

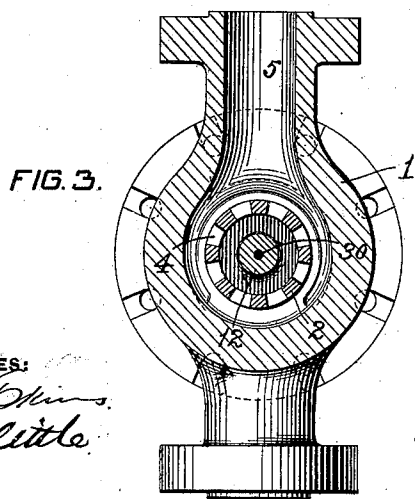
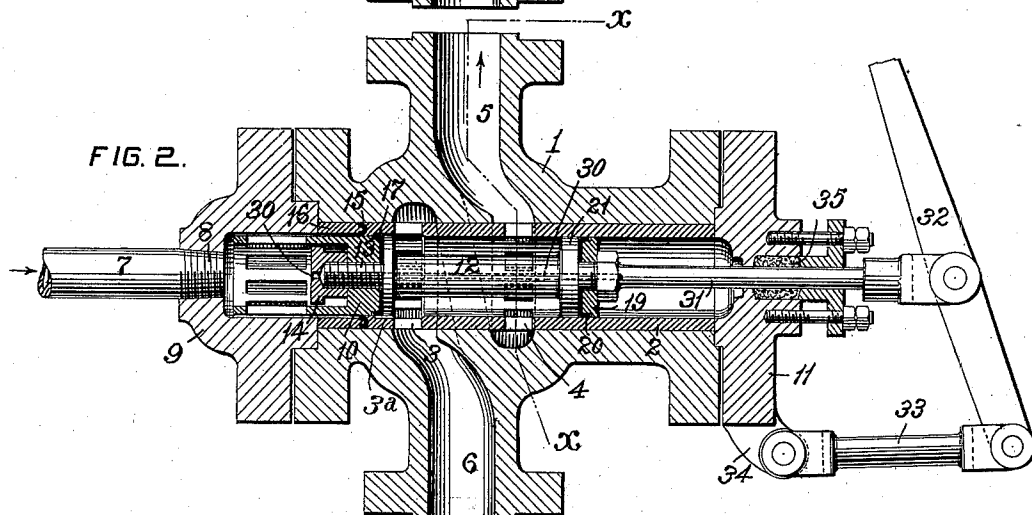
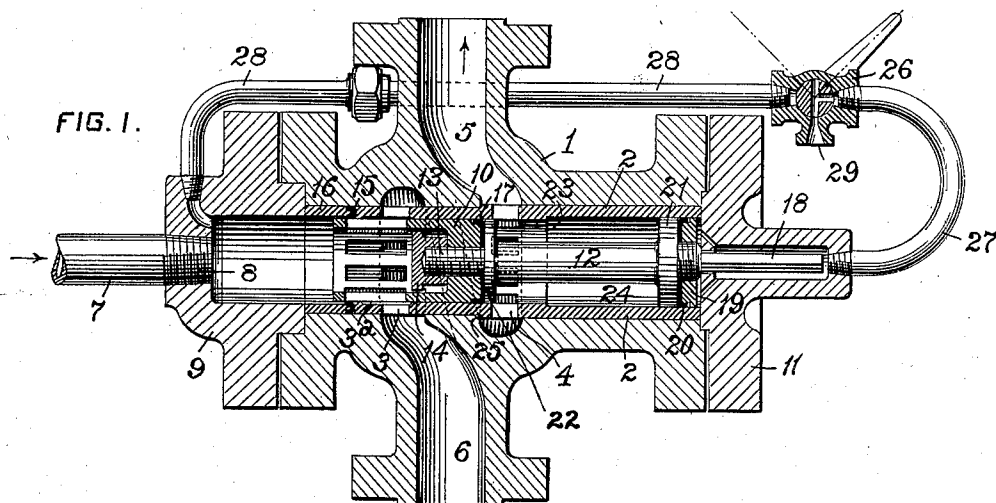
No. 653,187.

