No. 743,985. PATENTED NOV. 10, 1903.

C. W. A. KOELKEBECK.

VALVE.

APPLICATION FILED JAN. 20, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

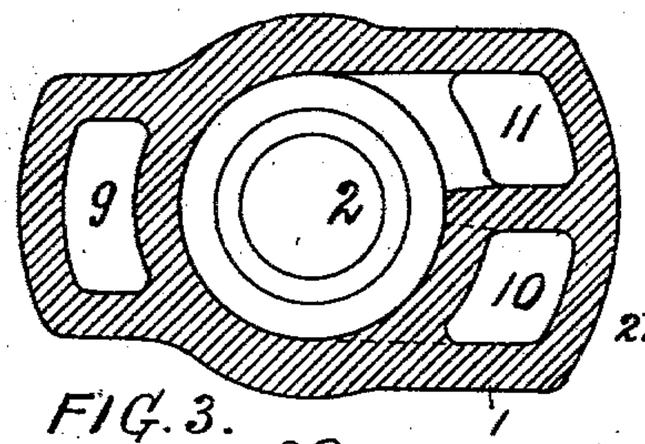


FIG. 3.

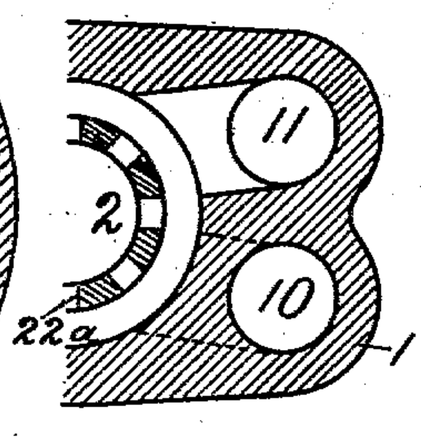
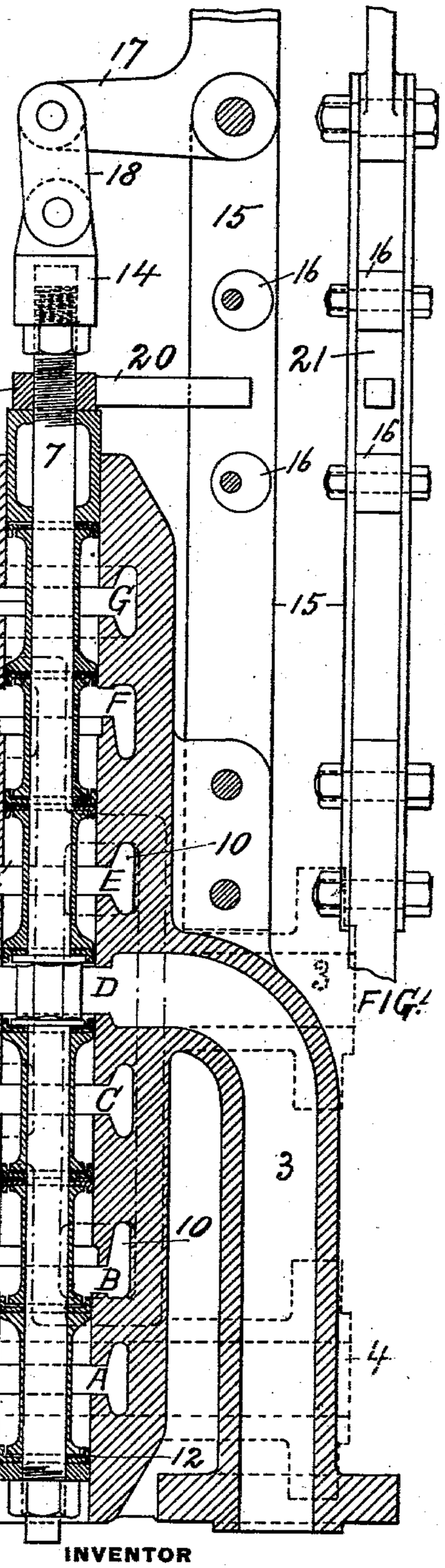


FIG. 9.



