Aug. 7, 1945. R. E. EVARTS 2,380,956

THROWOVER REGULATOR

Filed June 4, 1941 4 Sheets-Sheet 1

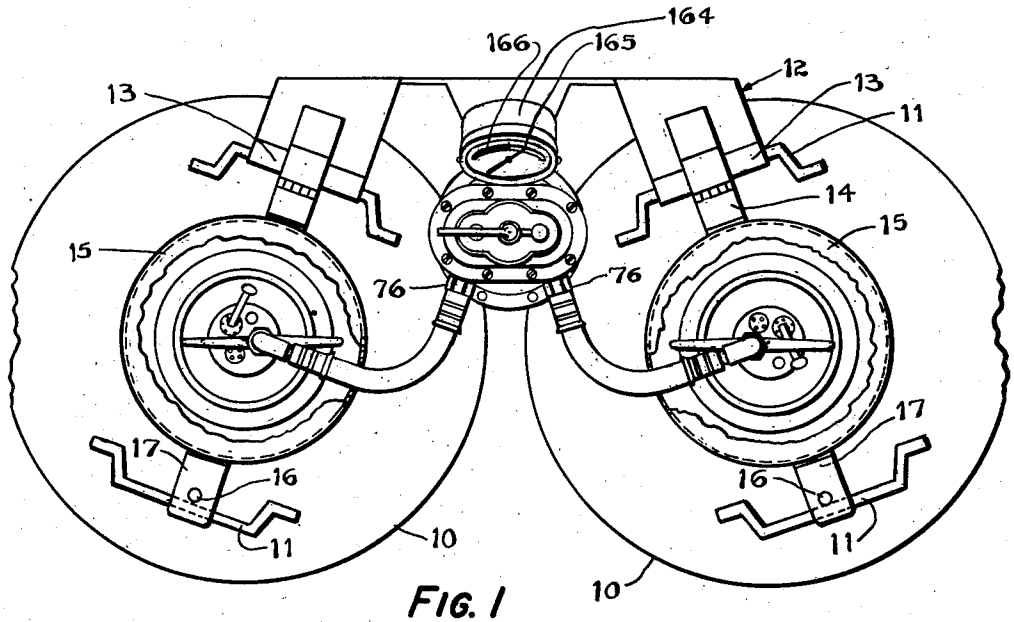


FIG. 1

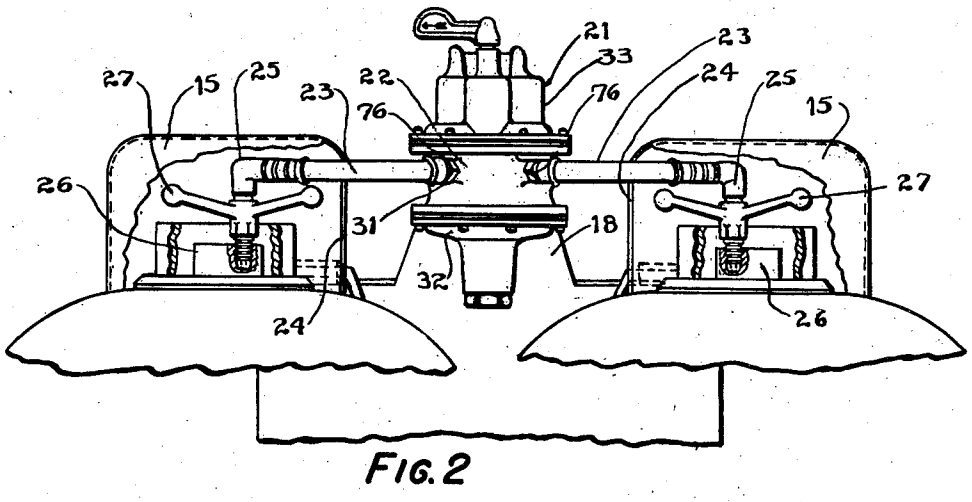


FIG. 2

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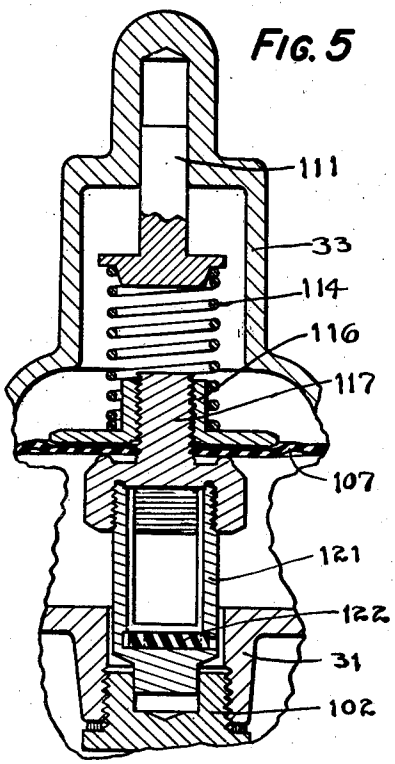
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THROWOVER REGULATOR

