Dec. 26, 1939. H. J. McC. BURDICK 2,185,016

VALVE

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FIG. 1

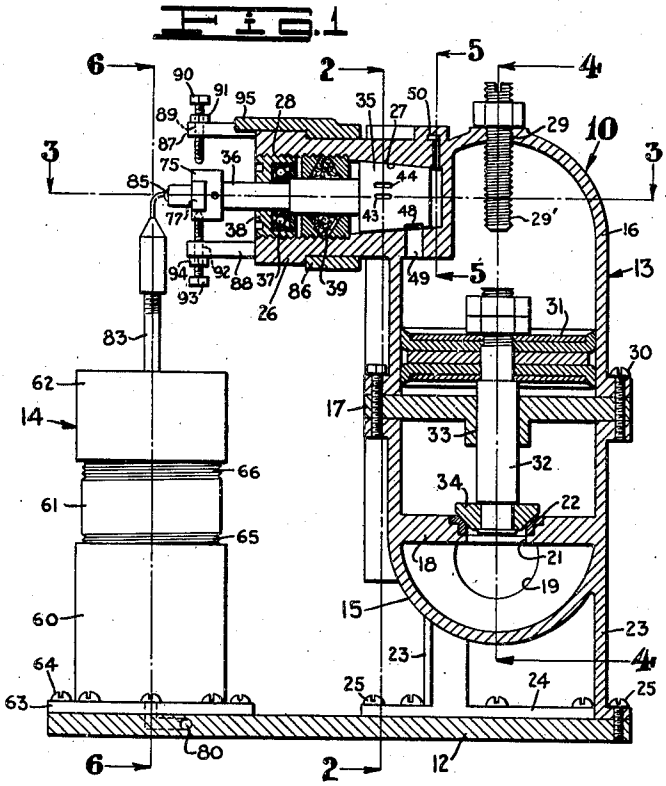


FIG. 2

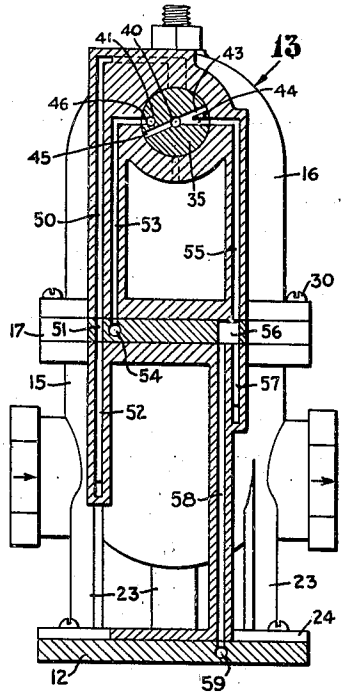


FIG. 3

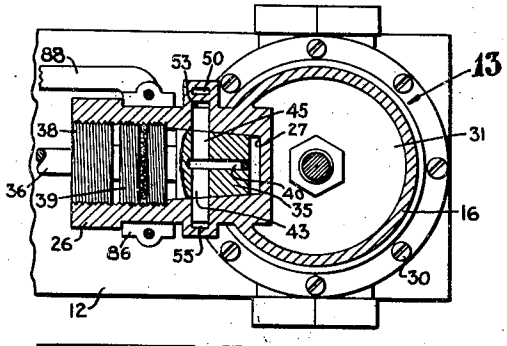


FIG. 4

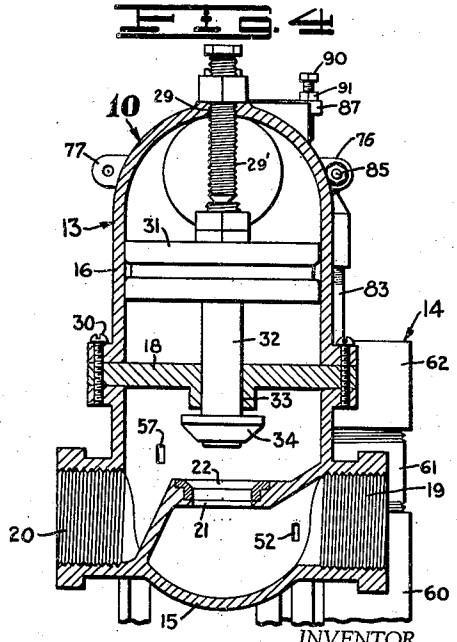
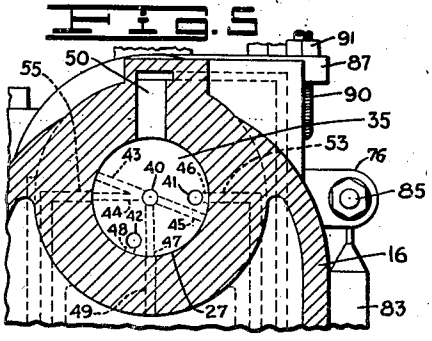


