

June 5, 1934.

R. G. MINER, JR

1,962,027

AUTOMATIC CHANGE-OVER VALVE

Filed Dec. 2, 1931

3 Sheets-Sheet 1

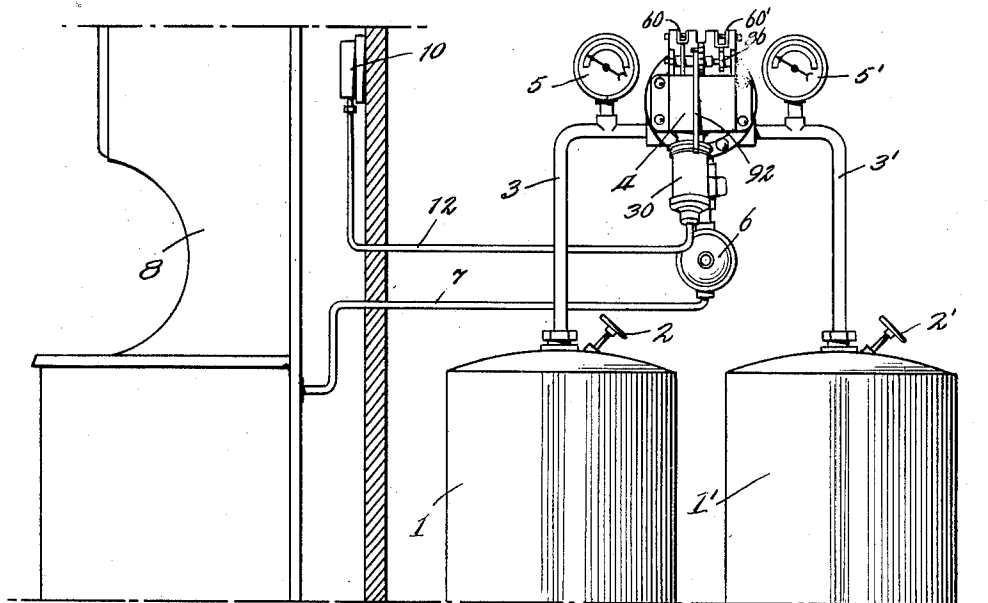


Fig. 1.

