

(No Model.)

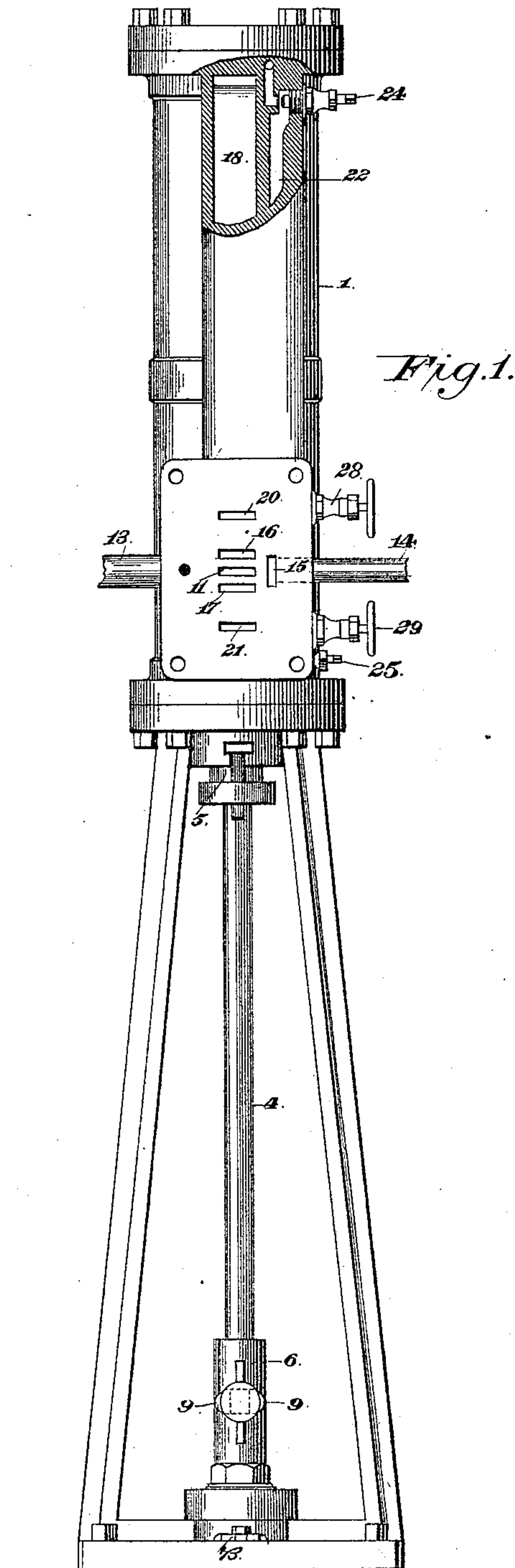
4 Sheets—Sheet 1.

A. D. COOK & G. E. WILLERS.

VALVE FOR STEAM PUMPS.

No. 460,562.

Patented Oct. 6, 1891.



Witnesses

M. Fowler
Wm. Bagger

By their Attorneys,

Inventors

August D. Cook and
George E. Willers

C. A. Snow & Co.

(No Model.)