FIG. 5



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FIG. 5

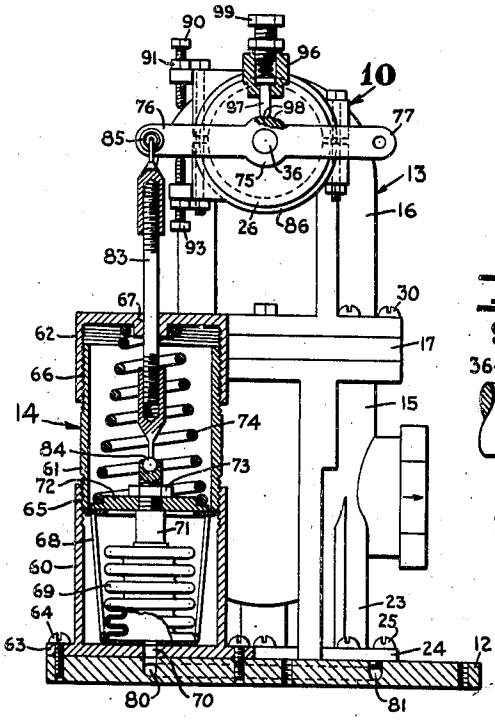


FIG. 7

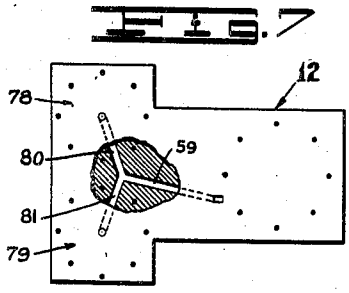


FIG. 8

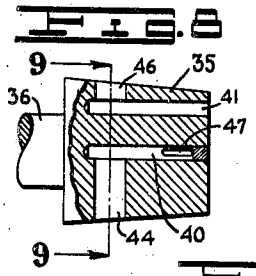


FIG. 9

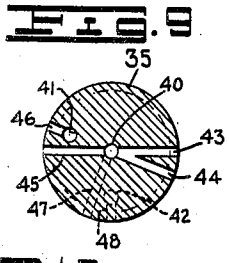


FIG. 10

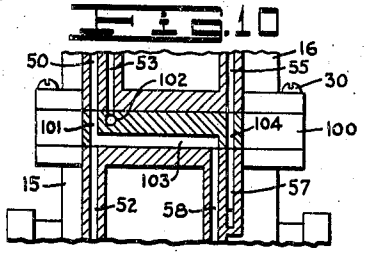


FIG. 12

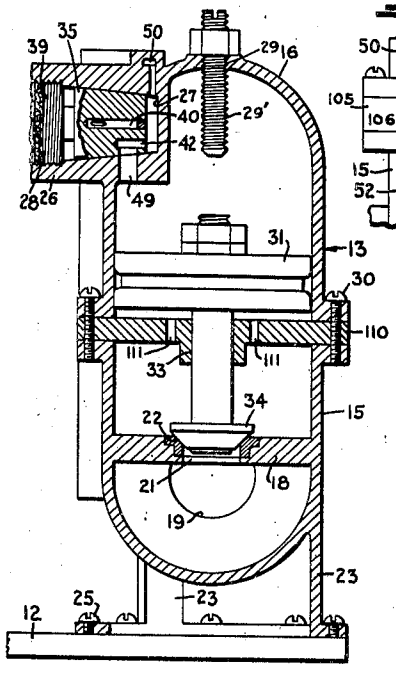


FIG. 11

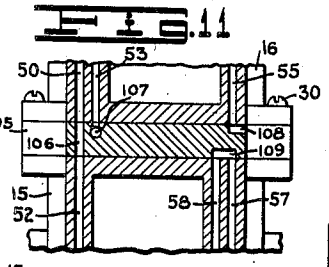


FIG. 13

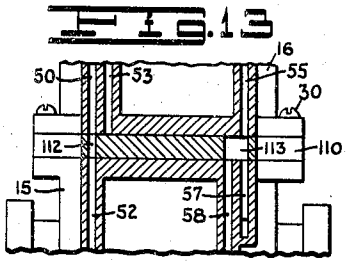
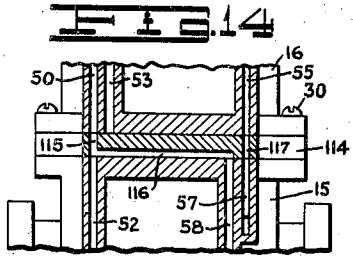


FIG. 14



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UNITED STATES PATENT OFFICE

2,185,016

VALVE

Harry J. McCombs Burdick, Anaheim, Calif.

Application November 19, 1937, Serial No. 175,443

2 Claims. (Cl. 50—11)

This invention relates to improvements in valves.

The general object of the invention is to provide an improved automatically controlled valve.

Another object of the invention is to provide an improved automatically controlled valve which is operated by the pressure of fluid passing through the valve.

A further object of the invention is to provide a reducing valve of the class described which is adapted to be operated either by fluid on the high pressure side or by fluid on the lower pressure side.

Another object of the invention is to provide a safety release valve to govern the initial pressure.

Other objects and the advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a central, vertical section through my improved valve;

Fig. 2 is a section taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary section taken on line 3—3 of Fig. 1;

Fig. 4 is a section taken on line 4—4 of Fig. 1;

Fig. 5 is an enlarged, fragmentary section taken on line 5—5 of Fig. 1;

Fig. 6 is a section taken on line 6—6 of Fig. 1 with portions of the valve broken away;

Fig. 7 is a top plan view of the base plate on a reduced scale with portions thereof broken away;

Fig. 8 is an enlarged detail view of the control valve, partly in section;

Fig. 9 is a section taken on line 9—9 of Fig. 8;

Fig. 10 is a fragmentary view similar to Fig. 2 showing a differently ported center partition;

