Oct. 13, 1931. W. D. LA MONT 1,826,941

METHOD AND MEANS FOR PREVENTING LEAKAGE IN VALVES

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Fig. 1.

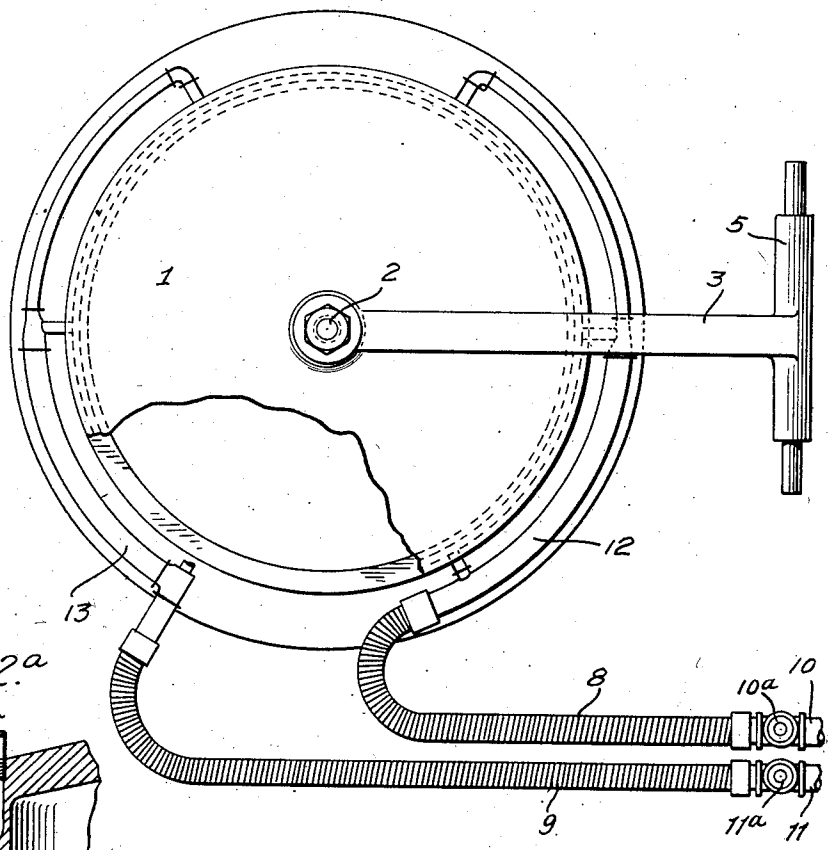


Fig. 2a

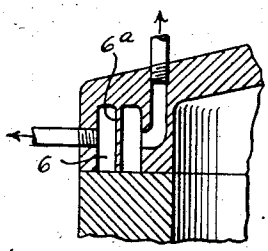
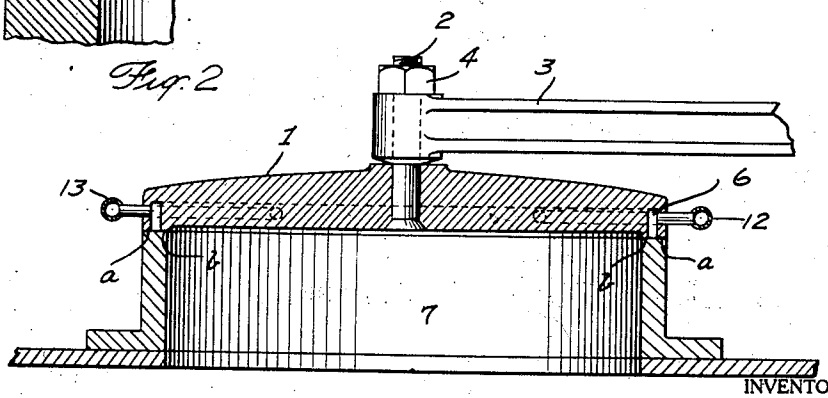


Fig. 2



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Fig. 3.

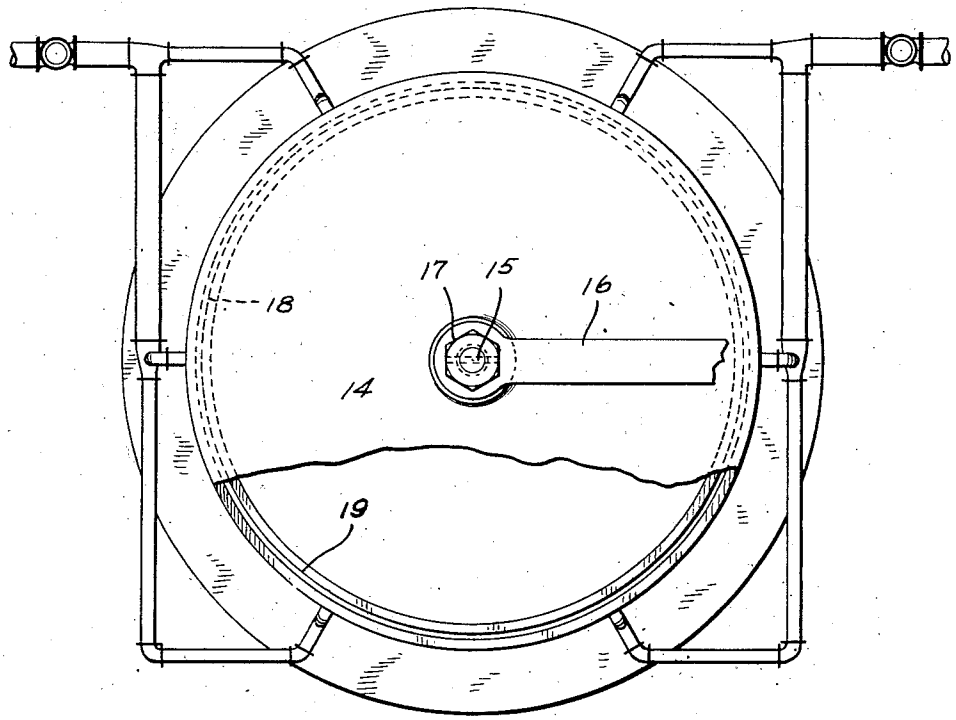
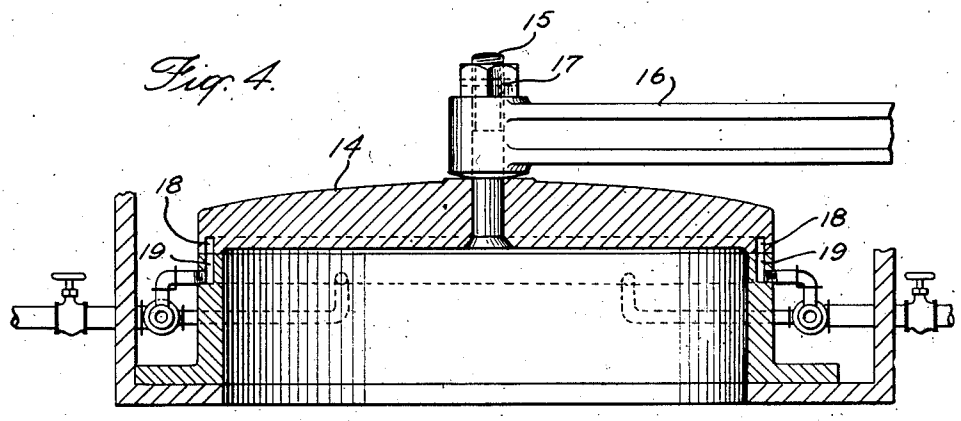


Fig. 4.



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METHOD AND MEANS FOR PREVENTING LEAKAGE IN VALVES

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Fig. 5.

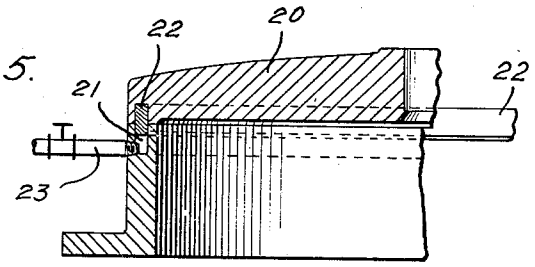


Fig. 6.

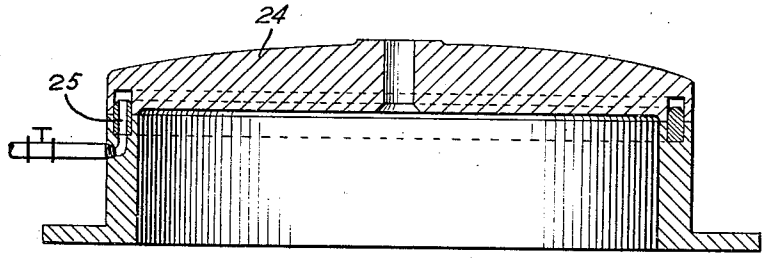


Fig. 7.

