

No. 647,014.

Patented Apr. 10, 1900.

F. W. MERRITT.  
THREE WAY VALVE.

(No Model.)

(Application filed Nov. 7, 1899.)

3 Sheets—Sheet 1.

Fig. 1.

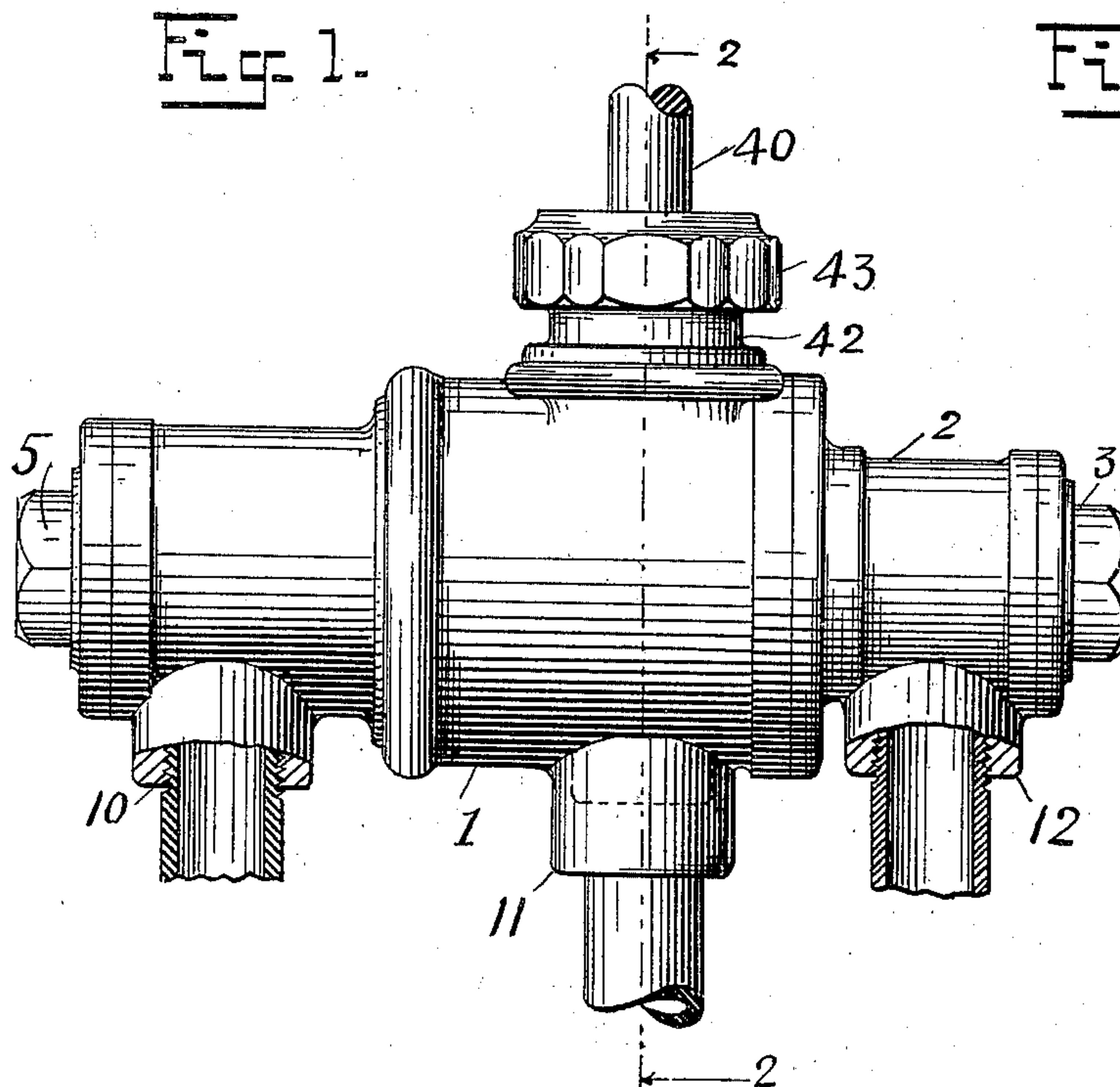


Fig. 2.