Fig. 11 is a view similar to Fig. 10 showing another type of center partition;

Fig. 12 is a fragmentary view similar to Fig. 1 showing further type of center partition;

Fig. 13 is a view similar to Fig. 10 showing the porting of the center partition shown in Fig. 12; and

Fig. 14 is a view similar to Fig. 13 showing another type of center partition.

Referring to the drawings by reference characters I have indicated my improved regulator valve device generally at 10. As shown the device 10 includes a base plate 12, a valve member 13 and a control member 14. The valve member 13 includes a bottom portion 15, a top portion 16 and a partition member 17 between the top and bottom portions.

The bottom portion 15 is hollow with a closed bottom and an open top and has a transverse partition 18 therein intermediate the bottom and top thereof and has an inlet opening 19 therein opening thereinto below the partition 18 and an outlet opening 20 therein opening thereinto above the partition 18.

The partition 18 has an aperture 21 therein which adjacent the upper face of the partition includes a valve seat portion 22. The bottom portion 15 includes a plurality of integral downwardly extending legs 23 which are connected by a base ring 24 which is shown as secured to the base plate 12 by a plurality of screws 25.

The top portion 16 is hollow with a closed top and an open bottom and has a boss 26 extending from one side thereof. The boss 26 has a top end plug valve recess 27 therein which opens into an enlarged threaded aperture 28 which opens through the outer end of the boss. Furthermore the portion 16 at the top thereof has a threaded aperture 29 therein to receive an adjustable stop screw 29'.

The bottom portion 15, the partition 17 and the top portion 16 are shown as secured together by a plurality of bolts 30.

Within the top portion 16 I provide a piston 31 which includes a rod 32 positioned in an aperture 33 in the partition 17. Adjacent the lower end the rod 32 has a valve member 34 thereon which is adapted to engage the valve seat 22 to restrict passage through the aperture 21.

