Aug. 8, 1939. W. C. BUTTNER 2,168,701

AUTOMATIC THROW-OVER

Filed Dec. 30, 1937 2 Sheets-Sheet 1

Fig. 1

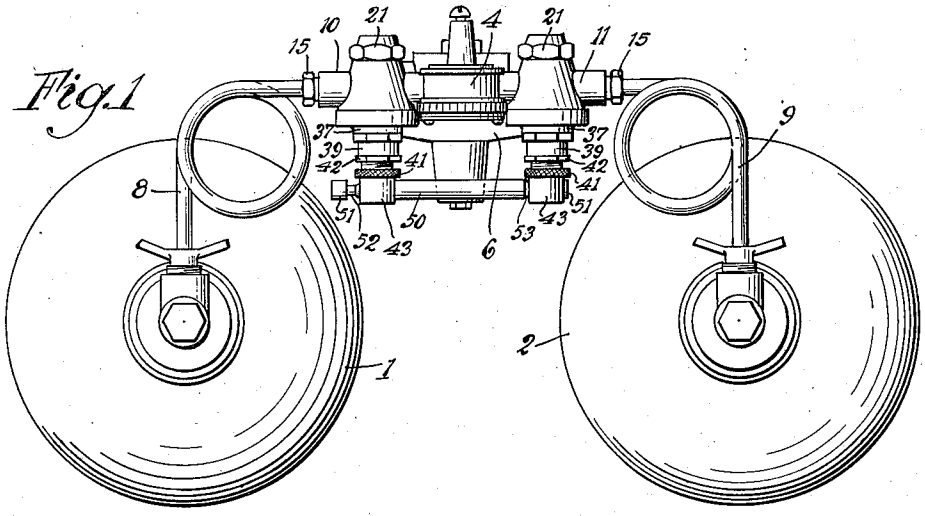
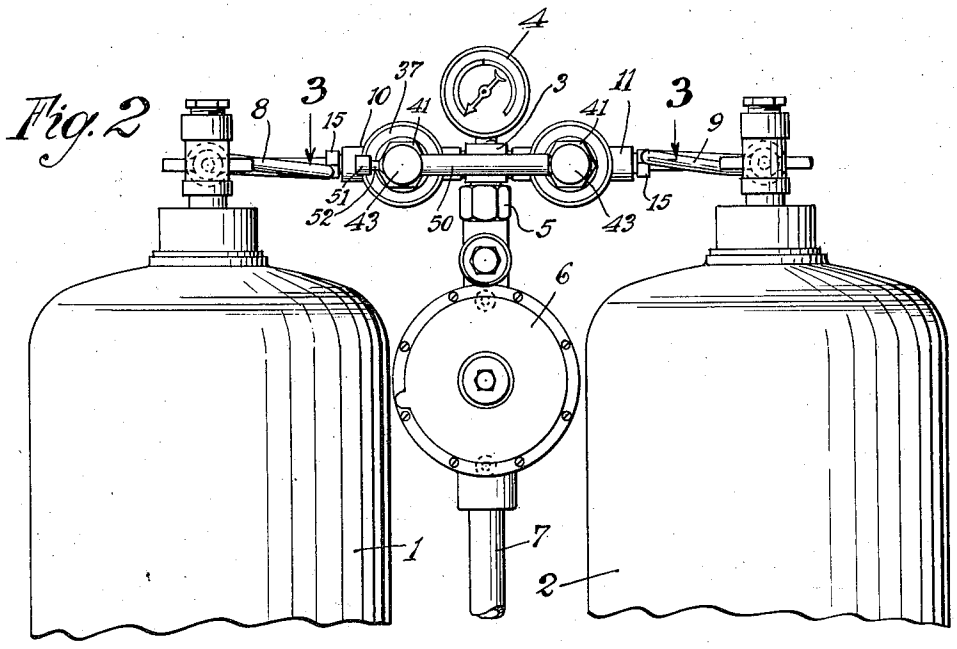