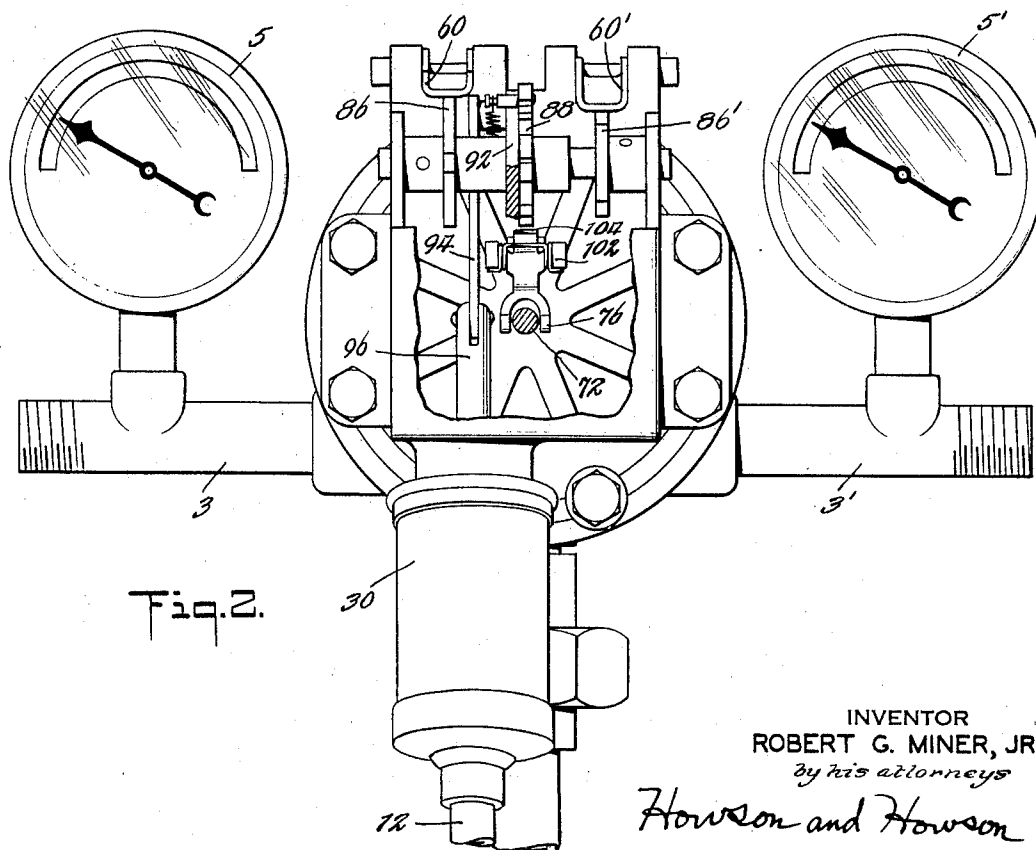


Fig. 2.

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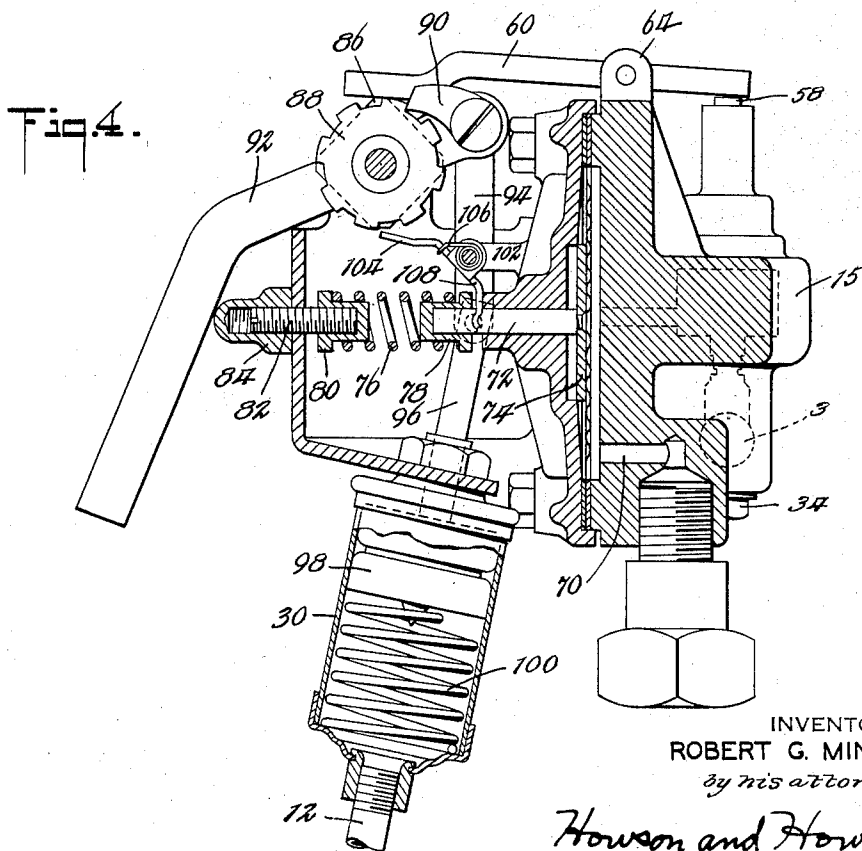
