Oct. 17, 1933. R. C. HUGHES 1,931,386

FLUID PRESSURE REGULATOR

Filed Jan. 2, 1932

FIG. 1

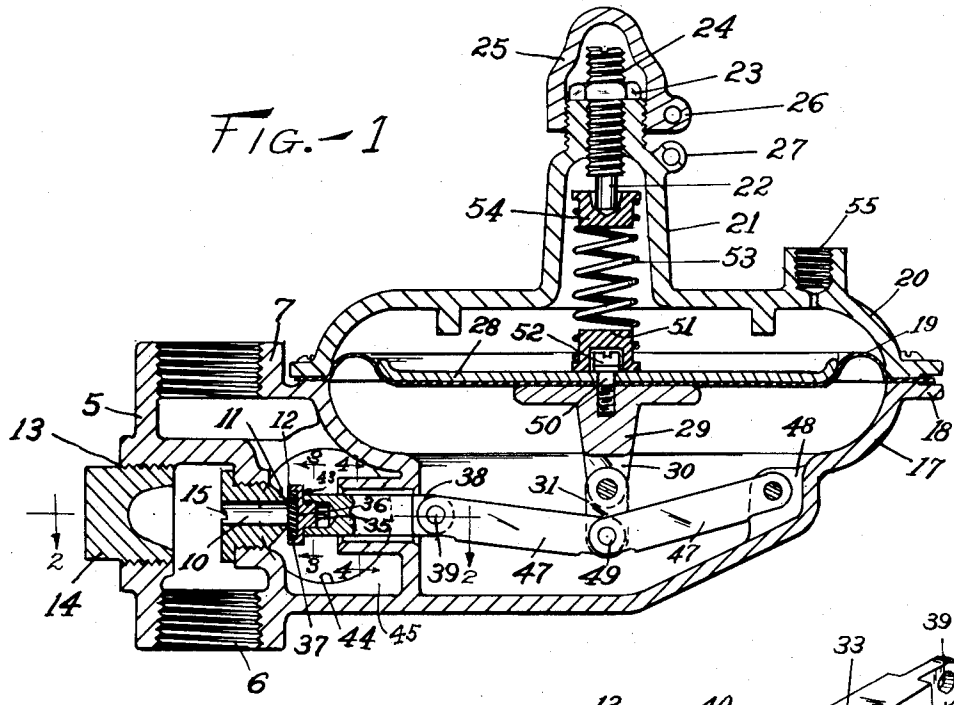


FIG. 2

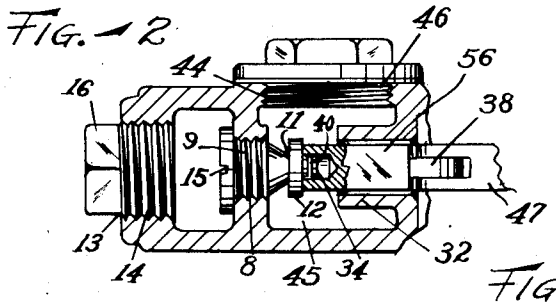
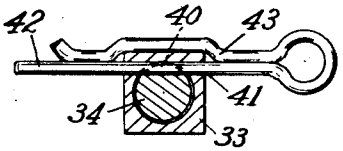


FIG. 3



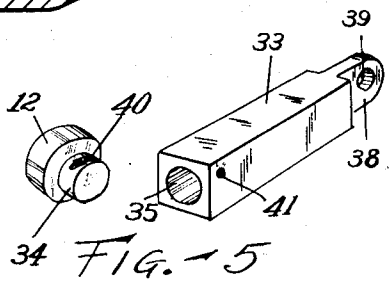
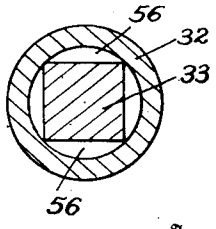


FIG. 5

FIG. 4



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FLUID PRESSURE REGULATOR

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7 Claims. (Cl. 50—26)

My invention relates to improvements in fluid pressure regulators and particularly to a type of regulator adapted to maintain uniform pressure in gas service pipes regardless of fluctuations of pressure in the supply mains.