Patented July 3, 1900.

J. K. SMITH.
VALVE FOR HYDRAULIC MACHINERY.

(Application filed Mar. 8, 1899.)

(No Model.)



WITNESSES:

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UNITED STATES PATENT OFFICE.

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VALVE FOR HYDRAULIC MACHINERY.

SPECIFICATION forming part of Letters Patent No. 653,187, dated July 3, 1900.

Application filed March 8, 1899. Serial No. 708,254. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH K. SMITH, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Valves for Hydraulic Machinery, of which improvement the following is a specification.

This invention relates to an improvement in valves, and more particularly to a new and improved valve designed to be employed in connection with hydraulic machinery; and its objects are to provide means whereby the fluid-pressure may be utilized to move the parts controlling the passage of the fluid to the machine and to the exhaust, a new and improved bushing that may be readily inserted in and removed from the valve-casing, a construction such that will permit of the parts subjected to the greatest wear to be easily replaced by new parts, and to strengthen and render more efficient the working parts of the valve.

It consists of certain features of construction and combinations of parts, all as more fully hereinafter set forth.

In the accompanying drawings, which illustrate applications of my invention, Figure 1 is a central vertical sectional view showing a pilot-valve in connection therewith; Fig. 2, a central vertical sectional view of a modified form of my invention; and Fig. 3, a partly sectional view and partly elevational view, the section being taken on the line xx of Fig. 2.

In the construction of large valves to be used with hydraulic machinery for which an enormous pressure of fluid is required it is essential that the valves should be simple in construction and of great strength. The parts subjected to wear should be capable of ready removal, so that new parts can be inserted in place thereof, and the valve should be capable of easy operation. These important features are embodied in the present invention.

Referring to the drawings, the valve-casing 1, preferably made of cast-iron, has a central bore, in which the bushing 2 is located. This bushing 2, preferably made of bronze or some similar material, may be readily inserted in and removed from the casing. It

is provided with two series of ports 3 and 4. An exhaust-passage 5 communicates with the bore, and 6 is a passage communicating with the machinery which is to be operated by the hydraulic pressure. As illustrated, the fluid-supply is introduced to the valve through the pipe 7 and the passage 8 in the cap 9. The cap 9 is adapted to receive a portion of the cage-valve 10 when the latter is in the position shown by Fig. 2 of the drawings. The cap 9 may be fastened to the casing in any suitable manner, and to the opposite end of the casing another cap or bonnet 11 is secured. A valve-stem or plunger 12 having enlarged heads is securely fastened to the valve 10 by means of the screw-stem 13, which passes through a screw-threaded hole in the head of the valve and the jam-nut 14. A U-shaped packing-ring or cup-packing 15 is interposed between one end of the bushing 2 and a follower 16, which latter is held in place against the cup-packing by a shoulder on the cap 9, which presses firmly against it. The cup-packing 15 performs a double function—that is to say, it prevents the fluid from passing behind the bushing 2 or between the bushing and the valve-casing and also forms a seal when the valve 10 is back in the position shown in Fig. 2. Between the head of the valve 10 and one of the enlarged ends of the valve-stem or plunger 12 a cup-leather 17, adapted to reciprocate with said valve, is placed. This cup-leather makes a seal between the exhaust-passage and the passage to the machine while the fluid is passing from the inlet-passage to the machine-passage. The opposite end of the valve-stem or plunger 12 has an enlarged head, an externally-screw-threaded collar, and a square extension-stem 18. Stem 18 extends into and slides within a corresponding square hole in the cap 11. The object in making the stem 18 square is to prevent the valve-stem and valve from turning as they travel forward and backward within the bushing. A screw-threaded follower 19 screws onto the threaded collar extending out from the enlarged head of the valve-stem, and between this follower and the head another cup-leather 20 is clamped.