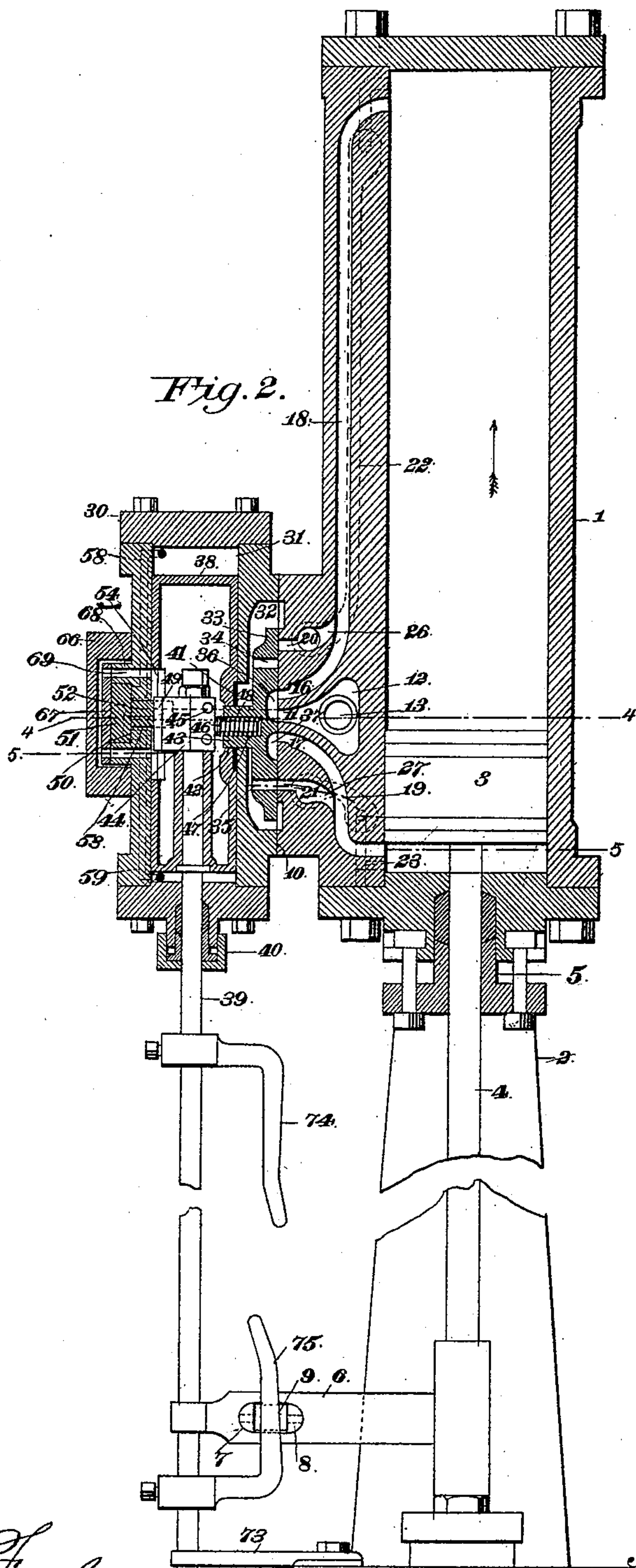
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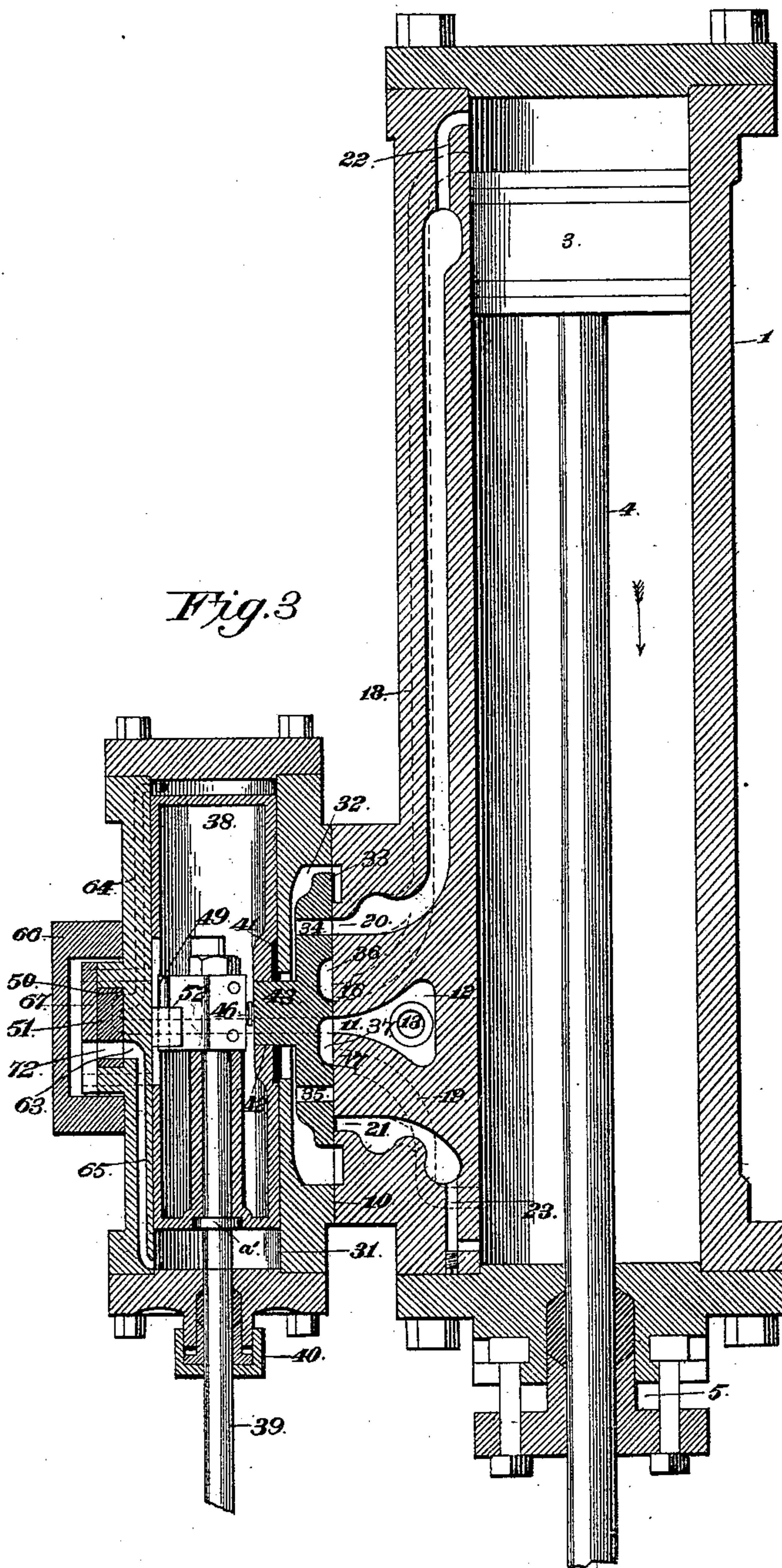
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Fig. 4.