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FIG. 5



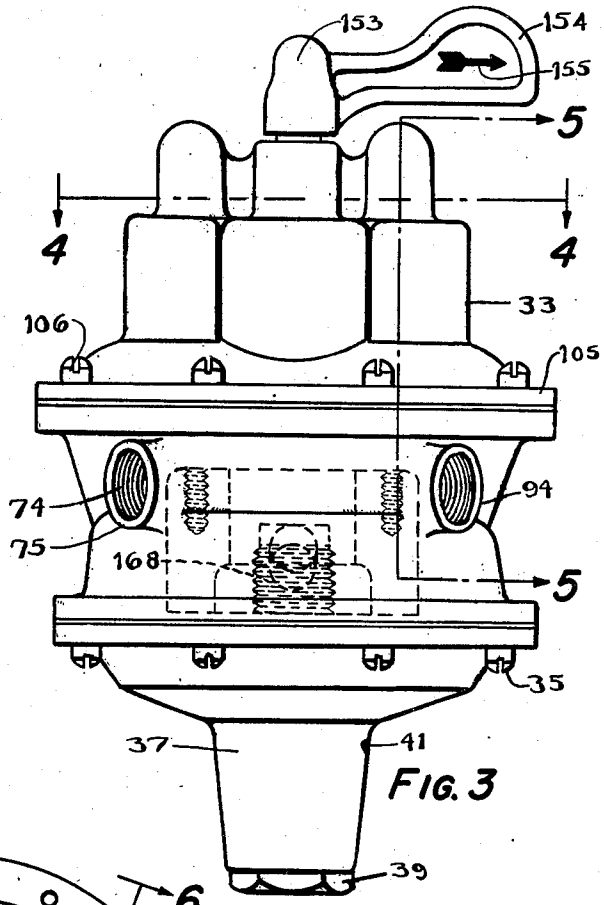


FIG. 3

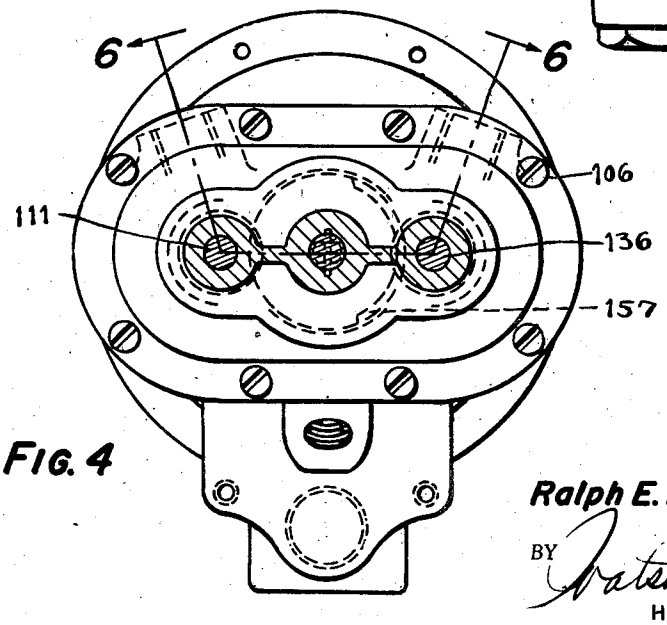


FIG. 4

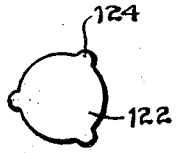


FIG. 9

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THROWOVER REGULATOR

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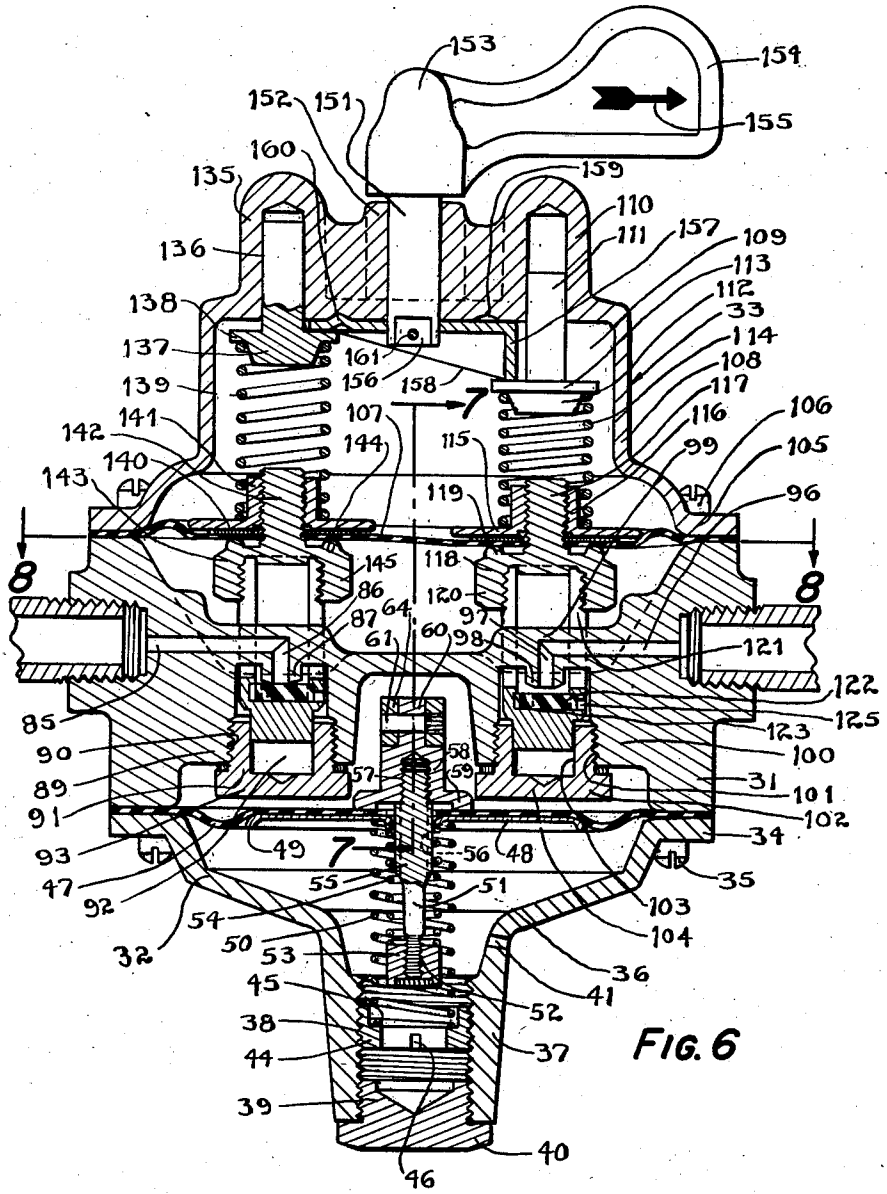


