

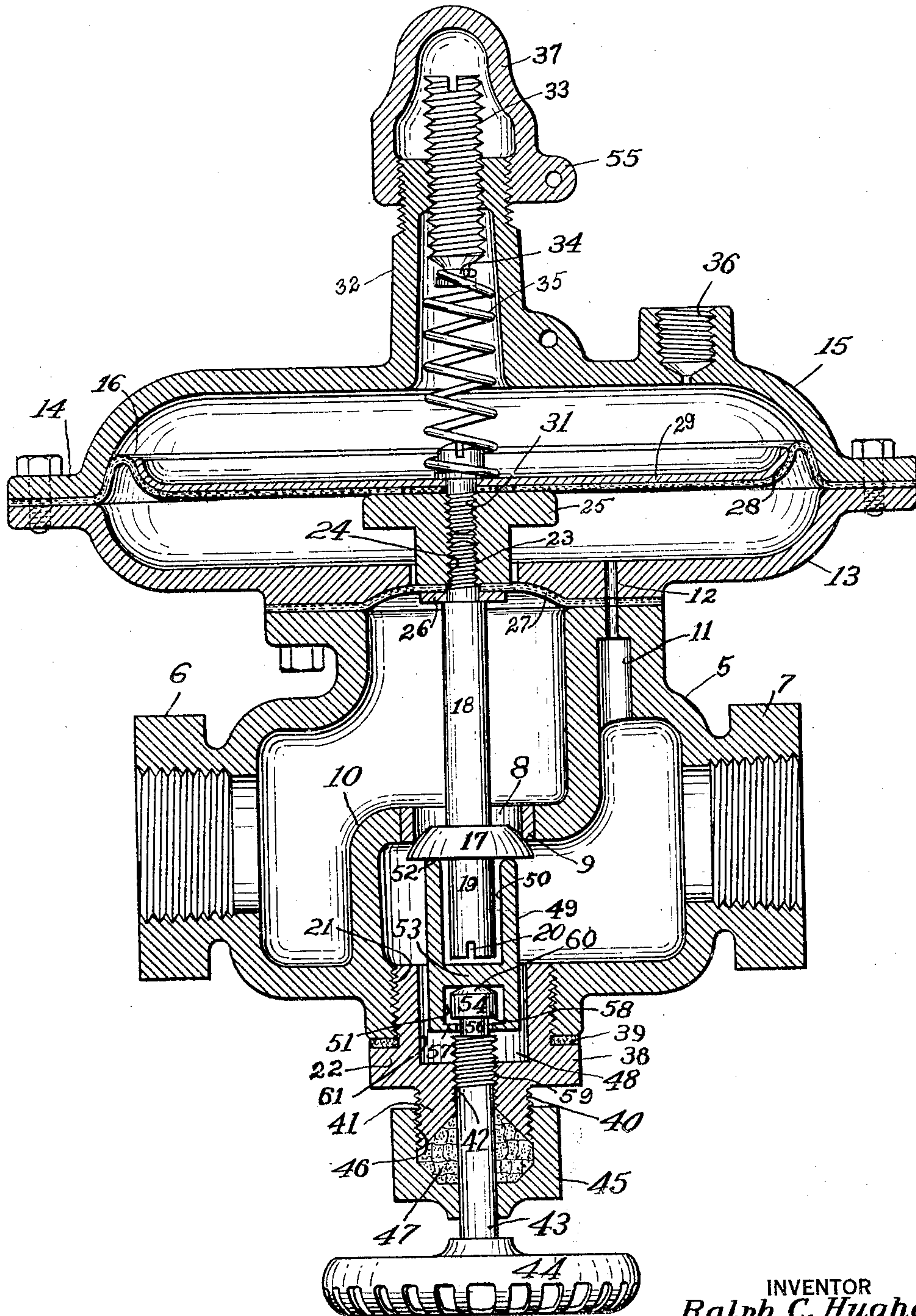
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PRESSURE REGULATOR

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PRESSURE REGULATOR

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My invention relates to pressure regulators and particularly to such regulators required for maintaining a uniform pressure in service pipes supplying gas therethrough irrespective of changes in pressure at the inlet port of such regulators.

It is an object of my invention to provide a pressure regulator which will be automatic in its action and will also be very sensitive to changes in pressure, increased pressure on the inlet side of the main valve tending to open the latter to permit increased flow of fluid, which results by increased pressure on the outlet side of the valve, in again raising the valve accordingly and thereby effecting uniformity in flow of the current. It is my purpose also to provide in such automatic pressure regulator a manually operated bar to mark the limit to which the valve may open.

The accompanying drawing illustrates a central vertical section of the device taken in the plane of the longitudinal axis of the mains, certain parts being shown in elevation.

In the present embodiment of my invention as illustrated I have provided a valve casing 5 having an inlet connection 6 and an outlet connection 7 which communicate through a port 8 having a valve seat 9, such port being formed through the transverse partition wall 10 in the chamber of said casing. A port 11 having a reduced upper end or extension 12 is provided in the casing 5 on the outlet side of the valve, extending upwardly into the bottom section 13 of the diaphragm casing 14, and the latter is provided with a top section 15, the two sections clamping between them the peripheral edge of the diaphragm 16.

