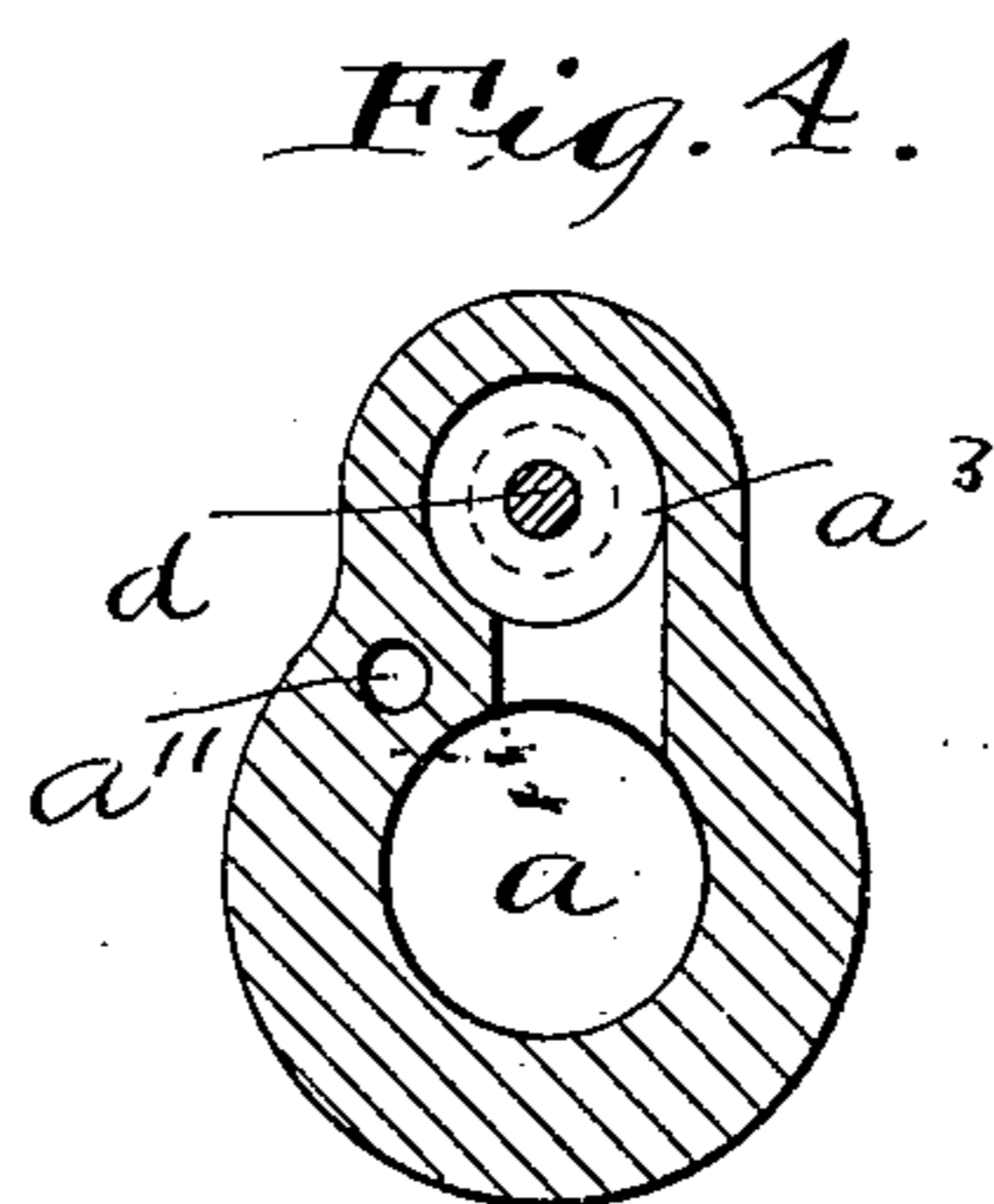