Fig. 2



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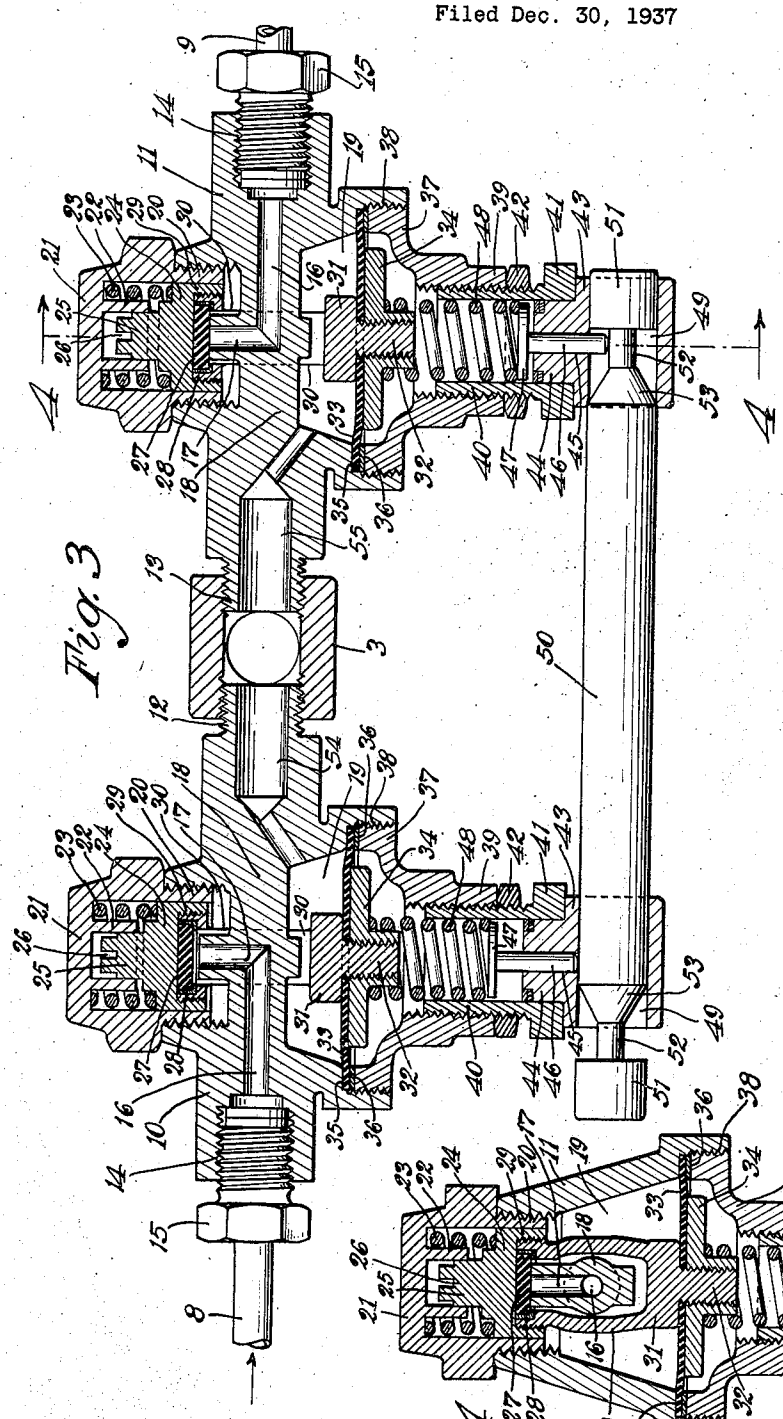

