

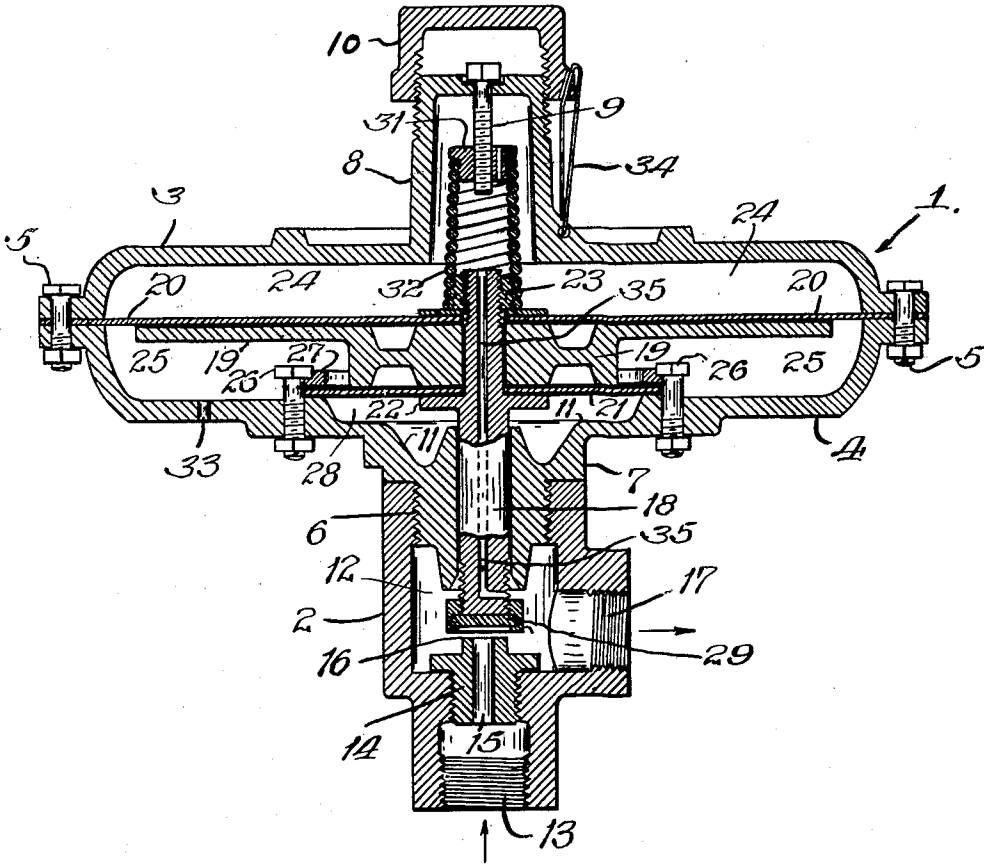
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PRESSURE REDUCING AND REGULATING VALVE

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PRESSURE REDUCING AND REGULATING VALVE

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My invention relates to improvements in pressure reducing and regulating valves as used in connection with high pressure gas mains and the object of the invention is to devise an improved form of valve which will be free from many undesirable features of valves hitherto used and which will have many points of superiority.

A particular object of my invention is to design a valve for use in gas conduits leading from natural gas reservoirs where conditions are such that the reservoir gas pressure is often in the vicinity of over 300 to 500 pounds to the square inch and the delivered gas pressure to the consumer somewhere in the vicinity of 8 ounces.

A further object is to so construct the valve that all parts thereof are readily accessible and servicing of the valves when in operation will be simplified.

A further object is to provide a valve which will be constant in operation so that when the valve has been adjusted and set to give a certain desired pressure on the low pressure side it will continue indefinitely to accurately regulate this pressure within very close limits so that the consumer is assured of a steady uniform pressure at all times.

Other objects of my invention will appear in the course of the following specification.

My invention consists in the construction and arrangement of parts, all as hereinafter more particularly described and illustrated in the accompanying drawing which shows a central axial section through my improved valve, a portion of a valve stem used therein being shown in elevation.

In the drawing the various parts are indicated by reference characters.

The casing of my improved valve consists of an upper part 1 and a lower part 2.

