J. FOLCO.

FLUID PRESSURE VALVE.

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940,385. **Patented Nov. 16, 1909.**

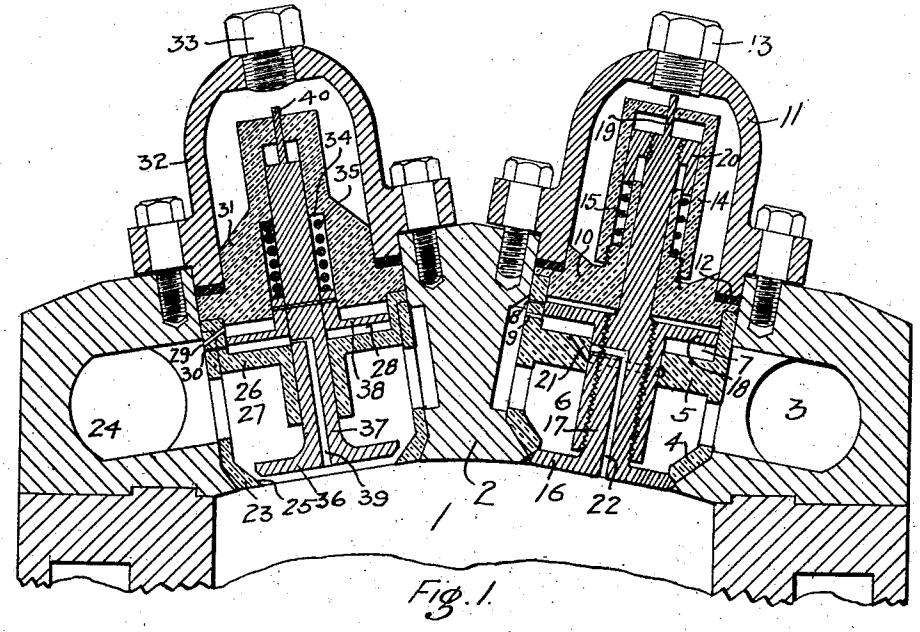

Fig. 1.

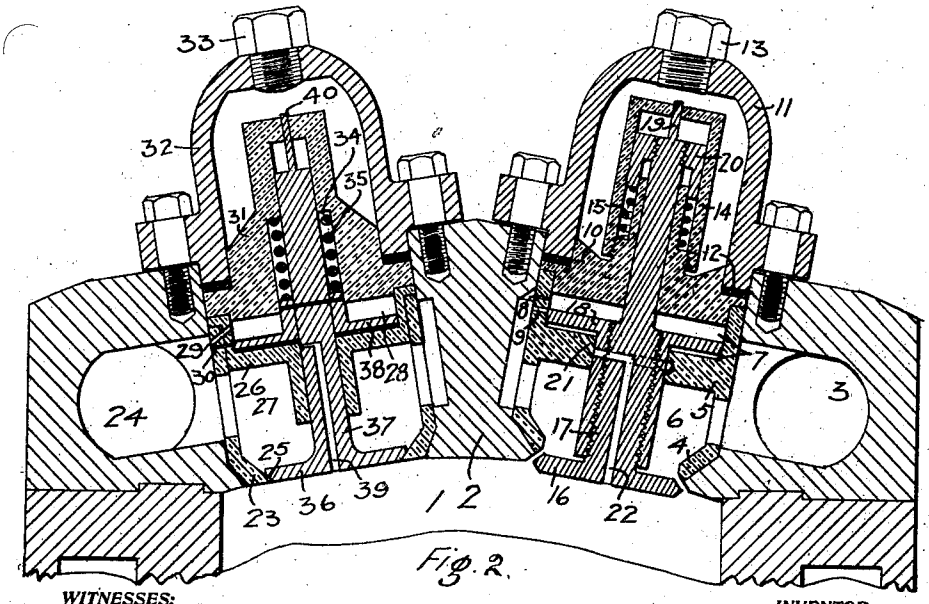

Fig. 2.

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FLUID-PRESSURE VALVE.

940,385. Specification of Letters Patent. Patented Nov. 16, 1909.

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To all whom it may concern:

Be it known that I, JOSEPH FOLCO, a citizen of the United States of America, residing at Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Fluid-Pressure Valves, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to valves and especially to that class of valves known as puppet valves wherein the valve consists of a disk having motion along its axis.

The object of my invention is to provide a valve adapted for use in fluid pumps, such as air, ammonia and other similar bodies, in which the valve will have a more positive motion and will not chatter.