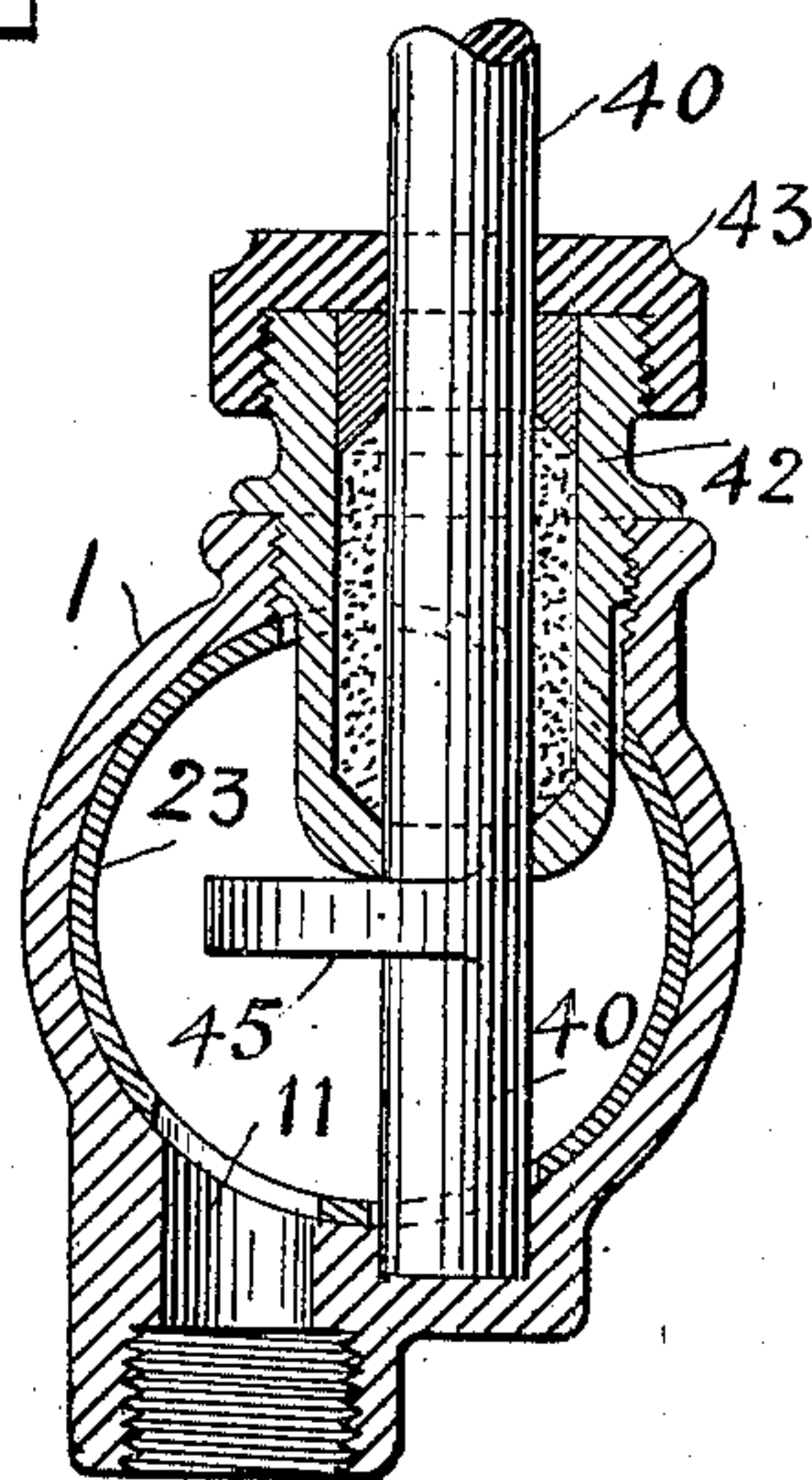
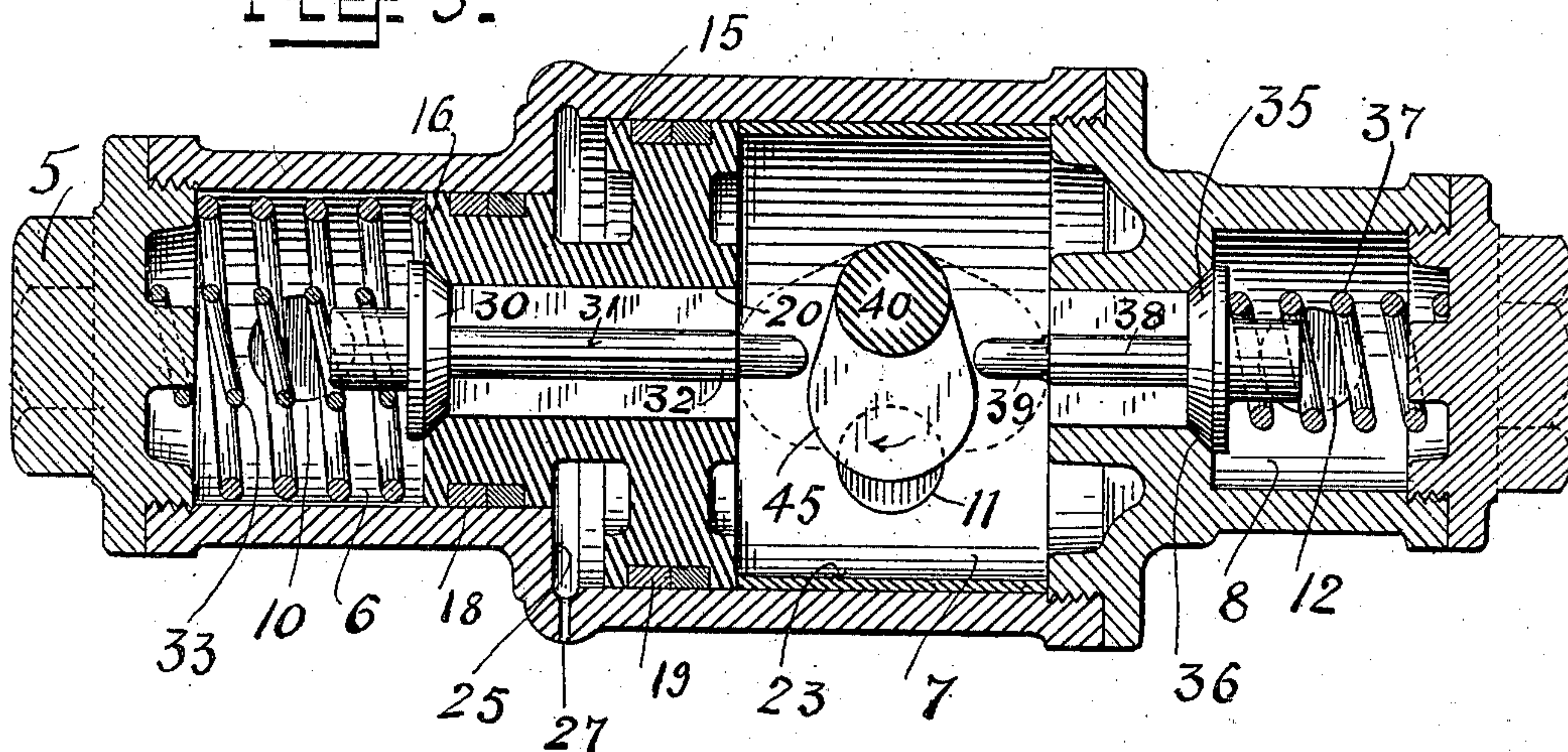