FIG. 6

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THROWOVER REGULATOR

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FIG. 7

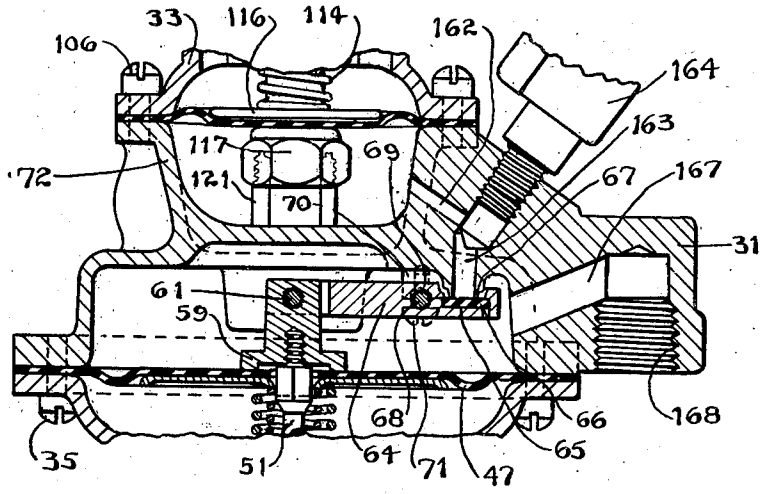
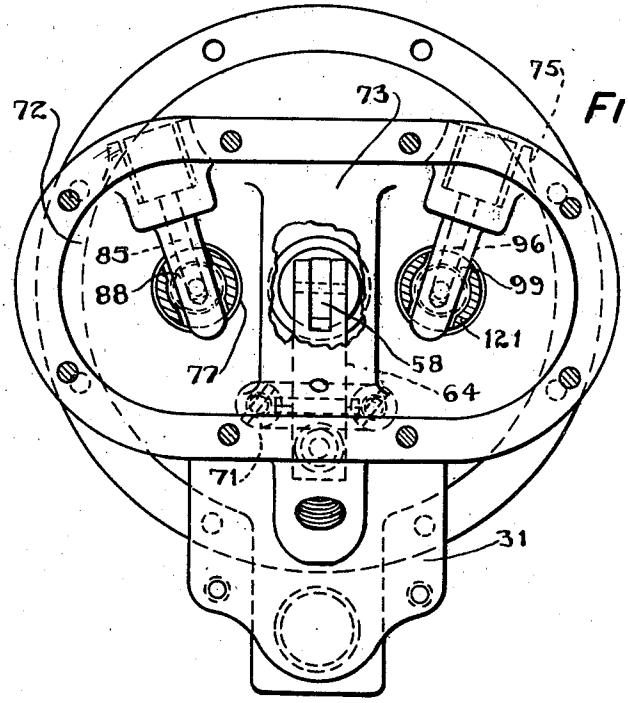


FIG. 8



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Patented Aug. 7, 1945

2,380,956

UNITED STATES PATENT OFFICE

2,380,956

THROWOVER REGULATOR

Ralph E. Evarts, Aurora, Ill., assignor to The Bastian Blessing Company, Chicago, Ill., a corporation of Illinois

Application June 4, 1941, Serial No. 396,566

17 Claims. (Cl. 222—6)

This invention is a continuation in part of my application for Letters Patent, Serial No. 249,997, filed January 9, 1939 for improvements in Throwover regulator and relates to portable liquefied petroleum gas systems and more particularly to an improved unit for dispensing and regulating the pressure of fuel gas supplied for household use.

In order to supply fuel gas to individual homes which do not have available to them the municipal or community supply of fuel, a system came into use wherein propane or the like can be supplied by individual outfits for each house including portable containers. These containers have outlet connections by which a service line running to an appliance in the house is detachable so that each container, when empty, may be replaced from time to time by a full container.

As a general rule two containers are allocated for each installation, one for service and the other for reserve. These containers are installed where they are readily accessible for service and inspection. The fuel employed, such as propane, must have a low boiling point so that the system will serve continuously throughout the winter. On the other hand, the use of a fuel results in the existence of a high vapor pressure during the summer.