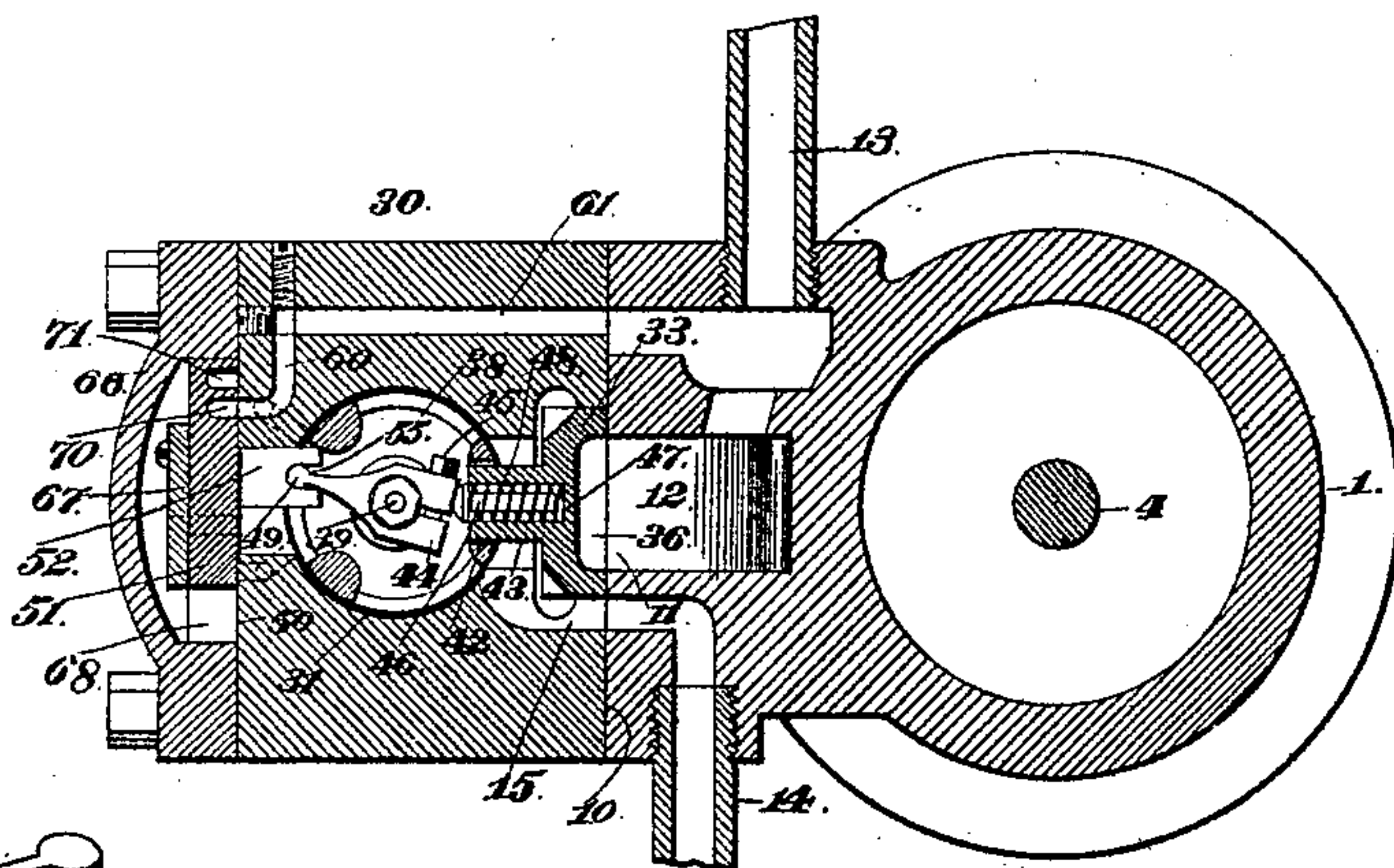


Fig. 9.

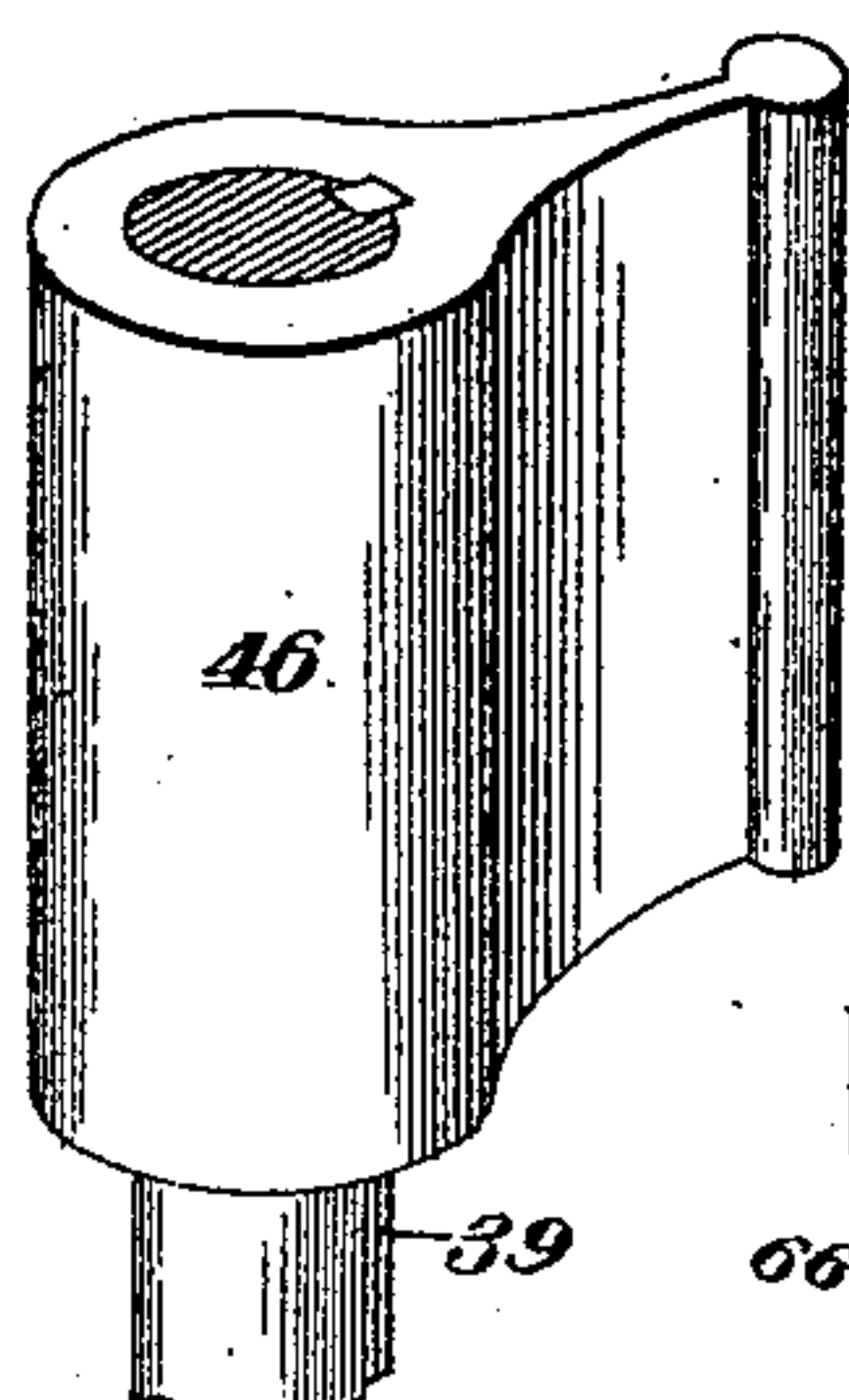


Fig. 8.