Fig. 3.



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Fig. 4.

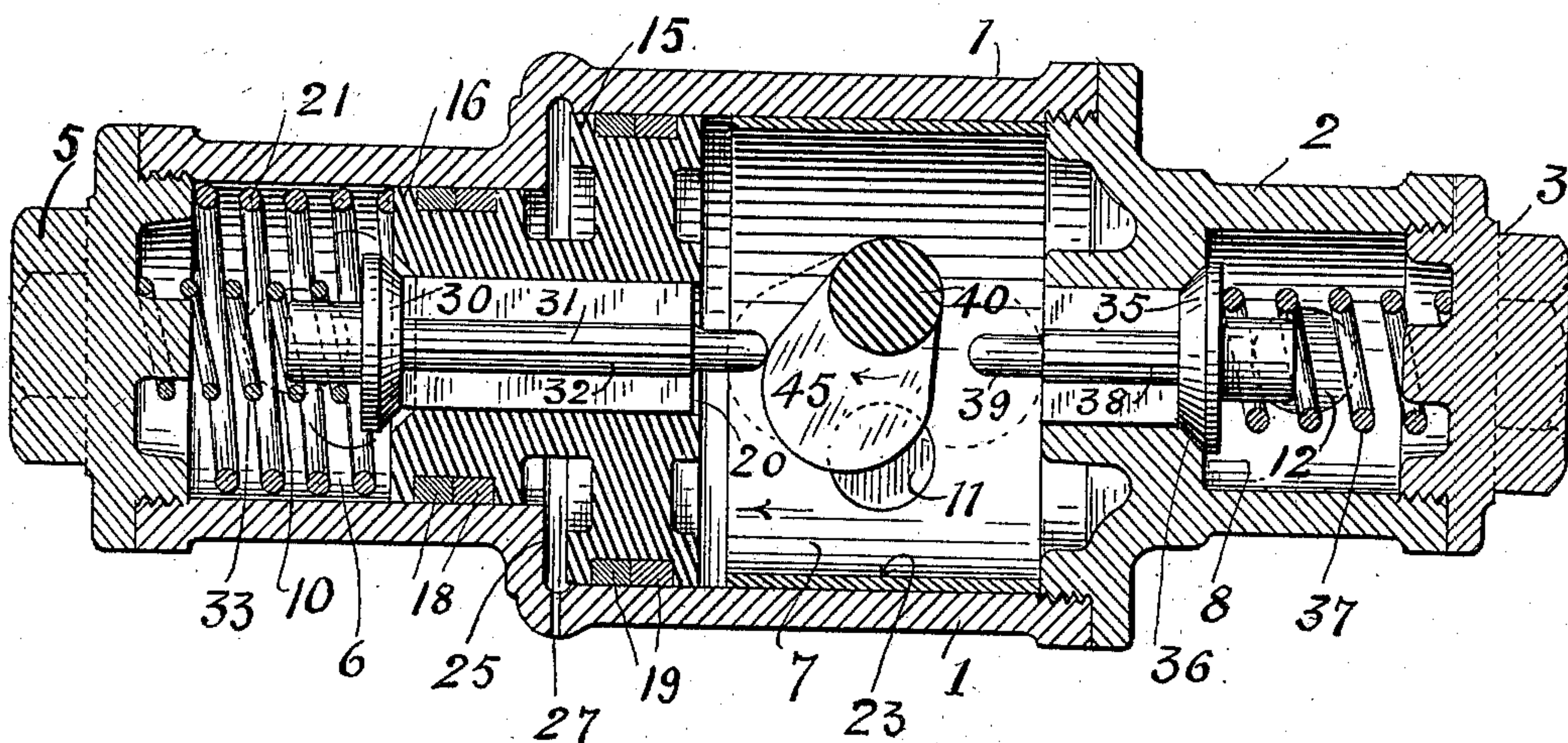
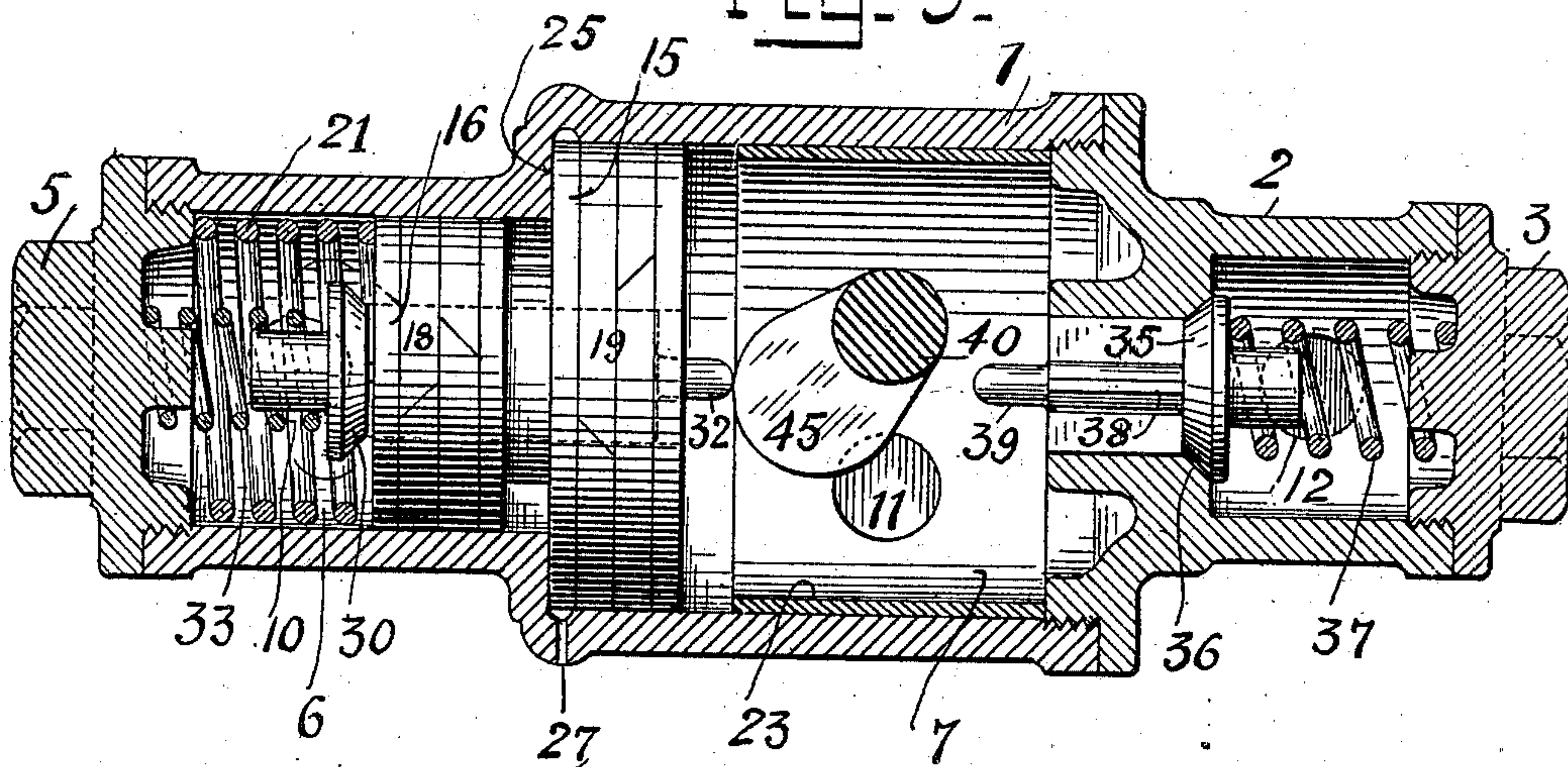