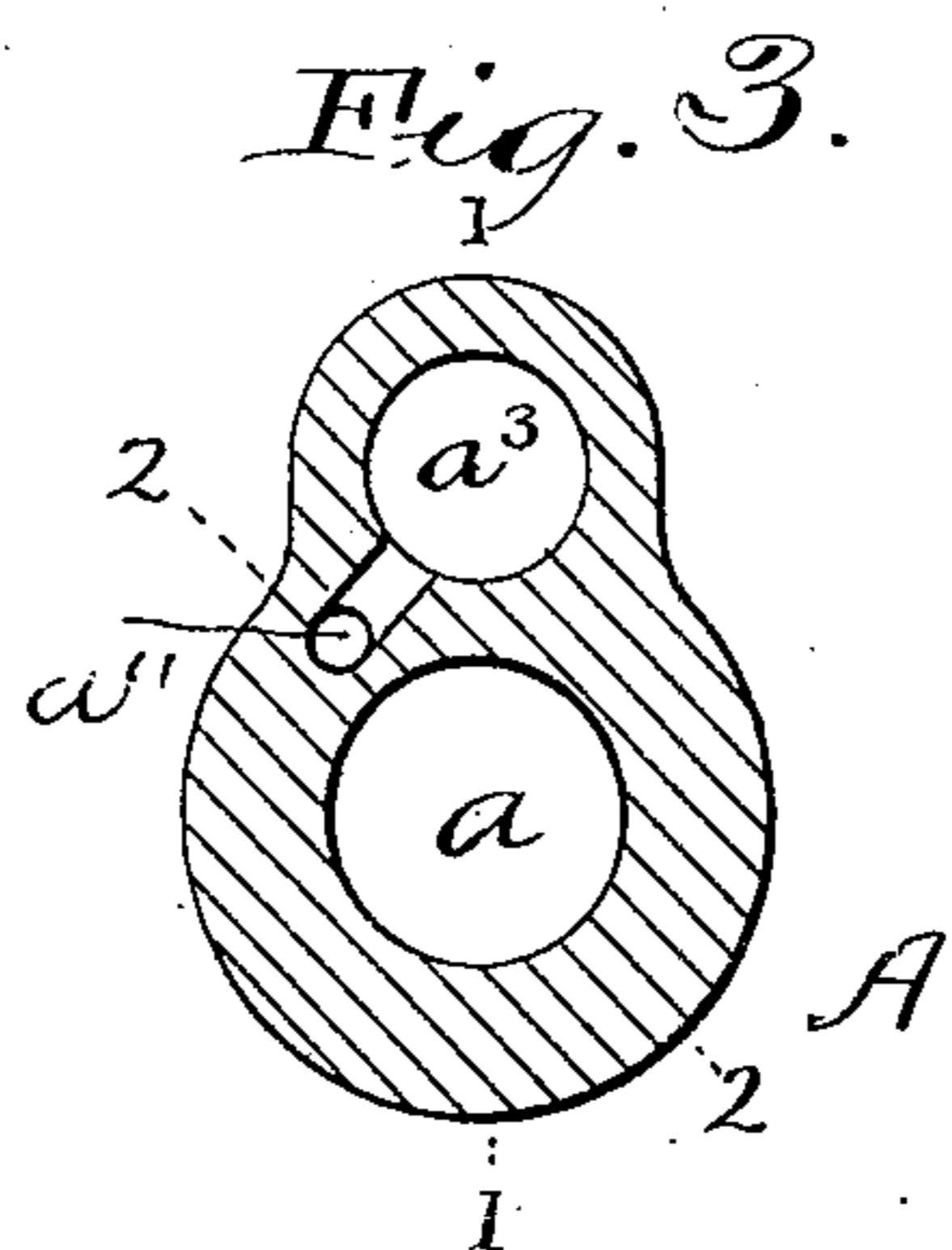
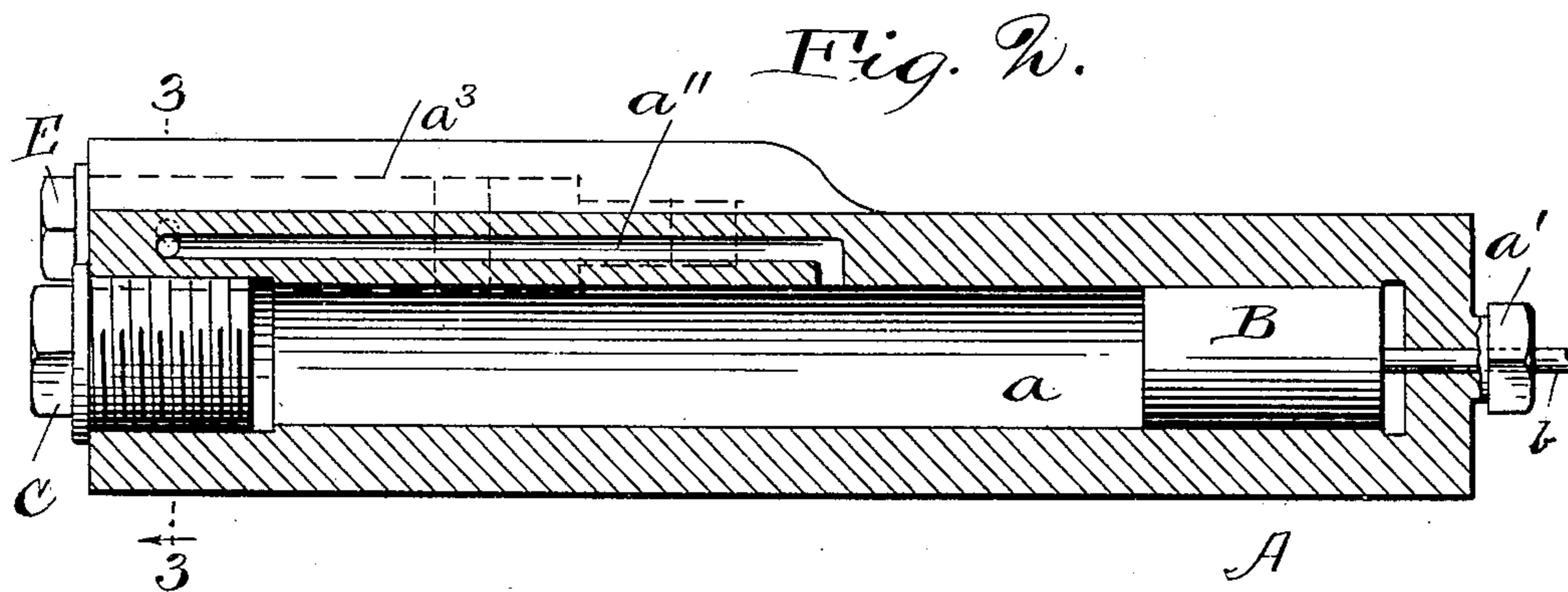
