May 4, 1943. T. A. ST. CLAIR 2,318,261

LOW PRESSURE AUTOMATIC CHANGEOVER DEVICE

Filed Oct. 17, 1941 2 Sheets-Sheet 1

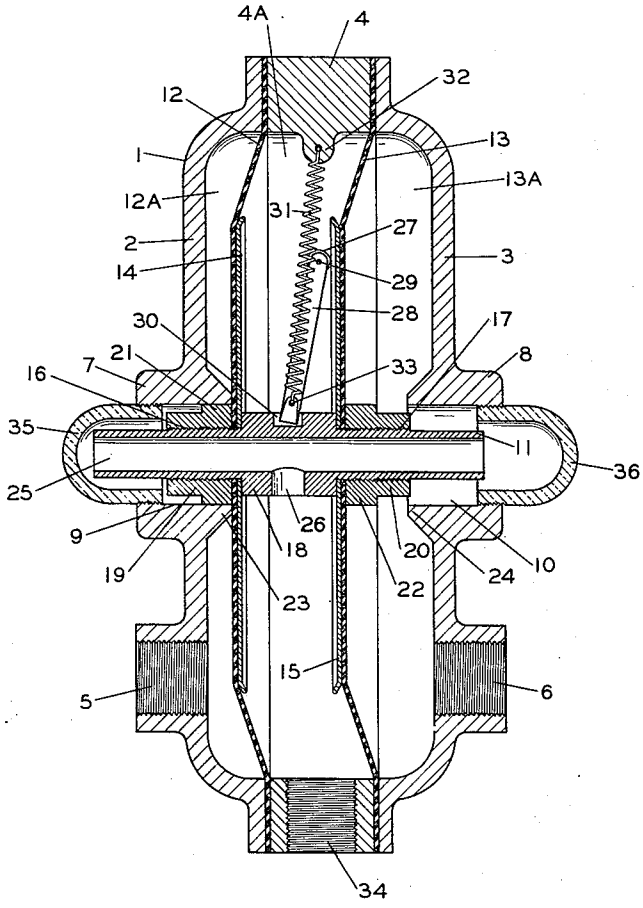



FIG. 1

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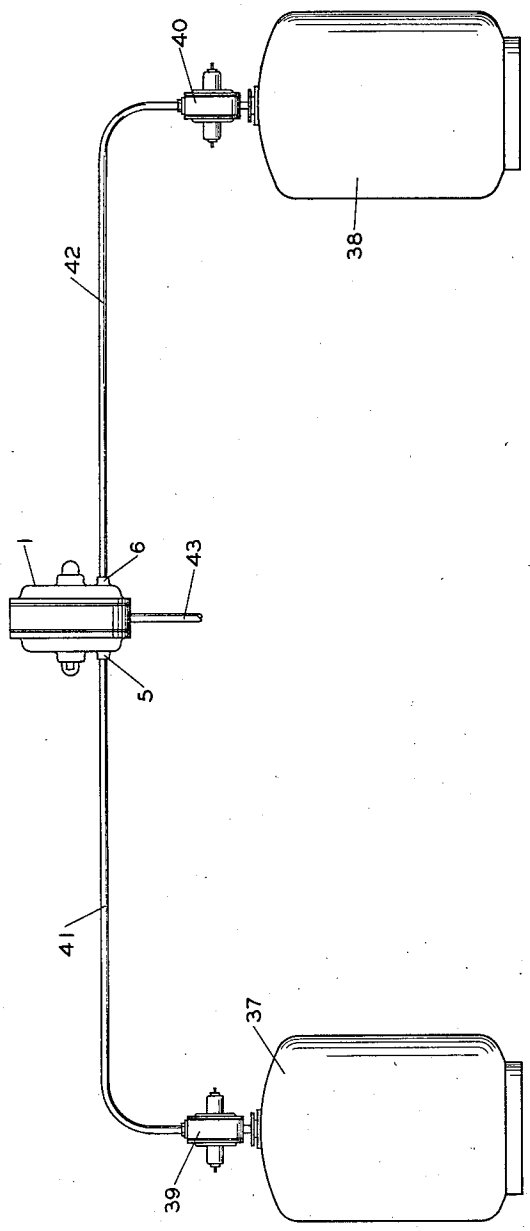



FIG. 2

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# UNITED STATES PATENT OFFICE

2,318,261

## LOW PRESSURE AUTOMATIC CHANGE-OVER DEVICE

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Application October 17, 1941, Serial No. 415,459

4 Claims. (Cl. 62—1)

The present invention relates to a fully automatic changeover device for the transfer of withdrawal connections from one source of high pressure gas to another upon decrease in pressure in the first source.