Fig. 5.



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3 Sheets—Sheet 3.

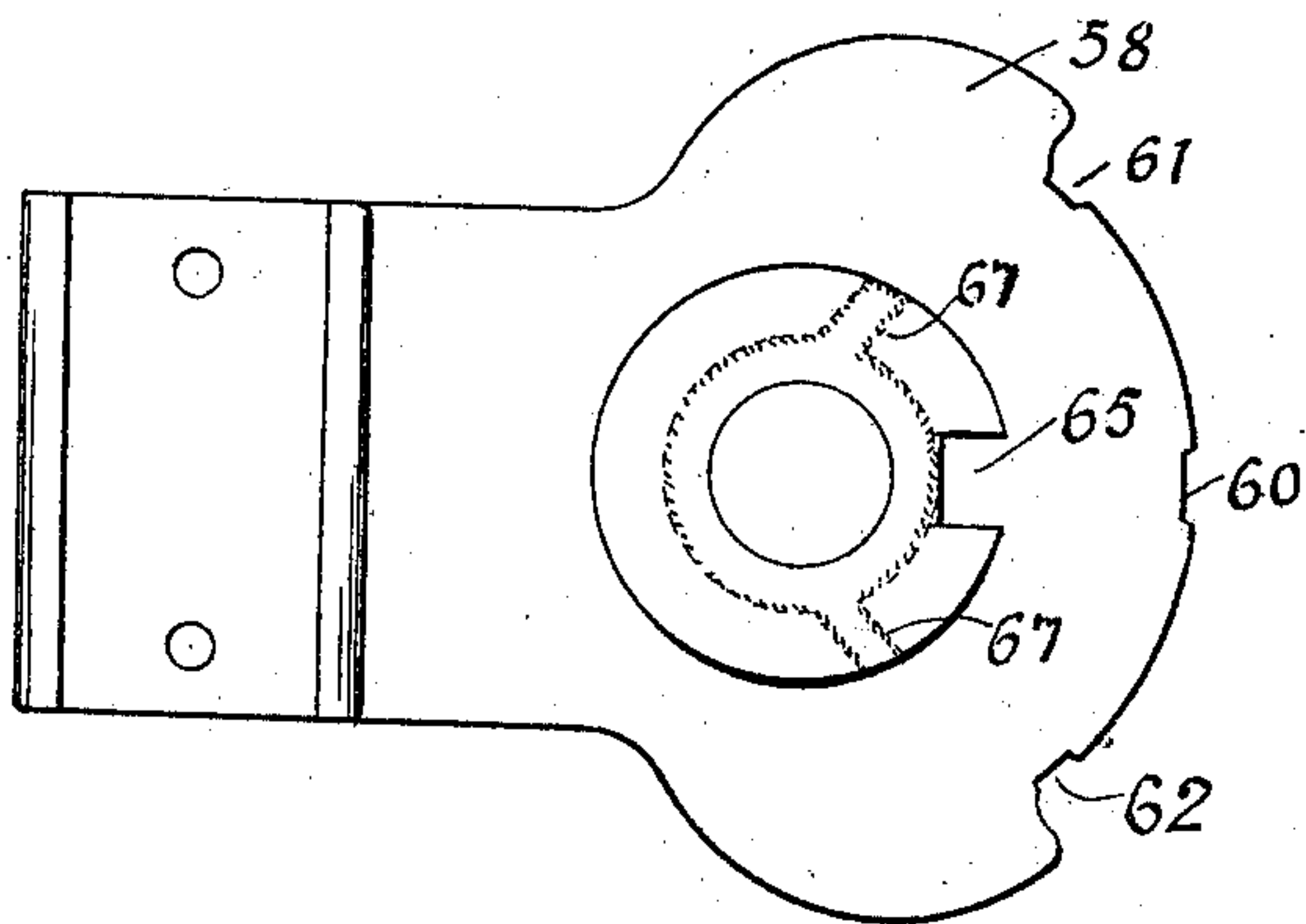


Fig. 7.

