Dec. 6, 1938. R. W. THOMAS ET AL 2,138,989

AUTOMATIC CHANGE-OVER DEVICE

Filed Sept. 14, 1937

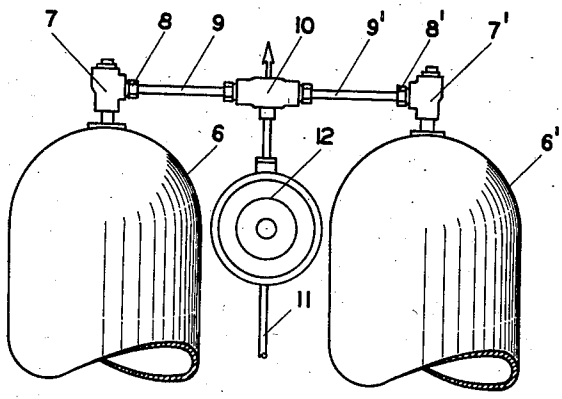

FIG. 1

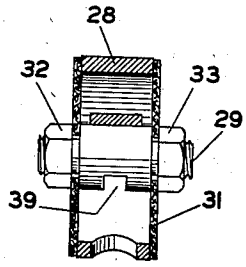

FIG. 4

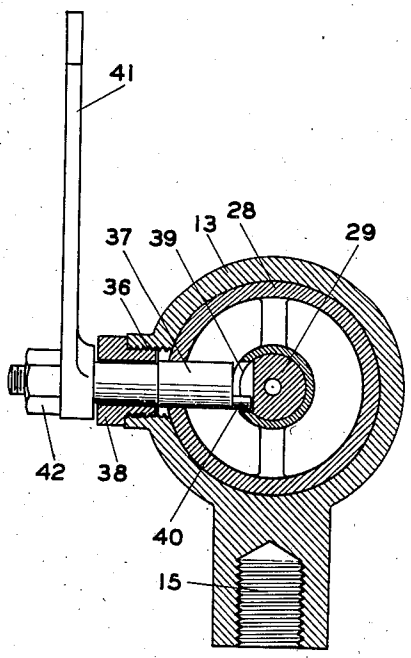

FIG. 3

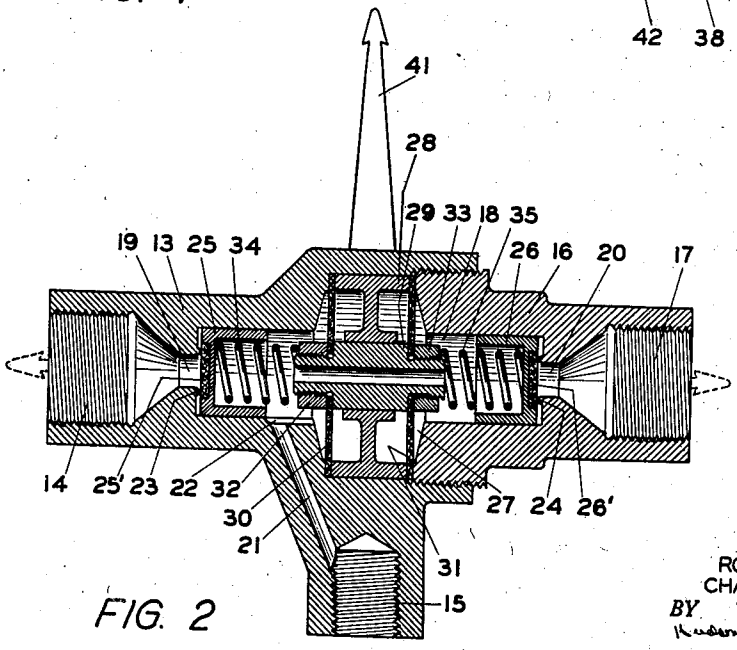

FIG. 2

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AUTOMATIC CHANGE-OVER DEVICE

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Application September 14, 1937, Serial No. 163,842

6 Claims. (Cl. 62—1)

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 exhausted cylinder with a new 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. 1,960,466, issued to Walter I. Thrall, and 2,047,338, issued to one of the present inventors, 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.

A further important object of the invention is to provide a change-over device capable of being set so as to permit withdrawal of gas from either of the two cylinders first.

This invention is an improvement over that disclosed in application Serial No. 163,841 filed September 14, 1937, with Rosswell W. Thomas as inventor.

In the drawing forming a part this specification, and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a view in elevation showing a system embodying the present invention,

Fig. 2 is a sectional view of the manifold,

Fig. 3 is a view partly in elevation and partly in cross section of the manifold in the neighborhood of the diaphragm assembly, and

Fig. 4 is a sectional view of the diaphragm assembly with part of the spool broken away.