In order to insure safe handling by inexperienced persons of such a fuel which provides many hazards other than high pressures which are not appreciated, one of the objects of the present invention is to provide a construction wherein field connections between the assembled parts are reduced to a minimum and a factory assembly unit, which can be fully tested before being placed in service, is provided for reducing the high pressures to service pressure.

Another object of the invention is to provide a unitary pressure control means for a system of the class described which automatically changes the fuel supply from one to the other of two containers in a first pressure reduction stage and automatically supplies the gas at service pressure.

Another object of the invention is to provide a compact unitary two-stage pressure regulator which can be readily assembled with two containers in a small space, and selectively receives a supply of fuel from one of the tanks automatically while indicating the status of the system at any time during the operation.

Another object of the invention is to provide automatic means for reducing the pressure of compressed fluids and, particularly, of liquefied petroleum gases to supply same at a substantially uniform predetermined pressure.

Another object is to provide an improved controlling means relating to fluid control applicable for use in connection with a plurality of fluid supply tanks, and to provide an improved means by which the connection from a plurality of tanks or containers to a system may be controlled from the outside, the changeover taking place without disconnection of any part.

A further object of the invention is to provide, in one simple unitary assembly, an automatic throwover, manifold regulator including an integral two-stage regulator for systems of the class described, which is simple in construction and operation, easy to maintain and service, and capable of being produced as an assembly line unit which will operate within the manufacturing tolerances permitted without need for special assembly adjustments.

These being among the objects of the invention, other and further objects will become apparent from the drawings, the description relating thereto and the appended claims.

Referring now to the drawings:

Fig. 1 is a top plan view partly in section illustrating the improved embodiment of a dispensing system forming a part of the invention.

Fig. 2 is a side elevation partly in section of the top part of the upper portion of the embodiment illustrated in Fig. 1.

Fig. 3 is a side elevation of an improved dispensing regulator forming a part of the invention.

Fig. 4 is a horizontal section taken at the line 4—4 in Fig. 3.

Fig. 5 is a vertical section taken upon the line 5—5 in Fig. 3.

Fig. 6 is an enlarged section taken upon the line 6—6 in Fig. 4.

Fig. 7 is a vertical section taken upon line 7—7 in Fig. 6,

Fig. 8 is a horizontal section taken on the line 8—8 in Fig. 6, and

Fig. 9 is a plan view of an improved valve disc forming a part of the invention.

Referring now to the drawings in further detail, in which like parts are designated with like numbers, two containers 10 having handles 11 on the top thereof are supported by a wall bracket 12 having a crooked holder 13 engaging one of the container handles in a manner whereby the container may be forced rearwardly at the top a slight distance and then lifted out and over the crooked holder whenever it is desired to re-

place an empty container with a full one. A pivoted arm 14 is welded to the bracket 12 where it will prevent the withdrawal of the handle 11 from the crooked holder 13 whenever the cap 15 carried by the handle is lowered over the top of the container and locked in place by a padlock (not shown) inserted through a hole 16 in the arm 17 and around another handle 11 provided upon the container at the opposite side thereof.

The wall bracket 12 has a crooked holder 13 for each container between which an upwardly extending portion 18 is provided for mounting the dispensing pressure regulator 21 between the caps 15 where forwardly diverging bosses 22 receive flexible pigtails 23 which extend through slots 24 in the caps 15 to a point where the connectors 25 upon the end of the hose may be attached to fittings 26 in the top of the tank by means of a wing nut 27, as more specifically described in the co-pending application, Serial No. 345,654 filed July 15, 1940, by William C. Buttner, reference to which is hereby made.

The dispensing regulator 21 comprises three main parts preferably made of die cast materials including a main body portion 31, a regulator bonnet 32 and a throwover bonnet portion 33. As more particularly shown in Fig. 6 these parts carry in assembly relationship the interiorly mounted operating parts which will be more fully described hereinafter.

The bonnet 32 is more or less bell shaped, being provided with a lateral flange 34 which is secured to the body portion 31 by means of screws 35. The bell portion 32 defines one wall of an enclosed space 36. Extending outwardly or downwardly from the bonnet 32 is a hollow integral extension 37 internally threaded as at 38 to receive and be partially closed by a correspondingly threaded plug 39 enlarged as at 40 in the form of a hexagonal head readily engageable by a tool.

The plug 39 may or may not have an opening therethrough to maintain the pressure in the space 36 at atmospheric pressure. It is preferred for purpose of economy to provide an opening 41 in the bonnet portion for that purpose.

A spring retainer 44 is threaded into the bonnet 32 for adjustment to receive upon a shoulder 45 one end of a spring, as described below, to vary the tension thereon as adjusted by a tool received in a notch 46 in the retainer 44.

A diaphragm 47 form another wall of the chamber 36 and is clamped by its edges between the flange 34 and the corresponding face of the body member 31. A plate 48 is positioned within the space 36 and normally bears against the diaphragm 47. Its outer edge may be curled or curved away from the diaphragm as at 49. The spring 50, mentioned heretofore as supported at one end by the adjustable nut 44, bears at its other end against the plate 48. A diaphragm stem 51 is positioned mainly within the bonnet 32 and is surrounded by the spring 50. The stem 51 is threaded as at 52 to receive a nut 53 against which one end of a spring 54 is supported. The opposite end of the spring 54 also contacts the plate 48.