My invention is adapted for use with either an inlet or an outlet valve and both forms thereof are illustrated in the drawings, in which—

Figure 1 is a vertical cross-section of the head of a cylinder for compressing ammonia showing the valves in the positions assumed when the piston is making its upward stroke, and Fig. 2 is a similar view showing them in the positions assumed when it is moving downward.

Similar numerals of reference refer to similar parts throughout the several views.

In order to point out that the two valves illustrated are really the same in principle and action, I will first give a broad description of the principal common points thereof and will follow with a more detailed description of each valve separately.

The valve stem has two valve disks mounted on it, the primary disk being adjacent the cylinder and being acted on by the pressure therein and controlling the connection between the cylinder and the passages in the cylinder head; the secondary disk works in a secondary chamber, which is separate from the main or primary valve chamber, and is actuated by the primary disk when it moves from its closed to its open position. When the valve is thus opened, a passage is opened giving communication from the cylinder to the secondary chamber so that the pressure therein will act on the secondary disk (which acts as a piston in the secondary chamber) and thus increases the force which holds the valve in this position against the action of the valve spring, thus reducing the effectiveness of the spring so long as the secondary chamber has the cylinder pressure in it. Then when the piston reverses its motion the primary valve immediately closes and shuts off the secondary chamber from the cylinder pressure; and the pressure therein is allowed to escape comparatively slowly into the passages in the cylinder head and thus the secondary disk acts as a cushion or buffer so that the main valve does not hit its valve seat with such force as to make it chatter thereon.

Further features of my invention are, that the action of the valves can be inspected and watched without interfering with the operation of the machine by simply removing an inspection plug; and that the valve seat is held in the cylinder head under direct downward pressure on the gasket, thus reducing the leakage therefrom.

Referring now to the drawings, I shall first describe the inlet or admission valve in detail. The cylinder 1 is provided with a head 2 in which both of the valves are secured and an inlet passage 3 is formed within said head 2. The end of the passage 3 is circular in plan and of slightly larger diameter than the valve seat casting. A cylindrical hole is made from the outer or upper surface of the head 2 and passes through the above mentioned circular part of the passage 3. The lower end of the hole is beveled inward to form a seat against which the valve seat is pressed. The valve seat casting 4 is formed with its lower end beveled to fit the above mentioned bevel and consists of a hollow cylindrical body having a horizontal partition 5 across it to form two chambers 6 and 7. The walls of the chamber 6 are perforated so as to provide free communication with the passage 3 which surrounds it. The walls of the chamber 7 are also perforated by small passages 8 and 9 whose function will be described later. The chamber 6 is the main valve chamber and the chamber 7 is the secondary chamber. The chamber 7 is closed at its upper end by the casting 10 which rests on the upper edge of the walls of the casting 4 and which is pressed downward thereon by the pressure of the main cap 11 which is secured to the head 2 by means of screws. A gasket or other packing 12 is placed between the cap 11 and the casting 10 to prevent any leakage around the sides of the casting 10. The cap 11 is made hollow and extends upward

from the head 2 and is provided with a removable inspection plug 13 at its top. The casting 10 also extends centrally upward around the valve shank, as hereinafter described, and has a shell 14 screwed to it to cover the upper end of the said shank. The valve spring 15 is placed within the shell 14 and around the upward extension of the casting 10. The valve comprises a disk 16 suitably beveled to fit the bevel of the valve seat formed on the outer lower edge of the casting 4. This disk 16 has a shank 17 extending upward therefrom and a secondary disk 18 secured to the shank 17 and fitting in the secondary chamber 7. The shank 17 passes through the partition 5, between the chambers 6 and 7, and through the center of the casting 10 and has a small projection 19 extending up through the top of the shell 14. A hollow nut 20 is screwed on the upper end of the shank 17 and fits in the shell 14 and around the upward extension of the casting 10 and engages the spring 15, so that when the valve 16 is opened the spring is compressed between the casting 10 and the nut 20. A passage 21 is formed in the partition 5 leading from the hole therein, for the shank 17, to the chamber 7. A passage 22 is made from the disk valve 16 up the center of the shank to a point so as to communicate with said passage 21 when the valve 16 has been slightly opened. The positions of the above mentioned small passages 8 and 9 through the walls of the chamber 7 are such that when the valve 16 and the secondary disk 18 are in their closed positions (Fig. 1), the passage 8 is closed by the disk 18 and the passage 9 opens communication between the chamber 7 (below the disk 18) and the inlet passage 3, and so that when the valve 16 is open (Fig. 2) the passage 9 is closed by the disk 18 and the passage 8 opens communication between the upper part of the chamber 7 (above the disk 18) and the inlet passage 3.

