Jan. 27, 1953

H. L. NORWAY ET AL

2,626,628

AUTOMATIC CHANGE OVER

Filed Dec. 17, 1948

3 Sheets-Sheet 1

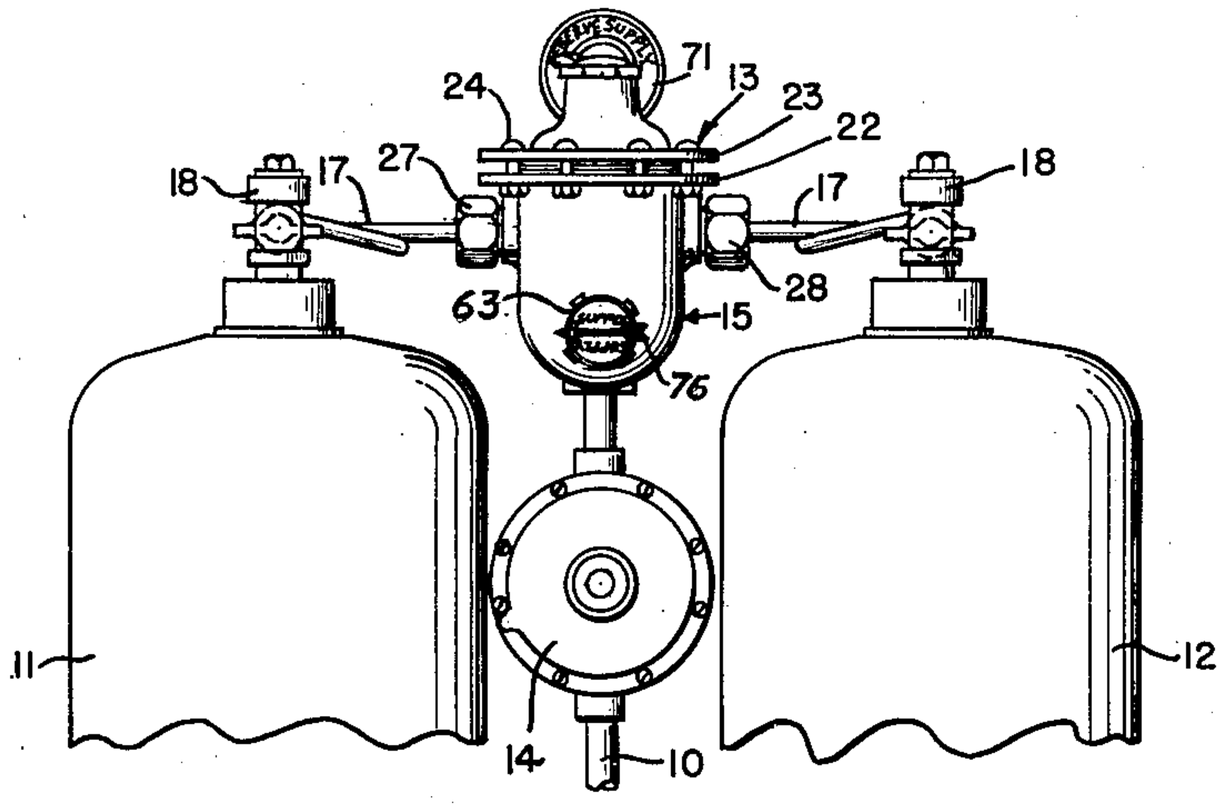

Fig. 1

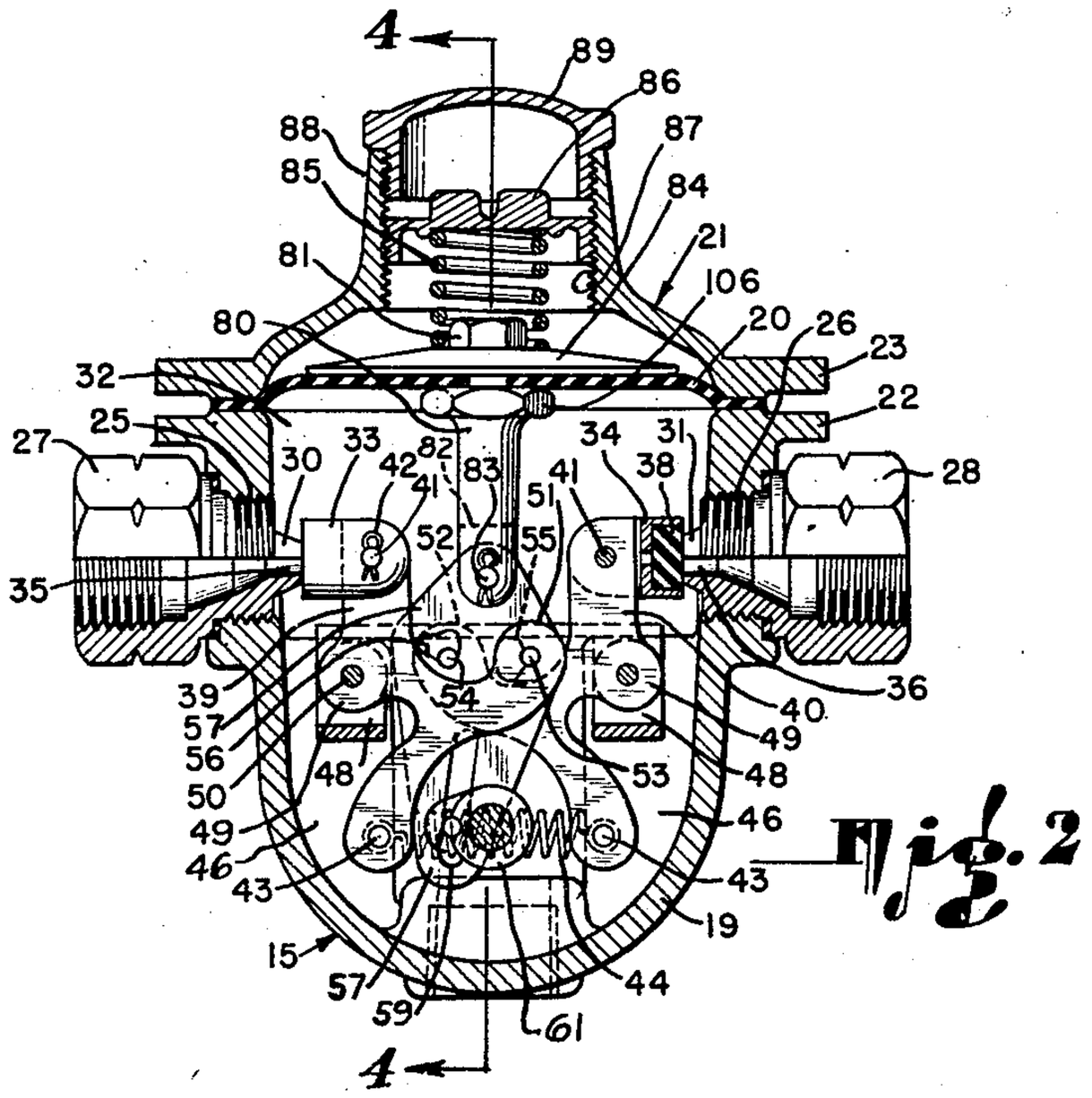

Fig. 2