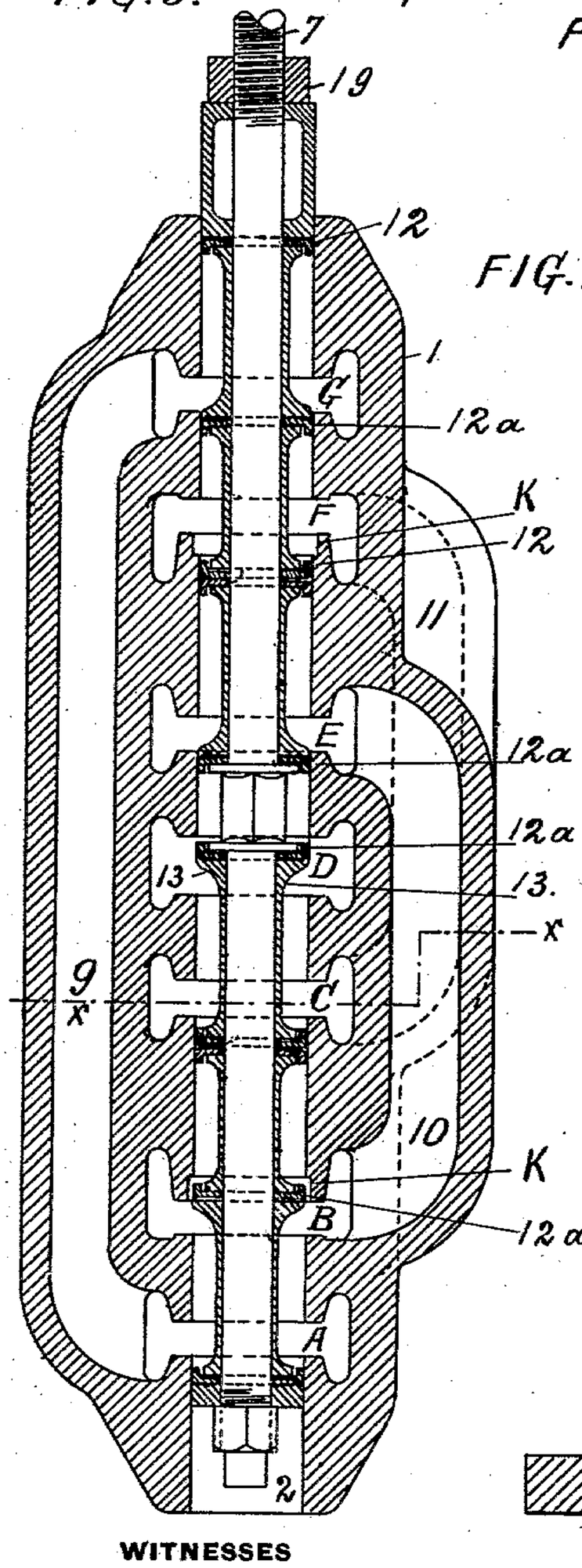


FIG. 2.

FIG. 1.

WITNESSES

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NO MODEL. 2 SHEETS—SHEET 2.