The outlet valve is similar to the above described inlet valve. The valve seat casting 23 is mounted in a cylindrical hole in the head 2 and communicates with the outlet passage 24 therein. The casting 23 is beveled at its lower end and is pressed against a similar bevel in the hole in the head 2. A valve seat 25 is formed on the inner side of the lower end of the casting 23. A secondary casting 26 fits in the upper end of the casting 23 to form therewith the main valve chamber 27 and the secondary chamber 28. The chamber 27 communicates directly with the outlet passage 24. Two small passages 29 and 30 are made in the wall of the secondary chamber 28 and lead to the outlet passage 24. A casting 31 closes the upper end of the chamber 28 and is pressed downward by the action of the cap 32 which is constructed similarly to the cap 11 and which is secured to the head 2 by suitable screws. The cap 32 is provided with an inspection plug 33. The casting 31 extends upward into the cap 32 and has a recess 34 extending up from its lower end, in which the spring 35 is placed. The valve disk 36 engages the seat 25 in the casting 23 and has a shank 37 extending upward, to which the secondary disk 38 is secured. The shank 37 passes through the casting 26 and into the casting 31 and has a small extension 40 passing through the top of said casting 31. The spring 35 acts between the shank 37 and the casting 31 so that when the valve 36 is opened the spring is compressed therebetween. A passage 39 extends through the center of the valve disk 36 and up the shank 37 to communicate with the secondary chamber 28 only when the valve 36 has been slightly opened as shown in the drawings. The position of the small passages 29 and 30 is such that when the valve 36 is closed (Fig. 2) the passage 30 is closed by the disk 38 and the passage 29 opens communication between the chamber 28 and the outlet passage 24 (above the disk 38), and so that when the valve is open (Fig. 1) the passage 30 opens communication between the chamber 28 (below the disk 38) and the outlet passage 24.

It will thus be seen that the two valves are the same in principle and have corresponding parts, and I have so arranged the cross-section lines on the drawings that corresponding parts are indicated by the same character of cross-section lines, said lines being used to indicate merely the corresponding nature of the parts and not the materials of which the parts are made.

It is evident that the valve disks 16 and 36 will act in the normal manner under the action of the difference of pressures on the two sides thereof and against the action of the springs 15 and 35; also that the disks 18 and 38, being secured to the shanks of the valves, will move with them; that when the valves 16 and 36 are closed the secondary chambers 7 and 28 are shut off from communication with the cylinder 1; that as soon as the valves 16 and 36 are slightly opened the communication is established between the cylinder 1 and the chambers 7 and 28, respectively, so as to assist the operating difference of pressures to hold the valves open by acting on the disks 18 and 38 in the same direction that they have been moved, and that at the same time the other end of the secondary chambers (on the upper sides of said disks) are open to the passages 3 and 24; that when the valves 16 and 36 are moved to close them the motion is retarded by the buffer action of said disks 18 and 38 in the secondary chambers; and that the action of either valve may be watched by unscrewing the inspection plugs 13 and 33 of

the caps 11 and 32 and observing the motion of the extensions 19 and 40 which project above the parts 14 and 31.

Having described my invention, what I claim is:

1. In a fluid pressure valve, the combination of a cylinder; a valve chamber communicating therewith and having a valve seat formed thereon; a disk valve adapted to close said valve seat; a spring engaging said valve to keep it closed against said seat; and means adapted to come into action, after the valve is opened, against the action of said spring, to reduce the effect of said spring, but to be inoperative when the valve is closed.

2. In a fluid pressure valve, the combination of a cylinder; a valve chamber communicating therewith and having a valve seat formed thereon; a disk valve adapted to close said valve seat; a spring engaging said valve to keep it closed against said seat; a secondary chamber; a secondary disk secured to the valve and fitting said secondary chamber; and a passage through said valve to the under side of said secondary disk and adapted to communicate with said secondary chamber when said valve is opened, to reduce the effect of said spring, but to be closed against communicating with said secondary chamber when said valve is closed.

3. In a fluid pressure valve, the combination of a cylinder; a valve chamber communicating therewith and having a valve seat formed thereon; a disk valve adapted to close said valve seat; a secondary chamber; a secondary disk fitting said secondary chamber; a valve shank joining said disk valve and said secondary disk and having a passage therein extending from below the disk valve to a point below the secondary disk; a spring engaging said shank to keep the valve closed against said valve seat; and a port to said secondary chamber and adapted to close the communication of said passage with said chamber when said valve is closed, but to open the communication between said parts when the valve is opened.

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

JOSEPH FOLCO.

Witnesses:
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