INVENTORS.
HAROLD L. NORWAY
WILLIS A. PERRY
BY
ATTORNEY

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Fig. 3

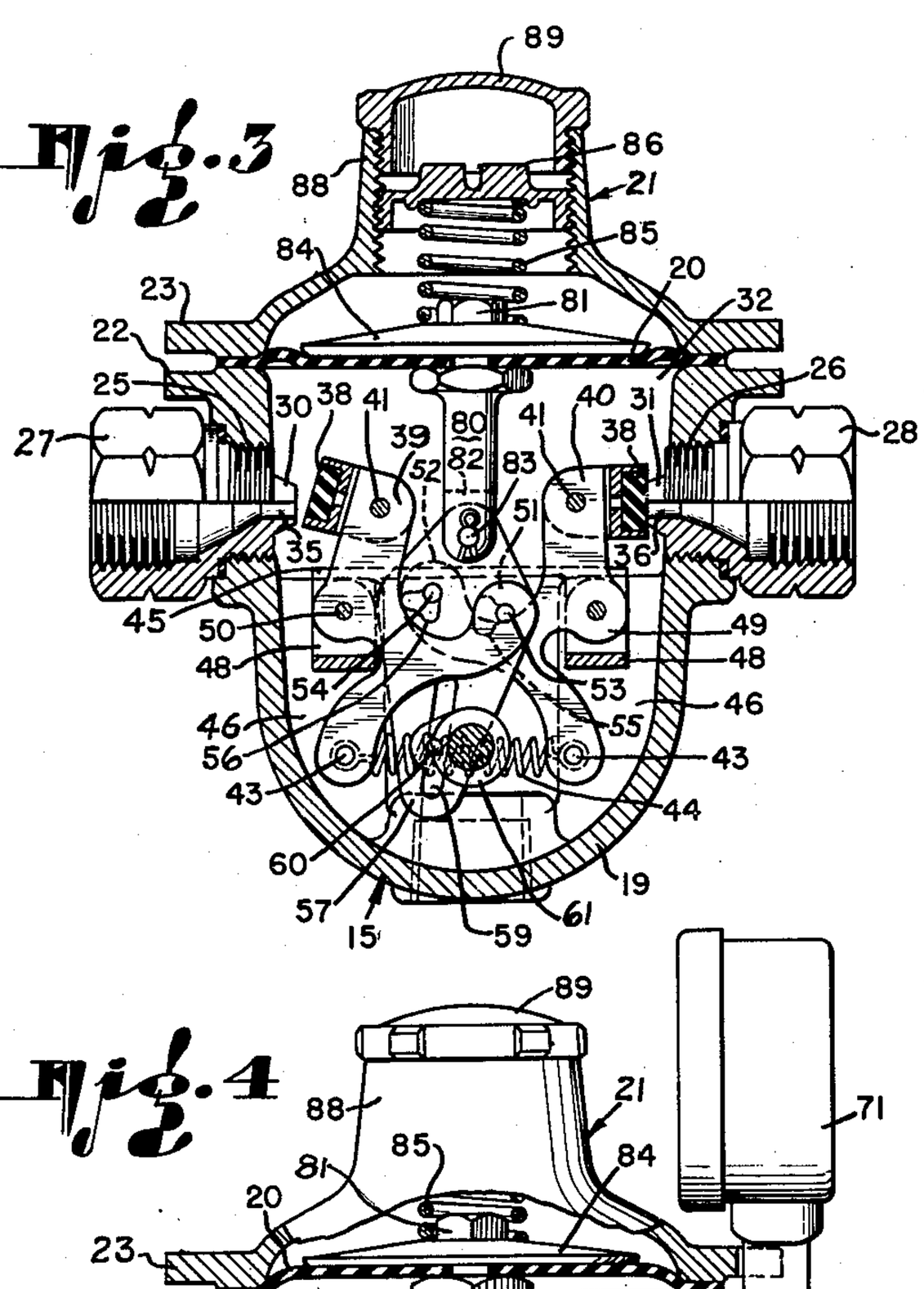
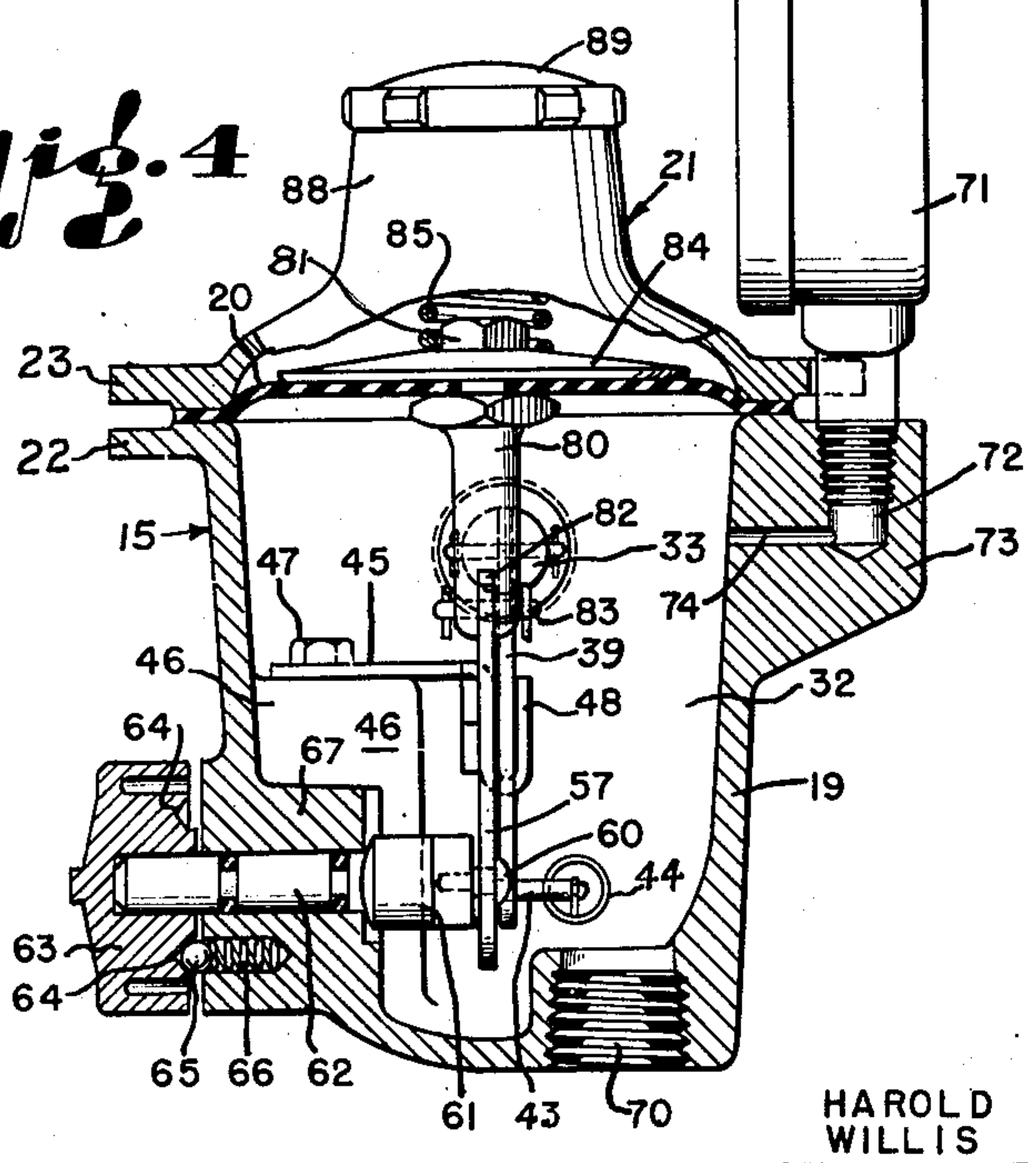