Fig. 3

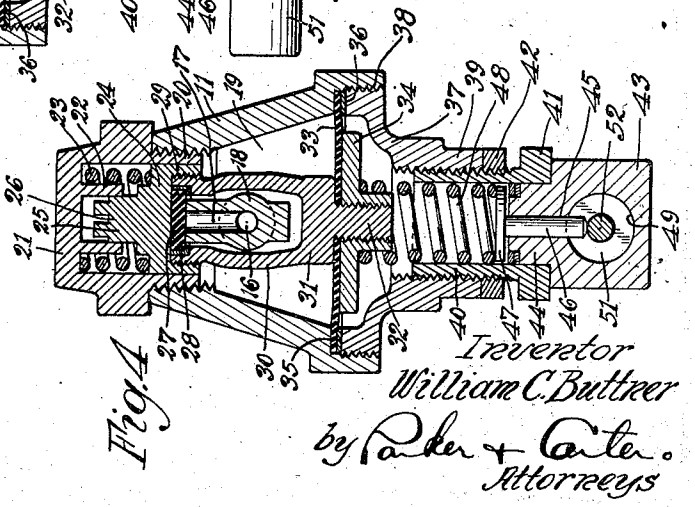

Fig. 4

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AUTOMATIC THROW-OVER

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Application December 30, 1937, Serial No. 182,426

17 Claims. (Cl. 221—73.5)

This invention relates to a controlling means and particularly to a fluid controlling apparatus of the sort generally referred to as a "throw-over." In the form illustrated herewith it is particularly applicable to use in connection with a plurality of fluid tanks of the type generally used in connection with the storage, supplying and use of combustible gases, although it is not limited to this association or use.

One object of the invention is to provide a "throw-over" mechanism by means of which the connections from a plurality of tanks to the system which they are to supply may be readily controlled from the outside without the necessity of disconnecting anything and particularly without the necessity of operating a plurality of valves individually. Another object is to provide a "throw-over" which may be operated without disconnecting any part of the system and by means of which several connections may be simultaneously controlled or changed so that as the discharge from one tank into the system is stopped the discharge from another tank into the system is begun, in accordance with the change in pressure conditions within the tanks.

Other objects will appear from time to time in the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a plan view of one application;

Figure 2 is an elevation of the application shown in Figure 1;

Figure 3 is a horizontal cross section taken at line 3, 3 of Figure 2 on an enlarged scale; and

Figure 4 is a transverse sectional detail taken at line 4, 4 of Figure 3.

Like parts are designated by like characters throughout the specification and drawings.

In the particular arrangement shown herewith two tanks 1 and 2 are shown as being connected to a system, into which the fluid discharged from the tanks passes for use. As shown the system includes a manifold center piece 3, which is hollow and may be provided with a connection suitable for receiving a pressure gauge 4. The manifold is also provided with a connection into which a discharge conduit may be placed and as shown the discharge is from the manifold 3 into the connection 5 of a regulator 6, from which a conduit 7 leads to carry the fluid to its point of use.

As shown each tank is provided with a connection member 8, 9. These being connected respectively to the tanks 1 and 2 at one end, and each being connected at its other end to the "throw-over" housing. As shown the "throw-over" housing is formed of several parts. There are thus two main body parts 10, 11 to one end of each of which is secured one of the connections 8 or 9. At the opposite ends the body members 10 are provided with threaded connection portions 12, 13 respectively, which are engaged with the manifold center piece 3, and thus the body portions 10 and 11 and the manifold 3, form in effect a composite housing for the "throw-over."

Each body portion 10 and the parts assembled with them are preferably identical. They are used one for each tank and each is connected to its own tank and to a manifold or other connection with the system in which the gas is to be used. A description of one will suffice for both.