The valve used in the present structure comprises a frusto-conical male member 17 adapted to engage the said valve seat 9 and is suitably secured upon the stem 18. The lower end 19 of said stem is slotted at 20 to permit turning the same by a screw driver or other suitable tool which can be inserted through an opening 21 in the bottom of casing 5 such opening being normally closed by the threaded plug 22 detachably secured therein.

The upper end of the stem 18 is reduced and screw threaded at 23 for engaging the threaded socket 24 in a clamping and guiding member 25 which at its bottom has clamped between it and a washer 26 on the stem 18, a diaphragm 27, and at its upper end clamps between it and a convex surface 28 of a cup-shaped plate 29, a flexible diaphragm 16. A screw 31 passes through the plate 29 and into the upper end of the socket 24 securing the two clamping members 25 and 29 together. The valve is normally urged downwardly by weight of supporting parts.

The upper section 15 of the diaphragm casing 14 is provided with an integral upwardly extending sleeve 32 having its upper portion internally threaded to receive adjustably therein a threaded screw 33 whose lower end normally within the sleeve or housing 32 has a reduced extension 34. The normal tendency of the valve member 17 to open by downward movement is supplemented by a coil spring 35 interposed between the head of the screw 31 above the plate 29, and the extension 34 of the screw 33. Section 15 is also provided with a vent opening 36 as shown. A protecting cover 37 is also provided which is internally threaded to provide detachable connection on the housing 32, and has apertured ear lock provision for receiving the usual lock to avoid unauthorized tampering with the adjustment of the screw 33, such apertured ear being designated 55.

The detachable plug 22 has an annular flange 38 having a gasket 39 engaging the outer edge of the sleeve about the opening 21 in the casing 5. Below the flange the plug is externally threaded at 40 upon a somewhat reduced lower extension 41 which is centrally apertured at 42 to receive from below an actuating stem 43 having a manual wheel 44, there being provided the conventional apertured cap 45 threaded at 46, on the extension 41 with the usual packing gland mechanism 47, as will be understood. Above the part 41 the plug 22 is centrally socketed at 48 to receive for axial movement therein an elongated actuating plunger member 49 having a cylindrical external outline, but whose interior chamber comprises spaced end sock-

ets 50 and 51 the former usually being the longer and having its end edges 52 positioned in the longitudinal path of movement of the valve member 17, whereby axial adjustment of the plunger 49 will either limit the opening movement of the valve 17, or if desired, may be actuated to positively close the latter.

The sockets 50 and 51 of the member 49 are spaced by a transverse partition 53 which serves the purpose of rendering the plunger member sufficiently rigid, and also the further purpose of receiving the force lengthwise thereagainst of an enlarged portion 54 mounted integrally upon the reduced portion 56 of the stem 43, when the latter is forced inwardly by rotation of the wheel 44. The lower socket 51 of the plunger is limited at the end opposite the partition 53, by a centrally apertured closure 57 which is integral with the plunger and serves to receive therein such reduced portion 56, the enlargement 54 thereby forming a shoulder 58 which, upon downward movement of the stem, engages the closure 57 and withdraws the plunger 49 as the threaded stem 43 is adjusted. The upper end of the main portion of the stem 43 is threaded at 59 for engagement of the threaded aperture 42 of the plug 22.

In operation, the gas or other fluid passes into the casing 5 through the connection 6 and thence through the main valve port 8, the port 11 serving by the outlet pressure in said case to oppose the downward movement of the diaphragm 16 and valve. When however, pressure on the delivery side builds up, the created back pressure exerts a force beneath the diaphragm 16 tending to raise the latter and move the member 17 to close the valve until such outlet pressure drops, the latter effect again permitting lowering of the diaphragm and restore the normal relative position of the parts 9 and 17. The construction of the parts 17 and 49, with the improved connection of the plunger and actuating stem having the enlargement 54 positioned loosely in the socket 51, is especially useful in providing an effective lost motion between parts 17 and 52, to positively limit the extent of opening the valve 17, to positively withdraw the plunger if desired, or to positively close the valve and wholly shut off flow of the fluid through the latter.

The said enlargement 54 is provided with an upper convex surface 60 to permit a slight rocking movement of the part 49 by its partition 53 on such enlargement; and the depth of the socket 51 is sufficiently greater than the length of the enlargement 54 to provide a space 61 between the shoulder 58 and the closure 57 to permit longitudinal movement of the plunger 49 relative to the stem 43. Adjustment of the latter part relative to the plug 22 affords the positive limit above referred

to, of the valve member 17 and yet permits movement of such member between the edges 52 and the valve seat 9, as will be understood.

Having thus described my invention, I claim:

1. A pressure regulator comprising a valve casing having opposite inlet and outlet openings and an internally threaded bottom opening, a downwardly opening valve for controlling the flow of fluid from inlet to outlet, a valve stem upon which said valve is mounted intermediate the ends of the stem, means connected with the upper end of the stem for urging said valve normally to open position, and a threaded and centrally apertured plug for detachable mounting in the said bottom opening, and a manually actuated stem adjustably mounted in the said plug aperture and having loose connection means carried on its inner end positioned in the path of movement of said valve, for limiting the downward movement of said valve.