In Fig. 1 of the drawings the head 21 of the valve-stem or plunger is of greater diameter than the head 22 on the opposite end of the

stem and the internal diameter of the bushing 2 to the left of head 21 is, up to the shoulder 23, of greater diameter than the remaining portion of the bushing. During the time the supply of fluid to the machine is cut off the chamber 24, through which the head 21 travels, is filled with fluid from the main source of supply, and owing to its greater area an unbalanced pressure is maintained. This unbalanced pressure is controlled by a three-way pilot-valve, which will be fully hereinafter described. A shoulder 25 on the bushing 2 comes in contact with and is pressed against a wall of the exhaust-passage 5. The purpose of this shoulder is to prevent the fluid from being forced between the bushing and the valve-casing.

The construction shown by Fig. 1 of the drawings is especially designed for use where an enormous pressure is required, and I have shown a three-way pilot-valve 26 in connection with the main valve. The pilot-valve illustrated is connected with the main valve by pipes 27 and 28 and is provided with an exhaust-port 29, through which the fluid is discharged.

The modified form shown by Fig. 2 is particularly applicable where less pressure is required to operate the machinery. In this instance the diameter of the bushing 2 is the same throughout its length and the heads of the valve-stem or plunger are of the same size. A small port 30, running from the valve 10 through valve-stem 12, allows fluid to pass from the supply-inlet to the chamber to the right of the head 21, and the pressure is balanced. A stem 31, connected at one end with the head of the valve-stem or plunger 12 and at the other end pivotally joined to a lever 32, passes through the cap 11. The operating-lever 32 at one end is pivotally connected with a post 33, which latter is supported by an extension 34 from the cap 11. The usual packing 35 is employed. The bushing 2 is slightly cut away, as shown at 3^a, for the purpose of permitting the cup-leather 17 to pass over the ports 3 without causing the lip of the cup to come in contact with the ports, thereby preventing the cup-leather from catching on the edges of the ports and greatly lessening the wear on the leather.

The operation of the valve, reference first being made to Fig. 1, which shows the pilot-valve connected with the main valve, is as follows: When the ports are in the position as shown by this figure, water or other fluid passes from the inlet to the machine through the cage of valve 10, whose openings register with the ports 3 of the bushing 2. These ports 3 are in alinement with the annular passage 6, leading to the machine. Communication between the exhaust-passage 5 and the passage 6 while the fluid is being delivered to the machine is cut off by the cup-leather 17. When it is desired to stop the supply of fluid to the machine, the three-way pilot-valve 26 is turned so as to permit the fluid to pass

from the main supply through pipe 28 and pipe 27 into the cap 11 and against the head 21 of the valve-stem. Owing to the greater diameter of the chamber 24 the pressure on the right of head 21 overcomes the pressure against the other head of the valve-stem and the valve 10 is forced back, cutting off communication between the supply-passage and the passage leading to the machine. While the valve 10 is in this position, communication between the exhaust-passage 5 and the passage 6 to the machine will be established, allowing the fluid from the machine to exhaust through the passage 6, ports 3 and 4, and thence through passage 5, from which it may be conducted to any convenient point. The valve 10 is moved forward by releasing the fluid in the chamber 24 and the pipe 27 through the exhaust-passage 29 of the pilot-valve. The forward movement of the cage-valve, together with the plunger or valve-stem, is effected by the pressure of the flowing fluid upon the reduction of pressure in the chamber 24 and pipe 27, which reduction is caused by the discharge of fluid through passage 29 of the pilot-valve. Thus it will be seen that the main fluid-supply is utilized to move the plunger and cage-valve forward, so as to permit the passage of fluid from the inlet to machine passage.

In the form of valve shown by Fig. 2, which, as stated above, is particularly designed for use where a lesser pressure is required to operate the machine, I do not employ a pilot-valve, as the valve proper may be readily operated by the hand-lever 32 in the usual manner.

What I claim is—

1. In a valve, the combination with the valve-casing, of a bushing having two series of ports, a fluid-supply passage, an exhaust-passage and a passage to the machine, one of the series of ports in the bushing registering with the passage to the machine and the other series of ports registering with the exhaust-passage, a cage-valve 10 in the supply-passage and connected with a valve-stem having enlarged heads, and a cup-leather between one head and the valve 10, substantially as set forth.