The upper part 1 consists of two flanged portions 3 and 4 which are secured together by bolts 5 so that an enclosed chamber is formed therebetween.

The lower portion 2 has threaded engagement at 6 upon a depending boss 7 carried by the part 4.

A portion 8 upstands from the portion 3

and an adjusting screw 9 extends centrally through the end of this portion 8, the purpose of which adjusting screw will later be explained.

A cap 10 has threaded engagement upon the outer end of the portion 8.

The bottom of the portion 4 is dished centrally at 11.

The lower portion 2 is formed with a chamber 12 therein which chamber will be referred to as a lower chamber within the valve.

Communicating with the bottom of the chamber 12 is a high pressure inlet passage 13 and mounted at the inner end of this passage 13 is a fitting 14 having an inlet port 15 there-through. This fitting 14 projects upwardly into the chamber 12 and its inner end forms a valve seat 16 within the chamber 12 raised above the bottom of the chamber.

The portion 2 is provided at its side with a low pressure outlet passage 17 which constitutes an outlet port communicating with the chamber 12.

Mounted axially within the depending boss 7 is a valve stem 18 the lower end of which projects into the lower chamber 12 and the upper end projects into the upper chamber formed between the upper casing portions 3 and 4. This stem is freely mounted for reciprocation and is in axial alignment above the valve seat 16.

Mounted upon the upper end of the valve stem 18 and within the upper chamber formed between the casing parts 3 and 4 is a diaphragm supporting plate 19 and secured against the upper and lower faces of this plate are two flexible diaphragms 20 and 21, these diaphragms and the diaphragm supporting plate 19 being held in place between an enlargement 22 on the stem 18 and a nut 23 engaging the threaded upper end of the valve stem.

The diaphragm 20 is secured about its periphery between the casing parts 3 and 4 and divides the chamber formed between these casing parts 3 and 4 into upper and lower portions 24 and 25 respectively.

The diaphragm 21 is secured about its periphery to the casing part 4 by bolts 26 and an annular ring 27.

This diaphragm 21 thus forms a wall sealing the top of the depression 11 and forms an enclosed chamber 28 therebelow.

Thus on each face of the diaphragm supporting plate 19 is a flexible diaphragm connected to the casing.

A rubber or rubber composition facing piece 29 is mounted upon the lower end face of the valve stem 18 being held in place by a cap 30. The cap 30 is orificed so that as the stem descends, the rubber facing 29 contacts with the valve seat 16 and this rubber facing thus forms a valve head cooperating with the valve seat. The cap 30 is formed with an annular recess into which the facing piece 29 extends and the facing piece is backed by the end of the stem 18. This provides a very secure mounting for the facing piece.

A nut 31 has threaded engagement upon the lower end of the adjusting screw 9 and a tension coil spring 32 has its ends connected to the nuts 23 and 31, these nuts being threaded exteriorly to receive the spring.

It will thus be seen that the spring 32 normally tends to draw the stem 18 and the diaphragm 20 upwardly and to draw the valve head 29 away from the valve seat to open the inlet port 15.

The casing 4 is provided with an orifice 33 which forms a breather opening or vent below the diaphragm 20 to allow free operation thereof. The breather opening 33 communicates with the lower portion 25 of the upper chamber.

The cap 10 may be locked against removal by a wire seal 34.

The valve stem 18 is formed with a passage 35 therethrough which extends from its upper end to a point adjacent to its lower end immediately above the cap 30.

This passage forms a communication between the lower chamber 12 and the upper chamber portion 24 above the diaphragm 20.

My valve is intended for use where it is desired to reduce and regulate gas pressure such as in the case of natural gas mains in which the pressure in the main may be very high and it is essential to reduce this pressure for delivery to the consumer to a few ounces.

In such cases it is not only necessary to reduce the pressure but the valve must be reliable and constant in operation so that when it has been adjusted and set to deliver a certain pressure on the low pressure side this pressure will remain constant within very close limits.

In using my valve the high pressure main is connected to the inlet connection 13 at the bottom of the casing and the low pressure outlet is connected to the outlet port 17.

