

PILOT VALVE.

**1,319,006.**

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# UNITED STATES PATENT OFFICE.

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## PILOT-VALVE.

1,319,006.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, RUSSELL C. KIMBALL, a citizen of the United States, residing at Salem, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Pilot-Valves, of which the following is a specification.

This invention relates to improvements in valves and particularly to the type of valves known as "pilot valves" used in connection with damper regulators.

The object of the present invention is to provide a simple, durable and economical valve which is so constructed as to prevent leakage which would affect the normal operation thereof and the working parts of which may be easily removed either for inspection or replacement.

Another object of the invention is to provide a conical valve for controlling the passage of fluid from the intake port to the delivery port and a second conical valve for controlling the passage of fluid from the delivery port to the discharge port thereof.

Still another object of the invention is to provide means for lubricating and packing the protruding stem of the valve through which connection is made with the damper operating instrumentalities.

The invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims.

Referring to the drawings:

Figure 1 is a vertical section through a valve embodying this invention.

Fig. 2 is a transverse section taken on the irregular line 2-2 of Fig. 1.

Like numerals refer to like parts in both views of the drawings.

In the drawings, 1 is a casing having an intake port 2, a delivery port 3 and a discharge port 4, all three of which have intercommunicating passages. The intake port terminates in a nipple 5 which is screw threaded for engagement with a suitable supply pipe, not shown in the drawings.

The delivery port 3 terminates in a nipple 6 and this nipple is screw threaded for connection with a suitable supply pipe and the discharge port 4 terminates in a nipple 7

which is screw threaded for connection with a suitable discharge pipe, not shown.

For convenience in manufacture and to facilitate repairs, the casing 1 is bored longitudinally at 8 to receive a core 9 formed in three sections 9', 9<sup>2</sup>, and 9<sup>3</sup>, and these sections are forced into said casing so as to make a tight joint between said core and said casing. The bore 8 extends throughout the greater length of said casing and terminates at its lower end in an enlarged internally threaded chamber 10, adapted to receive a screw threaded plug 11 which entirely closes the lower end of said casing.

The upper end of said bore terminates in an enlarged internally threaded chamber 12, which is partially filled by a screw threaded plug 13, leaving a cylindrical pocket 14 between the inner end of said plug and the end of the upper portion of said core. The pocket 14 communicates, through a passage 15, with an oil chamber 16, disposed at one side of said casing and adapted to be closed by a screw threaded plug 17. The sections 9' and 9<sup>2</sup> of said core are separated to form a recess 18 alining with the delivery port 3. This recess forms a part of the intercommunicating passage between said delivery port and the intake and discharge ports 2 and 4 respectively.

The section 9<sup>3</sup> of said core is centrally bored at 19 its entire length, that is, from the recess 18 to the chamber 12. The middle section 9<sup>2</sup> is also bored at 41 but is slightly larger than the bore of the section 9' and the lower end of said bore 41 is countersunk at 22 to form a conical seat. The lower end of the section 9<sup>2</sup> and the upper end of the section 9<sup>3</sup> are separated from each other a substantial distance to form a recess 23, which recess, together with the bore 41, constitutes a portion of the discharge passage of said valve, and communicating with said recess 23 is a passage 24 formed in the outer wall of the casing 1 and extending from said recess 23 to the discharge port 4.

A reciprocating valve 25 is arranged to substantially fit the bore 20 of the lower section 9<sup>3</sup>, said valve having a conical portion 26 constructed and arranged to seat

against the conical seat 22 of the portion 9<sup>2</sup> of said core and close communication between the delivery port 3 and the discharge port 4.

5 The valve 25 is also centrally bored at 27 which extends the entire length of said valve and provides communication between the recess 18 and the lower end of the bore 20 of the core section 9<sup>3</sup>. Communicating with  
10 the chamber 10 is a passage 28, leading to the intake port 2, said passage constituting a portion of the supply passage for said valve.