The diaphragm stem 51 may be enlarged as at 55 and may be longitudinally slotted or grooved as at 56. The stem extends through a suitable perforation in the diaphragm 47 and in the plate 48 beyond which it is threaded as at 57 to receive an actuating member 58. The actuating member may be provided with an enlarged, downwardly facing flange 59 which contacts the upper or inner surface of the diaphragm 47.

The member 58 is provided with an upwardly disposed extension 60 which is drilled to receive a pin 61 which pivotally supports a valve operating lever 64. Adjacent its opposite end, the lever 64, as better shown in Fig. 7, is provided with a hollow or depression 65 within which a disc 66 is receive in supported relationship which disc may be made of suitable material for engaging a seat 67 cast and machined in the body 31.

A bearing pin 68 projects through the lever 64 and is supported at its outer end in grooves 69 formed in bosses 70 and held in place by screws 71. The pin may be rigidly supported with respect to the body 31 or the lever 64, whichever may be desired, so that the one is rotatable with respect to the other.

The body portion 31 has a side wall 72 of a generally regular shape being relatively oval as shown in Figs. 4 and 8 with a partition wall 73 dividing the interior of the body 31 into upper and lower compartments and providing stock for a number of passages, valve seats and the like.

In the particular form shown here the dispensing regulator is connected to two sources of fuel supply, namely the containers 10 as already described. For these purposes, internally threaded inlet ports 74 and 94 are provided in bosses 75 as more particularly shown in Fig. 3, which bosses, as indicated in phantom in Fig. 4, extend divergingly outwardly to dispose the conduits 23 in a convenient position to handle for the arrangement shown in Fig. 1.

As shown, the threaded inlets 74 and 94 receive correspondingly threaded connectors 76 mounted on the ends of the flexible conduits 23. A passage 85 leads from the port 74 and is provided with a downwardly turned portion 86 which terminates in a seat 87. The conduits 85 and 88 are formed in part in a bridge-like member 88 formed integrally, in part at least, with the partition 73. A hollow enlargement 89 is formed integrally with the partition 73 and is threaded as at 90 to receive a sealing plug 91 which is provided with a cylindrical depression or hollow 92, the plug is hexed as at 93 to receive a tool by which it may be fastened in place. On opposite sides of the bridge 88 the partition 73 is apertured as at 77 to provide clearance around the bridge 88.

As a means for communicating with alternate sources of supply, there is provided an internally threaded inlet port 94 in which the other of the pigtails 23 carrying a connector 76 is received. A passage 96 leads from the port 94 and has a downwardly extending portion 97 terminating in a seat 98. As is the case of the passages 85 and 86, the passages 96 and 97 are formed in a bridge 99 integral with the partition 73. Here also an enlargement 100, integral with the partition 73 is internally threaded as at 101 to receive the plug 102 similar in all respects to the plug 91, having a cylindrical depression 103 therein and a hexed head 104 to receive a wrench.

The throwover bonnet 33 is provided with a lateral flange 105 secured in place upon the body 31 by screws 106. A diaphragm 107 is positioned between adjoining edges of the body 31 and the throwover bonnet 33. The throwover bonnet, as shown particularly in Fig. 6, corresponds in plan and generally to the side wall 72 of the body 31. The bonnet 33 is enlarged upwardly as at 108 to provide a bonnet space or well 109.

The throwover bonnet 33 is also provided with a

hollow socket portion 110 within which a stem 111 is mounted to reciprocate. The lower end of the stem is enlarged at 112 and carries a radial flange 113 which engages in supported relationship the upper end of a spring 114. At its opposite end the spring bears against the enlargement 115 of a collar 116 resting upon the upper side of the diaphragm 107. The collar 116 is threaded upon the diaphragm stem 117 and the stem is enlarged as at 118 and has machined on the upper face thereof an annular land 119 that bears against the ilnner face of the diaphragm 107 in opposition to the collar and flange 115.

The enlarged portion 118 is provided with an internally threaded depending skirt 120 which supports a yoke member 121 therein.

The yoke member is correspondingly threaded and is cut away along opposite sides as shown more particularly in Fig. 8 to straddle the bridge 99 and carry a valve seat member 122, more particularly shown in Fig. 9. The yoke is undercut as at 123 to receive the nibs 124 of the seat member and is apertured as at 125 to prevent the building up of pressure beneath the seat member 122.

The construction of the seat member 122 is significant, the construction shown being illustrative of an arrangement in which any swelling of a seat, due to the presence of deleterious chemicals in the fuel, is accommodated in the undercut portion without materially affecting the valve relationship between the seat member 122 and the seat 98.

Care should be taken in selecting the material of which the seat member 122 is constructed so that deleterious effects are minimized. In the particular embodiment illustrated, Paraprene P–109 has been found to be quite successful, it having very stable characteristics whereby close tolerances may be maintained in the design and assembly of the parts described.

At its bottom, the yoke 121 is provided with a projection received in the cylindrical opening 103 to guide the yoke in operation.

The throwover bonnet is symmetrically provided with a second hollow or cylindrical portion 135 which corresponds to the member 110. Within it, a stem 136 is positioned and the stem has an enlargement 137 and a radially extending flange 138 against which the upper end of a spring 139 is supported. At its other end the spring bears against an enlargement 140 of a diaphragm plate 141 which rests on its under face against the diaphragm 107 as threaded to a diaphragm stem 142. This stem is enlarged as at 143 and provided with a land 144 bearing against the under side of the diaphragm 107 in opposition to the member 140. Likewise the enlarged portion 143 is provided with an internally threaded skirt 145 which supports a yoke and valve assembly similar to that supported by the enlarged portion 120 of the stem 117.