2. A pressure regulator comprising a valve casing having opposite inlet and outlet openings and an internally threaded bottom opening, a downwardly opening valve for controlling the flow of fluid from inlet to outlet, a valve stem upon which said valve is mounted intermediate the ends of the stem, means connected with the upper end of the stem for urging said valve normally to open position, and a threaded and centrally apertured plug for detachable mounting in the said bottom opening, and a manually actuated stem adjustably mounted by threaded engagement in said plug aperture and having in the path of movement of said valve, loose connection means carried on the inner end of the stem for limiting the downward movement of said valve, and comprising an elongated plunger member having a socket in its upper end for receiving the lower end of said valve stem to guide said valve in position above the plunger.

3. A pressure regulator comprising a valve casing having opposite inlet and outlet openings and an internally threaded bottom opening, a downwardly opening valve for controlling the flow of fluid from inlet to outlet, a valve stem upon which said valve is mounted intermediate the ends of the stem, outlet pressure responsive means mounted on said casing and having connections with the upper end of the stem for urging said valve normally to closed position, and a threaded and centrally apertured plug for detachable mounting in the said bottom opening, a manually actuated stem having a threaded portion for adjustable mounting in said plug aperture, and limiting means loosely connected on the inner end of said actuating stem positioned in the path of movement of said valve, for limiting the downward movement of said valve, and means for normally opening the valve.

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4. A pressure regulator comprising a casing, a diaphragm mounted in said casing, a pair of clamping plates mounted one on each side of said diaphragm, the lower plate operating in an opening in the casing, a valve casing connected to said regulator casing, a diaphragm clamped between said valve and regulator casing, a valve stem threaded into said lower plate and having clamping means between which and the said lower plate the second mentioned diaphragm is clamped, a downwardly opening valve mounted on said stem intermediate its ends, the valve casing having an opening in alignment with the lower end of the valve stem and of a diameter greater than the downwardly opening valve, a threaded and centrally apertured plug for detachable mounting in said bottom opening, a manually actuated stem adjustably mounted in said plug aperture and having an enlargement on its upper end directed toward said valve, and limiting means for the axial movement of the valve and its stem comprising a plunger member having end sockets spaced by a cross partition, the upper socket receiving therein the lower end of said valve stem, and the lower socket receiving therein the said enlargement, the said plunger member being guided in movement axially of the valve stem and in the path of said valve, whereby manual actuation of said stem in said plug will adjust said plunger toward and from said valve to limit its opening movement.

5. A pressure regulator comprising a valve casing having opposite inlet and outlet openings and an internally threaded opening, a downwardly opening valve for controlling the flow of fluid from inlet to outlet, a valve stem upon which said valve is mounted intermediate the ends of said stem, means connected with the upper end of the stem for urging said valve normally downwardly to open position, outlet pressure responsive means connected with said stem for opposing said normal open tendency of said valve, a threaded and centrally apertured plug for detachable mounting in the said bottom opening, a manually operable stem adjustably mounted in said plug aperture, and means carried on the inner end of said stem mounted in the plug for limiting the downward movement of said valve to open the latter, said limiting means comprising an elongated plunger member having an upper socket to receive therein the lower end of said valve stem, and positioned in the path of movement of said valve stem and valve, and having a socket in its lower end to receive therein the upper end of said manually operable stem, the plunger and said last named stem having a loose connection to permit relative downward movement of said plunger toward said plug while the plug stem is fixed in positive adjusted position.

6. A pressure regulator comprising a valve casing having opposite inlet and outlet openings and an internally threaded bottom opening, a downwardly opening valve for controlling the flow of fluid from inlet to outlet, a valve stem upon which said valve is mounted intermediate the ends of the stem, means connected with the upper end of the stem for urging said valve normally to open position, a threaded and centrally apertured plug for mounting in said bottom opening a manually actuated stem adjustably mounted in said plug aperture and directed toward said valve, limiting means for the vertical movement of the valve and its stem comprising a hollow plunger member having open ends and an intermediate cross partition, the plunger ends receiving therein the valve stem and said actuating stem respectively, whereby said plunger is guided in the path of said valve and limits the latter in its opening movement.

7. A pressure regulator comprising a valve casing having opposite inlet and outlet openings and an internally threaded bottom opening, a downwardly opening valve for controlling the flow of fluid from inlet to outlet, a valve stem upon which said valve is mounted spaced from the lower end of the stem, outlet pressure responsive means having connection with said valve stem for normally closing said valve, and a centrally apertured plug for detachable mounting in said bottom opening, an actuating stem adjustably mounted in said plug aperture, and loose connection limiting means positioned in the path of movement of said valve, comprising an elongated and hollow plunger having an intermediate cross partition and open ends, the valve stem being seated in said upper end and the actuating stem in the lower end, whereby said actuating stem may loosely control the position of said valve in its opening.

In witness whereof, I have hereunto set my hand at Anderson, Indiana, this 25th day of January, 1932.

RALPH C. HUGHES.