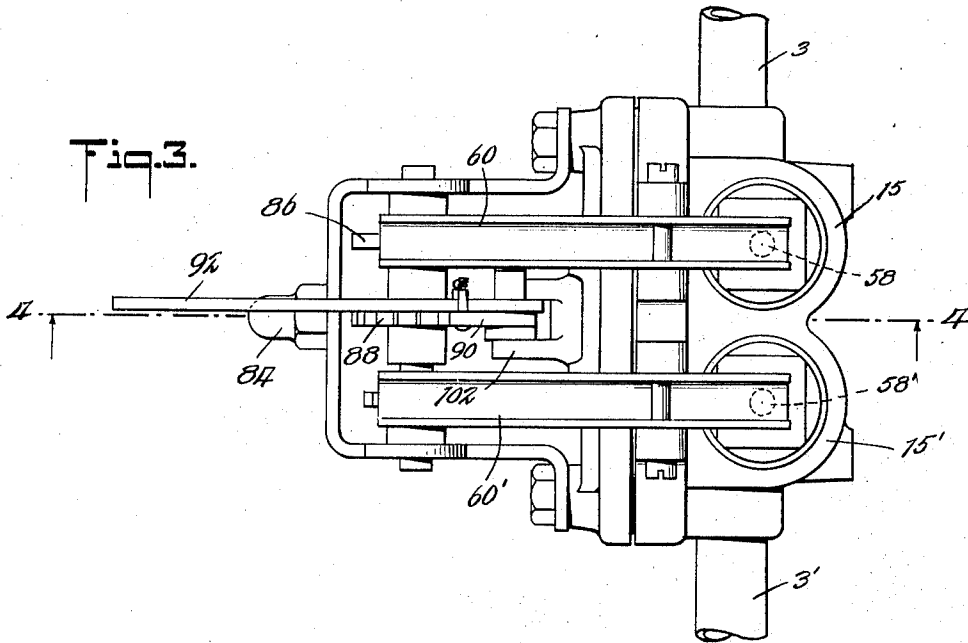
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AUTOMATIC CHANGE-OVER VALVE