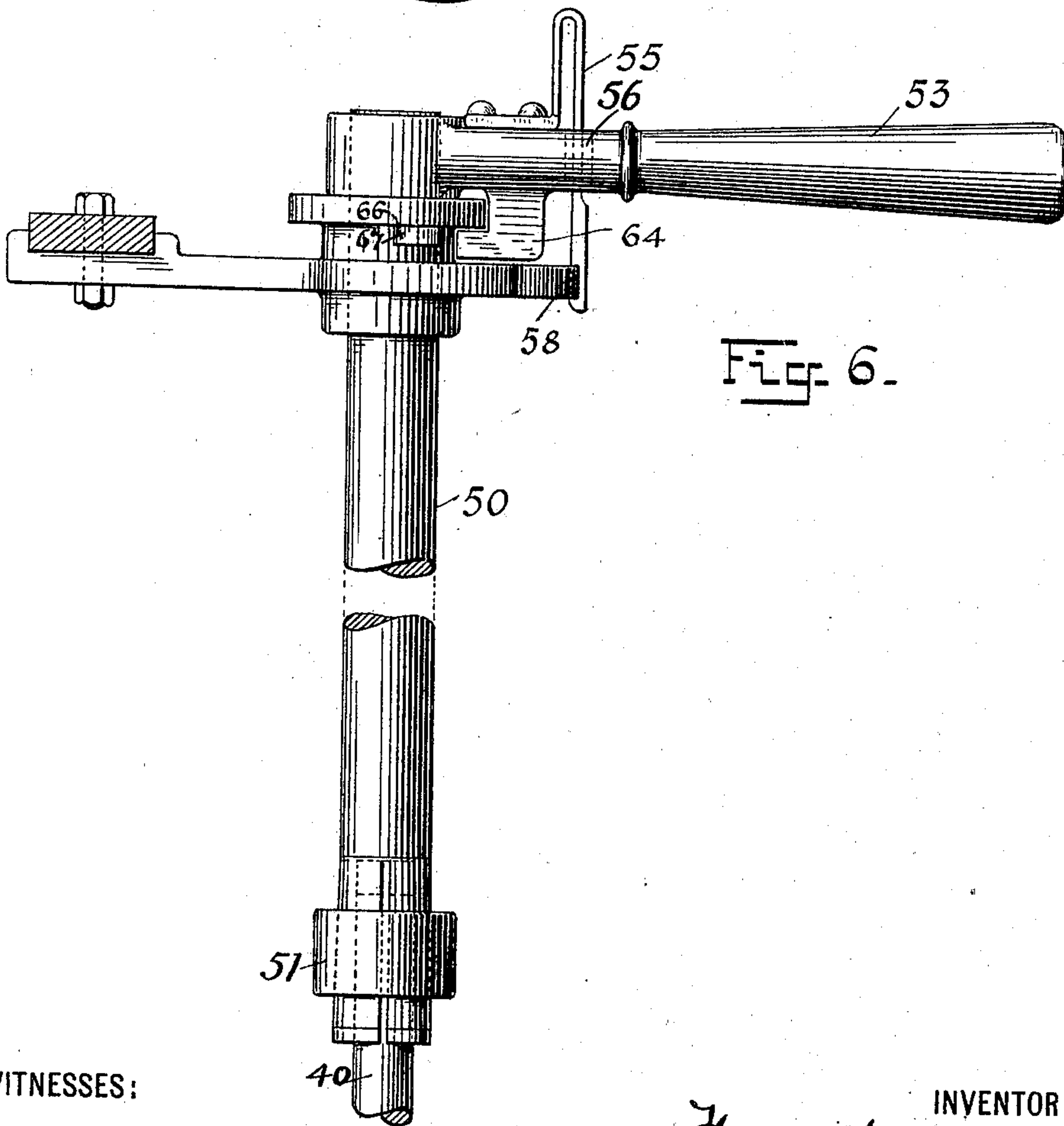


Fig. 6.

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# UNITED STATES PATENT OFFICE.

FRANK W. MERRITT, OF NEW YORK, N. Y., ASSIGNOR, BY MENSE ASSIGNMENTS, TO THE MERRITT ELECTRIC AIR BRAKE COMPANY, OF WEST VIRGINIA.