The body 10 at its inlet end is provided with an interiorly threaded cavity 14 to receive the connection member 15 of the part 8. Leading from this is a passage 16, which turns back as at 17 and is open to the interior of the body. A part of the passage 16 and the backwardly extending portion 17 are both formed in a bridge like portion 18 which extends across the hollow interior 19 of the body. The body 10 is provided, above the hollow 19, with an interiorly threaded seat 20, in which a back cap 21 may be seated. The hollow cap 21 is provided with an inwardly facing annular flange 22, about which is seated a spring 23. This spring bears upon a valve member or center piece 24, which in its lower portion contacts the inside surface of the cap 21 and is guided by it and in its upper portion is reduced as at 25 to slide within and guided by its inner surface of the annular flange 22. In its upper face the reduced portion 25 may be slotted as at 26 to receive a screw driver or other adjusting tool for turning it.

Positioned on the inner face of the valve member 24 is a seat member 27 which has associated with it a seat retainer 28. The lower face of the valve member 24 is provided on its outer margin with an annular, interiorly threaded, extension 29. The seat member 27 and the retainer 28 are positioned within this extension. A yoke 30, which is shouldered at 31, and exteriorly threaded, engages the threaded portion 29 on the annular extension of the valve member 24 and also engages and holds in place the seat and seat retainer 27, 28.

At its lower end the yoke 30, has a reduced threaded extension 32. A diaphragm 33 is positioned upon the extension 32 and bears against the shouldered portion 31 of the yoke 30, being held thereon by a diaphragm plate 34 screwed

upon the extension 32. The outer edge of the diaphragm 33 is positioned against a shoulder 35, formed in the body 10. A diaphragm washer 36 is positioned against its outer face. A hollow bonnet 37, itself exteriorly threaded, engages corresponding threading on the bonnet and so holds the diaphragm in position.

The bonnet 37 is provided with a hollow interiorly threaded extension 39, within which a hollow exteriorly threaded gland 40 is adjustably seated. At its outer end this gland 40 may be enlarged as at 41 and given any shape desired so that it may be conveniently engaged by a tool for rotating it into and out of position. If desired a lock nut 42 may be used to secure the gland 40 in the desired position of adjustment.

Positioned in the outer end of the gland 40, or otherwise suitably positioned with respect to the body 10 and the parts assembled within it is a bar guide 43. This guide is provided with a reduced portion 44 which extends into the outer end of the gland 40 and is suitably secured therein. It is perforated as at 45 to receive the stem 46 of a spring depressor 47. Upon the upper surface of which rests one end of a spring 48. The other end of this spring bears against the diaphragm plate 34. The bar guide is also perforated as at 49 to permit a shift bar 50 to pass through it. In the particular form here shown the perforation or passage 45 is at right angles to the perforation or passage 49, but they might be otherwise disposed.

The shift bar 50 as shown is provided adjacent each end 51 with a reduced portion 52 and between the reduced portion 52 and the main portion of the bar 50 is a tapered and preferably conical cam like surface 53.

It will be realized that whereas I have herewith shown and described a practical operative device, nevertheless many changes might be made in the size, shape, number and disposition of the parts without departing from the spirit of my invention and I wish, therefore, that my showing be taken as in a sense diagrammatic.

One particular change from the form illustrated is that in which the gauge 4 is positioned at a distance from the throw-over assembly. This is accomplished by putting a connection such as a tube or pipe of the desired length between the gauge 4 and the manifold center piece 3. The gauge could then be positioned nearer the point of use and the user could thus tell the condition of the system without going to the point where the bottles 1 and 2 and the throw-over assembly are located. The details of this arrangement might embody a very small restriction at the gauge opening of the manifold 3. A copper tube is connected to the manifold and run to the house or to the point of use and there connected to a pressure gauge of any desired form. The tube connected the remote pressure gauge to the throw-over assembly is preferably of such small size that its gas capacity is so low that even if a break should occur within the house, the gas being discharged through this small capacity tube would not be a great enough quantity to be dangerous.

The use and operation of the device are as follows:

In installations of the general type discussed herewith there is an installed system, usually within a house, and gas is supplied to it from a plurality of removable containers such as tanks or bottles. Ordinarily only one of these containers at a time is supplying fuel to the system, and, when it is emptied, or approximately emptied, it is important to have the other container come into use. The present device provides an automatic means for bringing the new container into use when the first used container is entirely empty or so nearly empty that it is not feeding at sufficient pressure.