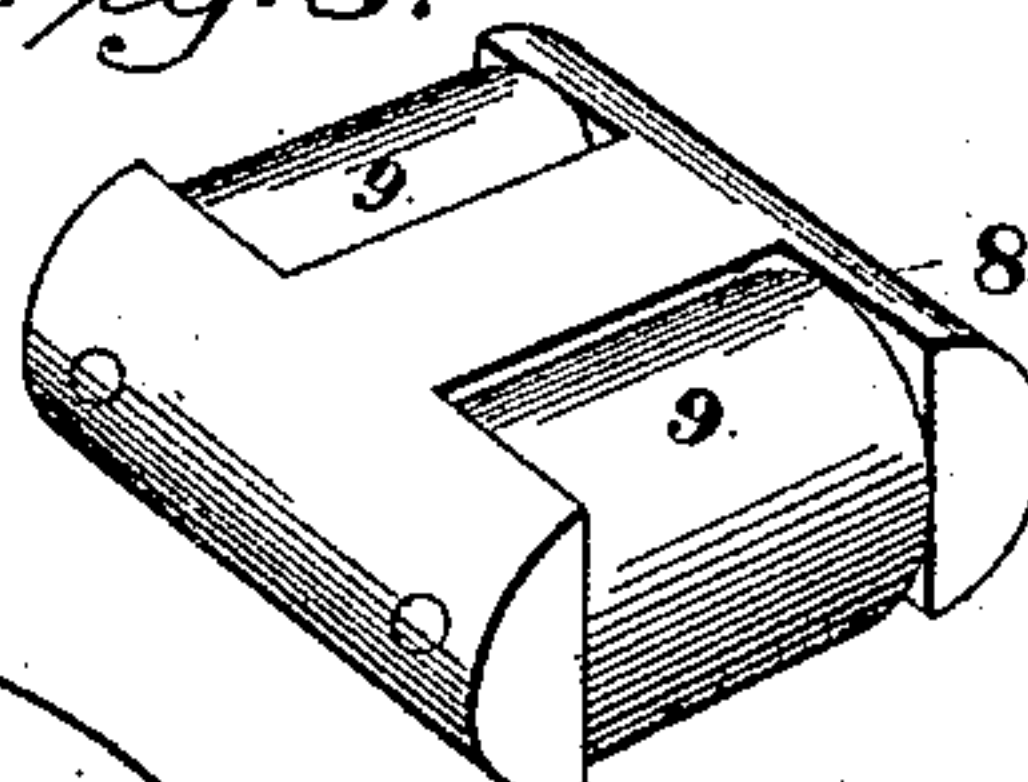


Fig. 5.