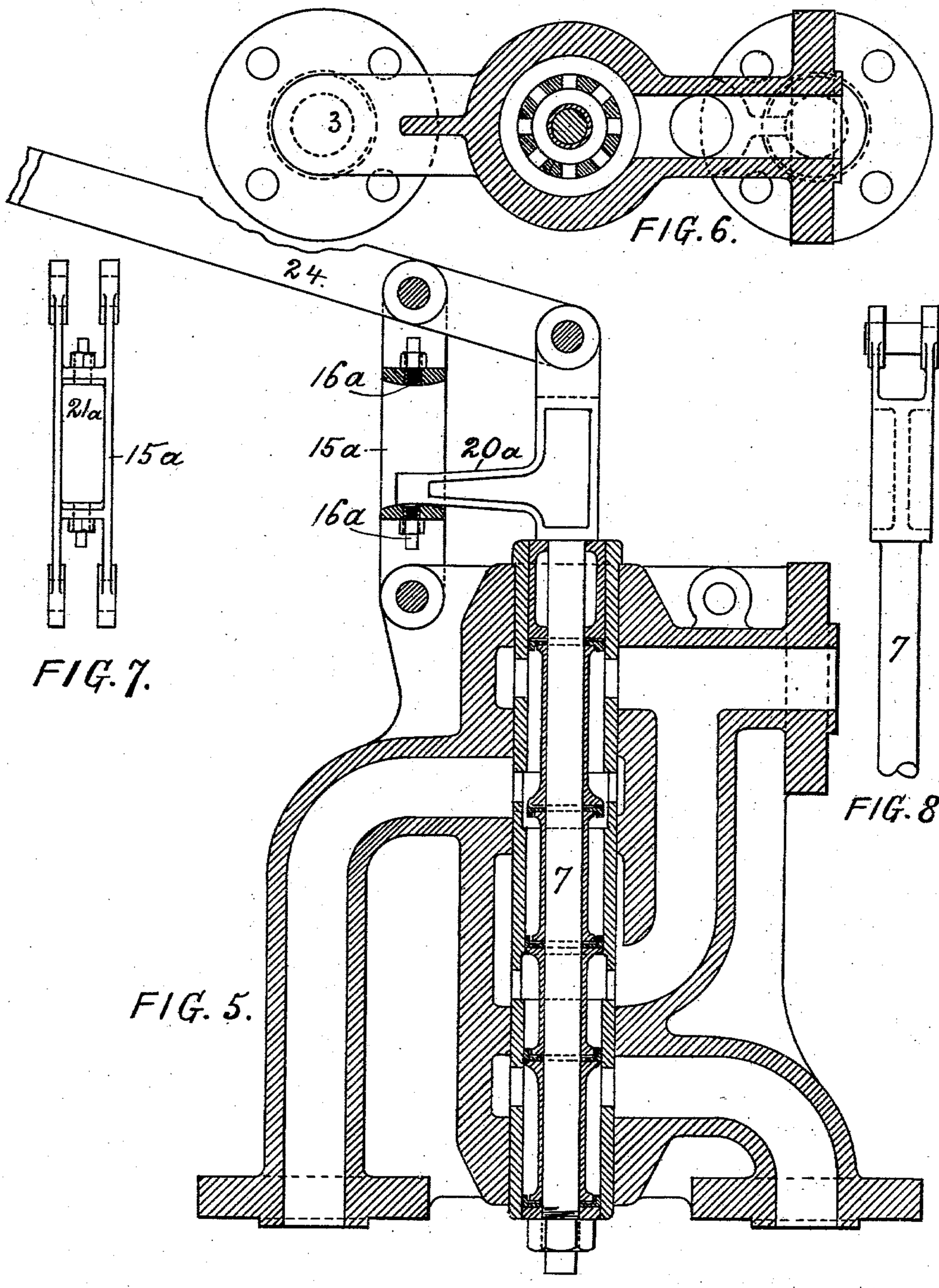

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 5.

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UNITED STATES PATENT OFFICE.

CARL W. A. KOELKEBECK, OF PITTSBURG, PENNSYLVANIA.

VALVE.

SPECIFICATION forming part of Letters Patent No. 743,985, dated November 10, 1903.

Application filed January 20, 1900. Serial No. 2,206. (No model.)

To all whom it may concern:

Be it known that I, CARL W. A. KOELKEBECK, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Valves, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improvement in valves, and more particularly to a new and improved valve mechanism designed to be employed for regulating the flow of fluid to and from hydraulic motors, such as the cylinders of hydraulic machinery.

To this end the invention consists of a new and improved valve, of means for automatically regulating the stroke of the valve-plunger, and in the construction and arrangement of ports, all as hereinafter set forth.