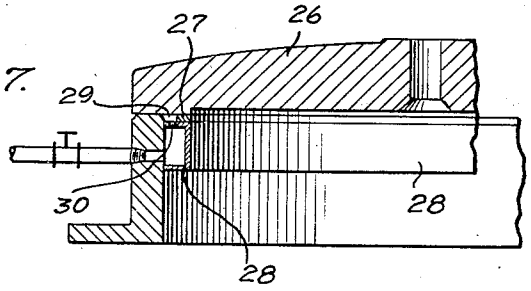


Fig. 8.

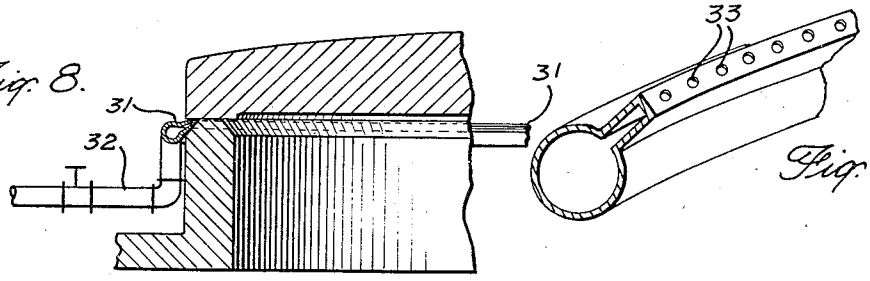
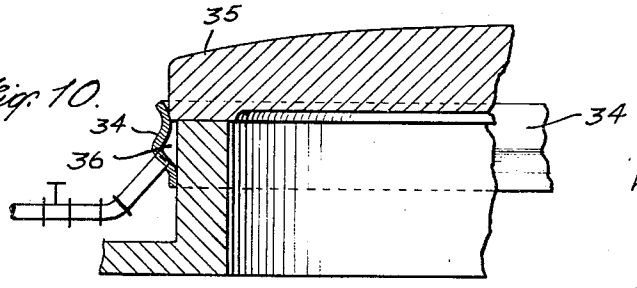


Fig. 9.

Fig. 10.



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Fig. 11.

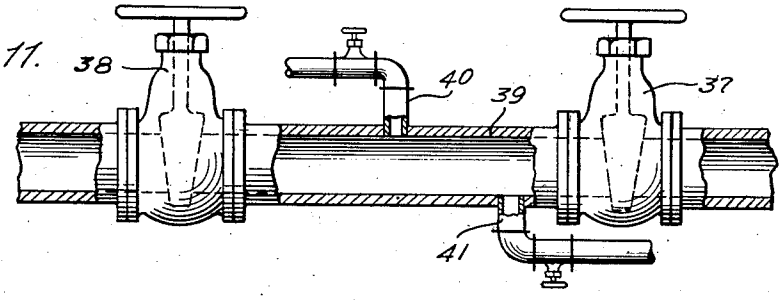


Fig. 12.

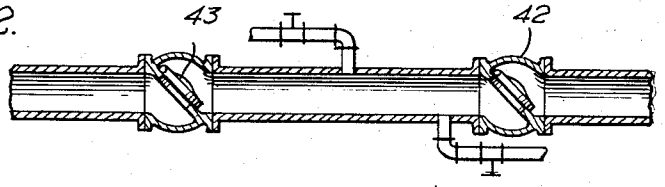


Fig. 13.

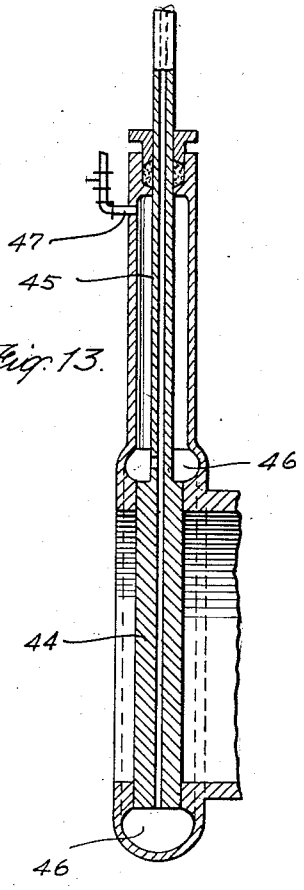
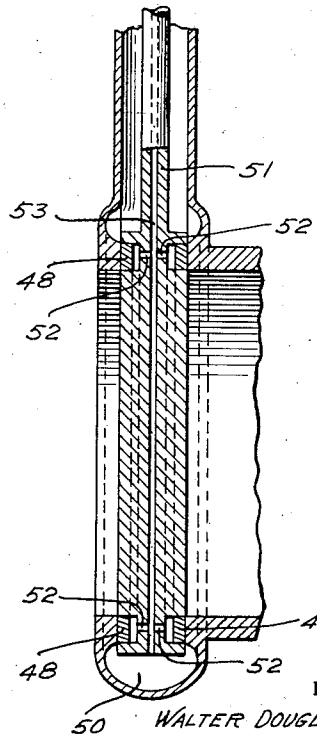


Fig. 14.



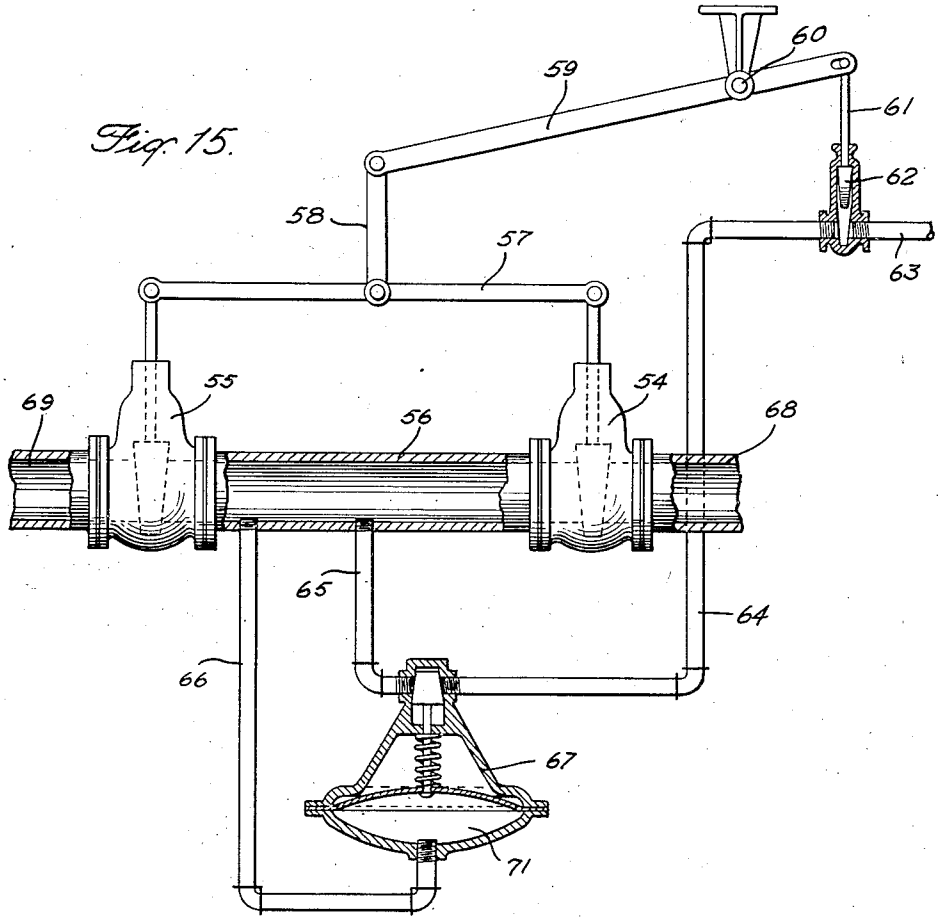
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METHOD AND MEANS FOR PREVENTING LEAKAGE IN VALVES

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Fig. 15.



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METHOD AND MEANS FOR PREVENTING LEAKAGE IN VALVES

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Fig. 16.

