AUTOMATIC CHANGE-OVER DEVICE

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The present invention relates to improvements in devices for automatically changing withdrawal connections from one source of high pressure gas to another upon decrease in pressure in the first source.

The usual two drum system for bottled gas distribution comprises a pair of cylinders containing liquefied gas, and a service line to the gas consuming appliance connected through a pressure reducing regulator to both the cylinders. Some means is provided for having one or both of the cylinders turned on at one time in order to supply gas to the regulator and service line and it is necessary to be able to disconnect and replace either cylinder without loss of gas and preferably without too much manipulation of valves or other mechanism. Prior practice has been to open the valve on the active cylinder while keeping the valve on the reserve cylinder closed. When the gas in the active cylinder became exhausted the valve on that cylinder was closed and the valve on the reserve cylinder opened. This series of steps was necessary to prevent the high pressure gas in the reserve cylinder from feeding into the exhausted cylinder. The result was that there was a cessation of the gas supply to the gas consuming appliances and all pilot lights were extinguished. Further in order to remove and replace the reserve cylinder it was necessary to close the valve in the active cylinder in order to prevent escape of its gas into the atmosphere again resulting in a cessation of the gas supply to the appliances.

To rectify this situation automatic change-over devices were developed such as those shown in U. S. Patents Nos. 1,980,466, issued to Walter L. Thrall, and 2,047,338, issued to Roswell W. Thomas, but these devices are complex and expensive.

The present device is a simple and inexpensive means of automatically accomplishing the change-over from an exhausted cylinder to the reserve cylinder without cutting off the supply of gas to the appliances.

An important object of the invention is to provide a simple inexpensive change-over device.

An additional important object is to provide a change-over device which will operate on a predetermined pressure differential between the two cylinders in the system.

Fig. 1 is a view in elevation showing the relative position of the cylinders, valve connections, manifold valve and regulator.

Figs. 2, 3 and 4 are cross sectional views of three modifications of a manifold valve, and

Fig. 5 is a view in cross section taken on the line 5—5 in Fig. 2.

Referring to Fig. 1 of the drawing, reference numerals 5, 6, indicate cylinders for containing the liquefied gas. Valves 7, 7' normally close these containers and have couplings 8, 8' for connection to withdrawal pipes 9, 9'. Pipes 9, 9' terminate in a manifold 10 which in turn is connected to a consumer service or supply line 11. Interposed in line 11 is a regulator 12 for controlling the pressure of the gas to be fed to the appliances at the other end of the service line. It will be evident from further description that 15 pipe 9, manifold 10 and pipe 8' together constitute a conduit connecting the two cylinders 5, 6' and that service line 11 is taken off this conduit at manifold 10. With the above connections completed, valves 7, 7' can be opened. Then service line 11, depending upon the position of the valves in manifold 10 as later described, will draw gas from either of the cylinders 5, 6'.

Referring to Fig. 2 which shows an enlarged sectional view of manifold 10, reference numeral 13 designates a modified pipe elbow having threaded pipe couplings 14, 15. Screw threaded into elbow 13 is a fitting 16 having a threaded pipe coupling 17. Fitting 16 and elbow 13 together form a chamber 18 which has a partition 19 therein. Partition 19 is held in place by the screw threaded joint between fitting 16 and elbow 13. The partition is formed of fiber or some resilient material so that it further constitutes a gasket to seal the joint. Pipe 15 couplings 14 and 17 open into chamber 16 through orifices 20 and 21 respectively and coupling 15 has a passage 15' opening into chamber 18, the orifices and passage constituting inlets and an outlet, respectively, for the chamber 18. Valve 22 seats 22 and 23 are formed around the periphery of orifices 20 and 21 on the chamber side. A pair of valve sleeves 24, 25 are slidably mounted in chamber 18. As shown in Fig. 5, valve sleeve 26, which is identical with valve sleeve 24 although reversed in position, is provided with radially extending fins 28 which serve as guides for the valve in its sliding movement in chamber 18 and provide a space between the walls of chamber 18 and the periphery of the valve sleeve to permit the flow of gas past the valve sleeve when the latter is open. Each valve sleeve 24, 25 is further formed with a valve face to co-act with valve faces 22 and 23, in the form of resilient disks 27, 28. A pair of springs 29, 30 are post-
tioned between partition 19 and each valve to bias the valves into closing position, the two springs 25, 30 being formed of equal length whereby, when they are positioned in the chamber, one spring, as shown in spring 30, will be compressed to a greater degree than the other spring 29 due to the position of partition 19. As a result valve 25 will have a greater bias than valve 24.