In the present system, each of the bottles 1 and 2 is connected to the system but as shown in Figure 3, only one, namely the bottle 1 is supplying gas. For the purpose of illustration it may be assumed that when each is full the pressure of gas within each container is the same and when both are open to the system, a condition of balance might result. With the container valves both open to the regulator, both containers would empty together which would be objectionable because the user would be left without a supply of gas. To prevent this, means are provided for insuring the use of one bottle at a time. As shown in Figures 1, 2 and 3 the bottle number 1 is supplying gas through its connector 8. The gas flows from the bottle 1 through the passage 16, 17, under pressure and builds up in the body 10, reacting against the diaphragm 33 to maintain an equalized pressure.

If there were no shift bar or other means for placing the two springs 48 under differing loads, a condition might arise at which both would open. If there were balanced pressure from the bottles on both sides, then the springs 48, if the load on them was equal, would hold both valves open. As above noted, this is undesirable, since both bottles would discharge at once and would become empty at once. In order to prevent this, means are provided for putting the springs 48 under unequal load and for shifting that condition so that each at the desired adjusted position may have a greater or less load with respect to the other, and may thus have a greater or less force tending to open its respective valve than the other. The shift bar 50 is for this purpose and in the position of adjustment shown in Figure 3 has been moved to compress the left hand spring 48. If both bottles were connected to the system and the valve controlling the discharge from each bottle were open simultaneously, the gas would come into the regulator system at balanced pressure, and this is effective against both of the diaphragms 33.

Since, however, in the position of adjustment shown, the left hand spring 48 is under greater compression than the right hand spring and therefore tends more strongly to raise its valve, pressure within the system effective on both diaphragms will depress the right hand diaphragm and close its valve. This is the condition illustrated in the right hand portion of Figure 3 and a condition of pressure balance has occurred within the system. If no gas is withdrawn from the system, for example by using the apparatus to which it is connected, the left hand valve may also close. When, however, gas is withdrawn from the system by use or otherwise, pressure is reduced within both bodies and because the left hand spring 48 is under greater load, the reduction of the pressure is effective to permit expansion of the spring 48 and thus to permit opening of its valve.

This process of alternately opening or closing of the left hand valve system will continue until the left hand bottle 1 has been exhausted or substantially so. If the use of the gas in the system is constant, the valve may remain constantly open. If the use is intermittent, the

valve will tend to open and close, but throughout this use, so long as there is an effective quantity of gas within the bottle 1, the bottle 2 will be kept closed because of the spring adjustment accomplished by the position of the shift bar shown in Figure 3 in particular.

When the gas in the bottle 1 is substantially exhausted, the pressure within the bodies 10 will be reduced to a point where the pressure within the right hand body 10 in particular is no longer sufficient to overcome the opening tendency of the right hand spring 48, which will then expand and open the right hand valve, and thus discharge commences from the right hand bottle 2. As soon as the valve on this bottle is open, gas from it passes into the system and may again establish a balanced pressure condition such as that which occurred during the emptying of the bottle 1.

The gauge 4 or some other means may be provided to show which bottle is discharging into the system, and the user can tell by that means whether or not the last bottle is being used. If the last bottle is in use, the user will ordinarily send for a new bottle and the operator, before disconnecting the exhausted bottle, will move the shift bar to a new position of adjustment. If the initial adjustment was that shown in Figures 1, 2 and 3, the shift bar will be moved to the right from that position and then the exhausted bottle 1 will be disconnected and a new full bottle installed in its place.

After the installation of the new bottle in place of the exhausted bottle, bottle 2 continues to discharge until it is substantially empty, and then an automatic shift, such as that described above in connection with the shift from bottle 1 to bottle 2, will occur, and the new bottle which has replaced bottle 2 will begin to discharge.