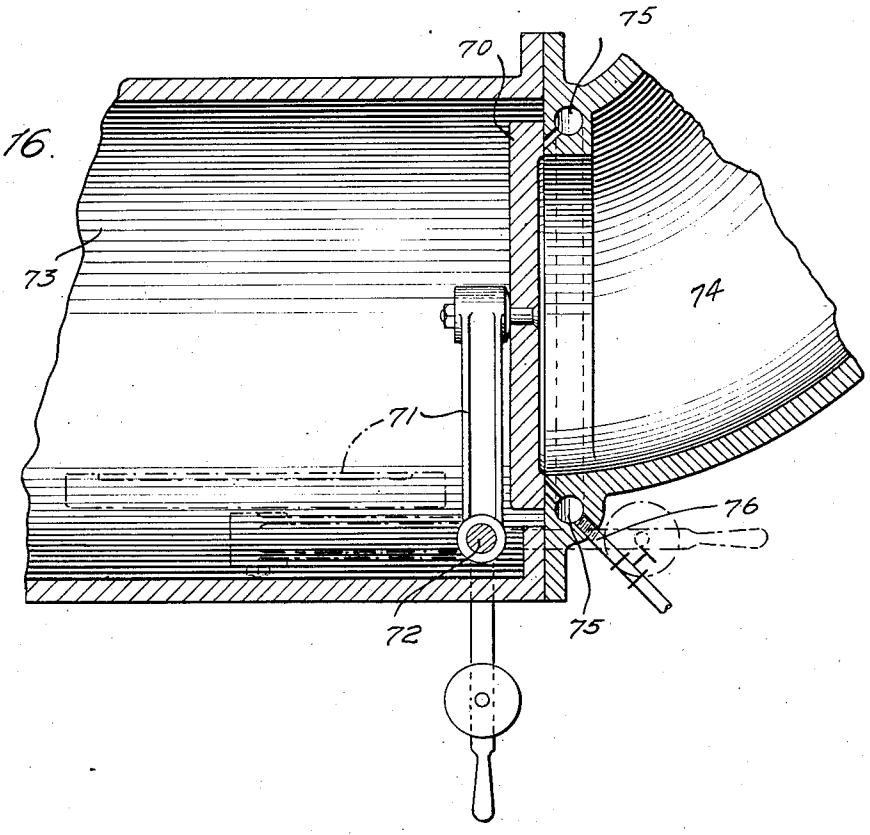
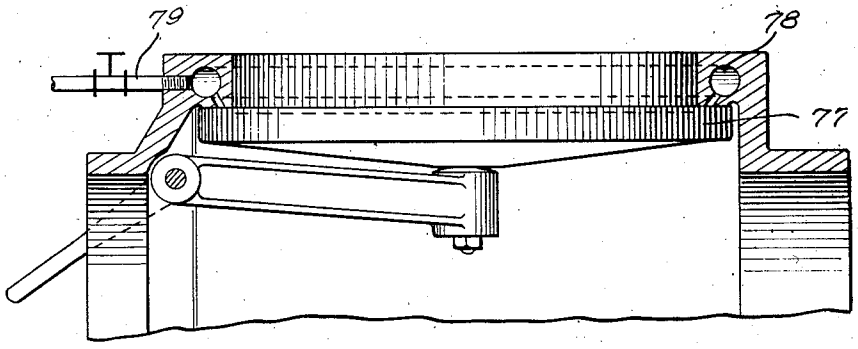


Fig. 17.



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Fig. 18.

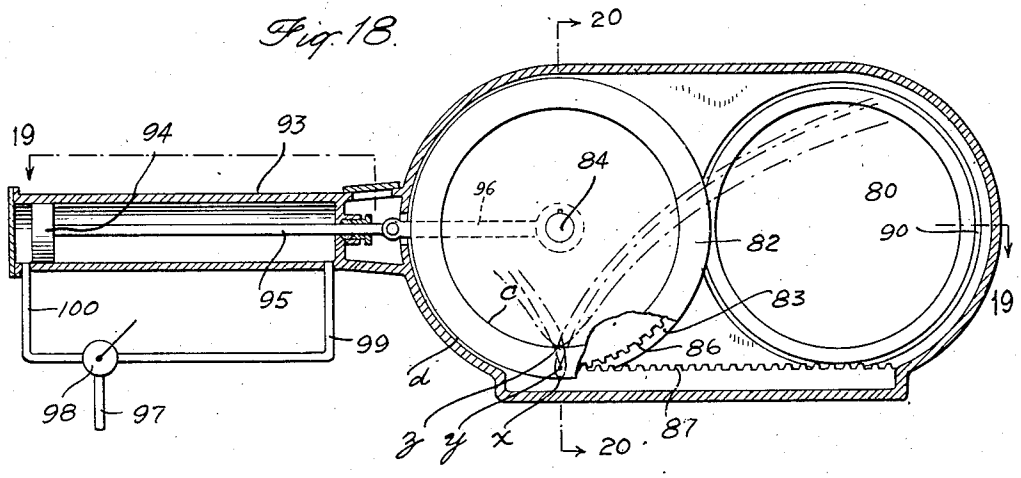
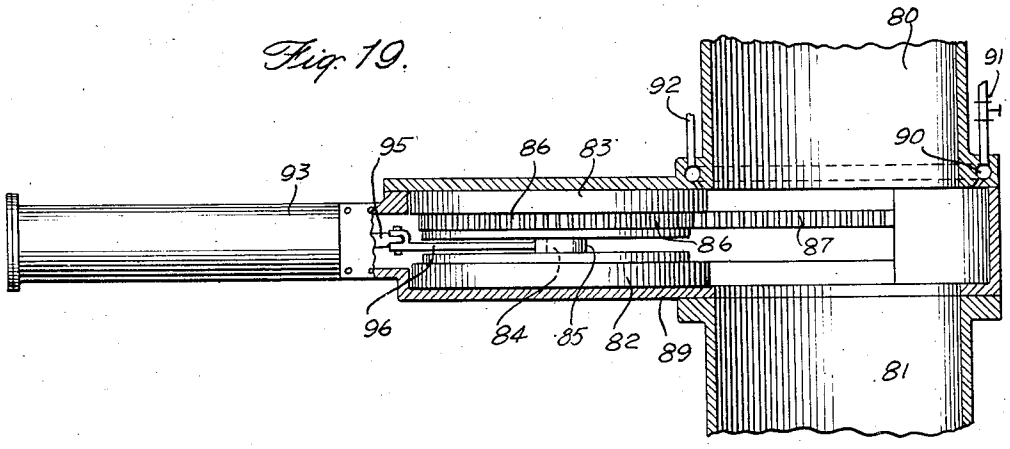


Fig. 19.



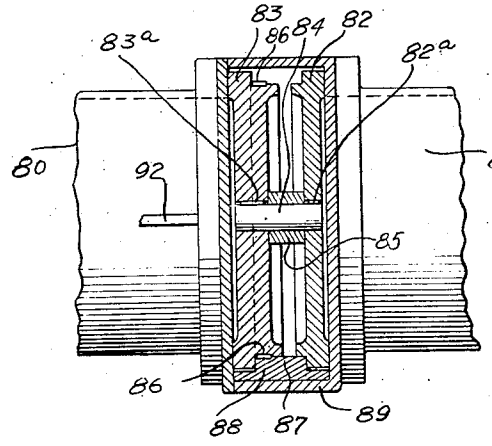


Fig. 20.

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Fig. 21.

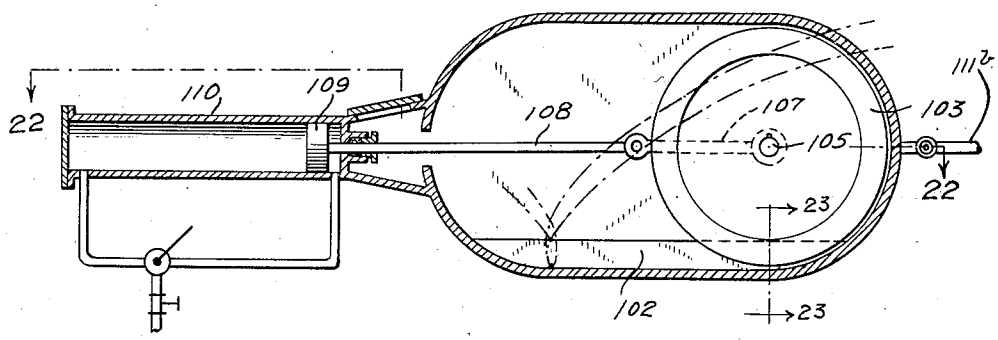


Fig. 22.

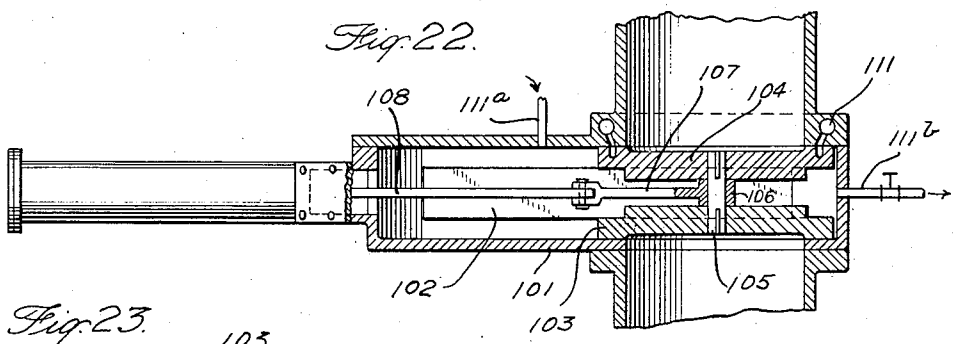


Fig. 23.