The spring 32 normally raises the valve stem 18 so as to uncover the inlet port 15.

The high pressure gas enters the lower chamber 12 and passes upwardly therefrom through the passage 35 in the valve stem 18

into the chamber 24 above the diaphragm 20.

The pressure thus created in the chamber 24 forces the diaphragm 20 and with it the valve stem 18 downwardly so that the valve head 29 cooperates with the valve seat 16 to restrict the high pressure inlet and results in a reduction of pressure in the lower chamber 12 which will be the pressure existing in the low pressure side.

The valve may be adjusted to give any desired pressure on the low pressure side by means of the adjusting screw 9 since this screw provides means for adjusting the tension in the spring 32.

If the tension of this spring is increased the result will be a rise of pressure on the low pressure side.

The cap 10 is removed to adjust this screw 9 and after the adjustment has been made the replacement of the cap and sealing by a wire seal 34 prevents any unauthorized tampering with the adjustment and the valve will continue permanently to deliver the desired pressure on the low pressure side.

In order to insure free unrestricted movement of the diaphragm 20 a vent or breather opening 33 is provided in the casing below this diaphragm.

The provision of the lower flexible diaphragm 21 dispenses with the need of a packing gland about the valve stem 18 which is a great advantage as a packing gland here tends to restrict the free movement of the stem.

The provision of the rubber or rubber composition valve head 29 on the valve stem insures much greater efficiency of operation and permanency of adjustment than if a metal valve head were used.

Hitherto in valves used for this purpose great difficulty has been experienced due to moisture in the gas in cold weather freezing within the valve and forming frost which interfered with the proper working of the valve.

This trouble is entirely eliminated in my valve since even if frost does form it cannot interfere with the proper operation.

In my valve the valve head is placed above the valve seat and the seat is raised above the bottom of the chamber 12 and any moisture which might form would lodge in the bottom of the chamber or in other words the valve seat is above the moisture line.

A further important feature is that the passage 35 in the valve stem does away with any outside pipe connections between the chambers 12 and 24. This absence of outside pipe connections taken together with the feature whereby the lower and upper parts of the casing have simple threaded connection, greatly facilitates servicing of the valve, since the entire upper part of the casing may be removed simply by unscrewing it without the necessity of breaking any pipe connections.

A further feature is that the inlet port 15 is entirely unrestricted and the entire valve co-operating therewith is above this port so that the high pressure tends to assist in the operation of the valve stem instead of opposing it, whereas in constructions where the valve seat and valve head are at the lower end of the port 15 and the valve stem extends through the port, not only does the valve stem restrict the inlet port with consequent tendency to freezing up but the high pressure in the main operates to close the valve instead of assisting to open it.

By the use of my lower or second diaphragm I have obviated the possibility of ice retarding the movement of the valve spindle as well as effectively preventing the gas pressure from entering the lower portion of the upper chamber. This construction in combination with my particular type of valve in which the flat faced valve head with its pliant face is raised and lowered in relation to the flat valve seat furnishes a device which will maintain correct regulation of the passage of gas even in the cold weather and under the worst moisture conditions.

From the foregoing it will be apparent that I have devised an improved valve of the character described whereby the objects of my invention have been attained.

Various modifications may be made in my invention without departing from the spirit thereof or the scope of the claim and therefore the exact forms shown are to be taken as illustrative only and not in a limiting sense and I desire, that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claim.

What I claim as my invention is:

A wholly automatic pressure reducing and regulating valve comprising a casing, a diaphragm extending across said casing and dividing it into lower and upper chambers, a diaphragm supporting plate contained within the lower chamber, and upon which the diaphragm rests, a portion extending centrally from the lower face of the casing and having a passage extending there-through also inlet and outlet orifices for the flow of gas, a reciprocal hollow valve stem contained within the passage and secured at its upper end to the diaphragm supporting plate, a valve seat formed around the inlet opening underneath the bottom of the stem, a flat faced valve face formed upon the lower end of the stem and adapted to co-act with the valve seat, and a second diaphragm contained within the lower chamber across the entrance to the passage in the extending portion and positioned between the inner bottom face of the lower chamber and the bottom face of the diaphragm supporting plate.

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