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MANUAL CHANGE-OVER REGULATOR

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In systems using compressed gas in cylinders for heating and lighting purposes and the like, it is customary to provide two tanks or cylinders of gas in the installation, the second tank being a standby or reserve tank which can be connected to the distribution system when the first has become exhausted. This assures continuity of service with a minimum of inconvenience. In these so-called "bottled gas" systems it is also necessary to have pressure reducing means of some kind, inasmuch as the gas pressure in the cylinders is much higher than the pressure required by the customary gas consuming devices.

Where change-over means have been provided in previous installations, the valves or other mechanism have necessarily been operated at the high pressure of the supply cylinder, inasmuch as the reducing valve or regulator is customarily connected in the pipe line between the change-over device and the gas consuming devices. This has meant that all the parts of the valve, as well as the ordinary threaded connections thereto, were much more subject to leakage than would be the case if they operated at the reduced pressure on the outlet end of the pressure regulating device.

My invention consists of a combination change-over and pressure reducing device wherein I eliminate all threaded connections on the high pressure side of the device, and wherein all the other parts and connections are subject only to the reduced pressure. The construction eliminates the very substantial hazard involved in the leakage of these highly explosive gases, as well as eliminating the economic waste represented by such leakage.

With the objects thus indicated, and with other objects which will become apparent as the description proceeds, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, in which:

Figure 1 is an elevational view of the parts involved in an installation using my device.
Figure 2 is an enlarged elevational view taken on the line 2—2 of Figure 1, showing the device embodying my invention.
Figure 3 is a further enlarged plan view partly in horizontal section taken on the line 3—3 of Figure 2.
Figure 4 is a perspective view of one of the inlet connection members forming a part of my structure.
Figure 5 is a vertical sectional view on the line 5—5 of Figure 3.
Figure 6 is a vertical sectional view on the line 6—6 of Figure 5.
In the accompanying drawings I have used the reference numeral 10 to indicated generally a housing. In Figure 1 the housing 10 is shown as connected by lengths of tubing 12 to the gas cylinders 14. The housing 10 consists of two principal parts which I have designated as the casting portion 16 and the bonnet portion 18. These two members are connected together by screws 20, and clamped between them is a flexible diaphragm 22. A threaded stud 24 passes through the diaphragm, and a nut 26 on the stud clamps a disk 28 against the diaphragm. A coil spring 30 bears against the disk 28 and is supported by a member 32 which is threaded into the bonnet 18. It will be seen that the member 32 can be rotated to vary the pressure exerted by the spring 30 against the disk 28 and thus against the diaphragm 22.

In the top of the casing 18 I form openings 34 adapted to receive inlet connections designated generally as 36. Each of the connection members 36 has a bore 38 which intersects inside the member with a bore 40. One end of the piston connection tube 12 is fixed in the bore 38 by sweating or by brazing. A hole 42 through the wall of the tubing 12 communicates with the bore 40, which extends into a nozzle portion 44 of the connection member, forming a valve seat. The connection member 36 is retained in the casing 16 by a clamp strap 46 which passes across the top of the connection member and is pressed against it by the screws 48 which are threaded into the casing 16. A gasket 50 is interposed between a shoulder 52 on the connection member 36, and the seat 54 formed in the casing 16.

Inside the casing 16 valve levers 56 are supported on pivots 58. The ends of the valve levers may be provided with removable tips 60 carrying any suitable type of material for effecting a tight fit with the valve seat portion 44. The valve levers 56 are coupled by toggle links 62 to the third link 64, the latter being pivotally connected also to the stud 24, and thus to the diaphragm.

Centrally located in the top of the casing 16 is a bore 66. At the top of the bore 66 is a diaphragm 68, and flexibly supported thereby is a post 72. At the lower end of the post is a foot...
member 14 having laterally projecting arms 76 and 78.

The diaphragm seal 68 allows flexibility for free movement of the post 72, constituting in effect a pivot for it, but eliminates the problems associated with the stuffing box or gland such as normally used in connection with the operating means for a valve or control device.

The head plate 70 extends upwardly in the form of a boss 80 having an annular groove 82 formed therein. A hollow handle member 84 has formed near one end a sleeve portion 86 which fits over the boss 80, and is retained thereon by pins 88 which pass through the sleeve 86 and extend into the groove 82 in the boss 80. The handle 84 is thus retained on the boss but may be swiveled around it.