## THREE-WAY VALVE.

SPECIFICATION forming part of Letters Patent No. 647,014, dated April 10, 1900.

Application filed November 7, 1899. Serial No. 736,095. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK W. MERRITT, a citizen of the United States, residing at the borough of Manhattan, in the city of New York and State of New York, have invented certain new and useful Improvements in Three-Way Valves, of which the following is a specification.

This invention relates to improvements in three-way valves, and particularly, although not exclusively, to such as are employed to control the operation of air-brakes for cars.

It is the purpose of the invention to deliver air in such manner through the valve to the jam-cylinder of the brakes that the brakes will respond practically instantaneously to the effort of the brakeman and also that in the ordinary stoppages of the car the brakes will be gradually applied with minimum consumption of power and wear of wheels, but that in emergencies the whole power of the air will be applied to quick stoppages of the car.

To this end the invention consists, essentially, in a valve so constructed that when opened by the operator for ordinary cases it will soon close automatically by the back pressure of the admitted air, but that when full opened by the operator for emergencies it cannot be automatically closed by the back pressure of the admitted air.

Referring to the said drawings to aid the description, Figure 1 is a longitudinal elevation of the valve-casing. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a horizontal longitudinal section of the casing and valve with the parts in normal position; and Figs. 4 and 5 are similar sections, but with the parts respectively in the partly-opened position for operating the brakes in usual conditions and full open for operating the brakes in emergencies. Fig. 6 is a vertical elevation of the valve-rod and stop-plate; and Fig. 7, a plan of said plate, showing how the valve-rod is secured at its several positions.

In the preferred construction (shown in the drawings) a bonnet or extension 2, closed by screw-plug 3, is threaded into the exhaust end of the casing 1, so that the valve-body contains the inlet-chamber 6 of intermediate area and closed by the screw-plug 5, the central

chamber 7 of greatest area, and the exhaust-chamber 8 of smallest area, and said chambers are respectively provided with the inlet 10, which is connected by suitable piping with any source of air or other fluid pressure, (as an air-reservoir in a car-brake system,) outlet 11 to the jam-cylinder of the brake, or to any other device operated by the valve, and exhaust or relief 12.

In the valve-casing reciprocates a piston provided with the larger head 15 and the smaller head 16, which heads, respectively, have an air-tight fit in said chambers 6 7 by the packing 18 19. Said piston is through-bored, as at 20, and normally pressed inward by spring 21 and the fluid-pressure in chamber 6, the inward movement being limited by any suitable stop, preferably a ported ring 23, set in said chamber 7, the outward movement of said piston being limited by the shoulders 25. A valve 30 seats on the head 16 of said piston so as to open from chamber 7 into chamber 6, being guided by feathers 31 in the stem 32, which projects through bore 20 and into said middle chamber 7. Said valve 30 is normally pressed to its seat by spring 33 and fluid-pressure in chamber 6. A valve 35 seats on the port 36, which connects chambers 7 and 8 so as to open from chamber 7 into chamber 8, being normally held to its seat by spring 37 and guided by feathers 38 on the stem 39, which projects through said port 36 into said chamber 7.

A valve-operating rod 40 passes through the stuffing-box and gland 42 43 and is stepped in the valve-casing as shown, Fig. 2. An arm or cam 45 on said rod 40 operates the valves 30 35 in the manner hereinafter described and also by its position under the stuffing-box 42 positions said rod 40 in the valve-casing. When the valve is applied to a car, I prefer to prolong said rod 40 by a rod 50, having a flaring chambered and split end which fits on the end of rod 40 and is tightened by tapping the ring 51 down on its flaring end, Fig. 6. Rod 50 may be of a length required by the dashboard of any car. To hold rod 40 and cam 45 in the position to which they may have been moved by the operator, a handle 53 is provided, having a removable fit on the segmental upper end of rod 50 and



equipped with a U-spring 55, the free end of which passes through a hole 56 in said handle 53 and bears against the circular edge of a plate 58, which is fixed on the dashboard of a car or at any other suitable place. The rod 50 passes through the center of and is guided by said plate 58, and at the normal positions of said cam 45 said spring 55 enters notch 60 in the edge of said plate. To insure that the handle 53 cannot be removed except when the valve is in normal position, a bent arm 64 is secured to the under side of said handle, which at the middle position of the handle corresponding to the normal position of the valve passes freely through the slot 65 in the flange of the collar 66, which is secured to plate 58, but in all other positions of said handle engages under said flange. To limit the motion of the rods and cam 45, stops 67 are fixed on said flange to engage said arm 64 at its extreme positions. To shift the valve-rod and cam 45, the operator applies sufficient force to the handle so that the beveled edges of said notches 60 61 62 force spring 55 out enough to ride past said notches. The friction of spring 55 on the edge of plate 58 is sufficient to hold the rod and cam in intermediate positions against displacement by the jolting of the car.