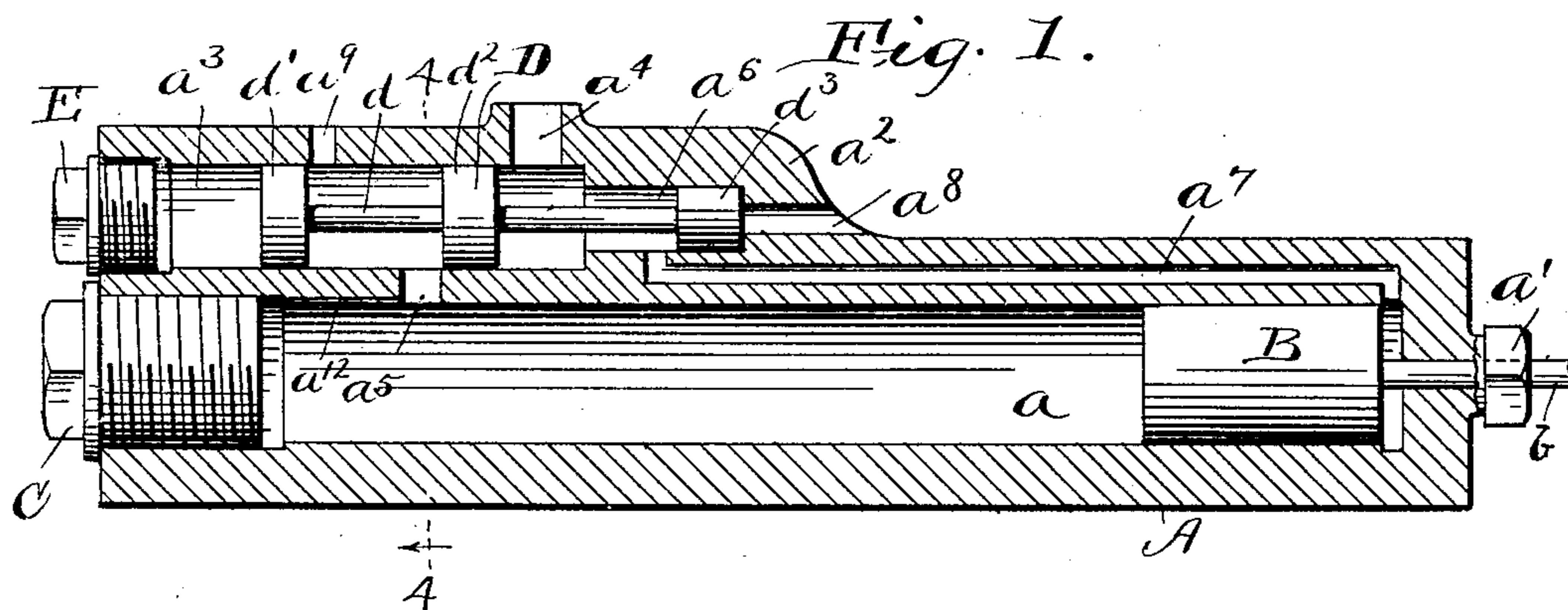