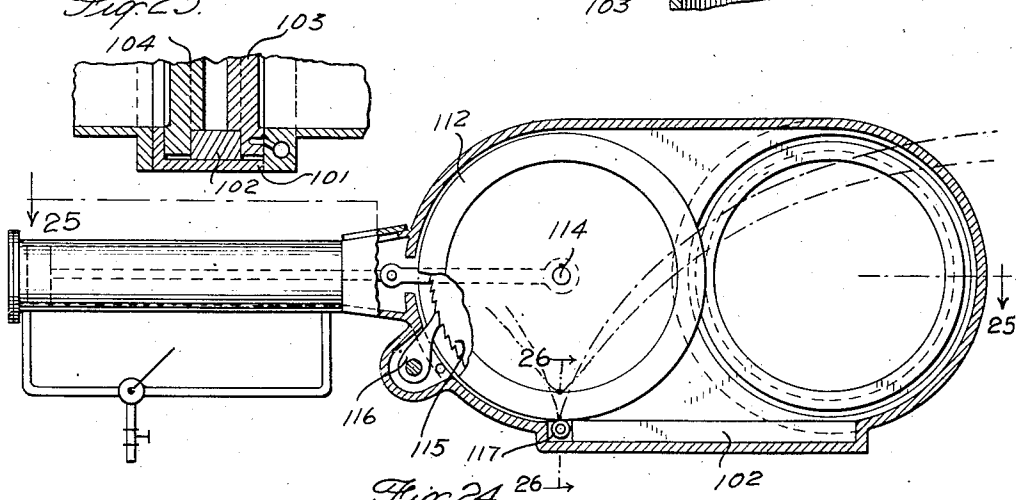


Fig. 24. 26

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Fig. 25.

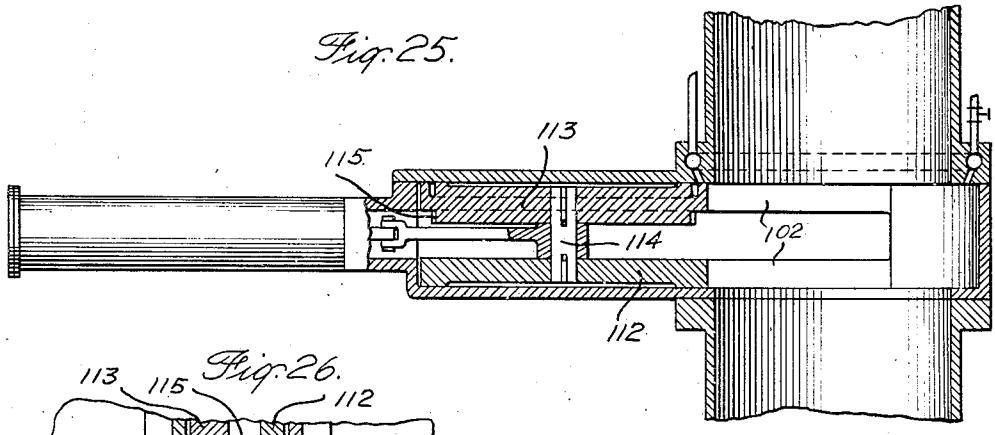


Fig. 26.

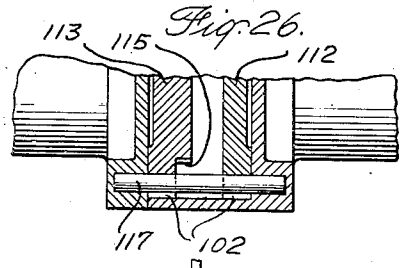


Fig. 27

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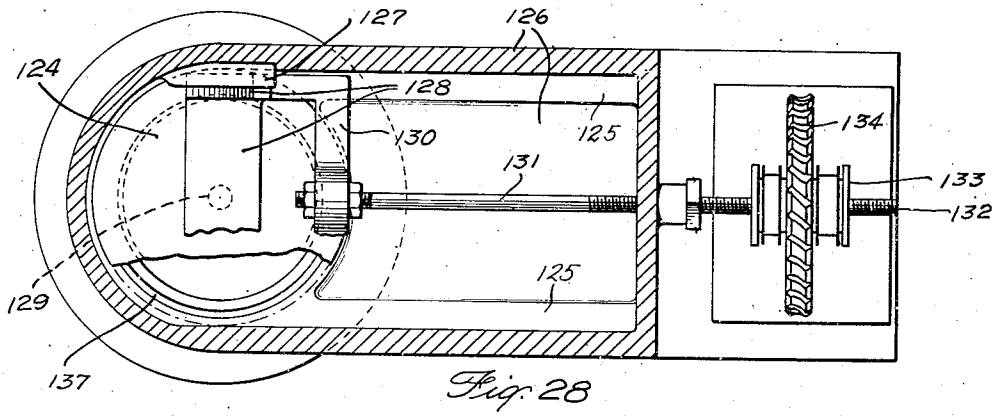


Fig. 28

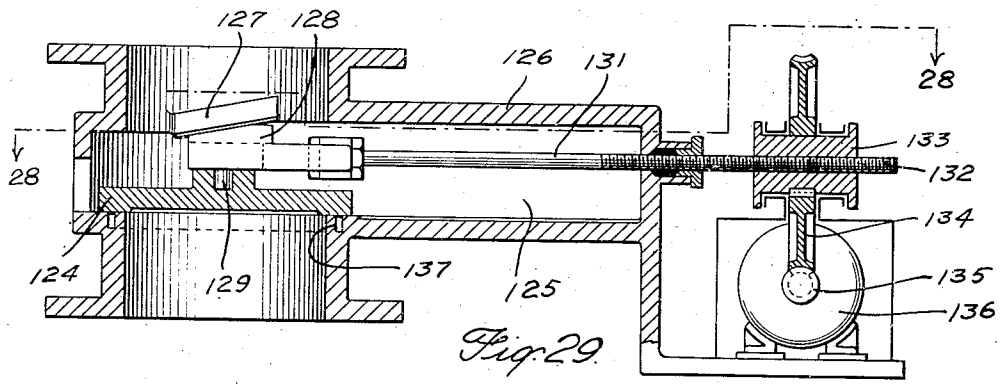


Fig. 29

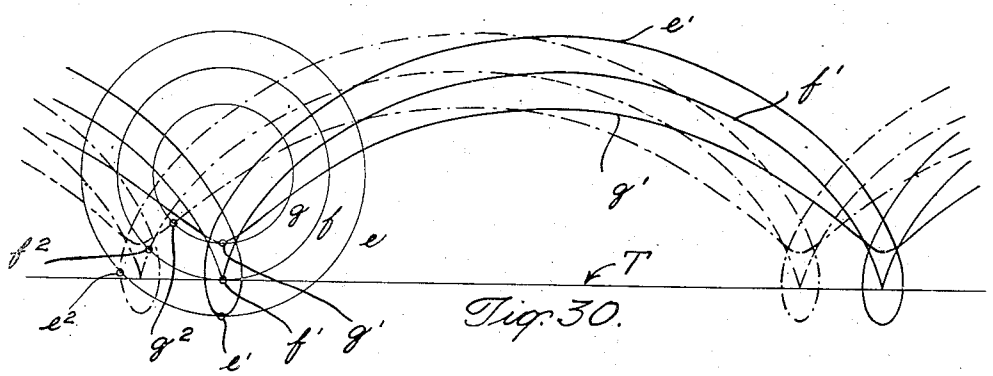


Fig. 30.