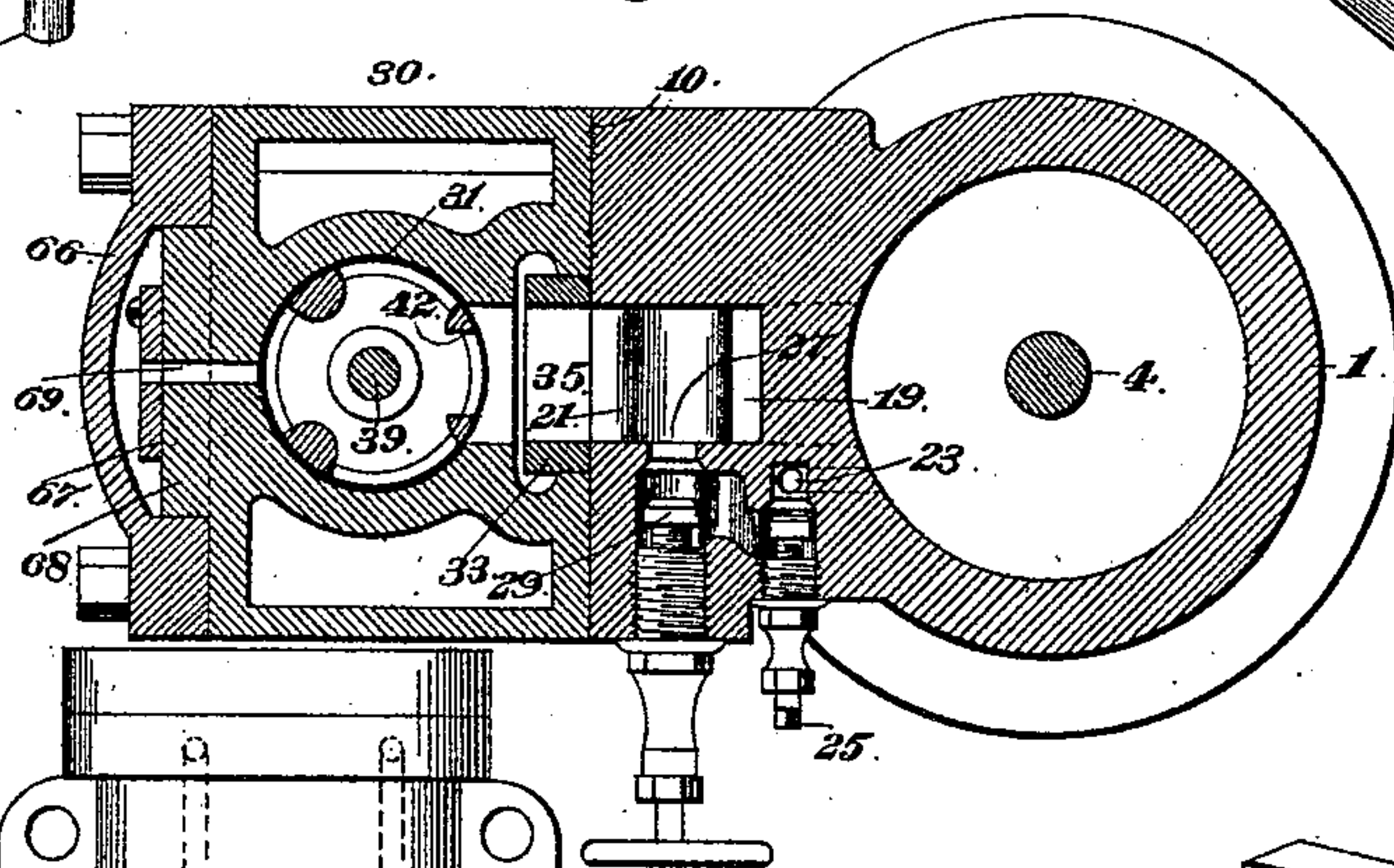


Fig. 7.

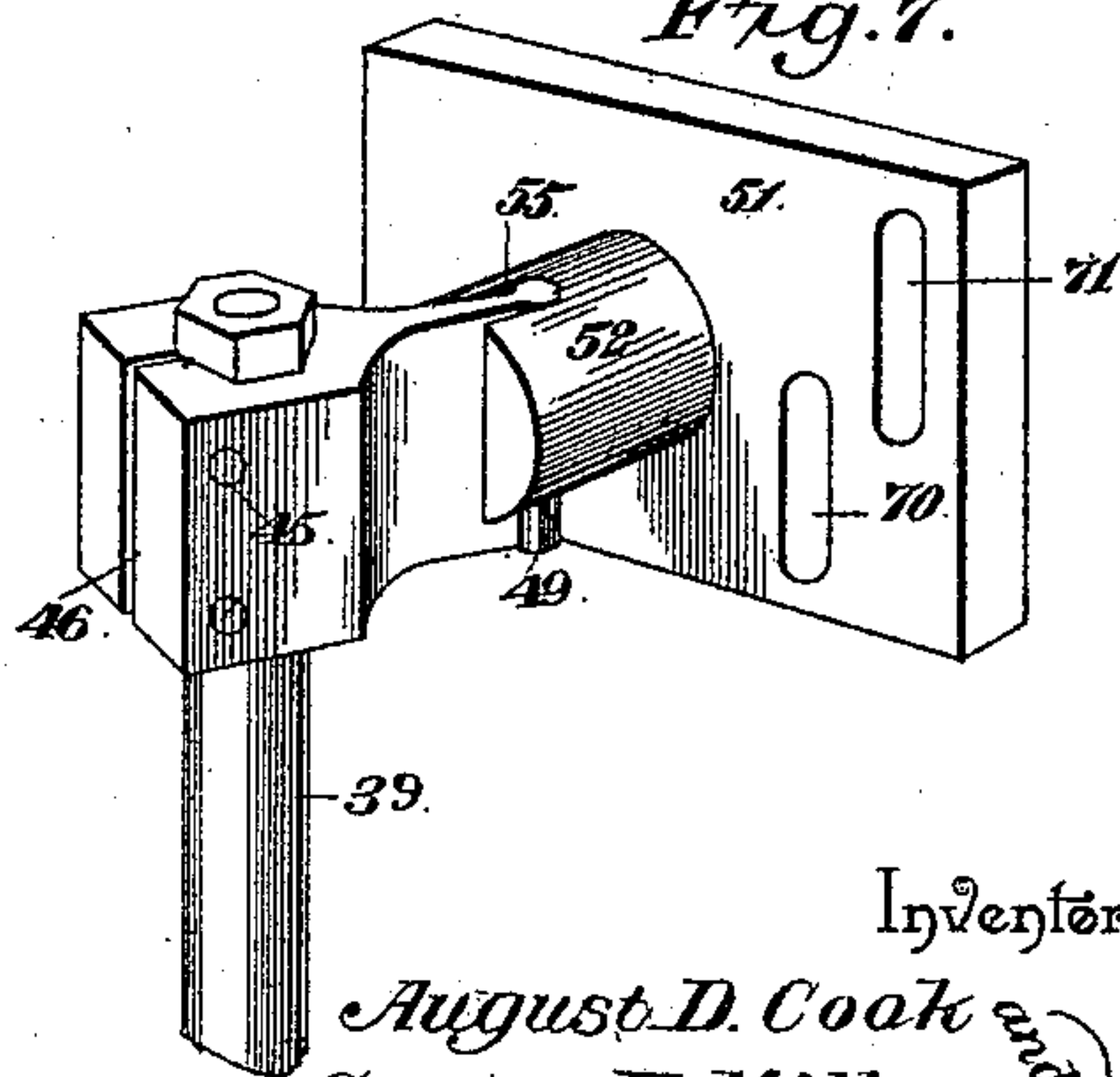
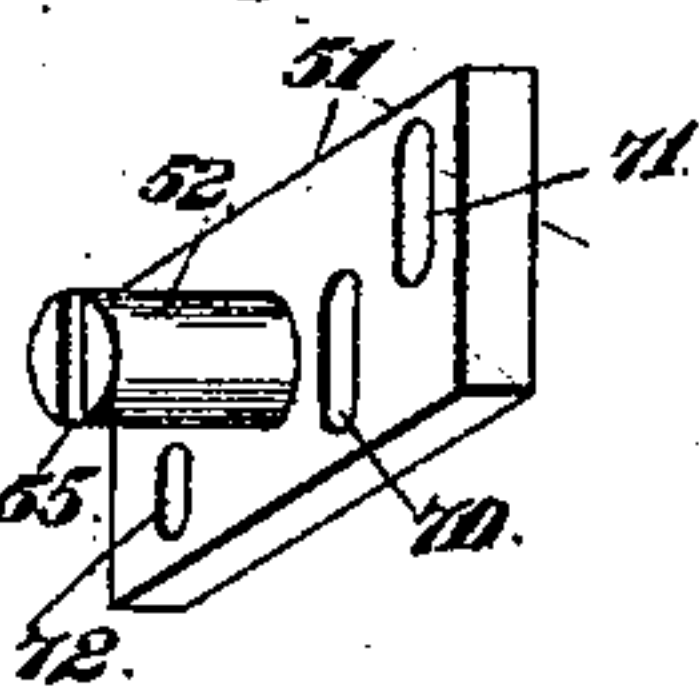