In the accompanying drawings, which illustrate applications of my invention, Figure 1 is a central vertical sectional view of a four-way valve and a side elevational view of the lever and adjusting mechanism; Fig. 2, a central vertical sectional view taken at right angles to view shown by Fig. 1; Fig. 3, a cross-sectional view on line $x\ x$ of Fig. 2; Fig. 4, a detailed end view of a standard, showing adjustable stops; Fig. 5, a central vertical sectional view of a three-way valve; Fig. 6, a sectional plan view; Fig. 7, a detailed side view showing modified form of adjusting mechanism; Fig. 8, a side view of upper end of valve-stem shown in Fig. 5, and Fig. 9 a cross-sectional view showing passages circular instead of the shape shown by Fig. 3. This figure also shows a bushing.

Referring to the drawings, the casing or casting 1 has formed therein a central bore 2, the fluid-supply passage 3, the main exhaust or waste passage 4, and the machine passage or passages 5. I find it to be a highly satisfactory arrangement to have the axis of the supply-passage and the waste-passage parallel with the axis of the central bore and have them lead into the sides of the valve; but, if desirable, they may be located as shown by dotted lines in Fig. 1.

Surrounding the central bore 2, which extends longitudinally throughout the length of the casing and in which the valve-stem 7 is located, are a number of annular ports or chambers A, B, C, D, E, F, and G. These ports or chambers are preferably formed in the casting and are in open communication with the central bore 2. The several passages above mentioned, as well as the waste-passage 9 and the by-passages 10 and 11, lead to these annular chambers. The ports or chambers into which the supply, machine, and main exhaust or waste passages lead are clearly shown by Fig. 1, and the ports into which the passages 9, 10, and 11 enter are particularly shown in Fig. 2. The by-passages are one of the characteristic features of the present invention, and their function and importance will be readily seen by those skilled in the art. The cross-section of these passages may be in the form shown by Fig. 3, or it may be circular, as shown by Fig. 9.

A number of cup-leathers 12 and 12^a surround the valve-stem 7 and are held in place thereon by the encircling sleeves 13, which latter are retained in position in the usual manner. While these cup-leathers 12 and 12^a are similar in form and material, their functions are somewhat different, and for the purpose of distinguishing the cup-leathers those marked 12 will be termed "sealing" cup-leathers, and those marked 12^a "controlling" cup-leathers. The center cups 12^a control the flow of fluid from the port or chamber D and the two other controlling-cups 12^a from the chambers B and F. It will be noticed that the width of the opening of the annular chamber D in immediate communication with the central bore is greater than the corresponding openings of chambers B and F and that the width of the controlling cup-leathers is much less than these openings. The bore 2 at the entrance of chambers B and F is enlarged or counterbored, as shown at K, for the purpose of allowing the cup-leathers to reënter the bore without danger of injury to the cups and to save the wear on the cups caused by the rush of fluid. The upper end of the valve-stem is connected to the lever and adjusting mechanism by means of an internally-screw-threaded cap 14. This mech-

anism, as illustrated in Fig. 1, comprises a yoke or standard 15, securely attached at its lower end to the valve-casing and provided with adjustable stops 16. These stops are suspended in the yoke or standard by bolts, which latter are inserted in holes in the sides of the yoke. The stops may be readily moved to the desired positions. The lever proper is pivoted to the upper end of the standard 15 and its short arm 17 connected with cup 14 by means of the links 18. A nut 19, having an outwardly-extending arm 20, which latter is adapted to enter and travel through the opening 21 of the standard 15, is securely fastened to the valve-stem and reciprocates with it. This arrangement provides a simple and efficient means for regulating the stroke of the plunger in its upward and downward movement and prevents a careless operator from moving the plunger in such a manner as to cause injury to the valve, particularly the cup-leathers.

In the construction of the four-way valve it is sometimes desirable to employ a bushing. If this is so, a suitable bushing 22^a may be employed, as is shown by Fig. 9.