As a means for establishing the desired tension upon each of the springs 114 and 139, selectively and alternatively, there is provided a shaft 151 which is journalled in a bearing enlargement 152 formed integrally with the diaphragm bonnet 33 between the cylindrical socket portions 110 and 135. The member 151 is provided with a handle 153 having a wing 154 thereon provided with a raised indicating arrow 155 which, as will be seen hereinafter, points to whichever container is in service.

The shaft 151 is squared as at 156 to receive a cam 157 thereon, which cam may be one of any number of interchangeable cams that may be provided at the factory for different customers upon request. The cam as shown is provided with a camming portion 158 that rides upon the top of the flanges 113 and 138 as disposed between them and the body portion of the throwover cap 33. Detents 159 are provided to engage a prick-punch offset 160 upon the cam body to locate the cam in any one of a plurality of selective positions, the detents thereby providing one or more points of adjustment for the cam. The cams is held upon the shaft 151 by a cotter pin 161.

The passage 162 (Fig. 7) leads from the compartment below the diaphragm 107 to a passage 163 terminating in the valve port 67 as controlled by the valve seat member 66 actuated by the diaphragm 47. Connected to the passage 162 is a pressure gauge 164 which, as seen in Fig. 1, has two indices 165 and 166 thereon indicating respectively the presence of a high or low pressure in the passage 162. The low pressure compartment above the diaphragm 47 is connected to a service line (not shown) by a passageway 167 which terminates in a downwardly presenting threaded opening 168 to receive the conventional connector.

A safety relief valve is provided for the service pressure stage. The diaphragm 47 and diaphragm plate 48 are slidable with respect to the stem 51. Whenever the pressure in the compartment above the diaphragm 47 becomes excessive it forces the diaphragm away from the flange 59 (Fig. 7) against the action of the springs 50 and 54 to permit gas to escape along the grooves 56 in the stem and out the vent 41.

In operation it will be observed, as already described, that the dispensing regulator is connected to two containers mounted upon the bracket 12 by pigtails 23.

With the present invention one of the containers supplies fuel to the serviceline while the other stands by as a reserve, the present device providing an automatic means for bringing the reserve container into operation when the service container is empty or below a predetermined pressure.

Immediately after installation of the system described herein, both containers will be full. The handle 154 will be turned in the direction of whichever container is to serve as the service container. The cam 157 will depress the spring 114 or 139, depending upon which direction the handle 154 is turned, and fuel from the container selected will flow through the respective port 97 or 86 until the pressure below the diaphragm 107 is sufficient to overcome the tension of the depressed spring and close the port controlled thereby, such pressure being sufficient to maintain the other port closed at all times. From the high pressure chamber the fuel flows through the passage 162 to the port 163 which will be normally open, until the pressure above the diaphragm 47 reaches the preferred pressure of 11" water column.

Flow from the service container will continue as long as the pressure therein exceeds the pressure for which the depressed spring and diaphragm are set to operate. By way of example, the depressed springs may be so constructed and arranged with respect to the cam 157 as to provide a pressure of 10# in the compartment below the diaphragm 107. As a general rule, the pressure in the service container will exceed 10# as long as there is liquefied gas remaining therein to be vaporized. When all the liquefied gas has been vaporized in the service container, the pressure

will drop rapidly below the 10# in which case the reserve valve will come into operation, which in the particular embodiment illustrated, is preferably 6#. With this drop in pressure, the hand of the gauge 164 will move from the service index 165 to the reserve index 166 to indicate that the system is continuing its operation upon the reserve container so that the next time the user passes or inspects the system he will know that it is time to replace the empty tank.

When the empty tank is replaced with a full one the handle 154 is then reversed to place on service the container which had been serving as a reserve, and to indicate that fact, the cam 157 then depressing the other spring to establish a 10# first stage pressure there and release the depressed spring to serve as a reserve control preferably at 6#, the two springs 114 and 139 otherwise being identical.

Having thus described the embodiment of the invention and the particular arrangement and operation of the parts, it will be apparent to those skilled in the art that an invention is provided within the purposes and objects stated at the beginning of the description and that various changes and alterations may be made therein without departing from the essential features of the invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. In combination in a pressure regulator, a unitary hollow housing, a partition formed therein dividing the housing into two chambers, a plurality of diaphragms, one forming a part of each of said chambers, a closing bonnet positioned outwardly with respect to each of said diaphragms, a plurality of passages leading from the outside into one of said chambers formed partially in said partition, another passageway interconnecting the chambers, a plurality of valves one for each of said plurality of passages, a valve operating means for each of said valves having rectilineal frictional contact with a portion of the partition, said valve operating means joined to one of said diaphragms, springs effective upon each of said valve operating means and tending to open them, and selective means effective to increase the compression of one of said springs above the others at a time, and valve means joined to another of said diaphragms for controlling the flow of fluid through said other passageway.

2. In combination in a pressure regulator, a unitary hollow housing, a wall forming a chamber in the housing, a diaphragm forming a part of the chamber, a closing bonnet positioned outwardly with respect to said diaphragm, a plurality of passages leading from the outside into said chamber, a plurality of valves one for each of said passages, a valve operating means for each of said valves, said valve operating means functioning independently of each other and joined to one of said diaphragms at spaced points exclusive of the intermediate support points for the diaphragm, springs effective upon each of said valve operating means and tending to open them, and selective means positioned within one of the bonnets effective to increase the compression of one of said springs at a time to establish different operating characteristics between the valve operating means.