Liquefied petroleum gases such as, propane, butane, or mixtures of the two have revolutionized domestic operations such as heating and cooking in rural communities and a great industry has arisen which is engaged in producing the fuel and the manufacture of equipment suitable for its handling by domestic consumers. The primary aim of manufacturers has been the development of a self-service system which can be safely manipulated by persons entirely unskilled in mechanical contrivances with the greatest of ease and which requires a minimum of care and attention. It is customary to provide the customer with two containers with some means of connecting them to a service line to the gas consuming appliance through a suitable ararngement of valves and pressure regulators. One of the cylinders is ordinarily used as the active source of gas supply, while the other serves as a reserve source until the first cylinder is exhausted, usually evidenced by some sort of indicating means. It has been desirable to effect the connection of the reserve cylinder with the service line automatically to avoid a temporary cessation of supply of the gaseous fuel. Various automatic and semi-automatic arrangements have been previously proposed to accomplish change of withdrawal connections, one of which utilized a valve in each conduit acting against the flow of gas under unequal spring pressure set by a manually operable device which it was necessary to reset every time the exhausted cylinder was replaced with a full one. A number of other fully automatic changeover valves have been suggested, but none have enjoyed extensive use due to their complicated construction which not only was prohibitive from a manufacturing standpoint, but added to the operating costs due to necessary periodic adjustment and replacement of parts. The changeover valve which I have developed is characterized by simplicity of construction and ease of manipulation, which I believe overcomes the objection inherent in prior structures.

A primary object of the present invention is to provide an improved changeover device which is fully automatic and of simplified construction while being entirely efficient and positive in its operation.

A further object is the development of an automatic changeover device which is composed of a minimum number of parts and depends for its operation on decrease in pressure from a supply source.

Another object of this invention is to provide a changeover device for liquefied petroleum gas dispensing systems which will give a visual indication when a change of withdrawal connections has taken place.

Figure 1 shows diagrammatically a sectional view of one form of my improved changeover valve.

Figure 2 illustrates the use of my improved changeover valve in a self-service system for dispensing liquefied petroleum gases.

Referring to Figure 1, the numeral 1 designates generally the changeover valve, the casing 1 of which is comprised of three parts, namely, end members 2 and 3 and intermediate member 4, which are suitably secured together by bolts or the like in the relationship shown in the drawing. The end members 2 and 3 are provided with left and right hand inlets 5 and 6, respectively, which connect with cylindrical containers of liquefied petroleum gas through suitable pressure regulators. The end members 2 and 3 are likewise provided with central flanges 7 and 8 for the formation of elongated cylindrical bores 9 and 10, as shown in the drawing. A valve actuating member or operating sleeve 11 is longitudinally moveable with respect to the cylindrical bores formed in the end members, and diaphragms 12 and 13 composed of synthetic rubber or other hydrocarbon resistant material are securely clamped between the end members 2 and 3 and intermediate member 4 of the casing. Although diaphragms have been shown in the specific embodiment illustrated, any suitable gas pressure responsive means may be utilized for shifting the valve actuating member. Pressure chambers 12A and 13A are thereby formed between the diaphragms and the end members 2 and 3, and a service chamber 4A is likewise formed between the diaphragms. The diaphragms 4 are provided with back-up plates 14 and 15. The operating sleeve has threaded sections 16 and 17 and a central enlarged section 18. The diaphragms 12 and 13 together with the back-up plates are rigidly secured to the operating sleeve between the enlarged central portion 18 and tubular clamping nuts 19 and 20. Cylindrical shoulders 21 and 22 on the clamping nuts engage the cylindrical bores in the end members with a sufficient close fit to prevent substantal leakage from the pressure chamber during a changeover and until the shoulder has cleared the inner end of the bore. The end members 2 and 3 are extended internally to form integral valve seats 23 and 24, respectively. The diaphragms 12 and 13, rigidly secured to the operating sleeve, alternately act as valves when the sleeve is moved to the extreme left or right, engaging the respective valve seat and sealing off the flow of gas through the passages formed between the cylindrical bores and the sleeve. A central passage 25 is provided within the operating sleeve which communicates with the pressure chambers 12A and 13A when the operating

sleeve is in the extreme right or left hand position, respectively, and a passage 26 connects the central passage with the service chamber 4A. Supporting arm 27 extends to a point midway of the central chamber between the diaphragm from the side of the casing. One end of a spring snap lever 28 is pivoted on the end of the arm at 29, while the opposite end is nested in a socket 30 situated on the top of the operating sleeve. One end of a changeover spring 31 is connected to an ear 32 on the inside of the intermediate casing section and the opposite end of the spring is connected under tension near the lower end of the snap lever at 33. The cylindrical shoulders 21 and 22 are slightly longer axially than the throw of the snap lever longitudinally of the sleeve, so that, for instance, when gas enters the pressure chamber 12A, unseating the diaphragm from the valve seat 23, the snap lever will move slightly past dead center before the shoulder 21 clears the end of the valve seat. An outlet 34 for the service chamber is provided in the lower portion of the intermediate section in the casing. The cylindrical bores are threaded near their outer ends for the attachment of covers 35 and 36 of glass, plastic or other transparent material. The ends of the operating sleeve 11 are preferably colored red so that it is readily apparent when a change over has occurred and the exhausted cylinder is to be replaced by a full one.