After a bottle has been exhausted, it is important that the operator alter the adjustment of the shift bar. If he failed to do this and merely disconnected the exhausted bottle, pressure would discharge from the passage 16 and the gas would be wasted to the air.

The device of the present invention provides an automatic means for shifting from one bottle to the other as one becomes substantially empty, and provides at the same time a manual throw-over means which, among other effects, prevents wasting of gas to the open air during the replacement of the bottle, and also permits the ready removal of the exhausted bottle.

There is a condition under which the tank will change-over, and then switch back again. This condition will occur under certain very cold atmospheric temperature conditions. For example, in a temperature of zero degrees Fahrenheit, the normal pressure in the tank might be in the neighborhood of 40 lbs. per square inch. Then assuming that a consumer used a large volume of gas such as is sometimes the case in a restaurant, the tendency would be for the cylinder to give up its heat, becoming colder than the zero degree atmospheric temperature, and this would tend to lower the vapor pressure so that before long, it is conceivable that the pressure would drop down to a point approximating the switch over point. This condition could occur with the service cylinder still half full of propane. As the pressure approached 5 or 6 lbs., or whatever pressure the system is set to change-over, the other cylinder would automatically cut in, and continue to supply the required amount of gas to the consumer. Then as the temperature in the first cylinder rose, which would be after the gas consumption from it had been stopped, as just described, there would be a tendency to re-establish the first cylinder into service. This is one of the advantages of the present system, insofar as it gives a much larger capacity under these extreme conditions of temperature.

While the operation above described of shifting from one tank to another will work when one tank is approximately empty, this shifting from one tank to the other may equally well work before either of the tanks is empty.

I claim:

1. In a fluid supply system, having a plurality of tanks, a control assembly, means for connecting each of said tanks to said assembly, a plurality of valves positioned in said assembly, one for each of said tanks, a plurality of diaphragms one connected to each of said valves, yielding compression means for each of said valves, tending to open it and adjusting parts for varying the compression of each of said yielding means, and a single unitary valve controlling member effective upon said adjusting parts to vary the compression of said yielding compression means, said controlling member mounted for limited movement and provided with cam portions, so positioned that said adjusting parts are acted upon oppositely to each other.

2. In a fluid supply system, having a plurality of tanks, a control assembly, means for connecting each of said tanks to said assembly, a plurality of valves positioned in said assembly, one for each of said tanks, a plurality of diaphragms one connected to each of said valves, yielding compression means for each of said valves, tending to open it and adjusting parts for varying the compression of each of said yielding means, and a single unitary valve controlling member mounted for limited movement and provided with cam portions, so positioned that said adjusting parts are acted upon simultaneously and oppositely to each other.

3. In a fluid supply system, having a plurality of tanks, a control assembly, means for connecting each of said tanks to said assembly, a plurality of valves positioned in said assembly, one for each of said tanks, a plurality of diaphragms within said assembly one connected to each of said valves, yielding compression means for each of said valves, tending to open it and adjusting parts for varying the compression of each of said yielding means, and a single unitary valve controlling member effective upon said adjusting parts, said controlling member mounted for limited movement and provided with cam portions, so positioned that said adjusting parts are acted upon simultaneously and oppositely.

4. In a fluid supply system, having a plurality of tanks, a control assembly, means for connecting each of said tanks to said assembly, a plurality of valves positioned in said assembly, one for each of said tanks, a plurality of diaphragms one connected to each of said valves, yielding compression means for each valve, tending to open it and adjusting parts for varying the compression of each of said yielding means, and a single unitary valve controlling member, said controlling member mounted for movement with respect to said adjusting parts and formed with sections of different diameters, positioned to effect said adjusting parts to compress one yielding means and to expand another.