A screen or filter 29 is secured to the lower  
15 end of the portion 9<sup>3</sup> of said core and filters all of the fluid which enters the bore of said core from the intake port 2. There will be substantially at all times a pressure upon the fluid which enters the casing through the  
20 port 2, and this pressure will be exerted against the larger end of the reciprocating valve 25, at certain times, to maintain said valve against its seat 22, and to prevent leakage of said fluid around the lower portion of said valve to the recess 23, a suitable  
25 packing ring 30 is attached at the lower end of said valve by means of a screw 31. This packing ring is cup-shaped to engage the walls of said core and is forced against said  
30 walls by the pressure of the fluid.

The upper end of the reciprocating valve 25 which protrudes into the recess 18 is preferably countersunk at 32 and constitutes a seat for a needle valve 33, said needle valve  
35 being loosely secured, preferably by means of a pin 34, to the lower end of a stem 35 which is slidably mounted within the small bore 21 of the core 9, and this stem also  
40 passes through the cylindrical pocket 14 and through the plug 13, receiving sufficient lubrication from the oil contained within the pocket 14 to enable it to work freely and this oil also forms a film about the portion there-  
45 of within the small bore 21 and assists in preventing a leak at this point.

The plug 13 is recessed at 36 to receive suitable packing 37, the upper end of said recess being internally threaded to receive  
50 a screw threaded plug 38 which is bored at 39 to receive the stem 35. The upper end of said stem is enlarged at 40 for engagement with the damper regulating instrumentalities, not shown in the drawings.

The operation of the valve hereinbefore  
55 specifically described is as follows:

The reciprocating valve 25 will be normally in engagement with the seat 22 and closes the passage connecting the port 3 with the port 4, and at this time the needle  
60 valve 33 may be slightly raised from its seat 32, permitting fluid to enter through the port 2, chamber 10, screen 29, bore 20 and through the passage 27 of said reciprocating valve to the port 3, the pressure of said fluid  
65 against the large end of said valve being

sufficient to maintain said reciprocating valve against its seat.

When the mechanism to be connected with the stem 35 operates said stem to move the  
70 needle valve 33 into engagement with the seat 32 of the valve 25, the passage through said valve 25 will be closed, shutting off the supply of fluid to the port 3 and a continued movement of said stem in the same direction  
75 depresses said reciprocating valve until the portion 26 thereof is moved away from its seat 22. This movement of said valve permits the fluid, which had previously passed through the delivery port 3 into the cham-  
80 bers communicating therewith, to return through the portion 41 of the bore of said core which surrounds the portion of said reciprocating valve immediately above the conical portion thereof and this portion 41  
85 is slightly larger than the adjacent portion of said valve and constitutes a passage through which said fluid will pass through the recess 23 then through the passage 24 to the discharge port 4, and after sufficient  
90 fluid has been permitted to escape there-through, the pressure will be reduced and the mechanism engaging said stem will act to withdraw the needle valve 33 from its  
95 seat 32 and the pressure of the fluid from the intake port will act against said reciprocating valve to move the same against its seat 26; the withdrawal of the valve 33 from its seat 32 permits fluid to pass through  
100 the port 3 and out to the chambers connected therewith.

In view of the arrangement of the valves in relation to their respective passages and particularly in view of the construction of said valves, the wearing of said valves will  
105 not develop any dangerous leaks for the reason that said valves are conical in shape and any wear on the seats thereof will only cause them to seat more tightly. The valve stem 35 is arranged in such a way that any leakage due to the wear of said stem in its  
110 socket will not affect the operation of the device and all of the wear which may take place at this point may readily be counteracted by screwing down the plug 38 and thus  
115 tighten the packing surrounding said stem and the method of lubricating said stem will also serve to greatly reduce such wearing action.

Having thus specifically described my invention what I claim and desire by Letters  
120 Patent to secure is:

1. In a device of the class described a casing provided with delivery, intake and discharge ports, a fluid pressure valve adapted  
125 to be actuated by the pressure of fluid entering said intake port to close communication between said delivery port and said discharge port, and a second valve operable exteriorly of said casing to close communication between said delivery port and said in-  
130

take port and to open communication between said delivery port and said discharge port.