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3 Sheets-Sheet 3

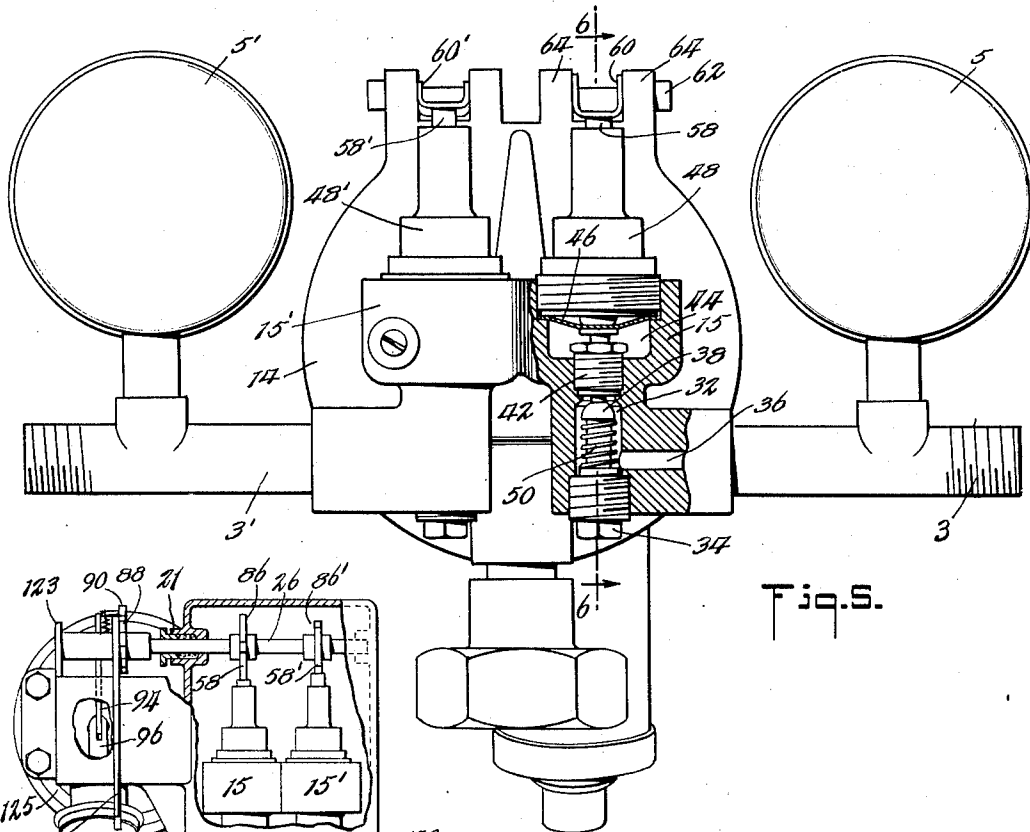


Fig. 5.

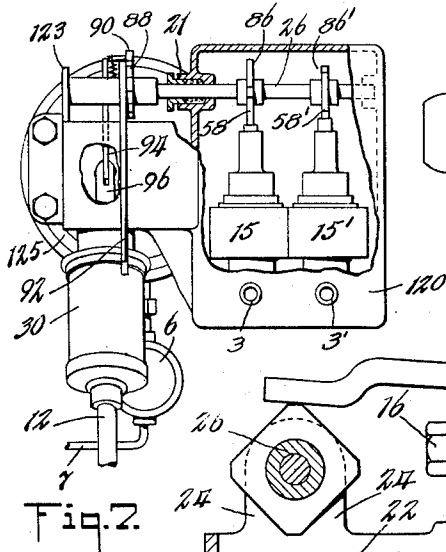


Fig. 2.

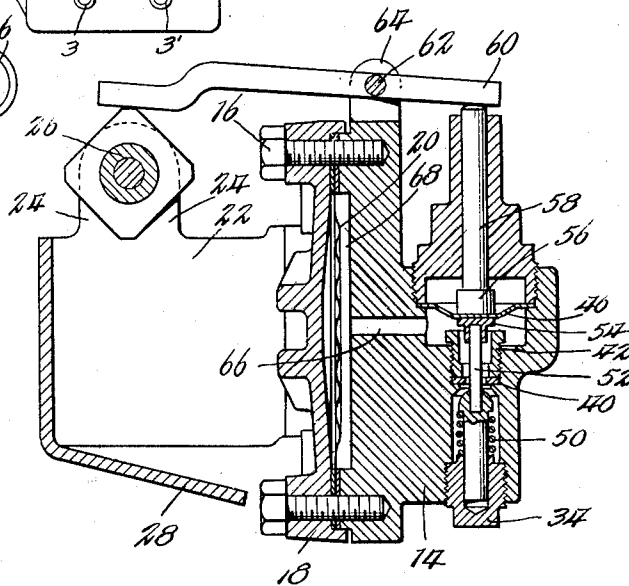


Fig. 6.

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UNITED STATES PATENT OFFICE

1,962,027

AUTOMATIC CHANGE-OVER VALVE

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Application December 2, 1931, Serial No. 578,580

12 Claims. (Cl. 137—144)

This invention relates to means commonly known as "change-over valves" for changing a connection from one source of supply of a fluid under pressure to another and it is an object of this invention to provide a means of the kind described which operates automatically to change the connection from one source of supply to another when the pressure of the connected source of supply falls below a predetermined pressure and it is also an object of this invention to provide an automatically operating means of the type described which gives an indication that a change from one source of supply to another has been made.

In the drawings—

Fig. 1 is a diagrammatic view in elevation of a fluid pressure system having a device constructed in accordance with this invention applied thereto;

Fig. 2 is a view in elevation drawn to a larger scale of the device shown in Fig. 1, parts being broken away to show other parts more clearly;

Fig. 3 is a top plan view of the device shown in Fig. 2;

Fig. 4 is a central vertical section of the device shown in Fig. 2 taken as on line 4—4 of Fig. 3;

Fig. 5 is a view in elevation showing the side opposite to that shown in Fig. 2 with some parts broken away to show other parts more clearly;

Fig. 6 is a vertical section taken on the line 6—6 of Fig. 5; and

Fig. 7 is a view in elevation of a modification, parts being broken away to show other parts more clearly.