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METHOD AND MEANS FOR PREVENTING LEAKAGE IN VALVES

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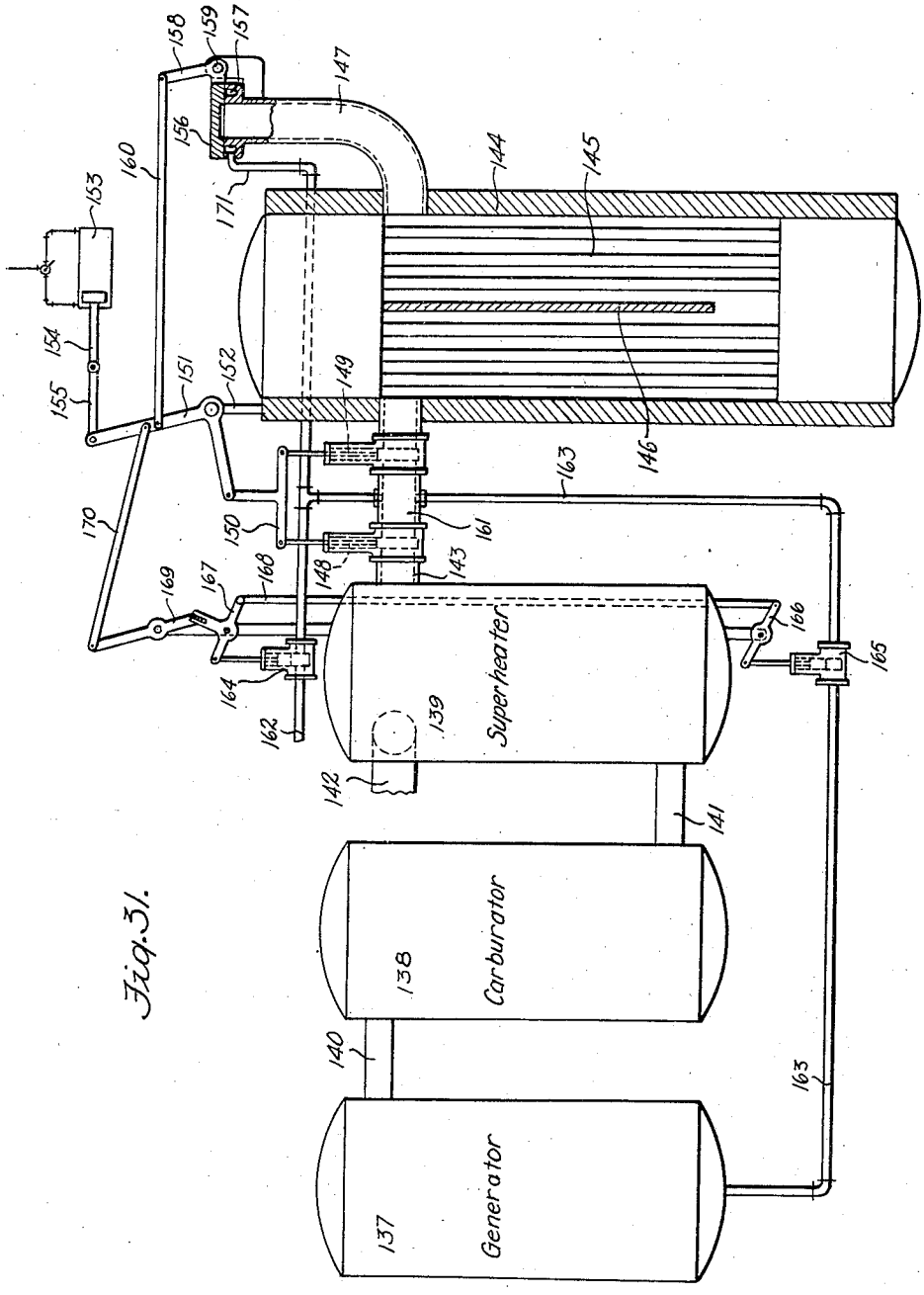


Fig. 31.

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Patented Oct. 13, 1931 1,826,941

UNITED STATES PATENT OFFICE

WALTER DOUGLAS LA MONT, OF NEW ROCHELLE, NEW YORK, ASSIGNOR TO LA MONT CORPORATION, A CORPORATION OF NEW YORK

METHOD AND MEANS FOR PREVENTING LEAKAGE IN VALVES

Application filed April 2, 1926. Serial No. 99,243.

This invention relates to valves and its object broadly considered is to prevent fluid controlled by a valve from leaking therethrough or where two fluids are separated by valve mechanism to prevent any mixture of these fluids. In some cases, one or both of these fluids may be air or one or the other may be various mixtures of gases. For example, in a waste heat steam generator system, to which my invention finds one of its many practical applications, the waste gases from the gas generator are led during the "blow" into a chamber where they may be used to heat water for the production of steam. However, during the "make", it is necessary that the combustible gases be completely shut off from the steam generating chamber. It is also necessary to prevent air from leaking into said chamber, otherwise an explosive mixture might be formed. In my co-pending application, Serial No. 76,945, filed December 2, 1925, I have shown a specific application of my invention to this kind of mechanism, and as described in said application, a valve closes the inlet from the gas generator to the steam generator chamber, and another valve closes said chamber from the atmosphere. Into this chamber between the two valves steam is introduced under such pressure as will prevent any leak past the lower valve, and likewise prevent the entrance of air through the upper valve.

The invention is, however, of a broader scope than is disclosed in said application and is susceptible of a great variety of uses.

In said application, the chamber into which the steam is introduced under pressure, is comparatively large. The principle of the invention does not require this, as in fact, quite a small chamber may be employed with equally advantageous results.

The invention, therefore, in one aspect may be viewed as a process for preventing leakage between two pressure volumes separated by a valve, which consists in providing a controllable pressure volume in the path of possible valve leakage. The valve structure itself may also be made to contribute to the better sealing of the valve and in this aspect, the invention consists in a construction and arrangement whereby the valve and valve seat are kept clean and compensation made for irregularities or warpage, in such cases the valve having a rolling action to and from its seat.

Referring to the drawings,

Fig. 1 represents a top plan view of one practical embodiment of means for practicing my improved process and is there shown as applied to a clapper valve;

Fig. 2 is a sectional view of the embodiment shown in Fig. 1;

Fig. 2a is a fragmentary sectional view showing a double chamber arrangement;

Figs. 3 and 4 are respectively a top plan and sectional view of another application of the invention to a valve structure;

Figs. 5, 6, 7 and 8 are still other forms which the invention may take as applied to a clapper valve installation;

Fig. 9 is a perspective detail of a modification;

Fig. 10 is a further modification of the invention as applied to a clapper valve;

Fig. 11 is an embodiment of the invention as applied to gate valves;

Fig. 12 shows an embodiment in which two check valves are used with a chamber therebetween;

Fig. 13 is a modification applied to large circular gate valves;

Fig. 14 is another modification applied to similar valves;

Fig. 15 shows a valve structure like that illustrated in Fig. 11, but with automatic control;

Fig. 16 shows an application of the invention to a valve in which the fluid pressure tends to seat it in one direction;

Fig. 17 shows an application of the invention to a valve tending to move open by gravity and which is seated by the fluid pressure against this gravitational tendency;

Fig. 18 shows a rolling valve construction, the view being taken in longitudinal section;

Fig. 19 is a section taken on line 19—19, Fig. 18;

Fig. 20 is a section taken on line 20—20, Fig. 18;

Fig. 21 is a sectional view of a rolling valve, the valve designed to roll on a track;

Fig. 22 is a section on line 22—22, Fig. 21;

Fig. 23 is a section on line 23—23, Fig. 21;

Fig. 24 shows a construction similar to that shown in Fig. 21, except that means are provided to give the valve a partial rotation at every opening movement so that a different area is presented to the seat;

Fig. 25 is a section on line 25—25 of Fig. 24;

Fig. 26 is a section on line 26—26 of Fig. 24;

Fig. 27 shows a structure like that shown in Fig. 24 but arranged for operation by a shorter piston stroke;

Fig. 28 is a horizontal section view of a rolling valve having but a single seat;

Fig. 29 is a longitudinal sectional view of the same, showing the cam arrangement for effecting firm seating and also an operating device;

Fig. 30 is a diagrammatic representation of curves taken by points at different locations on the seating area; and

Fig. 31 shows the application of my invention to a steam generator system.

The invention will be better understood by reference to the several specific embodiments now to be referred to. Referring to Figs. 1 and 2, 1 represents a hinged valve, sometimes referred to as a "clapper" valve. A pintle 2 provides means of attachment for an arm 3, which is hinged at 5, Fig. 1. This arm may be operated by power means so arranged that it tends to hold the valve tightly closed, or manual means only may be employed. A circular groove 6 is formed in the underside of the valve and of less width than the width of the valve seat, such groove constituting a pressure chamber.

Now, let it be supposed:—

First—that the valve 1 closes a gas chamber 7 from the atmosphere and that when the valve is closed the pressure of the gas is greater than atmospheric pressure. If now the pressure in the chamber or groove 6 be maintained at atmospheric pressure, any leakage from chamber 7 into chamber 6 will be taken out of 6 through connections later to be described and none of the gas in chamber 7 will get into the atmosphere. If, on the other hand, pressure in 6 equals that of the gas in 7, no leakage of gas will occur to chamber 6 and hence none to the atmosphere. A somewhat higher pressure in 6 than in 7 would also prevent leakage from chamber 7 into chamber 6, although in this case there would be a tendency to leakage from 6 into the atmosphere and also into chamber 7.

If the pressure in chamber 6 were less than atmospheric pressure, then both air from above the valve and gas from below it would tend to leak through the valve into the chamber 6. No gas, however, from 7 would get into the atmosphere, as any leakage past the valve and into chamber 6 would be sucked out to be discharged at some remote place or otherwise disposed of. Likewise, any leakage from the atmosphere to chamber 6. This method may be desired when the gas in 7 is of a very poisonous kind, or very irritating to the membranes, as chlorine. In the case just described, the gases mix in chamber 6. This may not be always desirable and this chamber may be divided by a ring 6*a* as shown in Fig. 2*a*. With such double chamber, of course, the connections by which the pressure will be controlled, would have to be duplicated.