Fig. 4



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ATTORNEY

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Fig. 5

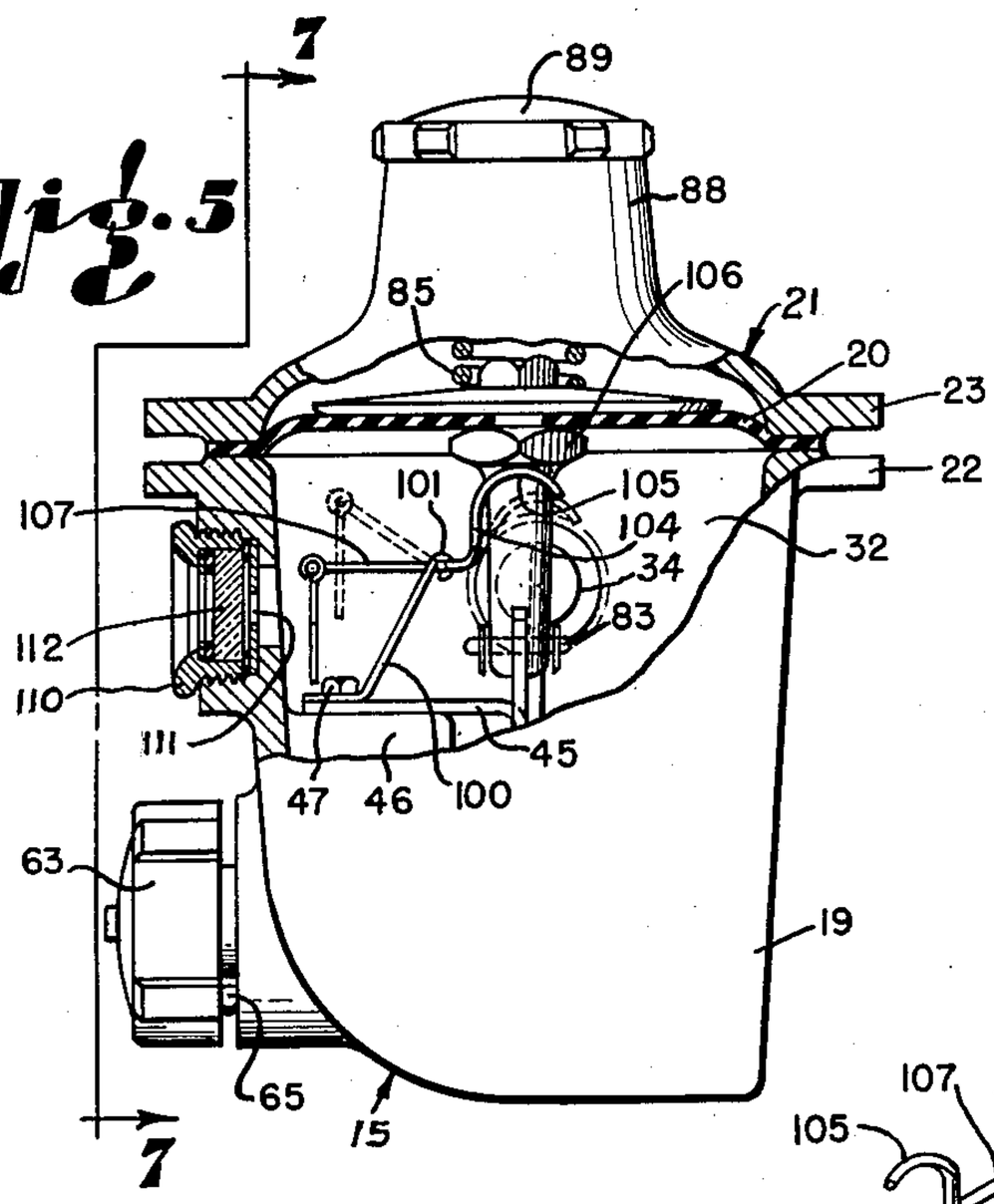