In the drawings a change-over valve constructed in accordance with this invention is shown in connection with a fluid pressure system arranged for supplying gas from storage reservoirs to a point of consumption. As shown in the drawings, storage reservoirs 1 and 1' containing gas under pressure and having shut-off valves 2 and 2' are connected through pipes 3 and 3' to the automatic change-over valve 4, pressure gauges 5 and 5' being connected to the respective pipes 3 and 3'. From the change-over valve 4 connection is established through a pressure reducing valve 6 and pipe 7 to the means for utilizing the gas which in the drawings is shown as a stove 8. Conveniently arranged so as to be readily observed by the attendant at the stove 8 is an indicator 10 connected through pipe 12 to a part of the change-over valve 4.

The change-over valve 4 comprises a back body portion 14 shown as a casting arranged

to provide a plurality of valve casings 15 and 15' which are connected to the pipes 3 and 3' respectively. To the body portion 14 bolts 16 secure a front body portion 18 which cooperates with the back body portion 14 to secure a diaphragm 20 in position. Some of the bolts 16 also serve to secure to the body portions 14 and 18 a yoke or bracket 22 having upwardly extending lugs, 24 in which are mounted a cam shaft 26 and an inwardly projecting lip or flange 28 at the bottom of the yoke which serves as a support for a cylinder 30. The valve casings 15 and 15' and the valve structures mounted therein are identical, so for the sake of brevity, a description of one only will be given.

The valve casing 15 comprises a chamber 32 which is closed at the bottom end thereof by a plug 34 and is connected by a passage 36 to the pipe 3. Mounted in the chamber 32 is a valve 38 which engages with a seat 40 held in position by a threaded sleeve 42 to prevent passage of gas from the chamber 32 to a chamber 44 in the upper portion of the valve casing. Chamber 44 is closed at its upper end by a sealing diaphragm 46 secured in position by a clamping bushing 48. Surrounding the valve 38 is a spring 50 confined between a shoulder on the valve 32 and the plug 34 and tending to press the valve 32 into engagement with its seat 40. The upper end of the valve 32 is recessed to receive pin 52 which projects through an opening in the valve seat 40 and through the sleeve 42 and at its upper end is provided with a cap 54 which engages with the underside of the diaphragm 46. Engaging with the upper side of the diaphragm 46 is the head 56 of a plunger 58 which extends through an opening in the bushing 48 and projects beyond the upper end thereof so as to be engaged by a lever or rocker arm 60 pivotally mounted on pin 62 carried by spaced ears or lugs 64 formed integral with the back body portion 14.

Leading from chamber 44 of each of the valve casings 15 and 15' is a passage 66 communicating with the diaphragm chamber 68 and extending from the diaphragm chamber 68 is a passage 70 through which communication is made to the reducing valve 6 and pipe 7 leading to the stove 8 or point of consumption of the gas. The upper end of the valve casing 15' is also closed by a bushing 48' through which projects a plunger 58' which is engaged by a lever or rocker arm 60'. Projecting through the front body portion 18 is a plunger 72 having a head portion 74 which contacts with the dia-

phragm 20. At its outer end the plunger 72 is subjected to pressure of a spring 76 confined between a cap 78 mounted on the outer end of the plunger 72 and a cap 80 mounted on a threaded pin 82 adjustably mounted in the outer end of the yoke 22 and secured in adjusted position by a lock nut 84.