Figure 2 shows the automatic changeover in a liquefied petroleum gas dispensing system. The storage cylinders 37 and 38 are provided with first stage regulators 39 and 40 which connect with the changeover inlets 5 and 6 through gas withdrawal conduits comprising flexible tubes 41 and 42. If desired, a second stage regulator is secured in the service line 43. Where a second stage regulator is employed, the changeover operates under a relatively higher pressure. However, if the reduction to line pressure is accomplished by the first stage regulator, the changeover will operate under a low pressure and slightly larger diaphragms should be employed.

The operation of my improved automatic changeover in a system for dispensing liquefied petroleum gas may be described as follows: When the left hand regulator is connected first to a cylinder, gas will enter the changeover inlet 5, pressuring the chamber 12A and, due to the low pressure in chambers 4A and 13A, move operating sleeve 11 to the right against the action of the changeover spring 31 until the snap lever 28 just passes dead center. At this time, a snap action will occur, due to the changeover spring, forcing the operating sleeve completely to the right and seating the diaphragm 13 on the valve seat 24. When the right hand regulator is connected to the inlet 6, due to the fact that the regulators have approximately equal seatings, gas will enter the pressure chamber 13A at the same pressure as that existent in the chamber 12A. It is obvious that the pressure on the diaphragms 12 and 13 will be approximately equal, but due to the action of the changeover spring 31, the diaphragm 13 will remain firmly seated against the valve seat 24. With the parts in the position shown in the drawing and when both regulators are connected into the changeover, gas flow will take place through the inlet 6, pressure chamber 13A, cylindrical bore 10, central passage 25 in the operating sleeve, passage 26 through service chamber 4A and to the second stage regulator or directly to the line through outlet 34. Flow will continue to occur from the right hand cylinder until the pressure in chamber 13A decreases due to the exhaustion of the cylinder and changeover will thereupon take place due to the pressure differential in the chambers 12A and 13A which forces the diaphragm 12 to the right until the snap lever 28 passes dead center, closing diaphragm 13 against valve seat 24.

It is obvious that various other arrangements may be employed without departing from the spirit and scope of the present invention.

The principal advantage in the device of the present invention resides in its manifest simplicity and the minimum number of operating elements. The result is a great savings in manufacturing costs, in addition to ease of manipulation and efficiency of operation.

I claim:

1. A system for dispensing liquefied gas comprising two containers for the gas and a valve housing, a service line for connecting the housing with gas consuming appliances, a gas withdrawal conduit connecting each container with the valve housing, a valve controlling each withdrawal conduit, a valve actuating member connecting said valves, gas pressure responsive means connected with the valve actuating member and exposed to the gas pressure on the inlet side of the said valves.

2. A system for dispensing liquefied gas comprising two containers for the gas and a valve housing, a service line for connecting the valve housing with gas consuming appliances, a gas withdrawal conduit connecting each container with the valve housing, a valve controlling each withdrawal conduit, a valve actuating member connecting said valves movable between two positions to open one valve and close the other, gas pressure responsive means associated with the valve actuating member and exposed to the gas pressure on the inlet side of said valves and means urging said valve actuating member into one or the other of said positions.

3. A system for dispensing liquefied gas comprising two containers for the gas and a valve housing, a service line for connecting the valve housing with gas consuming appliances, a gas withdrawal conduit connecting each container with the valve housing, a valve controlling each withdrawal conduit, a valve actuating member connecting said valves movable between two positions to open one valve and close the other and gas pressure operated means connected with the valve actuating member and responsive to pressure differential on the inlet side of the valves to reverse their position.

4. A system for dispensing liquefied gas comprising two containers for the gas and a valve housing, a service line for connecting the valve housing with gas consuming appliances, a gas withdrawal conduit connecting each container with the valve housing, a valve controlling each withdrawal conduit, a valve actuating member connecting said valves movable between two positions to open one valve and close the other, loading means urging said valve actuating member into one or the other of said positions, and pressure responsive means connected with the valve actuating member and exposed to gas pressure on the inlet side of said valves adapted to overcome said loading means and reverse the position of the valves on failure of pressure in one of said withdrawal conduits.

THEODORE A. ST. CLAIR.