Fig. 6

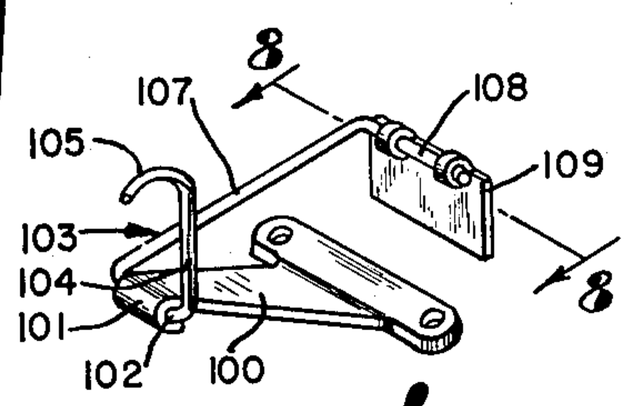


Fig. 7

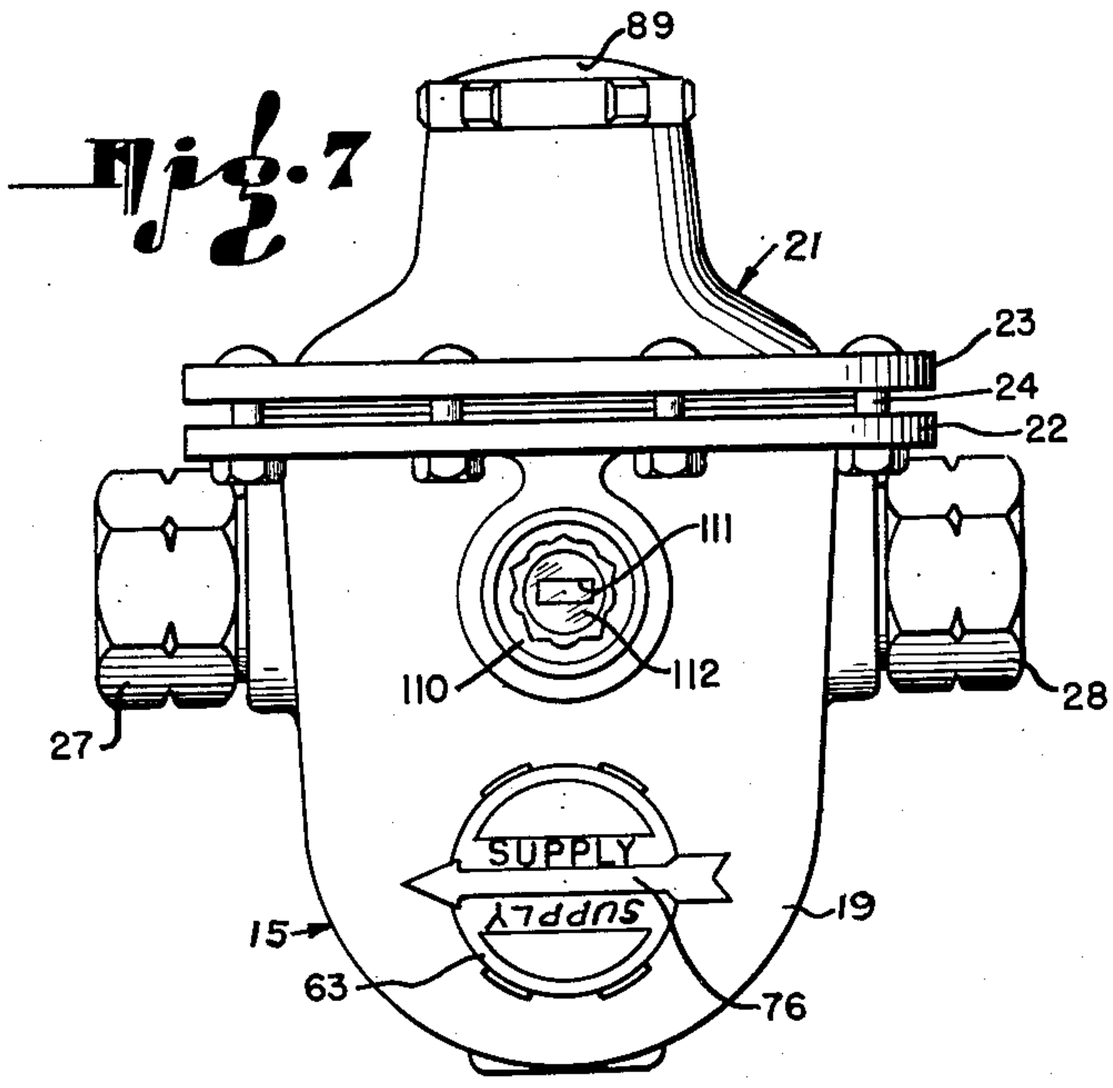
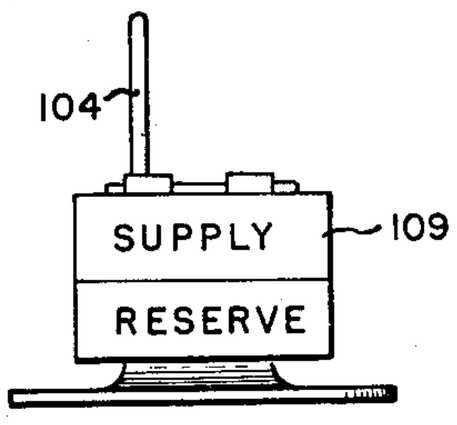