2. In a valve, the combination with the valve-casing, of a bushing having a series of ports 3 and 4, a fluid-supply passage, an exhaust-passage and a passage to the machine, a cage-valve 10 in the supply-passage and connected with valve-stem 12, cup-leather 17, cap 9, a follower 16, and a cup-packing 15, held between said follower and one end of the bushing, substantially as set forth.

3. In a valve, the combination with the valve-casing, of a bushing having a series of ports 3 and 4, a fluid-supply passage, an exhaust-passage and a passage to the machine, a cage-valve 10 in the supply-passage and connected with valve-stem 12, and a cup-leather between the valve-stem and the cage-valve, adapted to make a seal between the

exhaust-passage and the passage to the machine while fluid is passing from inlet to machine passage, substantially as set forth.

4. In a valve, the combination with the valve-casing, of a bushing having a series of ports 3 and 4, a fluid-supply passage, an exhaust-passage and a passage to the machine, a cage-valve 10, valve-stem 12, said cage-valve in the supply-passage and arranged to reciprocate with the valve-stem a cup-leather 17, and a cup-packing 15 securely held against the end of the bushing, substantially as set forth.

5. In a valve, the combination with the valve-casing, of a cylindrical bushing having a series of ports 3 and 4, said bushing for a portion of its length being of greater internal diameter than the remaining portion, a fluid-supply passage, an exhaust-passage and a passage to the machine, a cage-valve, a valve-stem having enlarged heads, one of the heads having a greater diameter than the other head, cup-packing, and cup-leathers, substantially as described.

6. In a valve, the combination with the valve-casing, a fluid-supply passage, an exhaust-passage and a passage to the machine, a bushing having two series of ports, one series registering with the exhaust-passage and the other series registering with the passage to the machine, a cage-valve in the supply-passage and connected with a valve-stem having enlarged ends, and cup-leathers held against the ends of the valve-stem, substantially as set forth.

7. The combination, with a main valve having a fluid-supply passage, an exhaust-passage and a passage to the machine, of a bushing provided with ports one registering with the exhaust-passage and one with the machine-passage, said bushing for a portion of its length being of greater internal diameter than the remaining portion, a cage-valve in the supply-passage connected with and adapted to move with the valve-stem, cup-packing and cup-leathers, and a three-way pilot-valve connected with the main valve, substantially as set forth.

8. In a valve, the combination, with the valve-casing having an exhaust-passage and

a passage to the machine, of a removable bushing provided with ports registering with said passages, a valve-stem provided with enlarged heads one head being of greater diameter than the other, a cage-valve, caps on the ends of the casing one adapted to receive a square stem connected with one head of the valve-stem and the other cap containing the fluid-supply passage and adapted to receive a portion of the cage-valve, substantially as set forth.

9. In a valve, the combination, with the valve-casing, of a fluid-supply passage, an exhaust-passage and a passage to the machine, a removable bushing having two series of ports one registering with the passage to the machine and the other with the exhaust-passage, said bushing for a portion of its length being of greater internal diameter than the remaining portion and provided with an external annular shoulder adapted to bear against a wall of the exhaust-passage, a valve-stem having enlarged heads at both ends one head being of greater diameter than the other, a cage-valve in the supply-passage and connected with the valve-stem, cup-leathers arranged on both heads of the valve-stem, and a pilot-valve connected with the main valve, substantially as set forth.

10. In a valve, the combination, with the casing, of inlet, machine and exhaust passages, a removable bushing provided with ports registering with the machine and exhaust passages, a plunger adapted to reciprocate within the bushing, a cage-valve in the inlet-passage and connected with the plunger, a pilot-valve, said plunger and cage-valve arranged to utilize the fluid-pressure to move them, and a cup-leather held between one end of the plunger and the cage-valve which is adapted to make a seal between the machine and exhaust passages while the fluid is passing to the machine, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOSEPH K. SMITH.

Witnesses:

EDWARD B. VAILL,
W. G. DOOLITTLE.