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

AUGUST D. COOK AND GEORGE E. WILLERS, OF LAWRENCEBURG, INDIANA;
SAID WILLERS ASSIGNOR TO SAID COOK.

VALVE FOR STEAM-PUMPS.

SPECIFICATION forming part of Letters Patent No. 460,562, dated October 6, 1891.

Application filed April 1, 1891. Serial No. 387,466. (No model.)

To all whom it may concern:

Be it known that we, AUGUST D. COOK and GEORGE E. WILLERS, citizens of the United States, residing at Lawrenceburg, in the county of Dearborn and State of Indiana, have invented a new and useful Valve for Steam-Pumps, of which the following is a specification.

This invention relates to steam-pumps of that class in which the plunger of the pump is adapted to be directly connected with the piston-rod of the motor-engine; and it has for its object to improve the construction of the said engine in the particulars to be hereinafter fully described, and particularly pointed out in the claims.

Heretofore the class of steam-pumps to which our invention particularly relates have usually been provided with oscillating valves operated by an arm extending laterally from the piston-rod of the engine, which said arm at each end of the stroke has been carried into engagement with a cam-shaped bracket mounted upon the valve-stem, two such brackets being secured and properly adjusted upon the latter, and thus oscillating the stem and the valve mounted upon the latter.

One part of our invention has for its object to so construct the engine as to dispense with a valve which requires to be bodily oscillated, and to substitute therefor a slide-valve which may be actuated by the oscillating movement of the stem.

Our invention has for a further object to so construct and arrange the main valve, whereby the admission of the steam into the cylinder is controlled, that it may be thrown or operated by the pressure of steam against a cylindrical piston mounted in the steam-chest proper.

A further object of our invention is to so construct the engine that the steam shall be admitted into the cylinder by degrees, thus starting the piston at a slow rate of speed, and gradually increasing the speed toward the end of the stroke, and hence avoiding excessive vibration of the working parts, and also insuring the most complete and economical use of the steam.

A further object of the invention is to simplify the construction of the working parts.

With these ends in view the invention consists in the improved construction, arrangement, and combination of parts, which will be hereinafter fully described, and particularly pointed out in the claims.

In the drawings hereto annexed, Figure 1 is a side elevation of a steam pumping-engine constructed in accordance with our invention, the steam-chest having been removed from the same to expose the valve-seat. Fig. 2 is a longitudinal sectional view taken through the cylinder and steam-chest and showing the latter in position. Fig. 3 is a similar view showing the valve-operating piston in a different position. Fig. 4 is a transverse sectional view taken on the line 4 4 in Fig. 2. Fig. 5 is a transverse sectional view, taken on the line 5 5 in Fig. 2. Fig. 6 is a plan view of the steam-chest with the cover removed and with the slide-valve 51 and covering-plate 67 likewise removed and partly inverted in perspective. Fig. 7 is a detail perspective of the slide-valve 51 and its operating mechanism. Fig. 8 is a detail perspective of the roller-frame 8 and rollers 9. Fig. 9 is a detail perspective view of a modified form of the valve-operating crank.

Like numerals and letters of reference indicate like parts in all the figures.

Our improved steam pumping-engine may be arranged and operated in a horizontal or vertical position, as may be desired.

In the drawings hereto annexed the cylinder 1 has been shown as mounted upon suitable supports 2 in a vertical position. The piston 3, which is of ordinary construction, has the stem or rod 4, which extends through a packing-box 5 in one end of the cylinder. Said piston-rod is provided with a laterally-extending arm 6, suitably mounted thereon and having a transverse elliptical opening 7, in which is mounted a frame 8, at the ends of which are journaled rollers 9 9, which are preferably made of steel in order that they may be able to resist the wear to which they will be subjected.

The cylinder 1 is provided at one side near its lower end with the valve-seat 10, having a central port or opening 11, communicating with a pocket or recess 12, which is connected with the exhaust-pipe 13 at one side of the