Fixed upon the cam shaft 26 are cams 86 and 86' identical in construction but arranged at an angle of 45° to each other on the shaft 26. The cams 86 and 86' are arranged to engage with the outer ends of the levers or rocker arms 60 and 60' and by raising the outer ends thereof to force down the plungers 58 and 58' and operate the valves 38 to permit the passage of gas from the containers 1 and 1' to the diaphragm chamber 68. Intermediate the cams 86 and 86' there is fixed on the cam shaft 26 a ratchet or index wheel 88 which is engaged by a pawl 90 pivotally mounted on the upper end of a reset lever 92 journalled on the cam shaft 26. The teeth of the ratchet or index wheel 96 are spaced so that movement of the pawl from one tooth to another is equivalent to a movement of 45° and the movement of the index wheel by the pawl is sufficient to shift the cams 86 and 86' 45° so that one cam, as 86, is shifted to free the lever 60 permitting the valve operated thereby to close while the lever 60' is engaged by the cam 86' and the valve operated thereby is opened.

Connected to the inner end of the reset lever 92 is a link 94 the opposite end of which is connected to a piston rod 96 attached to a piston 98 in the cylinder 30. Intermediate the piston 98 and the opposite end of the cylinder 30 is a spring 100 which tends to force the piston 98 to the upper end of the cylinder 30 as shown in Figure 4. The outer or lower end of the cylinder 100 is connected through pipe 12 to the indicator 10. This indicator is of the type shown in my co-pending application, Serial No. 576,566, filed Nov. 21, 1931, and is of such construction that the movement of the piston 98 to the outer or lower end of the cylinder 30 operates the indicator to the normal or clear position by the compression of the fluid in the cylinder 30 and pipe 12, and the movement of the piston 98 to the upper end of the cylinder 30 under the influence of the spring 100 causes the indicator 10 to take a position which indicates an operation of the change-over mechanism.

On lugs 102 formed integral with the front body portion 18 there is pivotally mounted a latch 104 which is engaged by a spring 106. The spring 106 tends to raise the latch 104 to a position where it will engage with a tooth of the index or ratchet wheel 88. The latch 104 is provided with a forked extension portion 108 which projects into the path of the cap 78 on the plunger 72 so that movement of the cap 78 to the right in Figure 4 under the influence of the spring 76 will cause the latch 104 to be disengaged from the index or ratchet wheel 88.

In the modified construction shown in Fig. 7 the body portion having the valve casings 15 and 15' is arranged to provide a housing 120 which encloses both valve casings 15 and 15' and is provided with bosses forming bearings for the cam shaft 26. As shown the shaft 26 extends through one wall of the housing 120 and the bearing 21 at this point may be arranged to prevent leakage of gas from the interior of the housing 120. The cams 86 and 86' are mounted upon the shaft 26 as in the other

modification but in this construction the cams are positioned to act directly upon the plungers 58 and 58' respectively. Upon the projecting portion of the shaft 26 there is secured the index or ratchet wheel 88 which is engaged by the pawl 90 pivotally mounted at one end of the reset lever 92. The lever 92 is pivotally mounted on the cam shaft 26. The outer end of the shaft 26 is supported in a bearing 123 carried by a body portion 125 attached to the housing 120. The body portion 125 is arranged to provide a diaphragm chamber and latch support for the control of the cam shaft 26 as in the other construction. Attached to the body portion 125 is the cylinder 30 having the piston therein which is connected through piston rod 96 and link 94 to the reset lever 92. As in the other construction the gas under pressure is supplied through the pipes 3 and 3' to the valve casings 15 and 15', through ports and passages to the chamber of the diaphragm controlling the index wheel 88 and then through the reducing valve 6 and pipe 7 to the point of consumption. As both modifications operate in the same manner except for the engagement of the cams 86 and 86' directly with the plungers 58 and 58' in the structure of Fig. 7, a further showing of the details of the structure of Fig. 7 is believed unnecessary and the description of the operation of the devices will be given in connection with the construction shown in Figs. 1 to 6.