Fig. 8



INVENTORS.
HAROLD L. NORWAY
WILLIS A. PERRY
BY
ATTORNEY

Patented Jan. 27, 1953

2,626,628

UNITED STATES PATENT OFFICE

2,626,628

AUTOMATIC CHANGE-OVER

Harold L. Norway, Inglewood, and Willis A. Perry, Los Angeles, Calif., assignors to Southwestern Development Company, Inglewood, Calif., a corporation of California

Application December 17, 1948, Serial No. 65,888

17 Claims. (Cl. 137—113)

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This invention relates generally to fluid flow control means, and relates more particularly to automatic changeover apparatus for fluid pressure systems.

While the apparatus may be used in other types of installations, it has particular utility in systems handling gases, such as liquefied petroleum gas, under high pressures.

In one type of such systems gas in liquefied form is supplied in suitable containers or "bottles." These containers are removably connected to the system which has gas using devices connected thereto, and the gas is supplied by the containers to the system through a pressure regulator.

Usually there are two such containers connected to the inlet pipe of the system which leads to the pressure regulator, one being used as a service or supply container, the other being a reserve container. In such an arrangement it is desirable to draw gas from the supply container until that source becomes depleted, or from any other cause loses the required operating pressure and then automatically to draw gas from the other or reserve source or container. Hence, the connecting means is provided with a valve arrangement whereby one or the other of the containers will supply gas to the system as the supply container, while the other container is held in reserve until the depletion or exhaustion of the gas in the supply container, whereupon the reserve container is automatically brought into communication with the system so that the exhausted container may be replaced.

It is therefore an object of the present invention to provide improved changeover apparatus adapted to automatically effect a change from the supply container to the reserve container when the pressure of the gas in the supply container falls to a predetermined low value.

Another object of the invention is to provide apparatus of this character that is extremely simple in construction and operation.

Still another object of the invention is to provide a device of this character adapted to so operate that either container may be used as a supply or a reserve container.

A further object of the invention is to provide a device of this character having easily operated manual means for effecting the changeover.

A still further object of the invention is to provide a device of this character whereby the exhausted container connection may be automatically cut off when the manually operated mechanism is actuated to provide service pressure from the container being used as a reserve container.

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Another object of the invention is to provide means for automatically indicating which source of supply is being drawn upon.

A still further object of the invention is to provide a device of this character having simple accurate and reliable indicating means for indicating which source of supply is being drawn upon.

Other objects and advantages of the invention will be brought out in the following part of the specification.

Referring to the drawings, which are for illustrative purposes only,

Fig. 1 is a side elevation of apparatus embodying the present invention as installed;

Fig. 2 is a sectional view of the device;

Fig. 3 is a view similar to Fig. 2 but showing the service valve open;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is a partial section of the apparatus showing an alternative indicating mechanism;

Fig. 6 is a perspective view of the indicating mechanism per se;

Fig. 7 is a front view of the apparatus as it would be seen from line 7—7 of Fig. 5; and

Fig. 8 is a front view of the indicating mechanism shown in Fig. 6.

Referring more particularly to Fig. 1, there is shown a supply line 10 of a gas distributing system which receives gas from a cylinder or container 11, or a cylinder or container 12 through a manifold or control apparatus, indicated generally at 13, and a pressure regulator 14. The apparatus 13 comprises a housing 15. The pipes or tubes 17 connect the housing with the respective valves 18 of the containers 11 and 12.

Referring to Fig. 2, the housing 15 comprises a cup-shaped lower portion 19, as shown in the drawings, which is open at the top. The open end of the lower portion 19 of the housing is closed by a flexible diaphragm 20 marginally clamped between the upper end of said lower portion and a bonnet 21, the respective parts 19 and 21 having marginal flanges 22 and 23 respectively, whereby said parts may be secured together by screws 24 (Figs. 1 and 7).

The lower portion or body 19 of the housing is provided with a pair of oppositely disposed tapped inlet openings 25 and 26 respectively, for reception of the fixtures 27 and 28 which provide means for connecting the respective tubes 17 to the housing. The fixtures 27 and 28 are provided with

nozzle-shaped valve seats 30 and 31 respectively, which project into the chamber 32 formed by the body portion 19 of the housing 15.

Movable valve members 33 and 34 are provided for controlling the respective passages 35 and 36 of the fixtures 27 and 28 respectively. Each movable valve is provided with a closure disc 28 of suitable resilient material for cooperation with its respective valve seat. The respective movable valve members 33 and 34 are pivotally mounted to the adjacent ends of levers 39 and 40 by means of pins 41 which are secured by cotter pins or the like, 42, the valve members being provided with slots in which the adjacent ends of said levers are received.