My invention has for its object to provide a pressure regulator which will automatically respond to changes in pressure at the inlet-port thereof when the valve is open, thereby lessening undesired "throbbing" and which will be very sensitive to such variations, and in its action will be very positive and effective by reason of structure used affording high mechanical advantage in actuating the valve, though parts for such structure are positioned in small compass.

It is a further and special object of my invention to provide a construction allowing convenient and ready access to the valve and especially to the actuating parts thereof for removal of the same for repair or to remove any deposits or obstructing particles that may have accumulated in use.

Other and further objects of my invention will be hereinafter set forth and the novel features thereof defined by the appended claims.

In the following specification I have described a preferred embodiment of my improved regulator, and illustrated the same in the following drawing, in which—

Figure 1 is a central vertical section through the regulator; Figure 2 is a detail sectional view taken in the plane indicated by the line 2—2 of Fig. 1, showing the mounting of the valve seat, and certain parts being shown in detail;

Figure 3 is a longitudinal transverse section taken in the plane of the line 3—3 of Fig. 1;

Figure 4 is transverse section of the actuating pin and guide tube taken in the plane indicated by the line 4—4 of Fig. 1, and,—

Figure 5 shows in perspective detached parts of the actuating pin and clamp member.

In the illustrated embodiment of my invention I provide a valve casing 5 having an inlet connection 6 and outlet connection 7 having a communication opening 8 in which is mounted a threaded plug 9 apertured at 10 and forming a valve seat 11 at one end against which a flanged valve member 12 will be forced by means later to be described, when the valve is to be closed. The casing has also an outer opening 13 to receive a solid plug 14. These detachable parts 9 and 14 are suitably provided with the cross groove 15 and polygonal head 16, respectively, for actuation by tools, and the opening 13 is slightly larger than the plug 9 so that the latter may be inserted readily in such opening or removed therethrough for repairs. The plug 14 serves therefore as a closing plug, though it is obvious that the opening 13 might be used if desired, for the reception of other tubular connection.

The said casing 5 having the inlet and outlet connections 6 and 7 integral, includes also the lower section 17 of a flexible diaphragm mounting, and is provided with an annular flange 18 to receive thereon the edges of the flexible diaphragm 19. The upper section 20 has corresponding flanges for clamping the diaphragm against the flange 18. This upper section 20 serves both as a cover and clamping member but also comprises a cup-shaped dome 21 positioned centrally of the cover and in inverted position. The peak of the dome is threaded internally to receive adjustably therein a threaded stem 22 directed downwardly towards the diaphragm.

A lock nut 23 is provided on the threaded portion 24 of said stem to hold the stem in adjustment. Said peak of the dome is also threaded externally to receive thereon a small cover 25 having an ear 26 which may be brought adjacent the ear 27 on said dome, so that a suitable lock may be employed to prevent unauthorized removal of the cover. The diaphragm 19 is clamped between an upper apertured plate 28 and a lower support or guiding member 29. This clamping or guiding member is provided at its lower end with a pivoting fork 30 upon which is suspended link 31 for connection with actuating means for the valve member 12.

In the lower portion of the casing 5 a sleeve 32 projects outwardly and integral with the lower section 17, in horizontal alinement with the opening 8, the sleeve having an inner cylindrical surface and receiving therein the valve actuating pin 33 which is polygonal in cross section and fits neatly within the sleeves. Reciprocation of the pin 33 opens and closes the valve member 12 which is provided with a reduced neck portion 34 which is detachably mounted on one end of the pin by insertion of said portion 34 in an axial socket 35 of the pin or plunger 33.

The valve member 12 has at the end opposite the reduced portion, a shallow socket 36 for receiving therein a packing 37 against which the valve part 11 will be seated when the valve is closed. The actuating pin 33 is somewhat longer than the sleeve 32 and is provided at one end with a pivot ear 38 apertured at 39 for connection with an actuating element. In operation, the ear 38 extends inward beyond the sleeve into the casing section 17 where actuating connection is

established. The reduced end 34 of the valve 12 is detachably secured in the socket 35 by the provision of a transverse groove 40 on the surface of said end portion which, when the parts are attached, registers with a small transverse hole 41 adjacent the end of the main pin 33. A locking pin 42 has an arm insertable in said opening 41 and engaging said groove to lock the parts together, the pin 42 having a companion arm 43 for engaging the outer surface of the actuating pin 33 and thereby hold the locking pin in position.