In Fig. 5 of the drawings I have shown a three-way valve and a modified form of lever and adjusting mechanism. In this form the end of the valve-stem 7 is enlarged and bifurcated, as particularly shown by Fig. 8, and is connected with lever 24, which latter is supported by standard 15^a. Standard 15^a is joined to the lever and the valve-casing by pins and moves on said pins upon the movement of the lever. The stops 16^a comprise in this instance a fixed cross-piece preferably made integral with the yoke and the adjusting-bolts adapted to pass through the cross-pieces.

The operation of my valve, referring first to the four-way valve, shown by Figs. 1 and 2, is as follows: When the ports are in position, as shown by Fig. 1, the valve is closed, and fluid cannot flow to nor from the motor. Raising the plunger by means of the lever mechanism until the arm 20 strikes against the adjustable stop 16 the controlling cup-leather 12^a, protecting the lower opening of the annular port or chamber D, will have been raised a sufficient distance to permit the fluid to pass from the supply-passage 3 through chamber or port D, down through central bore 2 to port or chamber C, from which latter chamber it enters the passage 5, leading to cylinder. Fluid under pressure also enters and fills the by-pass 11. As soon as the fluid enters the lower machine-passage 5 water from the machine is exhausted through the upper machine-passage 5 into port or chamber E, from thence down by-passage 10 to annular port B into central bore 2, then downwardly to port or chamber A, from which it flows to the main exhaust nozzle or passage 4. By reversing the movement of the valve-stem until it reaches the position as illustrated in Fig. 1 the supply of fluid to the machine is cut off. Continuing the downward movement of the plunger having the cup-leathers arranged thereon, as described, until the arm 20 strikes the other adjustable stop 16, the cup-leather controlling the passage from the port or central chamber D to the central bore 2 will have been lowered sufficiently to allow the fluid to flow up through the bore 2 into port E and then to the machine through upper passage 5. When this is effected, fluid from the machine will be exhausted through lower passage 5 to annular port C, upwardly through by-passage 11 into port F, and from thence to the main exhaust-passage 4 by way of the port G, side waste-passage 9, and annular chamber or port A. The function of the sealing cup-leathers 12 during this operation is apparent. At the same time the fluid is passing to the upper machine-passage fluid under pressure enters and fills by-pass 10.

Attention is called to the fact that in the operation of my valve the fluid in all cases, whether entering or leaving the main bore 2 of the valve, passes to the rear of the controlling cup-leathers. The purpose of this is to allow the cup-leathers to pass a port or ports without the danger of being injured and to reduce the wear on the cup-leathers to a minimum.

A very important feature of the present invention is the adjusting mechanism shown. By this I am enabled to throttle the fluid down to its lowest desirable speed. The good results accomplished by this method of regulating the flow of fluid through the valve will be readily appreciated by those skilled in the art to which this invention relates, for experience has proved that cup-leathers exposed to the rush of water will last in inverse ratio to the velocity with which the water is forced through the valve.

By practical use I have demonstrated the utility and efficiency of the valve embodied in the present invention and am satisfied that it has many advantages over hydraulic valves heretofore employed and that it obviates serious defects that have hitherto existed in this class of valves.

Having thus described my invention, what I claim is—

1. In a single-bore valve, the valve-casing, fluid-supply, machine, and exhaust-passages, a central bore, a plunger provided with sealing cup-leathers and controlling cup-leathers, said supply and exhaust passages located on opposite sides of the central bore, a series of annular chambers in communication with the central bore, a by-pass connecting the upper and lower annular chambers, and intermediate by-passes each respectively in communication with a machine-passage and with an annular chamber located between a machine-passage and the upper and lower annular chambers, substantially as set forth.

2. In a valve, the valve-casing, fluid-supply, machine and exhaust passages, a central bore, a plunger, a standard, or yoke, provided with adjustable stops adapted to engage with means on the plunger for regulating the stroke of the plunger and means for moving the plunger, substantially as set forth.

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

CARL W. A. KOELKEBECK.

Witnesses:
EDWARD B. VAILL,
W. G. DOOLITTLE.