A plunger 90 in the outer end of the handle 84 has an eye 92 which receives one end of a coil spring 94. The other end of the spring encircles the top end of the post 72, and is retained thereon by a groove 86. The tension of the spring 94 on the post 72 causes the latter to tip about its flexible mounting in the diaphragm 68, to the inclined position indicated in Figure 5, where the lateral projection 76 bears against the left hand valve member 56. The pressure thus exerted against the valve member holds its tip 69 in tight engagement with the valve seat portion 44.

Assuming that a cylinder of gas is connected to each of the tubes 12, so that gas pressure exists therein, gas will flow into the casing 16 through the valve seat 44 of the right hand inlet connection 35, when the parts are in the positions shown in Figure 5. As gas continues to flow into the chamber 16, the pressure therein will increase, and the diaphragm 22 and its associated disk 20 and stud 24 will move downwardly against the force of the spring 30. Under the pressure exerted by the arm 76, the left hand valve member 56 is held in fixed position against the nozzle 44 of the connection member, and therefore the lower pivot 56 of the valve member may be considered as a fixed point for the apparatus being. As the stud 24 moves downwardly, then, it will tend to straighten out the toggle links 62, and thus move the pivot 100 toward the right, which will swing the right hand valve member 56 about its pivot 56 and ultimately will close off the flow of gas from the right hand inlet. When this condition has been reached, no further action will take place until some of the gas within the casing 16 is consumed through the outlet passage 102, to which the distribution pipe 104 is connected.

When gas is thus used, the pressure in the casing 16 will fall, the spring 30 will cause the diaphragm 22, and hence the stud 24, to rise; the toggle action of the links 62 will draw the pivot 100 toward the left, will open the right hand valve, and will allow more gas to flow into the supply cylinder, until the pressure within the casing is such to cause the valve to close once more.

It will thus be seen that gas is drawn only from the cylinder connected to the right hand supply tube 12 of Figure 5. When that cylinder is exhausted, however, the handle 84 may be swung from the position shown in Figure 5, to a point 180° from that position. It will be apparent from Figure 5 that when the handle is thus reversed the pull of the spring 94 on the post 72 will also be reversed. The post will also therefore be tipped in its flexible diaphragm mount-
2,884,977

on dial phragm for actuation from outside said housing.

2. In an automatic change-over pressure reducing device, a housing, external annular seat portions formed around each of a pair of openings in said housing, tubes for connection to high pressure gas sources, a connecting member permanently attached as by welding or brazing to each of said tubes, a valve seat formed on said member, means retaining said member in gas-tight position in one of said external annular seat portions, a diaphragm mounted in said housing and subject to flexure in response to the pressure therethrough, valve levers each carrying a valve engageable with the valve seat of one of said connecting members to control the flow of gas therethrough, a pair of toggle levers connecting said valve levers, said diaphragm being operatively connected with the intermediate joint of said pair of toggle levers, and externally operable means engageable with either valve lever to bias it to closed position against the valve seat of its associated connecting member.

3. A change-over regulator comprising a housing having inlet passages therein for connection to each of two high pressure sources, valve levers each carrying a valve operable to close one of said passages, a diaphragm mounted in said housing and responsive to the pressure therein, a control lever selectively operable upon either of the valve levers to bias it to closed position, linkage means between said diaphragm and said valve levers operable to open the valve not so biased when the pressure in said housing falls below a predetermined value, spring means external to said housing and operable to throw said control lever in either of two opposite directions, and a second diaphragm surrounding said control lever and constituting a flexible seal between said lever and said housing.

4. In a change-over pressure regulating device, a housing having external annular seats formed thereon around each of a pair of openings therein, tubes for connection to high pressure gas sources, a connecting member permanently attached to each of said tubes, a valve seat formed on each said member, means retaining each said member in gas-tight position in one of said external annular seats, valve levers each carrying a valve engageable with the valve seat of one of said connecting members to control the flow of gas therethrough into said housing, means responsive to the pressure in said housing, a pair of toggle levers connecting said valve levers, said pressure responsive means being operatively connected with said toggle levers, means selectively operable upon either of the valve levers to bias it to closed position, and a diaphragm mounted in said housing and constituting a seal, said selectively operable means passing through said diaphragm for actuation from outside said housing.

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