No. 809,012.

PATENTED JAN. 2, 1906.

J. M. & E. W. RAIKES.  
VALVE MECHANISM.  
APPLICATION FILED DEC. 19, 1904.



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# UNITED STATES PATENT OFFICE.

JAMES M. RAIKES AND EDWARD W. RAIKES, OF CLEVELAND, OHIO.

## VALVE MECHANISM.

No. 809,012.

Specification of Letters Patent.

Patented Jan. 2, 1906.

Application filed December 19, 1904. Serial No. 237,417.

*To all whom it may concern:*

Be it known that we, JAMES M. RAIKES and EDWARD W. RAIKES, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Valve Mechanisms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide in a very simple form an automatic valve mechanism.

The invention is applicable to various kinds of reciprocating mechanism; and it provides means whereby fluid under pressure may cause a reciprocating of a suitable piston, the fluid itself operating the valve to cause such reciprocation.

The invention is more fully hereinafter explained and its essential characteristics set out in the claims.

In the drawings, Figures 1 and 2 are longitudinal sections of a simple embodiment of our invention. These sections are taken on the correspondingly-numbered lines of Fig. 3. Figs. 3 and 4 are cross-sections on the line 3 3 of Fig. 2 and the line 4 4 of Fig. 1, respectively.

A represents a cylinder having a smooth bore  $a$ , in which is a piston B, adapted to reciprocate. The piston is shown as having a piston-rod  $b$ , extending out through a suitable stuffing-box  $a'$  on one end of the cylinder. The opposite end of the cylinder is shown as closed by a screw-plug C, which makes a very simple form of construction.

Made integral with the cylinder A is a casing  $a^2$ , having a cylindrical bore  $a^3$ , in which a valve D is placed, which is operated by the fluid itself to change the direction of stroke of the piston. A plug E, screwing into the end of the valve-casing, makes a closure for the same. A suitable admission-opening  $a^4$  is made into the valve-chamber  $a^3$ . Leading from the valve-chamber  $a^3$  into the cylinder is a passage-way  $a^5$ . The chamber  $a^3$  has a cylindrical extension  $a^6$ , and from this extension a passage-way  $a^7$  leads along in the wall of the cylinder to a point beyond the outer end of the piston B.

The valve D consists of three solid pistons  $d'$ ,  $d^2$ , and  $d^3$ , mounted on a common stem  $d$ . The pistons  $d'$  and  $d^2$  are of the same size and occupy the larger portion of the chamber  $a^3$ , and the smaller piston  $d^3$  occupies the extension  $a^6$ . The area of the piston  $d'$  is greater

than the difference between the effective areas of the pistons  $d^3$  and  $d^2$ . Leading from the extension  $a^6$  beyond the piston  $d^3$  is an exhaust-port  $a^8$ , and leading from the chamber  $a^3$  between the valve-heads  $d'$  and  $d^2$  is an exhaust-port  $a^9$ . The space between the plug E and the valve-head  $d'$  is connected by a passage-way  $a''$  with the cylinder  $a$  intermediate of the entrances of the passage-ways  $a^5$  and  $a^7$ .