The valve operates as follows: Suppose the parts in the normal position of Fig. 3. To apply the brake (not shown) in ordinary cases, the brakeman turns handle 53 so as to move cam 45 a little to the left, thereby forcing valve 30 off its seat on head 16 of the piston. Air now passes from chamber 6, which is connected by any suitable piping with an air-reservoir, (not shown,) through bore 20 of said piston, into chamber 7 and out by connection 11 and connected piping to the ordinary jam-cylinder of the brakes, (said cylinder and brakes not being shown, since the same are of common and well-known construction,) and the brakes are now applied with force corresponding to the opening of the valve. As soon as the pressure equalizes in the jam-cylinder and valve the pressure on the larger head 15 of the piston, overcoming the spring 21 and pressure on the smaller head 16, moves the piston to the left and against the valve 30, thereby automatically limiting the pressure admitted to the jam-cylinder, any air in chamber 7 to the left of head 15 escaping through the small hole 27. If the brakeman wishes to apply the brakes more forcibly, he moves the handle more to the left, again forcing valve 30 off its seat on head 16 and admitting more air to the jam-cylinder. Again, when the pressure has equalized in the jam-cylinder and chamber 7 the piston moves to the left and closes valve 30, and so on in the ordinary applications of the brakes. When the full power of the air is needed, as in emergencies, the brakeman turns the handle full over to the left, now throwing valve 30 so far off its seat that the movement of the piston cannot bring head 16 again up to the valve.

Therefore in this position the valve remains full open as long as desired and the brakes are forced with full power on the wheels.

To release the brakes from the wheels, the brakeman moves the handle to the right, thereby forcing valve 35 off its seat and allowing the air to pass from the jam-cylinder, through chamber 7, by port 36, to chamber 8, and thence to atmosphere by the relief-outlet 12. The brakes now retract from the wheels in the ordinary manner, and, the air-pressure in chamber 7 being relieved, spring 21 and the fluid-pressure in chamber 6 force the piston back to the normal position of Fig. 3, while spring 33 and said fluid-pressure force valve 30 to its seat on head 16. The brakeman finally turns the handle to the middle position and all parts of the valve are normal and ready for the next application of the brakes.

Of course any other suitable fluid may be used in place of compressed air, as steam, and the valve may be applied to operating other devices than brakes.

The springs 21 33 may be omitted, although I prefer to employ them to prevent accidental displacement of the valves, and other changes of construction may be made without departing from the invention.

Now, having described my improvements, I claim as my invention—

1. In a valve, the combination of a piston having a limited motion, a valve seated thereon and having a greater range of motion, and means controlled by the operator for opening said valve within the limits of the movement of said piston or beyond said limits, substantially as described.

2. The combination in a valve, of a casing, a ported piston therein having heads of different area, a valve closing said port, springs adapted to move said piston and said valve to normal position, and means controlled by the operator for moving said valve either within or beyond the limits of the motion of said piston, substantially as described.

3. The combination in a valve, of a casing, a ported piston having heads of different area, an inlet-valve closing said port, springs adapted to move said piston and said valve to normal position, a relief-valve and a spring for closing the same, and means controlled by the operator for moving said inlet-valve either within or beyond the limits of the motion of said piston and also for opening said relief-valve, substantially as described.

4. The combination in a valve, of a casing having an inlet adapted to be connected with a source of fluid-pressure, an outlet adapted to be connected with a device to be operated by said pressure, and a relief, a ported piston having heads of different area in said casing, a valve adapted to open said port to said pressure, springs adapted to move said piston and valve to normal position, a relief-valve adapted to connect said outlet and relief and a spring for normally closing said relief-valve, and means controlled by the oper-



ator for opening said valves, substantially as described.

5 5. The combination in a valve, and with a ported piston having heads of different areas, a valve closing said port, and springs adapted to move said piston and valve to normal position, of a valve-operating rod and cam adapted to move said valve either within or beyond the limits of motion of said piston, 10 substantially as described.

6. The combination, in a valve, and with a ported piston having heads of different areas, an inlet-valve closing said port, springs adapted to move said piston and valve to normal

position, a relief-valve and a spring for closing the same, of a valve-operating rod and cam adapted to move said inlet-valve either within or beyond the limits of movement of said piston and also to open said relief-valve, substantially as described. 15 20

In testimony whereof I have signed my name to this specification in the presence of two witnesses.

FRANK W. MERRITT.

Witnesses:

BERNARD J. ISECKE,  
HENRY V. BROWN.