Removal of the cotter pin 42 permits detachment of the valve 12 for repacking or other desired repair, as will be understood. An opening 44 is provided in the side wall of the valve chamber 45 and is threaded to receive a threaded plug 46 to close the same, as shown in Fig. 2. The actuating plug 33 is reciprocated in the guide sleeve 32 by pivoted links 47 one of which is pivoted to the apertured ear 38 and the other pivoted to the stationary ear 48 located substantially in alinement with sleeve 32. The said links are pivoted together at 49 and are there pivotally connected to the link 31, so that vertical movement of the diaphragm 19 will operate the links as a toggle mechanism to thereby reciprocate the parts 12 and 33 to open and close the valve 12.

The clamping parts 28 and 29 are clamped together by provision of the threaded bolt 50.

Above the clamping plate 28 is mounted a socketed head 51 for receiving therein the head 52 of the member 50, to protect the latter and having a cylindrical external surface for receiving there-around one end of the vertical coil spring 53 the upper end of which engages a socket plug 54 in which the smooth stem 22 normally rests. The parts 22 and 23 will be adjusted to exert a normal downward pressure upon the clamp member 29 and thence upon the pin 49, to exert a normal tendency to open the valve 12 against the pressure-responsive action of the diaphragm 19 which responds to the pressure in the lower section 17 to straighten the toggle members 47 and thereby force the packing 37 laterally against the valve seat 11. An internally-threaded vent 55 is provided in the upper section 20 to receive a suitable threaded plug to prevent undue trapping of gases in the chamber above the diaphragm.

In the operation of my invention the fluid pressure entering the inlet 6 opposes the valve part 12, passes through the sleeve 32 through the passages 56 about the plunger 33 and thereby exerts an upward pressure in the chamber of the lower section 17, to lift the diaphragm 19 and thereby close the valve 12 by pressing the packing 37 against the valve seat 11. This adjustment is automatic and responsive to the inlet pressure of the line. If a constant pressure of higher intensity is desired, the cover 25 may be readily removed, the clamping nut 23 loosened and the threaded stem 24 adjusted to present the desired force to the coil spring 53, the cover 25 providing a very suitable protection for the adjusted parts. A suitable lock may obviously be connected to the apertured ears 26 and 27 to avoid unauthorized tampering with the adjustment. The plug 46 may be readily removed from the aperture 44, thereby providing entrance to the chamber 45 for repair of the valve 12.

For the purpose of repacking the valve 12, the latter may readily be disconnected from the pin 33 by removing the cotter 42 laterally to repack, or to substitute a new member 12. The removal of the plug 14 as well as the plug 46 renders very feasible the removal of the plug 9 from the opening 8, which is especially practicable, since the removal of the plug 14 permits entrance of a suitable tool for rotating the valve plug 9, either for removal of the latter or for delicately adjusting the same in the aperture 8 to bring the part 11 in proper position for receiving the thrust of the actuator 33 thereagainst. It is obvious that when the three plugs 9, 14 and 46 are removed, the casing 5 is very skeleton-like in structure—making repair of the actuator 33 convenient.

It will be evident that changes may be made in the details of construction and also of the character of regulator valve to which this invention may be applied without departing from the spirit of the invention as defined by the appended claims.

Having described my invention and set forth its merits, what I claim, and desire to secure by Letters Patent, is—

1. In a gas regulator, the combination with a casing having an inner chamber and vertically alined inlet and outlet connections, a detachable plug mounted in its wall intermediate said connections and an integral and cylindrical sleeve leading to said chamber and in axial alinement with said wall plug, of a detachable but stationary threaded plug having a valve seat at one end and mounted axially intermediate the sleeve and wall plug, an elongated valve member polygonal in cross section guided for movement in said sleeve toward said valve seat, pressure responsive means in said chamber, and mechanism connected with said means for actuating said valve member.