Positioned in the recess 27 of the boss 26 I provide a tapered plug valve 35 which includes a stem portion 36. As shown the valve stem 36 is journaled in an anti-friction bearing 37 mounted in a screw plug 38 which is positioned in the threaded aperture 28. Intermediate the screw plug 38 and the plug valve 35 in the threaded aperture 28 I provide a suitable packing gland 39 surrounding a portion of the valve stem 36.

As shown the plug valve 35 has a central chamber 40 therein and two spaced side recesses 41 and 42 therein (see Figs. 5, 8 and 9). The two side recesses open through the small end of the plug valve. Adjacent the large end of the plug and at one side the central chamber 40 has two ports 43 and 44 opening therein.

Opposite the port 43 the chamber 40 has a port 45 opening thereinto. The valve recess 41 opposite the port 44 has a port 46 opening thereinto. Adjacent the small end of the valve the central chamber 40 has a port 47 opening thereinto and in line with the port 47 the recess 42 has a port 48 opening thereinto. The boss 26 within the top portion 16 has an aperture 49 therein in line with the valve ports 47 and 48.

The top portion 16 has a conduit 50 therein one end of which opens into the boss recess 27 between the bottom thereof and the end of the plug valve 35. The opposite end of the conduit 50 communicates with a similar conduit 51 in the center partition 17 which in turn communicates with one end of a conduit 52 in the bottom portion 15. The opposite end of the conduit 52

opens into the interior of the bottom portion 15 on the initial pressure side of the partition 18 that is below the partition 18.

The upper portion 16 has another conduit 53 therein one end of which opens into the plug valve recess 27 in line with the valve ports 45 and 46 (see Fig. 9). The opposite end of the conduit 53 communicates with one end of a conduit 54 in the partition 17. The opposite end of the conduit 54 opens through the top of the partition within the upper portion 16.

The upper portion 16 has still another conduit 55 therein which at one end opens into the valve recess 27 opposite the conduit 53 and in line with the valve ports 43 and 44. The opposite end of the conduit opens into a chamber 56 in the center partition 17.

The bottom portion 15 has a conduit 57 therein in line with the conduit 55 one end of which opens into the partition chamber 56 and the opposite end into the interior of the bottom portion 15 on the low pressure side of the partition 18, that is above the partition 18. The bottom portion 15 has another conduit 58 therein one end of which opens into the partition chamber 56 and the opposite end communicates with a conduit 59 in the base plate 12.

From the foregoing it will be apparent that when the control valve 35 is in the position shown in Figs. 1, 3 and 5 wherein the valve port 47 registers with the conduit 49 and the valve port 44 registers with the conduit 55 an unrestricted passageway is provided from above the piston 31 through the conduits 49 and port 47 to the recess 40 and the port 44 and thence through the conduit 55 and through the chamber 56 and the conduit 57 to the low pressure side of the valve.

At the same time an unrestricted passageway is formed from the high pressure side of the valve through the conduits 52, 51 and 50 into the recess 27 and thence through the valve recess 41 and the port 46 and through the conduit 53 and 54 into the bottom portion 16 below the piston 31. When the control valve 35 is in this position high pressure fluid forces the piston upward until the valve 34 disengages its associated seat 22.

When the control valve 35 is in the position shown in Fig. 1 wherein the valve port 48 registers with the conduit 49, the valve port 43 registers with the conduit 55 and the valve port 45 registers with the conduit 53 an unrestricted passageway is formed from below the piston 31 through the conduit 53 and the valve port 45 and 43 and the conduit 55 to the low pressure side of the valve. At the same time an unrestricted passageway is formed from the high pressure side of the valve through the conduits 52, 51 and 50 into the recess 27 and thence through the valve recess 42 and the port 48, and thence through the conduit 49 into the upper portion 16 above the piston 31. When the control valve 35 is in this position high pressure fluid forces the piston 31 downward which in turn moves the valve 34 into engagement with its associated seat 22.

The control valve 35 is adapted to be actuated by the operating member 14 which in turn is operated by either low or high pressure fluid from either station 78 or 79 of the base plate 12 which will be explained more fully hereinafter.