5. In a fluid supply system, having a plurality

of tanks, a control assembly, means for connecting each of said tanks to said assembly, a plurality of valves positioned in said assembly, one for each of said tanks, a plurality of diaphragms one connected to each of said valves, yielding compression means for each of said valves, tending to open them and adjusting parts for varying the compression of each of said yielding means, and a single unitary valve controlling member for varying the compression of said compression means, said controlling means mounted for movement with respect to said adjusting parts and formed with sections of different diameters, so positioned that irrespective of its position of adjustment the said adjusting parts are in contact with sections of different diameters, positioned to effect said adjusting parts to compress one yielding means and to expand another.

6. In a fluid supply system, a plurality of tanks, a pressure control assembly, means for connecting each of said tanks to said assembly, a plurality of valves positioned in said assembly, one for each of said tanks, a diaphragm within said assembly connected to each of said valves, yielding compression means tending to open each of said valves and a stem for each of said yielding means, a single unitary valve controlling member effective upon said stems, said controlling member mounted for limited movement and provided with reduced portions, so positioned that when one is in contact with one of said stems the other is not.

7. In a pressure control mechanism for controlling the passage of fluid under pressure from a plurality of tanks to a single point of discharge, a hollow control housing, a connection to said housing from each of said tanks, a valve for each such connection, said valves when closed preventing the entrance of gas into said housing, a spring for each valve tending to open it, and unitary means movably supported on said housing for controlling a plurality of valves to insure the opening of one and the closing of others, said valve controlling means including a unitary, movable, adjusting member adapted in one position of adjustment to decrease the pressure of one of said closing springs and to increase that of another, and adapted in another position to reverse this relationship.

8. In a pressure regulator for regulating the discharge of gas under pressure from a plurality of containers into a single system, a plurality of hollow regulator housings, one for each container, a manifold, connections from each housing to said manifold, a connection from each container to one of said housings, a valve within each housing controlling the passage of fluid into it, yielding compression means within the housing tending to open said valve, a diaphragm within said housing associated with said yielding compression means, and unitary means supported adjacent said housings for simultaneously controlling the opening means of a plurality of said valves, said unitary means including a movably mounted member adapted, when moved, to act oppositely upon a plurality of said yielding compression means, to free one for expansion and to compress another.

9. In a supply system for supplying fluid from a pair of containers to a single source, a composite hollow control housing therefor, said housing comprising hollow body members, one for each of said containers, and a manifold to which each of said bodies is connected, an inlet from each of said containers to a body member, and valves positioned in said body members to control said inlets, yielding members adjacent each valve tending to open it, diaphragms adjacent each of said yielding members, transmission elements in contact with said yielding members, and a sliding unitary control member in contact with each of said transmission members and shaped to move one of said transmission members to compress one of said yielding members and to permit simultaneously expansion of the other said yielding members forming the only connection between said transmission members and said diaphragm.

10. In a fluid control system for a plurality of containers, a control housing, including a plurality of hollow body members, one for each container, a connection from each container to one of said body members, a valve effective to control discharge through each connection, a spring for each of said valves and tending normally to open said valve, a diaphragm associated with each valve, and within a body and positioned to receive pressure from within said body, spring depressors effective one upon each of said opening springs and provided with a stem extending outward from the body, a sliding shift bar, said shift bar being positioned in contact with each of said spring depressors and shaped when in one position of adjustment to permit expansion of one spring while simultaneously compressing another, said springs forming the only links between said depressors and said diaphragms.

11. In a pressure control system for fluid discharge control from a plurality of tanks, a plurality of separate hollow housings, a manifold, a connection from each housing to said manifold, means joining each tank to one of said housings, a valve within each housing positioned to control the passage of fluid from the tank to which said housing is connected into said housing, springs, one for each valve and tending normally to open each valve, and movable unitary means for adjusting the compression of each of the springs of a plurality of housings, whereby in one position of adjustment of said unitary means the spring of one valve is compressed to increase its opening effect, and simultaneously the spring of another valve is expanded to decrease its opening effect, said springs forming compressible links between said valves and said controlling means.