2. In a gas regulator, the combination with a casing having an inner chamber and vertically alined inlet and outlet connections separated by an apertured partition, a detachable plug mounted in the casing wall intermediate said connections and an integral and cylindrical sleeve leading to said chamber and in axial alinement with said wall plug, of a detachable but stationary threaded plug having a valve seat at one end and mounted axially in the partition aperture, a detachable plug mounted in the casing wall and directed axially at an angle to said valve seat plug, an elongated valve member polygonal in cross section guided for longitudinal movement in said sleeve toward said valve seat, pressure responsive means in said chamber, and mechanism connected with said means for actuating said valve member.

3. In a gas regulator, the combination with a casing having an inner chamber and vertically alined inlet and outlet connections separated by an apertured partition, a detachable plug mounted in the casing wall intermediate said connections and an integral and cylindrical sleeve leading to said chamber and in axial alinement with said wall plug, of a detachable but stationary threaded plug having a valve seat at one end and mounted axially in the partition aperture, an elongated valve member guided for longitudinal movement in said sleeve toward said valve seat and comprising detachable members having registering apertures and locking pin device for disconnecting and securing said members in axial relation for repair purposes, and pressure responsive means connected with said valve member for actuating said valve member in said sleeve.

4. In a gas regulator, the combination with a casing having an inner chamber and vertically

alined inlet and outlet connections separated by an apertured partition, a detachable plug mounted in the casing wall and directed axially at an angle to the aperture of said partition, of a detachable but stationary threaded plug having a valve seat at one end and mounted axially in the partition aperture and having a longitudinal opening therethrough concentric with said aperture, an elongated valve member comprising detachable members having a common axis and telescopically connected and provided with transverse registering openings, a detachable locking pin fitting said openings and positioned within the range of said casing wall plug, so that removal of the latter renders the locking pin manually accessible, cylindrical guiding means for said valve member axially in alinement with said partition aperture, and pressure responsive means connected with said valve member for actuating the latter in said guiding means.

5. In a gas regulator, the combination with a casing having an inner chamber and spaced and alined inlet and outlet connections separated by an apertured partition, a detachable plug mounted in the casing wall and directed axially at an angle to said partition aperture, and a detachable threaded plug mounted in the partition aperture and having an axial opening and a valve seat at one end, of an elongated valve member movable longitudinally toward and from said valve seat, tubular guiding means for said valve member leading to said chamber and valve member axially in alinement with said valve seat, pressure responsive means within said chamber, and mechanism connected with said responsive means for actuating said valve member to determine the effective opening in said partition plug and the flow of gas from one connection to the other.

6. In a gas regulator, the combination with a casing having a pressure chamber and integral inlet and outlet connections separated by an apertured partition, a detachable threaded plug fitting a wall aperture of the casing and axially directed toward said partition aperture, and an axially apertured threaded plug fitting said partition aperture and having a raised valve seat at one end, of a stationary tubular guide integrally mounted in said casing and alined with said valve plug, a composite valve member longitudinally movable in said guide and comprising a polyhedral portion having an apertured ear at one end and a shallow socket in the other, and a valve head portion comprising a reduced neck for fitting axially in said socket and an enlarged and flanged outer portion for carrying valve packing, said neck having a transverse external groove to register with a transverse opening through the socket walls, a cotter pin for fitting said transverse opening and groove to lock the parts detachably together, pressure responsive means mounted in said chamber, and actuating means connecting said pressure responsive means with said apertured ear for operating said partition valve.

7. In a gas regulator, the combination with a casing having a pressure chamber and integral inlet and outlet connections separated by an apertured partition, an axially apertured elongated plug detachably fitting said partition aperture and having a raised valve seat at one end, and a plurality of detachable plugs mounted in wall apertures of the casing in a common plane and directed toward said valve seat, of a stationary cylindrical guide mounted in alinement with said partition plug, a composite valve member longitudinally movable in said guide and comprising a polyhedral portion having a pivot ear at one end and a shallow socket in the other, and an enlarged portion comprising a reduced neck for fitting said socket and means at its opposite end for carrying valve packing, said neck having a transverse external groove and the walls of the socket having a transverse opening therethrough to register with said groove, a cotter pin for entering said opening and groove to lock the parts together, and pressure responsive mechanism within said chamber connected with said polyhedral portion for actuating said valve member.

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