As shown in Fig. 6 the operating member 14 includes a hollow lower portion 60, a hollow center portion 61 open at both ends and a hollow cap portion 62. The lower portion 60 is open at the top and has a closed bottom wall 63 which is secured to the base plate 12 by a plurality of bolts 64. The lower end of the center portion 61 is threaded into the lower portion 60 as indicated at 65 and the upper end is threaded into the cap 62 as indicated at 66. The upper end of the cap 62 is closed and has an aperture 67 therethru.

Positioned in the lower portion 60 I provide a frame 68 which is shown as held in position by the lower end of the center portion 61. Mounted in and suitably secured to the frame 68 I provide a Sylphon diaphragm 69. The bottom wall 63 and the bottom of the frame 68 have an aperture 70 therethru which opens into the diaphragm 69. The diaphragm 69 includes an upwardly extending rod 71 on which a plate 72 is secured by a nut 73.

Positioned in the center portion 61 and the cap 62 I provide a coiled spring 74 one end of which engages the plate 72 and the opposite end the upper wall of the cap 62. The spring 74 resiliently urges the diaphragm 69 to a compressed position and the tension of the spring 74 may be adjusted by either loosening or tightening the cap 62 on the center portion 61.

Secured on the valve stem 36 I provide an operating member 75 which includes two oppositely extending arms 76 and 77.

As shown in Fig. 7 two stations indicated at 78 and 79 provided on the base plate 12 for the operating member 14. When the operating member 14 is to be actuated from the low pressure side of the valve 13 as shown in the drawings it is located at the station 78 and when to be actuated from the high pressure side of the valve 13 it is located at the station 79. Extending from the station 78 to the conduit 59 the base 12 has an aperture 80 therein and from the station 79 to the conduit 59 the base has a conduit 81 therein.

When the operating member 14 is positioned at the station 78 as shown the conduit 81 is plugged and when the operating member 14 is positioned at the station 79 the conduit 80 is plugged. The conduits 80 and 81 are adapted to register with the aperture 70 in the operating member 14.

When the operating member 14 is positioned at the low pressure station as shown in the drawings a rod 83 having one end universally connected as at 84 to the diaphragm rod 71 and the opposite end is universally connected as at 85 to the arm 76 of the control valve actuating member 75. When the operating member is located at the station 79 the rod 83 is connected to the arm 77 of the control valve actuating member 75.

Mounted on the boss 26 I provide a collar 86 which includes an upper arm 87 which extends to a position above the arm 76 and a lower arm 88 which extends to a position below the arm 76. The upper arm 87 has a threaded aperture 89 therein to receive a bolt 90 which has a lock nut 91 thereon. The lower arm 88 has a threaded aperture 92 therein to receive a bolt 93 which has a lock nut 94 thereon. The bolts 90 and 93 are adapted to be set to adjust the limits of movement of the arm 76.

Extending outwardly from the collar 86 I provide an arm 95 having an apertured boss 96 thereon in a position above the plug valve operating member 75. Positioned in the boss 96 I provide a spring pressed plunger 97 the lower end of which is adapted to engage recessed portions 98 in the member 75. The tension on the plunger spring may be adjusted by a bolt 99 to restrict movement of the operating member 36 until a predetermined pressure is applied to the arm 76 or the arm 77 de-

pending upon which arm the rod 83 is connected.

When the operating member 14 is located at the station 78 as shown in the drawings and the pressure of the fluid on the low pressure side of the valve 13 falls below a predetermined amount the spring 74 moves the rod 83 downward against the receding pressure in the diaphragm 69 and thereby rocks the arm 76 to rotate the control valve to the position shown in Figs. 1, 2 and 5 wherein the high pressure fluid moves the piston upwards which in turn moves the valve 34 away from its associated seat in the manner previously described.

When the pressure on the low pressure side of the valve 13 builds up to a predetermined amount the pressure in the diaphragm 69 likewise increases and moves the diaphragm upward against the action of the spring 74 thereby moving the arm 76 upward and rotating the control valve 35 to the position shown in Figs. 3 and 9 whereupon the high pressure fluid moves the piston 31 downward as previously described.

When the operating member 14 is located at the station 79 the center partition 17 is replaced by a center partition 100 as shown in Fig. 10. The partition 100 has a conduit 101 therein which connects the conduits 50 and 52 and a conduit 102 similar to the conduit 54 in the partition 17. Differing from the partition 17 the partition 100 has a conduit 103 therein which at one end communicates with the conduit 58 thereby providing a passageway from the high pressure side of the valve 13 to the operating member 14. Furthermore the partition 100 has a conduit 104 therein connecting the conduits 55 and 57.