Each of the levers 39 and 40 are of substantially the same shape and size but are oppositely disposed. Each lever is pivotally mounted intermediate its ends, and the ends of said lever opposite the valve members are provided with pins 43 to which the respective ends of a spring 44 are attached for yieldingly urging said lever ends toward each other.

The means for mounting the levers 39 and 40 comprises a yoke 45, shown as formed of sheet metal, which is secured to the top sides of a pair of webs 46, shown formed integrally with the wall of the lower portion 19 and spaced laterally apart, said yoke being secured to said web by screws 47. Each arm of the yoke 45 is provided with a depending U-shaped portion 48, between the arms of which portions 49 of the levers are received and pivoted by means of pins 50. Each lever is provided with an arcuate projecting portion 51 and 52 respectively, which are provided with pins 53 and 54 respectively, which are received in openings 55 and 56 respectively, of a link 57. It is to be noted that the arcuate portions 51 and 52 are oppositely disposed and overlap, and that the openings 55 and 56 each include an elongated part that is disposed in a generally vertical direction and a laterally extending part. The laterally extending parts of said openings are oppositely disposed.

The link 57 also includes a longitudinally extending slot 59 for reception of a pin 60 secured in a cam 61 which is attached to a shaft 62 of an indicator. The shaft 62 has a knob 63 secured to the outer end thereof and said knob is provided with a pair of notches 64 arranged diametrically on its inner side. The notches 64 provide releasable stops which are engaged by a ball 65 urged toward said notches by a spring 66 disposed in a recess provided therefor in a bearing boss 67, shown as being formed integrally with the housing 19, said bearing boss also providing supporting means for the shaft 62.

The chamber 32 has an outlet 70 and a pressure gauge 71 is threadably attached in a tapped bore 72 provided in a boss 73 of the housing 19, and having a connecting passage 74 with the chamber 32. The pressure gauges shown in Figs. 1 and 4 are of conventional type, and hence, need not be described in detail except to call attention to the fact that the face of said gauge is divided and has a part marked "Supply" and a part marked "Reserve." The knob 63 is provided with an arrow 76 thereon (Figs. 1 and 7), with the word "Supply" also marked thereon on opposite sides of the arrow. One of the words "Supply" is upside down, while the other is right side up, so that which ever opposite position the knob 63 is moved to, one of the words "Supply" is upright and the arrow is pointing to the tank in operative service, the other tank being the reserve tank.

With the container or tank 11 functioning as the supply tank, and the knob 63 in the position shown in Fig. 1 so that the arrow 76 is pointing to said tank 11, the valve 33 controls the discharge of gas through the passage 35 into the compartment 32 from which it passes through the outlet 70 to the second stage regulator 14, and thence through the conduit 10 to the devices utilizing said gas. The pressure of the gas in the chamber 32 urges the diaphragm 20 upwardly, and upward movement of the diaphragm is imparted to the link 57 which is connected to said diaphragm by means of a connecting member or yoke 80 which is connected to the diaphragm by means of a nut 81. The yoke 80 is provided with a slot 82 (Fig. 4) in which the link 57 is received and pivoted on a pin 83 which is secured by means of a cotter pin or key. Also secured to the upper side of the diaphragm is a plate 84, against which one end of a spring 85 reacts. The other end of the spring 85 reacts against a plug 86 screwed into a threaded bore 87 formed in an upward extension 88 of the bonnet 21. The upper end of the bore 87 is closed by a cap 89 which is also threaded therein. The plug 86 may be screwed inwardly or outwardly to adjust the tension of the spring 85 which urges the diaphragm downwardly, and downward movement of said diaphragm will cause a corresponding downward movement of the link 57.

It is to be noted that with the mechanism arranged as shown in Figs. 1 and 2, the valve 33 is directly connected to the diaphragm 20 due to the fact that the pin 53 of lever 39 is in the lateral extension of the opening 55 of said link 57. At this time the pin 54 of the lever 40 is received in the vertical portion of the opening 56 and is located at the lower end of said opening.

Any suitable service pressure may be provided, a common pressure being approximately twelve pounds. With the mechanism adjusted for the supply pressure, the valve 33 will be so controlled as to maintain said supply pressure in the chamber 32, and downward movement of the diaphragm 20, except as hereinafter described, will not effect opening of the valve 34, the spring 44 functioning to maintain said valve 34 closed.

Should the pressure in the tank 11 drop, as when said tank is exhausted or nearly exhausted, the pressure in the chamber 32 will drop to another predetermined pressure, termed the reserve pressure, and commonly being approximately six pounds. As the pressure in the chamber 32 drops, the spring 85 will move the diaphragm 20 downwardly, causing the valve member 33 to move in the opening direction, and also causing the link 57 to move downwardly so that pin 54 of the lever 40 will contact the upper end of the opening 56. Further downward movement of the diaphragm 20 will cause the valve 34 to open sufficiently to admit pressure from the tank 12 which is functioning as the reserve tank, and the pressure in chamber 32 will be maintained at the desired reserve pressure.

When the pressure in the chamber 32 is at the above mentioned twelve pounds, the indicator of the gauge 71 will point to the area marked "Supply." However, when the tank 11 is exhausted to the point where the pressure in the chamber 32 drops to the reserve pressure, the indicator of said gauge 71 will point to the reserve area. The user of the mechanism will then know that it is time to have a new tank installed.