valve-seat. To the opposite side is connected the steam-pipe 14, which communicates with a recess 15 at one side of the steam-chest into which live steam may thus be admitted. Adjacent to the central port 11 are the exhaust-ports 16 and 17, which are connected by channels 18 and 19 with the interior of the cylinder near the ends of the same. The live-steam ports 20 and 21 near the ends of the valve-seat are connected with the ends of the cylinder by channels 22 and 23. The said channels 22 and 23 are provided near their ends with valves 24 and 25, by means of which the admission of steam into the ends of the cylinder may be regulated, and they are connected with the channels 18 and 19 by means of auxiliary channels or passages 26 and 27, having valves 28 and 29, by means of which the passage of steam through the said channels may be controlled and regulated. The steam-chest 30, which is bolted or otherwise secured upon the side of the cylinder, has a cylindrical bore 31, and it is provided in the side adjacent to the valve-seat 10 with a recess or steam-chamber 32, which receives steam through the port or recess 15. In this space or recess 32 is mounted the slide-valve 33, which is provided near its ends with openings 34 and 35, adapted to register with the steam-ports 20 and 21, respectively. Adjacent to said openings the valve is provided with recesses 36 and 37, adapted to connect the exhaust-ports 16 and 17, respectively, and alternately with the central exhaust-port 11. In the cylindrical bore of the steam-chest 30 is mounted a piston 38, having the stem 39, which extends through a packing-box 40 in the end of the said steam-chest. The piston 38 is provided with a central annular recess 41, and it has in one side an opening 42 to receive the head 43, projecting from the slide-valve 33, which latter is thereby connected with the piston. The latter is preferably made hollow for the greater portion of its length, and is provided with an interior bushing 43, forming a bearing for the valve-stem 39, upon which it is usually mounted. The valve-stem is provided near its inner ends with a metallic collar a' , which is shown as being recessed into the lower end of piston 38, and at the end of the said valve-stem 39 there is provided a clip 44, securely mounted thereon by means of transverse bolts 45. The space on the valve-stem 39 between the metallic collar a' and the said clip 44 is such as to coincide with the length of the annular hole through bushing 43 in the lower end of the piston 38, and the parts are so arranged that undue end motion may be taken up by the proper adjusting of said clip 44, and at the same time allow for the oscillation of the valve-stem 39 within the bushing 43, for purposes hereinafter explained. Said clip 44 forms a bearing for a stem 46, which is mounted in a recess 47 in the head 43 of the slide valve, and around which is coiled a spring 48, the function of which is to hold the said valve

to its seat. The opposite side of the clip 44 is provided with a longitudinal segmental rib 49, the function of which will be presently more fully described.

Upon the outer side of the steam-chest 30 is formed a seat 50 for the auxiliary slide-valve 51, which is provided with a stem or head 52, extending through the opening 53 in the side of the steam-chest 30 and through a corresponding opening 54 in the side of the piston 38, and having a groove 55 to receive the rib 49. The valve-seat 50 is provided at one side of the central opening 53 with exhaust-ports 56 and 57, which are connected with the ends of the cylindrical bore 31 by channels 58 and 59. Between the ports 56 and 57 is formed the central exhaust-port 60, which communicates through a channel or passage 61 with the exhaust-chamber 12. At the opposite side of the central opening 53 in the valve-seat are formed the steam-ports 62 and 63, which are likewise connected with the ends of the cylindrical bore 31 by means of channels or passages 64 and 65. To the side of the steam-chest 30 is secured a casing 66, forming an auxiliary steam-chest. The slide-valve 51 is held to its seat by means of a plate 67, which is secured by means of screws or studs 68, between which the said slide-valve is mounted. Steam ports or passages 69 extend through the said flanges and covering-plate, as well as through the wall of the steam-chest 30 and connect the cylindrical bore of the latter with the auxiliary steam-chest formed by the casing 66, into which live steam may thus be admitted.

The slide-valve 51, which is fitted upon the seat 50, is provided at one side of the stem 52 with recesses 70 and 71, adapted to place the exhaust-ports 56 and 57 alternately in communication with the central exhaust-port 60. Said valve is also provided with a perforation 72, which is adapted to align with the steam-port 63 when the steam-port 62 is covered by the valve 51. When the said valve is at the opposite end of its stroke and the port 62 is uncovered and open to steam, the port 63 is obviously covered by the solid portion of the valve.

The stem 39 of the valve-piston has a bearing in a bracket 73, and it is provided with cam-shaped arms 74 and 75, adjustably mounted thereon and adapted to be alternately engaged by the rollers 9 of the frame 8, mounted in the arm or bracket 6 upon the piston-rod of the engine when the said piston-rod approaches the ends of its stroke.

The operation of the invention is as follows: Steam is admitted to the steam-chamber 32 through the pipe 14 and recess 15. Assuming the piston 3 to be in the position shown in Fig. 2 of the drawings, near the extreme lower end of its stroke, one of the rollers mounted in the arm 6 has already engaged the cam-shaped arm 75, so as to oscillate the valve-stem 39, causing the clip 44 of the latter to actuate the slide-valve 51, thus opening the upper end of

the tubular bore 31 to steam through the port 62 and channel 64 and connecting the lower end of said tubular bore, through the channel 59, port 57, recess 71, port 60, and passage 61, with the exhaust-chamber 12. The piston 38 has accordingly been driven to the lower end of its stroke, carrying with it the slide-valve 33, the recess 36 of which connects the exhaust-port 11, through the channel 16, with the upper end of the cylinder 1, while the lower end of said cylinder is connected by the channel 23 and auxiliary passage 27 with the steam-port 21, which, being in alignment with the opening 35 in the slide-valve, receives steam from the chamber 32. The piston 3 is accordingly forced in an upward direction, as indicated by the arrow in Fig. 2, at a comparatively slow rate of speed until it passes the channel 19, through which a fuller head of steam is admitted, thus accelerating the upward movement of the piston. This upward movement continues until one of the rollers 9 in the arm 6 engages the cam-shaped arm 74. The step 39 is thus oscillated to cause the clip 44 to operate the slide-valve 51, so as to connect the upper end of the bore 31 with the exhaust through the channel 58, port 56, recess 70, port 60, and passage 51 and opening the lower end of the bore 31 to steam through the channel 65 and port 63. The piston 38 is now forced in an upward direction, carrying with it the valve 31, thus opening the lower end of the cylinder 1 to the exhaust through the channel 19 and port 17, recess 37, and port 11, and connecting the upper end of the cylinder with the live-steam space 32 through the channel 22, port 20, and valve-opening 34, and after the piston has started on the downstroke also through the channel 18. It will be seen that the passage of steam into the ends of the cylinder is capable of being regulated by the valves 24, 25, 28, and 29, thus enabling the weight of the piston and the pump-plunger attached thereto, as well as the volume of water that is being raised by the pump, to be balanced, thus insuring an easy and steady motion. The main valve 31, instead of being operated by the direct action of the piston-rod, is carried by the steam-actuated reciprocating piston 38, and its movement is thus rendered not only absolutely certain, but smooth and easy, and is carried into effect with less wear upon the operating parts of the machinery than would ordinarily be the case. The only part that requires to be operated by the direct impact of the arm 6, extending from the piston-rod 4, is the oscillating valve-stem 39, the clip 44 of which operates the auxiliary slide-valve 51, which controls the admission of steam to the chamber in which the reciprocating piston 38 is located. The annular recess 41 in the body of the said piston permits the steam to pass to the openings 69, through which it is conducted into the auxiliary steam-chest composed by the casing 66. The openings in the opposite