When the operating member 14 is actuated from the low pressure side of the valve 13 the center partition 17 may be replaced by a partition 105 as shown in Fig. 11. The partition 105 has a conduit 106 therein connecting the conduits 50 and 52, and a conduit 107 therein similar to the conduit 54 of the partition 17. Differing from the partition 17 the partition 105 has a conduit 108 therein which at one end communicates with the conduit 55 and at the opposite end opens to the atmosphere. Furthermore the partition 105 has a conduit 109 therein which connects the conduits 57 and 58. Thus when the partition 105 is used the fluid which operates the piston 31 is exhausted to the atmosphere.

In Figs. 12 and 13 I have shown a partition 110 operatively assembled in the valve 13 to replace the partition 17. As shown in Fig. 12 the partition 110 has a plurality of apertures 111 therethrough which form passageways from the lower portion 15 to the upper portion 16. The partition 110 has a conduit 112 therein which connects the conduits 50 and 52 and a chamber 113 therein into which the conduits 55, 57 and 58 open similar to the partition 17. Differing from the partition 17 the partition 110 does not include a conduit communicating with the conduit 53. In operation when the control valve 35 is operated to exhaust the pressure above the piston 31, as previously described, the high pressure fluid acts against the valve 34 to unseat it. When the control valve 35 is operated to direct fluid to above the piston 31 as previously described the fluid below the piston 31 is exhausted through the apertures 111 in the partition 110.

In Fig. 14 I have shown a partition 114 to replace the partition 110 when the operating member 14 is operated from the high side of the valve 13. The partition 114 has a conduit 115 therein connecting the conduits 50 and 52 and has a conduit 116 connecting the conduits 115 and the conduit 58. Another conduit 117 in the partition 114 connects the conduits 55 and 57 and like the partition 110 the partition 114 does not include a conduit communicating with the conduit 53. From the foregoing description it will be apparent that I have provided a novel automatically controlled regulating valve device which may be operated in various manners and which is simple in construction and is highly efficient in use.

Having thus described my invention I claim:

1. In a flow control device, a valve including an upper member open at the lower end and a lower member including an upwardly opening chamber and a lower chamber, a partition member between the upper and lower members, said lower member having an inlet and an outlet, a valve seat between said inlet and said outlet, said upper member having a piston thereon, a rod on said piston and having a valve thereon adapted to engage said valve seat, said upper member having a laterally directed tapered plug recess therein and having a tapered plug valve in said recess, said plug valve recess including a conduit to said cylindrical upper member, said plug valve having a radial operating arm thereon and projecting from said upper member and a control member including a housing, a Sylphon in said housing, a rod on said Sylphon, spring means to urge the Sylphon in one direction, an operating member on said second mentioned rod, means to adjustably connect said operating member to said arm, means to bleed said cylindrical upper member, conduit means to conduct fluid from one chamber to said Sylphon, and other conduit means extending from said plug valve to one of said chambers, said plug valve having conduits therein adapted to afford communication between said previously mentioned conduits.

2. In a flow control device, a valve including a housing comprising a cylindrical upper member and a lower member, said lower member including an upper and a lower chamber, a partition member between said members, said lower member having an inlet into said lower chamber thereof and an outlet from said upper chamber, a valve seat between said members, said upper member having a piston therein, a rod on said piston and having a valve thereon adapted to engage said valve seat, said upper member having a laterally directed tapered plug valve recess and a tapered plug valve therein, said plug valve recess including a conduit to the atmosphere and a second conduit to said cylindrical upper member, said plug valve having a radial operating arm thereon, and a control member including a housing, a Sylphon in said housing, a rod on said Sylphon, spring means to urge the Sylphon in one direction, an operating member on said second mentioned rod, means to adjustably connect said operating member to said arm, means to conduct fluid from one chamber to said Sylphon, and other conduit means extending from said plug valve through said partition to one of said chambers, said plug valve having conduits therein adapted to afford communication between said previously mentioned conduits, said partition member having apertures aligned with said other conduit means.

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