In installing a new tank the knob 63 is turned substantially 180° so that the arrow points to the tank 12. This movement of the knob causes the pin 60 to move the link 57 in a counterclockwise direction (Figs. 2 and 3) so that the pin 53 of the lever 39 is disposed in the vertical portion of the opening 55 and the pin 54 of the lever 40 is disposed in the lateral portion of the opening 56. The valve 34 now has a direct connection with the diaphragm 20 and a supply pressure of approximately twelve pounds is established and maintained in the chamber 32 which now derives its supply pressure from the tank 12. The spring 44 is calibrated to maintain the valve 33 closed under these conditions, and hence, tank 11 may be replaced by a full tank which now becomes a reserve.

In Figs. 5 to 8 there is shown an alternative indicating mechanism which is of extremely simple construction and operation. This mechanism comprises a bracket 100, attached to the webs 46 by means of the screws 47 which also hold the yoke 45. The bracket extends upwardly and is provided with an end portion 101 which is turned about a part 102 of a lever, indicated generally at 103, which pivots in said part 101. The lever 103 includes an upstanding portion 104 which terminates in a curved end part 105 disposed beneath the nut-like portion 106 of the yoke or member 80. The lever 103 also includes a generally horizontal part 107 which extends from the part 102 at the side opposite the part 104. The lever 103 is shown as being formed of a piece of wire or other similar suitable material and includes a laterally turned portion 108 adjacent the free end of the part 107. The portion or part 108 has a pivotal connection with a plate 109 which has the front face thereof divided into upper and lower parts bearing the words "Supply" and "Reserve" respectively. These parts may also be colored so as to be more readily distinguishable, one color scheme being such that the supply portion is colored green, and the reserve portion red.

The plate 109 is arranged to hang behind a plug 110 which is screwed into an opening provided therefor in the casing 19. The plug is provided with a peep opening or slot 111, and a transparent window 112 is suitably sealed in the plug.

When the diaphragm 20 is in the upper position for regulating the supply pressure, the portion of the plate 109 which bears the word "Supply" thereon, is in front of the peep hole 111. However, when the pressure in the chamber 32 drops to the reserve pressure and the diaphragm 20 moves downwardly, the nut-like portion 106 of the yoke 80 urges the curved end 105 of the lever 103 downwardly and causes the part 107 to pivot in the clockwise direction, Fig. 5, so as to raise the plate 109 until the part marked "Reserve" is displayed before the peep opening 111.

When the diaphragm 20 raises under an increase of pressure from the reserve value to the supply pressure, the weight of the plate 109 and relatively long portion 107 of the lever 103 causes the plate to move downwardly and the curved portion 105 of the lever to move upwardly and maintain operative contact with the nut-like portion 106 at all times.

We claim:

1. In fluid flow control apparatus: means defining a chamber having a pair of inlets and an outlet; a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; yielding compression means exerting effective pressure on said wall in opposition to the pressure in the chamber; connecting means between said movable wall and said valves, said connecting means including direct and lost motion connections for each valve, said connections being so arranged that when one valve is directly connected with the movable wall a lost motion connection is interposed between said wall and the other valve; and means for selectively actuating the connecting means.

2. In fluid flow control apparatus: means defining a chamber having a pair of inlets and an outlet; a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; connecting means between said movable wall and said valves having two operative positions, said connecting means including direct and lost motion connections for each valve, said connections being so arranged that when one valve is directly connected with the movable wall a lost motion connection is interposed between said wall and the other valve; yielding means urging the valves in the opening direction and acting in opposition to the pressure in the chamber on said movable wall; yielding means urging the valves in the closing direction; and means for actuating the connecting means from one operative position to the other.

3. In fluid flow control apparatus: a housing defining a chamber, said housing having a pair of inlets and an outlet; a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; a pivoted lever for each valve for actuating same; a pin for each lever; a link pivotally connected to the movable wall and having a pair of slots therein for reception of the respective pins, each of said slots having a laterally extending part, said laterally extending parts being oppositely disposed and said slots being so arranged that when the link is in one position there will be a direct connection between the movable wall and one of said valves and a lost motion connection between the movable wall and the other of said valves; yielding means for urging the valve in the opening direction against the pressure in the chamber acting on the movable wall; and means for moving said link from one operative position to the other.

4. The invention defined by claim 3, wherein the last mentioned means includes a rotatable knob having an arrow thereon pointing in the direction of the valve having the direct connection with the movable wall.

5. The invention defined by claim 3, wherein said levers are pivoted intermediate their ends and there is yielding means connecting the free ends of the levers together and urging same toward each other so that the valves are urged in the closing direction thereby.

6. In fluid flow control apparatus: means defining a chamber having a pair of inlets and an outlet, a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; connecting means between said movable wall and having two operative positions, said connecting means including direct and lost motion connections for each valve, said connections being so arranged that when one valve is directly connected with the movable wall the other valve is connected thereto by a lost motion connection, the pressure in said chamber acting on said movable wall urging the valves in the closing direction; yielding means for urging the valves in the closing direction; means for selectively actuating

the connecting means; and pressure indicating means for indicating which inlet is supplying fluid pressure to the chamber.

7. In fluid flow control apparatus: means defining a chamber having a pair of inlets for connection with sources of fluid pressure, and an outlet; a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; connecting means between said movable wall and said valves, said connecting means including a direct connection with one valve and a lost motion connection with the other valve, pressure in said chamber urging the movable wall in a direction to effect closing of said valves; yielding means urging said valves in the opening direction against the pressure in said chamber urging the movable wall in the valve closing direction, the connections between the movable wall and the valves being such that the directly connected valve will control the flow of fluid into the chamber when the movable wall operates in one range and the other valve will control the flow of fluid into the chamber when the movable wall operates in another range; and pressure indicating mechanism including a plate operatively connected with the movable wall and movable thereby to indicate which range the movable wall is in.