In operation, assuming that the tanks 1 and 1' are both fully charged and connected to the automatic change-over valve 4, the reset lever 92 is raised to its fullest extent causing the pawl 90 to travel over the index wheel and engage with the following tooth and through link 94 and piston rod 96 shifting piston 98 to the lower part of the cylinder 30 and causing the indicator 10 to give the normal indication. One of the cams on the cam shaft, as cam 86, will be in engagement with the lever 60 forcing down the plunger 58 and holding the valve 38 open so that pressure is supplied from the tank 1 through the pipe 3 to the change-over valve 4 where it passes through the passage 36 past valve 38 to the chamber 44, thence through passage 66 to the diaphragm chamber 68 and through passage 70, the pressure reducing valve 6 and pipe 7 to the stove 8 for consumption. As the cam 86' is not in engagement with the lever 60' at this time the valve operated by the lever 60' is closed cutting off the flow of gas from the tank 1' to the diaphragm chamber 68. The pressure of the gas in the diaphragm chamber 68 is sufficient to force the diaphragm to the left, as shown in Fig. 4, overcoming the spring 76 and permitting the spring 106 to hold the latch 104 in engagement with the index or ratchet wheel 88. Engagement of the latch 104 with the index wheel 88 prevents rotation of cam shaft 26 by the spring 100 acting through piston 98, piston rod 96, link 94 and pawl 90.

As the gas in the container 1 is consumed the pressure in diaphragm chamber 68 falls and eventually becomes less than the pressure to which the spring 76 is adjusted whereupon the diaphragm 20 and plunger 72 are moved to the right in Fig. 4 and the cap 78 on plunger 72 engages the extension 108 of the latch 104 and withdraws the latch 104 from the index wheel 88. Upon release of the latch 104 from the index wheel 88 spring 100 shifts piston 98 and through rod 96 and link 94 shifts the reset le-

ver 92 and the pawl 90 carrying therewith the index wheel 88, cam shaft 26 and the cams 86 and 86' thus moving cam 86 from beneath the lever 60 permitting spring 59 to close the valve 38 and shut off communication from the tank 1 to the diaphragm chamber 68. At the same time cam 86' is brought beneath the lever 60' to open the valve operated thereby thus establishing the communication for the supply of gas from the tank 1' through pipe 3' and the valve chamber to the diaphragm chamber 68 and then through the passage 70, pressure reducing valve 6 and pipe 7 to the stove 8. Movement of the piston 98 under the influence of the spring 100 also operates the indicator 10 as set forth in my co-pending application above mentioned so as to give an indication that the change-over valve 4 has been operated and that the supply is now coming from the reserve tank.

When a charged tank is substituted for the empty tank 1 and connected to the automatic change-over valve 4 through pipe 3, the reset lever 92 is raised shifting the pawl 90 to engage with the succeeding or following tooth on the index wheel 88 and through link 94 and piston rod 96 operating the piston 98 to shift the indicator 10 to give the normal indication.

While the device has been shown in connection with a system arranged to supply combustible gas from either of a plurality of containers to a device in which the gas is used, it will be understood that the device is not limited to such applications but may be used in other fluid pressure systems in which it is desired to automatically change from one source of fluid pressure supply to another when the pressure of the first source of supply becomes reduced below the predetermined amount.

What is claimed is:—

1. In a device of the class described, a plurality of independently movable valves each controlling the flow of fluid from a separate source of fluid under pressure, means for operating said valves, a detent for preventing operation of said means, a diaphragm subjected to the fluid pressure, a plunger operated by said diaphragm to hold said detent in operative position and means operating said plunger to release said detent upon fall of pressure on said diaphragm, said diaphragm moving said detent to operative position upon the operation of said valves.

2. In a device of the class described, valves controlling the supply of fluid from a plurality of separate sources, means for operating said valves comprising a spring operated plunger, an indicator operated by said plunger and means responsive to the pressure of the fluid supplied by said valves for controlling said valve operating means said indicator being reset upon resetting said operating means.