3. In combination in a pressure regulator, a unitary hollow housing, a partition formed therein, dividing the housing into two chambers, a plurality of diaphragms, one forming a part of each of said chambers, a passage interconnecting the chambers, a closing bonnet positioned outwardly with respect to each of said diaphragms, means carried by one of the diaphragms for controlling the flow of fluid under pressure through said passage, a plurality of passages leading from the outside into one of said chambers, a plurality of valves one for each of said passages, a valve operating means for each of said valves, said valve operating means joined to one of said diaphragms, springs effective upon each said valve operating means and tending to open them, and selective means positioned within one of the bonnets effective to increase the compression of one of said springs at a time, and operating means extending outside of said bonnet for moving said spring compressor to effect compression of one or another of said springs.

4. In combination in a pressure regulator, a unitary hollow housing, a partition formed therein dividing the housing into two chambers, a high pressure and a low pressure diaphragm, one forming a part of each of said chambers, a closing bonnet positioned outwardly with respect to each of said diaphragms, a plurality of passages leading from the outside into one of said chambers means for maintaining a pressure differential between the chamber including a passageway and a valve controlled by one of said diaphragms, a plurality of valves one for each of said passages, a valve operating means for each of said valves, said valve operating means joined to said high pressure diaphragm and interconntected by an intermediate portion of said diaphragm which is free to move under pressure in said high pressure chamber, springs effective upon each said valve operating means and tending to open them, and selective means effective to increase the compression of one of said springs at a time.

5. In combination in a pressure regulator, a unitary hollow housing, a partition formed therein dividing the housing into two chambers and having a passageway interconnecting the chambers, a high pressure and a low pressure diaphragm, one forming a part of each of said chambers, a closing bonnet positioned outwardly with respect to each of said diaphragms means carried by said low pressure diaphragm for controlling the flow of fluid through said passageway, a plurality of passages leading from the outside into one of said chambers, formed partially in said partition, a plurality of valves one for each of said passages, a valve operating means for each of said valves, said valve operating means joined to said high pressure diaphragm, springs effective upon each said valve operating means and tending to open them, and selective means positioned within one of the bonnets effective to increase the compression of one of said springs at a time above the compression of another, and operating means extending outside of said bonnet for moving said spring compressor to effect increased compression of one or another of said springs.

6. In combination in a pressure regulator, a hollow housing, a plurality of inlets into said housing and a single service outlet therefrom, an entrance pressure responsive member including a diaphragm and a final pressure regulator means positioned in said housing including a diaphragm, a partition in said housing between said regulators dividing the housing into an entrance chamber and a low pressure chamber and said diaphragms forming a part of the wall of each of said chambers, said diaphragms being substantially the same as regards their maximum dimen-

sions, valves and operating means for each of said inlets, yielding means tending normally to open said valves and selective means effective upon the said yielding means and adapted to be moved to increase the compression upon one or another of said valve operating means.

7. In combination in a pressure regulator means for combustible gases, a hollow housing, two inlets thereto, a single service outlet therefrom, an entrance pressure responsive means including a diaphragm positioned within said housing and an outlet pressure regulating means including a diaphragm positioned within said housing, a valve for each of said inlets secured to said entrance pressure responsive means, means effective upon each of said valves tending to open it, selective means positioned in part within said housing and adapted to be moved to effect selectively said valve opening means to increase the opening effect upon a selected valve.

8. In combination in a pressure regulator means for combustible gases, a hollow housing, two inlets thereto, a single service outlet therefrom, an entrance pressure responsive means including a diaphragm positioned within said housing and an outlet pressure regulating means including a diaphragm positioned within said housing, a valve for each of said inlets secured to said entrance pressure responsive means, means effective upon each of said valves tending to open it, selective means positioned in part within said housing and adapted to be moved to effect selectively said valve opening means to increase the opening effect upon a selected valve and a pressure relief formed in said entrance pressure responsive means adapted upon the occurrence of excess pressure to yield to cause discharge through said responsive means and away from said service outlet.

9. In combination in a pressure regulator, a unitary housing having concavities upon opposite sides divided by a partition, said partition having two hollow enlargements forming wells and a portion of the body structure bridging each well, diaphragms on opposite sides of the housing closing said concavities to provide pressure chambers, a bonnet on opposite sides of the housing securing the diaphragms in place, the bonnet opposite said wells having therein a well with recesses corresponding to said wells in the hollow enlargements, a plurality of passages leading from different sources outside the body and terminating in valve ports on said bridging portions, a passageway leading from the chamber having the wells therein to the other chamber and terminating in a valve port, springs in the bonnet recesses, cam means journalled in the bonnet between said bonnet recesses for establishing a differential spring tension upon said springs, valve means cooperating with the valve ports on the bridge portions, said valve means being connected to the diaphragms and springs and urged to their open position by said springs and to their closed position by the pressure in the compartment acting upon the diaphragm, and valve means disposed between said wells upon the opposite sides of the partition for controlling the flow of fluid from one compartment to the other through the connecting passageway.