8. In fluid flow control apparatus: means defining a chamber having a pair of inlets for connection with sources of fluid pressure, and an outlet; a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; connecting means between said movable wall and said valves, said connecting means including a direct connection with one valve and a lost motion connection with the other valve, pressure in said chamber urging the movable wall in a direction to effect closing of said valves; yielding means urging said valves in the opening direction against the pressure in said chamber urging the movable wall in the valve closing direction, the connections between the movable wall and the valves being such that the directly connected valve will control the flow of fluid into the chamber when the movable wall operates in one range and the other valve will control the flow of fluid into the chamber when the movable wall operates in another range; and pressure indicating mechanism including a lever pivotally mounted intermediate its ends, one end being operatively connected with the movable wall and the other end having a substantially horizontal portion, a plate hinged on said horizontal portion of the lever and depending therefrom, said plate being located adjacent a peep hole provided in the means defining said chamber, said plate being so marked as to indicate the range in which the movable wall is operating.

9. In fluid flow regulating apparatus: means defining a pressure chamber having an outlet; a pair of inlet valves for said chamber; a movable wall subjected on one side to pressure in said chamber; connecting means between said movable wall and said valves, said connecting means including a direct connection with one valve and a lost motion connection with the other valve, pressure in said chamber urging the movable wall in a direction to effect closing of said valves; yielding means urging said valves in the opening direction, the connections between the movable wall and the valves being such that the directly connected valve will control the flow of fluid into the chamber when the movable wall operates in one range and the other valve will control the

flow of fluid into the chamber when said wall operates in another range; and means controlled by said movable wall for indicating the range within which said wall is operating.

10. In fluid pressure regulating apparatus: means defining a pressure chamber having an outlet; a pair of inlet valves for said chamber; yielding means urging said valves closed; a movable wall subjected on one side to the pressure in said chamber; connecting means between said movable wall and said inlet valves, said connecting means including positive connection means and lost motion connection means for each valve, said wall being positively connected to one valve for controlling same in one stage of pressure regulation, and connected through said lost motion connection with the other valve, the latter valve being controlled in a second stage of operation; and yielding means urging the valves in the opening direction in opposition to the pressure in the chamber acting on the movable wall urging the valves in the closing direction.

11. In fluid pressure regulating apparatus: means defining a pressure chamber having an outlet; a pair of inlet valves for said pressure chamber; yielding means urging said valves closed; and control means for said valves, including a movable wall subjected to the pressure in said chamber and positive and lost motion connecting means between said wall and said valves whereby the wall controls one valve for effecting regulation of the pressure in said chamber when said pressure is substantially at one predetermined value, said yielding means maintaining the other valve closed, and when the pressure in said chamber drops to substantially another predetermined value said wall moves to a position whereat it controls the other valve so as to maintain the pressure in said chamber at substantially the second mentioned predetermined value.

12. In pressure regulating apparatus: means defining a pressure chamber having an outlet; a pair of inlet valves for said pressure chamber; a movable wall subjected on one side to pressure in said chamber; and connecting means between said wall and said valves, said connecting means including releasable interlocking parts which, when interlocked, provide a direct connection between said wall and one of said valves, and when released provides a lost motion connection therebetween, said connecting means being so arranged that when there is a direct connection between said wall and one of the valves there is a lost motion connection between said wall and the other of said valves.

13. In fluid pressure regulating apparatus means defining a pressure chamber having an outlet; a pair of inlet valves for said pressure chamber; a movable wall subjected to pressure in said chamber; and connecting means between said wall and said valves, said connecting means including a part having two operative positions at either of which there is a positive connection between the wall and one of the valves establishing a fixed relationship between said wall and valve so that said wall effects positive opening and closing movements of said valve with respective movements of said wall, and a lost motion connection between said wall and the other valve having a predetermined amount of lost motion between said wall and other valve.

14. In fluid pressure regulating apparatus: means defining a pressure chamber having an outlet; a pair of inlet valves for said pressure

chamber; yielding means urging said valves closed; a movable wall subjected to the pressure in said chamber and having two pressure controlling positions determined by the pressure in the control chamber; and means connecting said wall with the inlet valves, said connecting means including means for establishing a positive direct connection between said wall and each of the valves and a lost motion connection between said wall and said valves and being so arranged that when there is a direct connection between said wall and one of the valves there is a lost motion connection between said wall and the other of said valves.

15. In fluid pressure regulating apparatus: means defining a pressure chamber having an outlet; a pair of inlet valves; yielding means urging said valves closed; a movable wall subjected on one side to pressure in said chamber; yielding means exerting effective pressure on said valves in the opening direction and adapted to overcome the first mentioned yielding means; and connecting means between said movable wall and said valves, said connecting means including direct and lost motion connections for each valve arranged so that when one valve has a direct connection with the movable wall, the other valve is connected to said wall by a lost motion connection whereby said movable wall is adapted to regulate the pressure in said chamber for maintaining a substantially predetermined pressure therein by control of the directly connected valve, and at a lower substantially predetermined pressure said wall is adapted to control the other valve for regulating the pressure in said chamber.

16. In fluid flow apparatus: means defining a chamber having a pair of inlets and an outlet; a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; yielding means exerting effective pressure on said wall in opposition to the pressure in the chamber; connecting means between said movable wall and said valves, said connecting means including direct and lost motion connections for each valve, said connections being so arranged that when one valve is directly connected with the movable wall a lost motion connection is interposed between said wall and the other valve; and manual operable means for selectively actuating the connecting means.

17. In fluid flow control apparatus: means defining a chamber having a pair of inlets and an outlet; a valve for each inlet; a movable wall subjected on one side to pressure in said chamber; yielding means exerting effective pressure on said wall in opposition to the pressure in the chamber; connecting means between said movable wall and said valves, said connecting means including direct and lost motion connections for each valve, said connections being so arranged that when one valve is directly connected with the movable wall a lost motion connection is interposed between said wall and the other valve; and means for selectively actuating the connecting means.

HAROLD L. NORWAY.
WILLIS A. PERRY.

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