12. In a pressure control system for fluid discharge control from a plurality of tanks, a plurality of separate hollow housings, a manifold, a connection conduit from each of said housings thereto, means joining each tank to a housing, a valve mounted within each housing, and positioned to control the passage of fluid from a tank into the housing to which it is connected, springs, one for each valve, each tending normally to open its valve, and unitary adjusting means for controlling the action of the springs of a plurality of housings, whereby in one position of said unitary adjusting means the spring of one valve is compressed to increase its opening effect, and simultaneously the spring of another valve is expanded to decrease its opening effect, and diaphragms mounted one in each housing and connected each to a valve, said diaphragms adapted to be moved outwardly by pressure from within the housing whereby pressure from within the housing is adapted to effect closing said springs forming compressible links between said diaphragms and said controlling means.

13. In a supply system for supplying fluid from a plurality of containers to a single source, a plurality of containers, a composite hollow control housing therefor, said housing comprising hollow body members, one for each of said containers, and a manifold to which said bodies are connected, an inlet for each of said containers to its respective body member, and valves, one positioned to control each inlet, a yielding member tending to open each of said valves, a diaphragm adjacent each of said yielding members, a transmission element in contact with each of said yielding members, and a movable unitary control member in contact with both of said transmission members and shaped to move one of said transmission members to compress one of said yielding members and to permit simultaneously and substantially equal expansion of another of said yielding members when said control member is moved from one position to another.

14. In a fluid control system for a plurality of containers, a control housing, including a plurality of hollow chamber-forming members, one for each container, a connection from each container to said respective chamber-forming members, a valve for each of said connections, spring means tending to open each valve, a diaphragm associated with each of said valves, and positioned each to receive pressure from within one of said chamber-forming members, spring depressors effective upon said opening springs and each provided with an outwardly extending stem, a shift bar having portions of reduced diameter, said shift bar being positioned in contact with both of said spring depressors, one depressor stem bearing upon the portion of reduced diameter and permitting expansion of its spring, another depressor stem bearing simultaneously upon the unreduced diameter of the bar and compressing its spring.

15. In a fluid supply system, having a plurality of tanks, a control assembly, means for connecting each of said tanks to said assembly, said assembly comprising a housing part for each of said tanks, a valve positioned within each of said housings, a diaphragm in each housing operatively associated respectively with said valves, yielding compression means for each valve tending to open it, a load-transmitting element associated with each yielding compression means and a single unitary valve-controlling member effective upon said load transmitting elements to vary the compression of said yielding compression means, said controlling member mounted for limited movement and provided with cam portions, so positioned that said load-transmitting elements are acted upon oppositely and substantially equally to each other, said valve-controlling member mounted outside of said housings.

16. In a fluid supply system, having a plurality of tanks, a control assembly, means for connecting each of said tanks to said assembly, said assembly including a pair of chamber-forming housing members, a manifold, each chamber-forming housing communicating with it, a service outlet from said manifold, a plurality of valves positioned in said assembly, one for each of said tanks, a plurality of diaphragms, one associated with each of said valves, yielding compression means for each of said valves, tending to open it and adjusting parts for varying the compression of each of said yielding means, and a single unitary valve-controlling member effective upon said adjusting parts to vary the compression of said yielding compression means, said controlling member mounted for limited movement and provided with substantially equal cam portions, so positioned that said adjusting parts are acted upon oppositely to each other.

17. In a fluid supply system, having a pair of tanks, a control assembly, means for connecting each of said tanks to said assembly, a pair of valves positioned in said assembly, one for each of said tanks, a pair of diaphragms mounted within said control assembly, one associated with each of said valves, yielding compression means for each of said valves, tending to open it, and a single unitary valve-controlling member effective upon both of said yielding compression means, said controlling member mounted for limited movement and provided with two identical, oppositely faced cam portions so positioned and shaped that said compression means are acted upon equally and oppositely when said controlling member is moved throughout its excursion.

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