With manifold 10 as shown in Fig. 2, mounted in the system of Fig. 1, it will be evident that pipe coupling 13 will be threadedly engaged with pipe 9 and pipe coupling 17 will be threadedly engaged with pipe 9'. Service line 11 and regulator 12 will be threadedly engaged with pipe coupling 15. In the operation of the device, assuming that cylinders 6 and 6' are both filled with liquefied gas and the ambient temperature is such that the pressure present in both cylinders is one hundred pounds per square inch, springs 29 and 30 can be so designed that flow of gas through orifice 29 will encounter a one-pound pressure drop and flow of gas through orifice 21 will encounter an eleven-pound pressure drop, giving a ten-pound pressure differential between the two valves. On opening valves 7 and 7' with the accompanying application of the gas pressure in the cylinders 6, 6' to valve faces 27 and 28 respectively, both these latter valves will tend to open against their respective biases. Flow of gas through orifice 20 will result in a pressure of ninety-nine pounds in chamber 16 due to the one-pound pressure drop around valve 24. With a pressure of ninety-nine pounds in chamber 16 and a pressure of one hundred pounds on valve face 28, it will be apparent that the resulting one-pound pressure exerted upon valve 25 will be insufficient to open the valve and that cylinder 6 will be unaffected by any pressure in the service line 11. When the liquefied gas in cylinder 6 is depleted, the pressure in the cylinder will begin to drop. When the pressure has dropped to ninety pounds, it will be seen that pressure in chamber 16 will be eighty-nine pounds in view of the one-pound pressure drop still present around valve 24. With the pressure in chamber 16 at eighty-nine pounds there will be a pressure differential of eleven pounds across valve 25 which, under the conditions set forth above, will cause said valve to open. Since the pressure in cylinder 6 is constantly dropping while the pressure in 16 is maintained at eighty-nine pounds by the flow of gas through orifice 21, valve 24 will close because the pressure in the chamber 16 will be above the pressure in cylinder 6. Depleted cylinder 6 has therefore been disconnected from service line 11 while filled cylinder 6' has been connected thereto.

Referring to Fig. 3, a modification of manifold 10 is shown. In this construction a T-fitting 31 having a pipe coupling 32 screwed threaded into each end thereof fittings 33, 34. The joints are sealed by gaskets 35, 36. Each fitting 33, 34 has a tube coupling 37, 38 respectively, having passages 39, 40 terminating in orifices 41, 42 surrounded by valve faces 43, 44. T-fitting 31 and fittings 33, 34 form a chamber 45, corresponding to chamber 16 in Fig. 2, in which are slidable disposed valves 46, 47, identical with valves 24 and 25 of Fig. 2. T-fitting 31 carries a projecting member 48 which projects into chamber 45. A pair of springs 49, 50 are positioned between projections 48 and 49 and exert the same into closing position. Instead of these springs being identical as in the modification of Fig. 2, one of the springs, for instance spring 50, is heavier and stiffer than the other so as to exert a greater bias on valve 47 than the other spring 49 exerts on valve 46. Here again the design of the springs can be such as to cause a one-pound pressure drop across valve 46 and an eleven-pound pressure drop across valve 47. The operation of this modification is identical with that of Fig. 2.

The manifold of Fig. 4 is of similar construction to that of Fig. 2 except that partition 19 has been omitted resulting in the necessity of a gas- ket 51 between elbow 13 and fitting 16. In this modification only one spring 52 is used between valves 24 and 25 but orifice 20 is formed with a greater area than orifice 21. The pressure of orifices 20 and 21 can be such that there is a one-pound pressure drop around valve 24 and an eleven-pound pressure drop around valve 25 resulting in the same operation as in Fig. 1.

It is to be understood that the form of my invention heretofore shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention. Further, the operation set out, although believed to be accurate are not to be considered as the sole basis of the operativeness of my device but that my device does operate successfully whether or not upon the principles described herein, my invention to be limited solely by the appended claims.

I claim:

1. In a system for storing and utilizing high pressure fuel gas, the combination comprising a pair of containers for said gas, a conduit connecting said containers together, a consumer's service line connected to said conduit at a point intermediate said containers, a pair of valves in said conduit one on each side of said point, a spring acting upon each said valve for biasing said valve closed against pressure in said container, one of said valves having a greater bias than the other.

2. A manifold for use in high pressure fuel gas systems wherein a pair of containers for said gas are connected to a consumer's service line for withdrawal of said gas from consecutive containers, comprising a body portion having a chamber with space for pressure in said container and a gas outlet for communication with said service line, a pair of valves movable in said chamber, each of said valves biased to close a said inlet, said valves being operable by pressure in said containers, one of said valves being designed to open before the other said valve.

3. A manifold for use in high pressure fuel gas systems wherein a pair of containers for said gas are connected to a consumer's service line, comprising a body portion having a chamber with a pair of gas inlets and discharge valves, a pair of gas outlets and means for biasing said valves into closing position, said springs means exerting a greater bias.
on one of said valves than on the other said valve.

5. A manifold for use in high pressure fuel gas systems wherein a pair of containers for said gas are connected to a consumer's service line, comprising a body portion having a chamber with a pair of gas inlets for connection with said containers and a gas outlet for connection with said service line, a pair of valves for closing said inlets against pressure in said containers, a projecting member in said chamber between said valves, a spring between each valve and said projecting member for biasing said valves into closed position, the biasing action of one said spring being greater than that of the other.

6. In a system for storing and utilizing high pressure fuel gas, the combination comprising a pair of containers for said gas, a conduit connecting said containers together, a consumer's service line connected to said conduit, a pair of valves in said conduit, one on each side of said service line, each said valve being biased to close said conduit but being openable by pressure in said containers, one of said valves being designed to present a greater resistance to gas flow than the other said valve.

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