2. In a device of the class described a casing provided with a delivery port and having supply and discharge passages communicating with said delivery port, a reciprocating valve provided with a passage extending therethrough, constituting a portion of said supply passage, a conical valve seat for said valve, said valve being adapted to be moved, by the pressure within said supply passage, against said seat to close said discharge passage, a second valve adapted to seat on said reciprocating valve and close the passage therethrough, whereby said supply passage will be closed, and a valve stem for said second named valve, adapted to protrude from said casing, whereby said second-named valve may be operated exteriorly to open or close communication between said delivery port and said supply passage and to open communication between said discharge passage and said delivery port.

3. In a device of the class described a casing provided with delivery, intake and discharge ports, said casing also having passages connecting said intake port with said delivery port and said discharge port with said delivery port, a reciprocating conical valve adapted to be operated by fluid pressure within the passage from said intake port to said delivery port to close said discharge port, said reciprocating valve having a passage extending therethrough, and a second conical valve operable from the exterior of said casing, adapted to seat upon said reciprocating valve and to close the passage therethrough, said second named valve being also adapted to move said reciprocating valve to open said discharge passage.

4. In a device of the class described a casing provided with delivery, intake and discharge ports, said casing also having a passage connecting said intake port with said delivery port and a passage connecting said discharge port with said delivery port, a valve adapted to be operated by the pressure within the passage from said intake port to automatically close the passage from said discharge port to said delivery port, said valve having a passage extending therethrough, adapted to constitute a portion of the passage from said intake port to said delivery port, and a second valve operable toward and away from the first-named valve from the exterior of said casing adapted to seat against the end of said first-named valve and close the passage therethrough, said second named valve being also adapted to operate said first named valve to open the passage leading to said discharge port from said delivery port.

5. In a device of the class described a

casing provided with a pair of passages, a conical valve adapted to be actuated by pressure in one of said passages to close the other passage, said valve having a passage therethrough constituting a portion of a pressure passage, a second valve constructed and arranged to slide in said casing independently of said first-named valve and adapted to close the passage through said first named valve, and means connected with said second named valve, adapted to operate the same from the exterior of said casing.

6. In a device of the class described a casing provided with a pair of passages, a conical valve adapted to be actuated by fluid pressure in one of said passages to close the other passage, said conical valve having a passage therethrough constituting a portion of a pressure passage, a reciprocating valve stem arranged to protrude from said casing, and a second valve loosely connected with said stem, adapted to be operated to close the passage through said conical valve and to move said conical valve to open the passage controlled thereby.

7. In a device of the class described a casing provided with a pair of passages, a conical valve adapted to be actuated by fluid pressure in one of said passages to close the other passage, said valve having a passage therethrough constituting a portion of a pressure passage, a reciprocating valve stem arranged to protrude from said casing, a lubricant container in said casing surrounding said stem and through which said stem extends and a second valve connected with said stem, adapted to be operated to close the passage through said valve and to move said valve to open the passage controlled thereby.

8. In a device of the class described a casing provided with a supply passage and a discharge passage, a reciprocating conical pressure valve arranged to be operated by fluid pressure within said supply passage to close said discharge passage, said valve having a passage therethrough constituting a part of said supply passage, a packing ring attached to said reciprocating valve, adapted to be expanded by the pressure against said valve, and an exteriorly operated conical valve mounted independently of and adapted to seat against said reciprocating valve to close the passage therethrough and to move said reciprocating valve to open the passage controlled thereby.

9. In a device of the class described a casing provided with a supply passage and a discharge passage, a reciprocating conical pressure valve arranged to be operated by fluid pressure within said supply passage to close said discharge passage, said valve having a passage therethrough constituting a part of said supply passage, a packing ring attached to said reciprocating valve, adapted

to be expanded by the pressure against said valve, and a screen arranged at the rear of said reciprocatory valve, adapted to filter fluid passing thereto and constituting a stop  
5 for said valve.

In testimony whereof I have hereunto set

my hand in presence of two subscribing witnesses.

RUSSELL C. KIMBALL.

Witnesses:

SYDNEY E. TAFT,  
HATTIE E. STRATTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."