3. In a device of the class described, valves controlling the supply of fluid from a plurality of separate sources, levers for operating said valves, a reciprocating means for operating said levers, a fluid pressure operated indicator operated by said reciprocating means and means responsive to the pressure of the fluid supplied by said valves for controlling said reciprocating means.

4. In a device of the class described, valves controlling the supply of fluid from a plurality of separate sources, levers for operating said valves, cams for operating said levers, a reciprocating member for rotating said cams to operate said levers, a latch for preventing rota-

tion of said cams, means responsive to the pressure of the fluid supplied by said valves for controlling said latch and an indicator operated by movement of said reciprocating member.

5. In a device of the class described, valves controlling the supply of fluid from a plurality of separate sources, levers for operating said valves, cams for operating said levers, a reciprocating member having a pawl and ratchet connection for rotating said cams to operate said levers, a latch engaging the ratchet to prevent operation of said cams, means responsive to the pressure of the fluid supplied by said valves for controlling said latch and an indicator operating upon each movement of said reciprocating member.

6. In a device of the class described, a plurality of independently movable valves controlling the supply of fluid from a plurality of separate sources, levers for operating said valves, a reciprocating means for operating said levers, a latch for preventing operation of said reciprocating means, an indicator operated by said reciprocating means, means responsive to variations in the pressure of the fluid supplied by said valves for shifting said latch to operative and inoperative positions and means to reset said reciprocating means, said indicator being reset by the resetting of said reciprocating means.

7. In a device of the class described, a plurality of valves, each controlling the flow of fluid from a separate source of fluid under pressure, means for opening said valves against the fluid pressure controlled thereby, an indicator controlled by said valve operating means said indicator being reset upon the resetting of said operating means and means responsive to the pressure of the fluid supplied by each of said valves for controlling said valve operating means, said valve operating means operating said valves to stop flow from one source of pressure and start flow from another source of pressure.

8. In a device of the class described, a plurality of independently movable valves each controlling the flow of fluid from a separate source of fluid under pressure, means for opening said valves against the fluid pressure controlled thereby, an indicator operated by said valve operating means and means responsive to the pressure of the fluid supplied by each of said valves for controlling said valve operating means, said pressure responsive means operating upon a reduction to less than a predetermined value of the pressure to which it is subjected to effect an operation of said valve operating means to cut off the source of supply then supplying fluid and supply fluid from another source.

9. In a device of the class described, valves controlling the supply of fluid from a plurality of separate sources, levers for operating said valves, cams for operating said levers, a reciprocating member having a pawl and ratchet connection for rotating said cams to operate said levers, a latch engaging the ratchet to prevent operation of said cams, means responsive to the pressure of the fluid supplied by said valves for controlling said latch, a resetting means for said reciprocating means and an indicator operated by said reciprocating means.

10. In a device of the class described, valves controlling the flow of fluid under pressure, cams operatively connected to said valves, a fluid tight housing for said valves and cams, a shaft for said cams projecting from said housing, operating means for said shaft engaging said shaft

outside said housing and means responsive to the pressure of the fluid delivered by said valves for controlling said shaft operating means.

11. In a device of the class described, valves
5 controlling the flow of fluid from a plurality
of separate sources, cams for operating said
valves, spring operated means for operating said
cams, a detent preventing operation of said
cams, a plunger for operating said detent, a dia-
10 phragm subjected to the fluid pressure operating
said plunger to hold said detent in operative
position and means opposing the action of said
diaphragm and operating said plunger to move
said detent from operative position.

12. In a device of the class described, valves
controlling the supply of fluid from a plurality
of separate sources, means for operating said
valves comprising a spring operated plunger, an
indicator operated by said plunger and means 80
responsive to the pressure of the fluid supplied by
said valves for controlling said valve operating
means, means for resetting said plunger upon
operation thereof, said plunger operating said
indicator to reset said indicator upon resetting 85
of said plunger.

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60	135
65	140
70	145
75	150