sides of the hollow piston 38 cause the latter to be constantly filled with live steam, which completely surrounds the clip 44 and impinges against the stem 52 of the valve 51, thus balancing the latter.

The general construction of our improved steam pumping-engine is simple and durable, and it will be found to be very effective in operation.

We have in the foregoing described the preferred construction of our invention; but we desire it to be understood that we reserve the right to any changes and modifications which may be resorted to without departing from the spirit of our invention.

Having thus described our invention, we claim and desire to secure by Letters Patent of the United States—

1. In a steam pumping-engine, the combination, with the oscillating valve-stem having cam-shaped arms or brackets, of the piston-rod having a laterally-extending arm, and a plate mounted detachably in said arm and provided at its ends with rollers adapted to engage the said cam-shaped arms or brackets, substantially as set forth.

2. The combination, with the arm or bracket extending laterally from the piston-rod and having an elliptical perforation, of the frame mounted detachably in said perforation and provided at its ends with rollers, substantially as and for the purpose set forth.

3. In a steam pumping-engine, the combination of the cylinder having steam channels or passages controlled by valves, substantially as described, the steam-chest having a cylindrical bore, the steam-actuated piston mounted to reciprocate in the latter and having an oscillating stem provided with a clip at its inner end, the slide-valve carried by said reciprocating piston, and a spring arranged to bear against the clip upon the oscillating stem and serving to force the said valve to its seat, substantially as set forth.

4. The combination of the cylinder having channels or passages, as herein described, and provided with a valve-seat having ports connected with said passages and with the exhaust, the steam-chest having a cylindrical bore, the steam-actuated piston mounted to reciprocate in the latter, and the valve carried by said piston and provided with recesses and perforations, substantially as and for the purpose set forth.

5. In a machine of the class described, the combination of the steam-chest having a cylindrical bore, with the piston mounted to reciprocate therein and carrying the main slide-valve, and an oscillating stem mounted in said piston and having a clip or head at its inner end engaging and adapted to actuate an auxiliary slide-valve whereby the admission and exhaust of steam to and from the ends of the cylindrical bore of said steam-chest are controlled, substantially as set forth.

6. In a machine of the class described, the combination of a steam-chest having a cylin-

drical bore, the reciprocating piston mounted therein and carrying the main slide-valve, and an oscillating stem having a bearing in said piston and serving to actuate the mechanism whereby the steam for operating the reciprocating piston is controlled independently of the main slide-valve, substantially as set forth.

7. In a machine of the class described, the combination of a reciprocating piston carrying the main slide-valve with a stem mounted to oscillate in said piston, and an auxiliary slide-valve operated by said stem, and channels and passages, substantially as described, whereby the main and auxiliary valves are opened to the same steam-supply, as and for the purpose set forth.

8. The combination of the cylinder, the steam-chest having a cylindrical bore, the steam-actuated piston mounted in the latter and carrying the main slide-valve, an oscillating stem journaled in said piston and having a clip or head engaging an auxiliary valve whereby the admission and exhaust of steam to and from the ends of the cylindrical bore of the steam-chest are controlled, cam-shaped arms mounted upon the oscillating stem of the reciprocating piston, and an arm or bracket extending from the main piston-rod and having rollers adapted to engage said cam-shaped arms, substantially as set forth.

9. The combination, with the reciprocating piston having an interior annular hole, of the stem mounted to oscillate in the latter and having a clip or head provided with a segmental rib and the slide-valve carried by the latter, substantially as set forth.

10. The combination of the cylinder having

the valve-seat, the steam-chest having a cylindrical bore, the piston mounted in the latter and having an annular groove, the main slide-valve carried by said piston, the oscillating stem journaled in the latter and having a clip or head, the auxiliary valve engaged and actuated by the latter, which valve is provided with a covering-plate, the steam supply and exhaust pipes, and the ports and channels or passages, all constructed and arranged substantially as herein described, and for the purpose set forth.

11. In a steam pumping-engine, the cylinder having the valve-seat provided with a central port communicating with a pocket or recess connected with the exhaust-ports adjacent to said central port and connected by channels or passages with the interior of the cylinder near the ends of the latter, independent outer ports connected with the ends of the cylinder by channels or passages running in the direction of said ports adjacent to the central port, auxiliary channels connecting the said channels or passages in pairs, and independent valves located near the opposite ends of the passages communicating with said outer ports to regulate the passage of steam through said auxiliary channels and the outer passages or channels, respectively, substantially as herein described, and for the purpose set forth.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in presence of two witnesses.

AUGUST D. COOK.

GEORGE E. WILLERS.

Witnesses:

CHARLES L. SKINNER,
WILLIAM F. COOK.