Second—let it be assumed that the pressure in 7 is below atmospheric, and furthermore, that the mixture in 7 is such that it forms an explosive mixture with air. When the valve is closed, and if the chamber 6 is at that time also filled with air, then there would be a tendency for this air to leak from the chamber 6 along the path *b*, into chamber 7. This leakage would reduce the pressure in chamber 6, and air from outside the valve would tend to leak in along the path *a*. If now a suction be created in the chamber 6 so that the pressure therein is maintained just equal to the pressure in chamber 7, any air entering chamber 6 would be drawn out of the same, and none would enter chamber 7.

If the pressure in 6 equals that of the atmosphere, then while there might be some leakage from chamber 6 to chamber 7, there would be no leakage of air into chamber 6, and hence none to chamber 7. Of course, in this case, the gas in 6 must be an inert gas or one which under the circumstances may be introduced into chamber 7. If, however, the pressure in 6 were lower than that in 7, then any leakage would be from 7 into 6 and also from the atmosphere into 6, but no leakage from the atmosphere to 7. Here again, a divided chamber 6 might be desirable.

From these examples, it will now be readily seen that the chamber 6 provides a controllable pressure volume in the path of possible leakage between two pressure volumes separated by a valve. It is also apparent that the pressure differential in the chamber 6 may be varied to suit conditions.

If the pressure in said chamber is equal to the lower pressure controlled by the valve or equal to the higher pressure controlled thereby, there will be no leakage from one side of the valve to the other.

If the pressure in 6 be higher than the higher pressure controlled by the valve, there may be some leakage from 6 into both sides, but no leakage from the higher pressure side to the lower pressure side.

So also, if the pressure in 6 is below the pressure on the lower pressure side of the

valve, there will be no leakage between the sides of the valve, although there may be leakage from both into the chamber 6.

If the pressure in chamber 6 is higher than the lower pressure controlled by the valve, but less than the higher pressure controlled thereby, there may, in such an event, be some leakage, although not as much as there would be without the chamber 6. It may sometimes be sufficient to prevent leakage to a more or less extent but not highly important to prevent it altogether. In such cases, the pressure in the chamber 6 may be between the higher and lower pressures that the valve controls. Of course, the nearer the pressure in 6 approaches either pressure limit, the better the sealing effect produced. If it goes below the lower limit, the sealing is also completely effective, but the fluids on either side of the valve both enter the chamber 6. If the pressure is higher than the higher limit, there is, of course, a tendency to some leakage from the chamber 6 towards both sides of the valve.

Suitable pressure in the chamber or groove 6 to fit different conditions may be maintained in various ways and in the illustration, flexible connections 8 and 9 are shown, these leading to valve controlled pipes 10 and 11, respectively. The flexible connection 8 at its other end is joined to the conduit 12 which has three openings into the groove 6. The other flexible connection 9 is likewise connected to a conduit 13 which also communicates with the groove or chamber 6. Of course, conduits 12 and 13 may be one continuous conduit. Valves 10^a and 11^a control suitable sources of pressure supply, whereby a partial vacuum may be maintained in the chamber 6, or various higher pressures, as desired. For instance, if it is desired to maintain a pressure equal to the lower pressure controlled by the valve, then a circulation of the fluid in the chamber 6 is preferably maintained if the fluid is gaseous, because under these conditions there may be leakage from the higher pressure side of the valve into the chamber 6, tending to raise the pressure therein if this pressure were not constantly lowered in like amount.

Circulation in the chamber 6 may also be desirable under the several conditions above described, but a continuous circulation may not be necessary in all these cases.

If a pressure in chamber 6 is used which is less than the pressure controlled by the valve, such pressure may be obtained and the valves 10 and 11 closed. Of course, the pressure will gradually rise in chamber 6, if leakage thereto occurs from either or both sides of the valve, but at intervals the valves 10^a and 11^a may be opened, the pressure reduced and the valves again closed. Various other methods of maintaining the desired pressure in chamber 6 will be obvious. At times, it may be desired to cool the valve and for this purpose, a cooling fluid may be circulated in the groove 6. Such fluid, of course, may be either liquid or gaseous and may be maintained at such pressure as is suitable under the particular circumstances.

Not only may cooling of the valve be effected, but sealing as well. For instance, water may be introduced in an amount to fill the chamber 6 and under such pressure that it not only cools the valve, but also prevents leakage.

If a relatively small quantity of water is introduced into the chamber 6, and the valve is at a sufficiently high temperature, evaporation of the water may be utilized to produce a vapor pressure, such as will prevent leakage of the fluid controlled by the valve. Cooling will likewise take place under these circumstances.

Likewise, both water and steam may be introduced into the chamber 6 for both cooling the valve and supplying the desired pressure under appropriate circumstances.

While in the embodiment shown in Fig. 1, the groove 6 is shown only in the valve, it is obvious that a similar groove could be provided in the valve seat. There is, however, a practical advantage in having the groove in the valve only, because in applying my invention to valves already installed, it is only necessary to take off the valve, and turn a groove in it. Whereas, to produce a groove in the seat would be somewhat more difficult. Under some conditions, however, it might be of advantage to provide a groove in the seat alone or in both the valve and the seat.

In Figs. 3 and 4, this latter construction is shown. Here the valve 14 is shown likewise as a clapper valve having a pintle 15 and a pivoted arm 16 connected thereto by which the valve is lifted, the arm being secured by a nut 17. There is a groove 18 in the valve and likewise a groove 19 in the valve seat. In this case, the connections for maintaining fluid pressure lead to the valve seat groove and there need be no flexible connections employed. This form is therefore simpler insofar as the connections are concerned.

In Fig. 5, a clapper valve 20 is shown and there is a groove 21 in the valve seat and there is also a circular ring 22 formed on the valve and projecting below its edge and adapted to enter the groove 21. In this case, likewise fluid pressure is maintained in the groove 21 by a connection 23, and, of course, it is understood that there is also provided an outlet connection.

In Fig. 6, a valve 24 is shown with a groove therein. There is likewise a groove in the seat in which is fitted a circular ring having two openings, one connected to the inlet conduit 25 and the other to the outlet conduit (not shown). The ring is of less

depth than the sum of the depths of the grooves in the valve and valve seat, so that there is formed a chamber above the ring, as indicated. This construction is substantially the reverse of that shown in Fig. 5.

In Fig. 7, the valve 26 has no groove but there is formed on its under face a ring 27 which is adapted to fit closely against the upper face of a circular shaped trough 28 which is formed inside of the seat and extends all around the same. There is a small space 29 formed by the trough 28 and the projection 27 and the trough 28 has a series of holes 30 leading into this space. Openings are made at suitable places through the valve seat for the inlet and outlet pipes which connect the source of fluid pressure or exhaust as the case may be, with the trough 28.

In the form of device shown in Fig. 8, there is no groove formed in either the valve or in the seat, but a recess is cut in the seat and the fluid pressure is introduced through a ring 31 formed as shown with an opening around its inner edge. When fluid under pressure is introduced through the pipe 32, there, of course, is produced a pressure between the valve and valve seat in the path of possible leakage as in the other forms already described.

Fig. 9 merely shows a slightly different form of ring from that shown at 31 in Fig. 8 and in which perforations 33 are provided in an otherwise closed ring.

In Fig. 10, a spring ring 34 is secured to the valve seat and is adapted to engage the valve 35 when the valve is closed. This ring is so shaped that a pressure chamber 36 is formed.

In Fig. 11, a somewhat different kind of valve is shown. In this form of the invention, there is a valve 37 of the gate type and a valve 38 of similar type and between them a pressure chamber 39. The fluid may be introduced therein through an inlet 40 and is circulated by means of an outlet 41, both inlet and outlets being controlled by their own valves. Within the chamber 39, pressure of the desired amount may be maintained. Heretofore, the fluids considered have been treated as gases, but the invention is not limited to fluids in gaseous form. Suppose the conduit to the right of valve 37 is filled with water. If now a pressure equal to the hydrostatic pressure in this conduit is maintained in the chamber 39, no water can escape past the valve 37. In such a case, it would be practical to use air as the pressure fluid in chamber 39.

A very similar condition is shown in Fig. 12 in which the valves 42 and 43 are of the hinged variety and so placed that they will automatically close on a reduction of pressure in the conduit. The principle of the invention is, however, equally applicable to this type of valve.

In Fig. 13, the valve is of slightly different construction and consists of a circular portion 44 constituting the valve proper and a stem 45 which is hollow. The casing for the valve is so made that the pressure chamber 46 is formed about the periphery of the valve. The fluid may be introduced through the valve stem and circulation maintained, if desired, by an outlet 47 leading from the chamber 46.