Referring to Fig. 1 of the drawing, reference numerals, 6, 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 pipe 9, manifold 10 and pipe 9' together constitute a conduit connecting the two cylinders 6, 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 6, 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 coulings 14, 15. Screw threaded into elbow 13 is a fitting 16 having a threaded pipe coupling 17. Pipe couplings 14 and 17 open into a chamber 18, formed by elbow 13 and fitting 16, through orifices 19 and 20 respectively, while coupling 15 opens into the chamber through bore 21 and groove 22. Valve seats 23 and 24 are formed around the periphery of orifices 19 and 20 on the chamber side. A pair of valve sleeves 25, 26 are slidably mounted in chamber 18, the valve sleeves being hexagonal in cross section to allow flow of gas past them. Each valve sleeve 25, 26 is further formed with a valve face to co-act with valve faces 23, 24 in the form of resilient disks 25', 26'. Chamber 18 is enlarged at 27 to receive a diaphragm assembly comprising a spool 28 which acts as a guide for a slidable hollow connector 29. A pair of diaphragms 30, 31

are sealed between the spool, elbow 13, and the fitting 16. These diaphragms are further sealed to the connector 29 by means of nuts 32, 33. It is thus evident that this assembly divides chamber 18 into three parts, the middle part being hermetically sealed from the other two which are in communication with each other through hollow connector 29. A pair of springs 34, 35 are positioned in chamber 18 between the connector and the valve sleeves 25, 26. In the rear of elbow 13 is a screw threaded opening 36 through which passes a spindle 37 held in place by a gland 38. The inner end of spindle 37 passes through spool 28 and terminates adjacent connector 29. At this point the inner portion of spool 28 is cut away to expose connector 29 and the connector is slotted at 39 to receive an eccentric 40. On the exterior end of spindle 37 is positioned a lever 41 fixed with respect to the spindle by nut 42.

The springs are so designed that with the connector in the position shown in Fig. 2 each spring presses with equal force on its valve sleeve. Thus with containers 6, 6' full of liquefied gas and valves 7, 7' in open position, gas will feed equally from each container into service line 11. This usually is not desirable since both containers will become exhausted at about the same time. In normal operation, considering that it is desirable to draw gas from container 6 while maintaining container 6' in reserve, the lever 41 is turned clockwise through 90 degrees thereby through eccentric 40, moving connector 29 to the right and compressing spring 35 while relieving pressure on spring 34. The parts are so designed that the bias on spring 35 will be, for example, such that an eleven-pound pressure drop will occur across valve 26 while the bias on spring 34 will result in a one-pound pressure drop across valve 25. Assuming that the pressure in each container is one hundred pounds, it will be apparent that the pressure in chamber 18 will be ninety-nine pounds due to the one-pound pressure drop across valve 25. Since this leaves only one pound difference in pressure acting upon valve face 26', this valve will remain closed because eleven pounds difference in pressure is necessary to open it. When container 6 approaches depletion the pressure in chamber 18 will begin to drop. When the pressure has dropped to eighty-nine pounds, valve 26 will open. The decreasing pressure in container 6 will allow valve 25 to close. At the customer's convenience container 6 can then be replaced by a full container. If valve 7 is now opened it will be seen that valve 25 will open and valve 26 close since the same conditions are present as originally, namely one hundred pounds pressure in both containers. This is highly undesirable because the customer will have no way of telling how much gas remains in container 6'. The ideal situation would be to have the new container 6 as a reserve container to be connected in when container 6' became exhausted. The present device makes this possible. Upon the attachment of a new container 6 to pipe 9 and before valve 7 is open, lever 41 is moved counterclockwise through 180 degrees. This results in a reversal of the relative bias on springs 34 and 35. When valve 10 is opened service line 11 will still continue to draw gas from container 6' and new container 6 will not cut in until container 6' is exhausted.

It is to be understood that the form of this invention, herewith 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 this invention and further that the theories of operation set out, although believed to be accurate are not to be considered as the sole basis of the operativeness of this device but that this device does operate successfully whether or not upon the principles described herein, this invention to be limited solely by the appended claims.

We 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, a pair of valves in said conduit, one on each side of said service line, each said valve being biased to close said conduit against pressure in each said container, said valves openable by pressure in said containers, and means for varying the bias on each said valve so that whichever one said valve desired will present a greater resistance to gas flow than the other.

2. 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 against pressure in each said container, said valves openable by pressure in said containers, and a movable member operable from the exterior of said conduit for varying the bias on each said valve so that whichever one said valve desired will open before the other.

3. 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, said springs being separated from one another by a movable member, and means exterior of said conduit for actuating said movable member to vary the relative bias on said valves.

4. 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, spring means for biasing said valves into closing position, and means exterior of said manifold acting upon said spring means whereby the relative bias on said valves can be varied.

5. A manifold for use in high pressure fuel gas systems wherein a pair of containers for said gases 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 movable member in said chamber intermediate said valves, spring means in said chamber biasing said valves into closing position, said movable member having co-action with said spring means where-

by the bias on each said valve can be varied relative to the other.

6. 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 movable member in said chamber between said valves, a spring between each valve and said projecting member for biasing said valves into closed position, and means exterior of said manifold for actuating said movable member, whereby the relative biasing action of said springs can be varied.

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