger having a head engaging said segment on opposite sides of its pivot, and a spring within the last-mentioned recess pressing said plunger toward the valve, substantially as described.

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

THOMAS BARROW.

Witnesses:

ALBERT H. BATES,  
H. M. WISE.