In Fig. 14, the conditions are substantially like those described in connection with Fig. 13, except that there is provided a movable ring 48 on one side of the valve, if such valve be a single valve, and a similar ring 49 on the other side, if the valve be double. The valve casing forms a pressure chamber 50 and the valve stem 51 is hollow. When pressure is introduced into the valve chamber, it causes pressure to be applied to the inner face of each of the rings 48 and 49 and tends to seat these more securely, thereby preventing leakage by reason of greater pressure of the sealing rings against the valve seat as well as by introducing fluid pressure in the path of possible leakage. The rings 48 and 49 are movable in their seats and there is a connection 52 leading from the valve stem opening 53 into this opening behind the respective rings.

The arrangement shown in Fig. 15 is quite similar to that shown in Fig. 11, except that means are here shown for automatically controlling fluid pressure introduced into the pressure chamber between the valves. In this figure, there is provided a valve 54, a valve 55, and a pressure chamber 56. The two valves are connected by a link 57 at the center of which is pivoted another link 58. A lever 59 connects with the upper end of the link 58 and is pivoted at 60. The right hand end of lever 59 is pivotally connected to the piston rod 61 of a valve 62, which valve determines the admission of fluid under pressure from a pipe 63 to the chamber 56. When the lever 59 is swung to open the valves 54 and 55, the valve 62 is closed. When, however, the lever 59 occupies the position shown in Fig. 15, valves 54 and 55 are closed and valve 62 opened. Fluid under pressure then passes along pipe 64 and by means of pipe 65 enters chamber 56. A pipe 66 is also connected to said chamber and leads to a spring controlled diaphragm valve 67 which automatically closes when the pressure in the chamber 56 has reached a definite amount. The chamber 56, however, provides a means whereby fluid under pressure may be introduced into the path of possible leakage between the chambers 68 and 69 controlled by the valves 54 and 55.

In Fig. 16, the valve 70 is shown connected by means of arm 71 to swing about a pivot 72 to close the opening between a chamber 73

and a chamber 74. If the pressure in the chamber 73 is quite high, it will aid in closing of the valve. In this particular form escape of fluid from the chamber 73 into chamber 74 is prevented by introducing fluid under pressure into a circular chamber 75 formed in the valve seat and into which leads a suitable conduit 76 for supplying such pressure.

Fig. 17 is quite similar to Fig. 16, but differs from it in showing a construction in which the valve 77 is closed by pressure from beneath and in opposition to the force of gravity. A circular pressure chamber 78 is likewise provided which is supplied by fluid from conduit 79.

In quite a number of the applications of the invention to valves so far described, a clapper valve of hinge type has been illustrated.

The invention, however, is equally applicable to valves of a rolling type and in Figs. 18 to 29, I have illustrated my invention applied to some of these. The rolling valves also possess the additional advantage of keeping the seating faces clean.

In Figs. 18, 19 and 20, a rolling valve separates two chambers or conduits 80 and 81. The valve shown is double faced, consisting of a disk 82 and a disk 83 supported by a shaft 84 and connected thereto by splines 82*a* and 83*a*, respectively. A collar 85 is loosely mounted on the shaft between the two disks. These may be urged apart by fluid pressure introduced between them as described in detail in connection with Figs. 21 and 22. Formed with or connected to the disk 83 is a toothed disk 86. A track 87 in the valve housing 89 has a toothed portion 88 with which the teeth of 86 engage. The disk 82 bears upon the plane portion of track 87.

As the valve is moved from open to closed position, the disks roll upon the track, being compelled to do so by reason of the toothed members 86 and 87. This rolling motion causes grinding action between the valve disks and the faces of the seat, tending to keep the surfaces clean, and resulting in a tighter seating valve.

This grinding and smoothing action will be better understood by considering Fig. 18, wherein curves have been drawn showing the path of a point x, a point y and a point z. The circles c and d represent the inner and outer boundary of the bearing area of the valve face. The point x is just on this outer circle. The point z is on the inner circle and the point y is between the two but on the rolling circle. Other points on the valve face will describe similar curves and there will be crossings of curves as the valve rolls into position in contact with its seat.

The curves described will, of course, depend upon the position of the rolling circle in respect of the circles c and d. This is better illustrated in Fig. 30. Here, the rolling circle is represented at f, T being the track.

Any point as e' on the radius will describe a curate cycloid, while any point such as g' will describe the prolate cycloid. A point f' will describe a cycloid.

Any other points such as e^2, f^2 and g^2 will describe similar curves and there will be many crossings of points on the valve face with points on the valve seat. The result of this will be a smoothing of the faces of valve and seat and a better fit due to the rolling contact. The position of the area of the valve which engages its seat may be that determined by the circles e and f or by the circles f and g. Or the rolling circle may be slightly within the outer valve contact circle as actually is the case in Fig. 18. Here the rolling circle passes through the point y, the point x being on the circle d and the point z on the circle c.

In addition to this feature, I may also provide a groove 90 in the valve seat housing and connect this groove with an inlet 91 and outlet 92. Into this groove, fluid under pressure may also be introduced and maintained at such pressure as is necessary to suit different conditions.

A groove may be provided on the other side and adjacent to the disk 82 if desired. It is obvious too that a valve having but a single disk may be used.

A valve of the type just described may be quite large and consequently heavy. I have therefore shown a conventional power means to operate it, such means taking the form of a cylinder 93 in which slides a piston 94. A piston rod 95 has pivoted to it a pitman 96, the latter connected to the collar 85. A fluid supply pipe 97 admits pressure to either side of the piston under control of a valve 98 through conduits 99 and 100.

Figs. 21 to 23 illustrate another type of rolling valve, also shown as double faced. The valve housing 101 is provided with a track 102 and each valve disk 103, 104 has a flange and a traction face engaging the track. A splined shaft 105 supports the disks for rotation together and a collar 106 loose on the shaft forms a hub for the pitman 107 connected to the piston rod 108. A piston 109 slides in cylinder 110, the latter supplied with valve controlled fluid pressure conduits as described in connection with Figs. 18 to 20. In this form, the weight of the valve is relied upon to furnish sufficient traction to cause it to roll on its track when actuated by the operating means. A pressure chamber in the form of a groove 111 may be provided in the valve seat casing and the usual inlet and outlet conduits may likewise be provided. However, this groove may be omitted and fluid admitted to the chamber between the valve disks at 111*a*, an outlet 111*b* being also provided. The pressure then serves to hold

the valve disks against their slots, as well as to prevent leakage.

In order to compensate more accurately for warpage of valve or its seat, or for other irregularities, it may be at times desirable to use a valve structure wherein there is given to the valve a slight rotary displacement at intervals.

Such a form of valve is illustrated in Figs. 24 to 27, wherein the same general type of valve is shown, as already described in connection with Figs. 18 to 23. Thus, the two disks 112, 113, are connected by axle 114 and the valve of Figs. 24 to 26 is moved by power, as described.

To provide for the rotary displacement mentioned, the valve disk 113 has formed on it or connected with it, a ratchet disk 115 engaged by a pawl 116. The disks roll on their peripheries on a flat track, at the end of which is a roller 117, Figs. 24 and 26, upon which the disks rest when the valve is in open position. The movement of the valve is sufficient to give it a partial rotation during valve operation. Thus, a different part of the valve face is constantly being presented to the valve seat and compensation thus made for wear, warpage and like conditions, resulting in a close and accurate seating of the valve.

The structure shown in Fig. 27 differs slightly in the pawl and ratchet feature and also in the power operating feature. Here, the ratchet 118 faces the other way and the pawl 119 may then give movement to the valve disks, just at the commencement of the closing movement.

The power means consists of a cylinder 120 similar to that already described, but the piston 121 thereof is connected to the pitman 122 at a point intermediate its fulcrum 123 and the point of application of the power, this form permitting a shorter piston movement.

A single faced valve is shown in Fig. 28 and Fig. 29. This is also of the rolling type and consists of a disk 124 adapted to roll on a track 125 provided in the casing 126. Means to hold the valve firmly against its seat take the form of a cam 127, one on each side of the valve and supported by the casing. The valve has a cross head 128, whose upper face is bevelled and is provided with a pin 129 at the central portion thereof, upon which the valve may turn as it rolls on its track to and from closed position. A cross bar 130 is supplied with side arms which connect with the cross head and this furnishes a means of attachment for a rod 131 by which the valve is power-operated. The rod has screw threads 132 at its right end. These engage threads in a member 133 secured to a worm gear 134, the latter engaging a worm 135 driven by a suitable motor 136. Rotation of the motor in one direction will act through the screw rod 131 to close the valve, while reverse rotation will open it. The cam face of the cross head 128, by engagement with the cams 127 as the valve reaches closed position, will cause the valve to seat very firmly. A pressure groove may also be used in this form of construction, as in those forms previously described, such groove being indicated at 137.