10. In combination in a pressure regulator having two ports opening into the same pressure chamber, two valve systems controlling the flow of fluid through said ports, means for imposing upon the two systems different working characteristics, diaphragm means common to both systems including an interconnecting intermediate portion free to move the systems under any pressure present in the chamber, said systems being secured to the diaphragm means as units movable therewith and independent guide means for each system providing separate sliding relationships for the valve systems.

11. In combination in a pressure regulator a unitary hollow housing, a partition formed therein dividing the housing into two chambers, a diaphragm for each chamber forming a wall for each chamber, a closing bonnet positioned outwardly with respect to each of said diaphragms, a plurality of passages leading from the outside into one of said chambers, a plurality of valves one for each of said passages, a valve operating means for each of said valves, said valve operating means being joined to one of said diaphragms with a freely moving portion of the diaphragm between the valve operating means, springs effective upon each of said valve operating means and tending to open them, selective means effective to increase the compression of only one of said springs at a time, said housing having a passage interconnecting said chambers, a valve controlling the flow of gas through said passage, a valve operating means connected to the last mentioned valve and joined to the other of said diaphragms to control the pressure of fluid delivered to the other of said chambers through the last mentioned passage.

12. A throwover regulator including a housing having a pressure chamber and two inlet passages terminating in ports opening into the chamber at spaced points with the planes of their respective openings coinciding, two valve systems movable to normally open position in a direction transversely to said coinciding planes for controlling the flow of fluid through said ports, means disposed between said valve systems for imposing upon the two systems different working characteristics including a bonnet spring for each system and a handle movable between limits for establishing a differential in pressures exertible by the springs in the respective systems, diaphragm means disposed in a plane parallel to said coinciding planes and common to both systems, said systems being secured to the diaphragm means and movable therewith, and independent guide means for each system providing separately directed movement for each of the valve systems.

13. In a throwover regulator having a housing defining a chamber, said housing having a plurality of passages leading from the outside and terminating in the chamber in valve ports, the combination of a high pressure diaphragm forming a flexible closure wall for said chambers, a bonnet secured to the housing and holding the diaphragm in place, a plurality of valve members one for each of said ports, spring means in said bonnet urging the diaphragm inwardly, means interconnecting the valve members and diaphragm for urging the valve members away from the ports and maintaining them in a predetermined relative adjustment with respect to their respective ports, means for establishing a differential pressure on said valve members including said spring means, and means extending outside of the housing for operating said differential pressure establishing means, said valve members including elements having undercut portions and valve seats having retainer nibs thereon engaging in said undercut portions whereby any swelling of the seats is had in a

lateral direction to maintain uniform thickness of the seats without disturbing said predetermined relative adjustment between the valve members and the ports.

14. In a pressure regulator having a housing provided with a chamber and a plurality of passages leading from the outside and terminating in the chambers in valve ports, means for controlling the flow of fluid through said ports including valve members and a device for establishing differential operating conditions under which fluid is admitted through said ports, said device supporting the members and ports with respect to each other in predetermined adjusted positions, and means for maintaining the adjusted positions including valve seats and undercut portions on the valve members which allow for lateral expansion of the seats to control the thickness of the seats, and means for retaining the seats on said members.

15. In combination in a pressure regulator having two ports opening into the same pressure chamber, diaphragm means, two valve systems controlling the flow of fluid through said ports and secured to the diaphragm means as units movable therewith, means for imposing upon the two systems different working characteristics including a manually controlled element and springs constituting the sole connection between the manually controlled element and the systems secured to the diaphragms, and means for guiding each system separately for independent movement.

16. A throwover regulator for handling liquefied petroleum gas comprising a hollow housing, two inlets thereto adapted to be connected to separate sources of gas under pressure, a valve mounted in guided relationship in the housing for each inlet and cooperating therewith to control the admission of gas therethrough, pressure responsive means in said housing subjected to atmospheric pressure upon one side and to the pressure of the gas admitted through the inlets by the valves upon the other side for controlling the operation of the valves independently of each other, means effective upon each of said valves tending to open it, stem means reciprocably mounted in axail alignment with each valve in the housing for movement between two alternative positions with respect to the pressure responsive means, and selective means in said housing upon said atmospheric side of the pressure responsive means including a pivotally mounted element movable between two positions for disposing one of said stem means in one of its said alternative positions with respect to the diaphragm to increase the opening effort of said effective means upon one of the valves by which said one of the valves will operate to admit gas to the housing at a higher pressure than the other valve, and a single outlet from said housing for conducting gas to the valve of a service stage pressure regulator.

17. A throwover regulator for handling liquefied petroleum gas comprising a hollow housing, two inlets thereto adapted to be connected to separate sources of gas under pressure, a valve mounted in guided relationship in the housing for each inlet cooperating therewith to control the admission of gas therethrough, pressure responsive means in said housing subjected to atmospheric pressure upon one side and to the pressure of the gas admitted through the inlets by the valves upon the other side for controlling the operation of the valves independently of each other, means effective upon each of said valves tending to open it including a spring, stem means for each valve reciprocably mounted in alignment with each valve in the housing and movable between two alternative positions with respect to said pressure responsive means, said stem means supporting one end of the spring, and selective means in said housing upon said atmospheric side of the pressure responsive means including a pivotally mounted element for disposing either of said stem means alternatively with the other of said stem means in one of its said alternative positions to increase the opening effort upon one of the valves by which said one of the valves will operate to admit gas to the housing at a higher pressure than the other valve, and a single outlet from said housing for conducting gas to the valve of a service stage pressure regulator.

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