The purpose of the arrangement of passage-ways and the particular form of valve can be best understood from a description of the operation. With the parts as shown in Figs. 1 and 2 fluid under pressure entering the valve-chamber through the opening  $a^4$  enters the cylinder through the passage-way  $a^7$  and moves the piston toward the left. At the same time, acting on the head  $d^2$  of the valve, it forces it toward the left. Before the valve has moved far, however, the piston has covered the entrance to the passage-way  $a''$ , and this blocks the exit from the space between the plug E and the head  $d'$  and retards the movement of the valve. When the outer end of the piston uncovers the passage-way  $a''$ , the fluid at the left of the head  $d'$  is relieved and the pressure on the right side of the head  $d^2$  forces the valve to the left, so that by the time the piston has reached the inner end of its stroke and is bounding back by means of the cushion therein the passage-way  $a^4$  is coupled with the passage-way  $a^5$ . Fluid under pressure is thus admitted through the passage-way  $a^5$  onto the inner end of the piston, which is thus driven outward, forcing the fluid beyond it out through the passage-way  $a^7$  and the exhaust  $a^8$ . When the inner end of the piston uncloses the passage-way  $a''$  on its outward stroke, the fluid from the cylinder enters through the passage-way  $a''$  onto the left side of the head  $d'$  and acting on greater area than the head  $d^2$  forces the valve to the right. This closes the exhaust  $a^6$  at substantially the same time that the piston reaches the end of its stroke, and as the piston is in the position shown in Figs. 1 and 2 the fluid under pressure is again admitted through the passage-way  $a^7$  beyond the piston, forcing it inward. Before the valve has time to shut off the passage-way  $a^7$  the piston has covered the passage-way  $a''$ , blocking the movement of the valve. It will thus be seen that the piston B reciprocates rapidly backward and forward and the valve D is automatically shifted by the fluid itself to control the piston. A small groove  $a^{12}$  in the

wall  $\alpha$  leads from the port  $\alpha^5$  to the inner end of the bore to start the piston from its innermost position should it be there at the beginning of the operation.

5 We claim—

1. In a valve mechanism, the combination of a cylinder, a piston adapted to reciprocate therein, a valve-chamber, a piston-valve occupying said chamber and having three heads, 10 two of the heads being of different area and the third head having an area greater than such difference, and passage-ways from the valve-chamber to the cylinder, leading as follows when the valve is at the outer end of its 15 stroke, a passage-way to one end of the cylinder leading from a point between the heads of different area, a passage-way to the other end of the cylinder leading from a point between the other two heads, and a passage-way to an 20 intermediate part of the cylinder from a point beyond the large-headed end of the valve.

2. The combination of a cylinder, a valve-casing, a pair of passage-ways leading from the valve-casing to the cylinder, a piston-valve 25 occupying the valve-casing and having three heads, one of which is smaller than the other two, said valve being adapted to stand with one of said passage-ways between such small head and the next head, and the other passage-way between the other two heads, an admission passage-way between the heads when the valve is in such position, an exhaust passage-way controlled by the small head, and an 30 additional passage-way from the cylinder to the valve-casing beyond the large end of the valve when so positioned.

3. The combination of a cylinder and a cylindrical valve-casing side by side, and made solid with each other, a reciprocating piston 40 within the cylinder, a piston-valve comprising three heads and a connecting-stem adapted to

be inserted through the end of the valve-casing, means for closing such end, a passage-way from near one end of the valve-casing to near the end of the cylinder, a passage-way 45 from an intermediate part of the valve-casing to near the other end of the cylinder, and a passage-way from near the other end of the valve-casing to an intermediate part of the cylinder, an admission passage-way to the 50 valve-casing between two of the heads of the valve, and a pair of exhaust passage-ways leading from the chamber, one beyond the smallest head and the other intermediate of the two other heads. 55

4. The combination of a cylinder, a tubular valve-casing adjacent thereto, said valve-casing comprising a cylindrical chamber and a smaller cylindrical extension, a passage-way 60 from the extension to the cylinder near one end, an exhaust passage-way from the extension, a passage-way from the main valve-casing to the cylinder near the other end, a passage-way from near the end of the main valve-casing to an intermediate point in the cylinder, 65 a piston-valve having a stem and a pair of heads of the same diameter occupying said main valve-chamber, said stem extending into said extension, a smaller head on the stem within the extension, an admission-opening in 70 the chamber between the smaller head and the next adjacent head, an exhaust-opening from the cylinder between the two larger heads of the valve.

In testimony whereof we hereunto affix our 75 signatures in the presence of two witnesses.

J. M. RAIKES.  
EDWARD W. RAIKES.

Witnesses:

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