If the valve is sufficiently heavy, its traction may be sufficient to cause it to roll on its track. However, a rack may be used to insure such turning, if circumstances require it, and this may take the form shown in Fig. 18.

Likewise, pawl and ratchet mechanism as shown in Figs. 24 or 27 may be used.

In Fig. 31, I have schematically shown how my improved valve sealing method may be practically used in connection with a system for utilization of the waste gases from a gas generator system.

Only enough of the gas making unit is shown as will enable this application of my invention to be understood. In the drawings, a water gas making plant is shown, the gas generating unit of which includes a generator 137, a carburetor 138 and a superheater 139. The generator and carburetor are connected near their upper ends by a conduit 140, while the carburetor and superheater are connected by conduit 141 near their lower portions. At the upper end of the superheater, there is a conduit 142 which leads to intermediate devices for washing the gases and finally to the gas mains. During the so-called "blow" period of the water gas making process, the waste gases from the superheater may be used for generating steam, and for this purpose, there is provided a conduit 143 leading from the upper part of the superheater to a steam generating chamber 144. This chamber is provided with suitable heat absorbing units 145 and a baffle plate 146. The hot gases enter at the top and are first deflected downwardly by said baffle plate and they then pass upwardly and finally to the atmosphere through an outlet 147. It has been already stated in the beginning of this specification that it is important to prevent air from leaking into the steam generation chamber 144 during the "make" period as well as to prevent the highly combustible gases from passing from the superheater into the steam generating chamber at this time. This may be accomplished most effectively by the use of any one of several forms of my invention already fully set forth.

For instance, in the conduit 143, I provide two valves 148 and 149, which may be of the general form shown in Figs. 11 and 15. The stems of these valves are connected by a three-armed member 150, to the upper arm of which is connected a bell crank 151, the latter pivoted on extension 152 on the steam generating chamber. The two valves are designed to be

opened and closed simultaneously and for this purpose any suitable power device such as a hydraulic cylinder shown at 153 may be employed, this cylinder having the usual piston 154 connected by a pitman 155 to the arm 151.

The outlet 147 is also closed by a valve 156, which valve may be similar to any one of the various forms illustrated in Figs. 1 to 10; or if desired, the valve closing this outlet may likewise be of the form selected for controlling the gases through conduit 143 and I do not wish to be limited in selecting any particular form of valve structure because under different circumstances, different forms in which the invention may be embodied may be employed to suit particular circumstances.

In many cases, it may be desirable that the valves 148 and 149 and likewise the valve 156 be opened and closed together and I have illustrated a structure for doing this. Sometimes, however, it may be better practice to close the valves 148 and 149, either ahead of or after the valve 156, or to close valve 148 before or after valve 149, and it is obvious that the construction could be readily changed to give a proper lag or lead to the closing movement of these valves.

I have shown the valve 156 connected to an arm 158 pivoted at 159 and connected to a bell crank lever 151 by a link 160 so that the same power mechanism 153 controls both valves. It will be noted from this description that the valves 148 and 149 are slightly spaced apart so that there is provided a pressure chamber 161 between them into which a sealing medium in the form of a suitable fluid may be introduced or circulated as may be desired to suit the circumstances under which the valve is to be used.

In referring to a pressure chamber, it is to be understood that the term "pressure" is used very broadly and may include a pressure greater than or less than the atmosphere so that sometimes the chamber may really act as a suction chamber as has been pointed out earlier in the specification. When, however, this chamber is to be used between the superheater and the steam generator, it is preferable that the pressure in the chamber be greater than the pressure of the gases entering from the superheater.

The fluid used is preferably steam which may be obtained from any suitable source and conducted to the chamber through a supply pipe 162. To effect economy of operation, I may provide for a sufficient supply of steam to not only maintain the desired pressure in the chamber 161 to prevent any leakage through the valves 148 and 149, but I may also conduct some or all of this to the water gas generator 137 during the "make" period.

For this purpose, an outlet steam pipe 163 leads from the chamber 161 and to the generator 137. During the "make" period, the valves 148 and 149 are closed and steam is admitted through the supply pipe 162 under control of a valve 164 which is then in open position. A second valve 165 in the connection 163 is likewise open so that steam circulates through the chamber 161 and to the generator 137. The valves 164 and 165 may be controlled from the power device 153 and for this purpose a lever 166 connects to the stem of the valve 165. A three-armed member 167 has one of its arms connected to the stem of the valve 164. Another arm of this member is connected by a link 168 to the lever 166. The third arm is engaged by a lever 169, the upper end of which engages a link 170 pivoted to the bell crank 151.

When the parts are in the position shown in the figure with the valves 148, 149 and 156 closed, then steam passes to the generator 137 after passing through the pressure chamber 161, thereby preventing any valve leakage between the superheater and the steam generating chamber 144. The valve 156 prevents any air entering said chamber 144 and this valve may be sealed by steam from the same supply as that which enters the chamber 161. For this purpose, a pipe 171 is provided. When the "make" period has come to an end, the cylinder 153 is supplied with power at its left hand end to cause the piston to move to open the valves 148, 149 and 156 and to close the valves 164 and 165. This is the so-called "blow" period, and during such period, the hot gases flow into the steam generating chamber 144.

If, as already suggested, the valve mechanism in the conduit 143 is also utilized in the outlet 147, the steam may be conducted through both valves in series and to the generator 137, if desired.

Although I have illustrated a number of different types of structures, in which my invention may be embodied, there are still other forms it may take, all within the principles disclosed. Some of the features of the several forms disclosed may be used without others, and many variations made, all within the scope of the invention without departing from the spirit thereof.

Having thus described my invention, what I desire to secure by Letters Patent and claim is:

1. The process of preventing leakage between pressure volumes controlled by valve mechanism which consists in causing a continuous stream of fluid in volume and under pressure to flow across the path of possible valve leakage, whereby said volume of fluid acts as a vehicle to carry any leakage and prevents the flow thereof from one pressure volume to the other.

2. In combination, valve mechanism separating two pressure volumes, a pressure chamber in the path of possible valve leakage between the pressure volumes, and means for

causing a continuous stream of fluid to flow through said chamber at suitable pressure and in such volume as to prevent the passage of leakage from one pressure volume into the other through the valve mechanism.

3. The combination with a valve and a valve seat, of a support upon which the valve rolls in contact with the valve seat substantially throughout the opening and closing movements thereof, a pressure chamber in the path of possible valve leakage between the pressure volumes controlled by the valve, and means for circulating a continuous stream of fluid through said chamber at suitable pressure to prevent leakage from one pressure volume to another through the valve mechanism.

4. An apparatus for preventing leakage between pressure volumes controlled by valve mechanism in which said mechanism comprises two discs movable against their seats, and having a pressure chamber therebetween, and in which fluid from an independent source is caused to flow between the discs in a stream of considerable volume and under such pressure as to cause them to be cooled by said flowing stream and pressed against their seats to prevent leakage between pressure volumes.

5. An apparatus according to claim 4, in which the valve rolls in contact with its valve seat throughout substantially the entire opening and closing movement thereof.

6. The process of preventing leakage between pressure volumes controlled by valve mechanism which consists in causing a continuous stream of fluid in volume to flow across the path of possible valve leakage, whereby said volume of fluid acts as a vehicle to carry any leakage and prevents the flow thereof from one pressure volume to the other.

7. Process of preventing leakage between pressure volumes between which the normal flow is controlled by valve mechanism which consists in interposing in the path of said normal flow a mobile pressure volume the movement of which serves to prevent the passage of leakage from the one pressure volume to the other.

8. A valve mechanism comprising a valve body provided with two valve seats forming openings through which flows the fluid to be controlled by the valve mechanism, a valve disc associated with each valve seat for closing its respective opening and defining with said body and seats a chamber in the path of flow of the fluid, means for continuously introducing a sealing and cooling fluid into said chamber and causing it to flow in volume therethrough and to be discharged from the chamber, whereby when the valve discs cover the openings leakage through said openings of the fluid to be controlled is prevented.

9. A mechanism for control of the normal flow of a fluid from one pressure volume to another comprising walls forming a chamber through which the fluid flows, means for closing off the flow of the fluid through said chamber, means for passing a second fluid in a stream of appreciable volume through said chamber across the path of normal flow of the fluid being controlled, whereby the passage along said path of any of the fluid which leaks past the closing off means is prevented.

10. A valve mechanism for control of the flow of a fluid from one pressure volume to another comprising a valve body provided with seats, valves associated with said seats and defining with the valve body a chamber in the path of flow of the fluid, means for introducing a sealing fluid into the chamber, and means responsive to variation in the pressure within the chamber for automatically controlling said introduction so as to maintain in said chamber a suitable pressure to prevent leakage from one pressure volume to the other.

Signed at New York, New York, this 30th day of March, 1926.

WALTER DOUGLAS LA MONT.