

July 21, 1936.

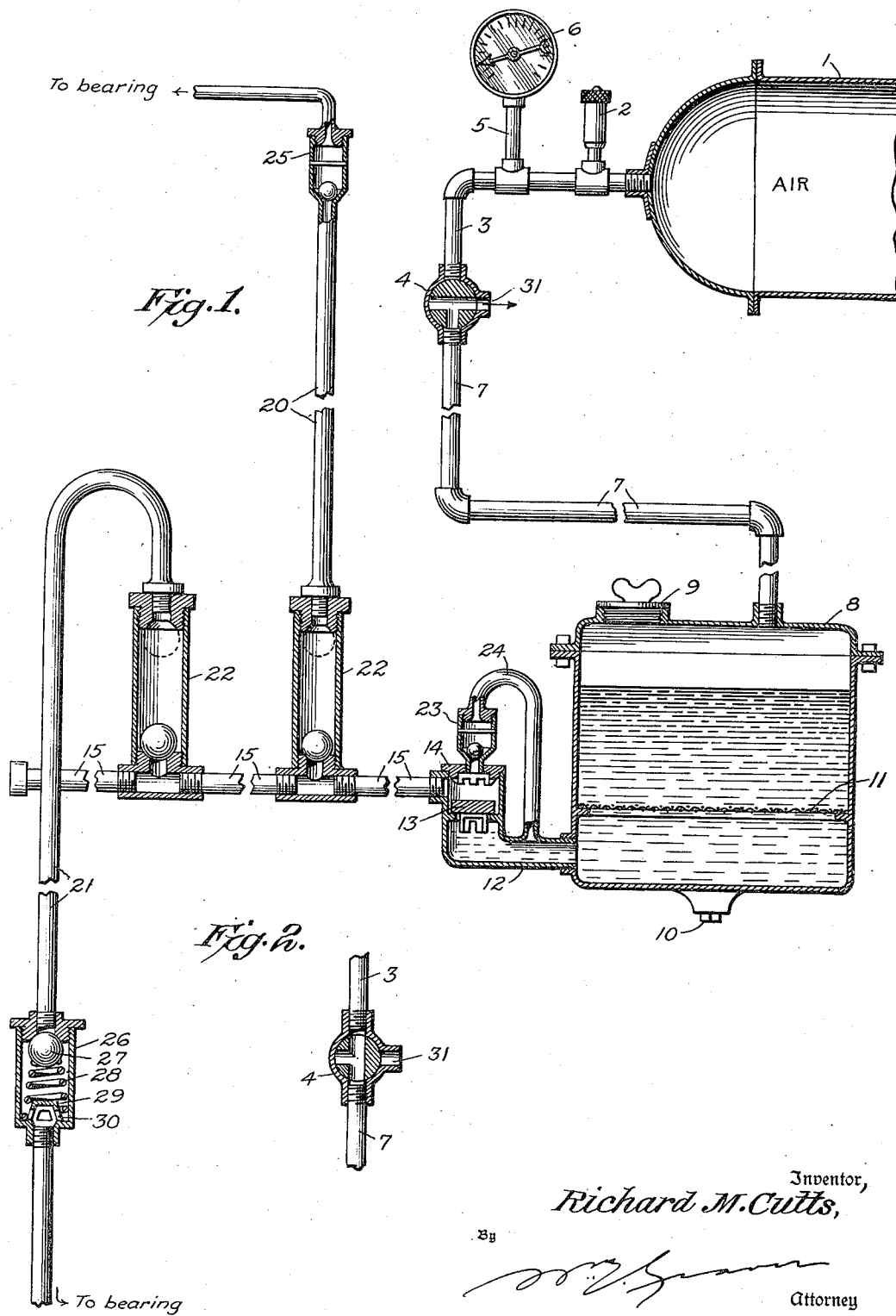
R. M. CUTTS

2,048,323

SYSTEM FOR METERING LIQUIDS

Filed March 2, 1932

2 Sheets-Sheet 1



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Fig. 3.

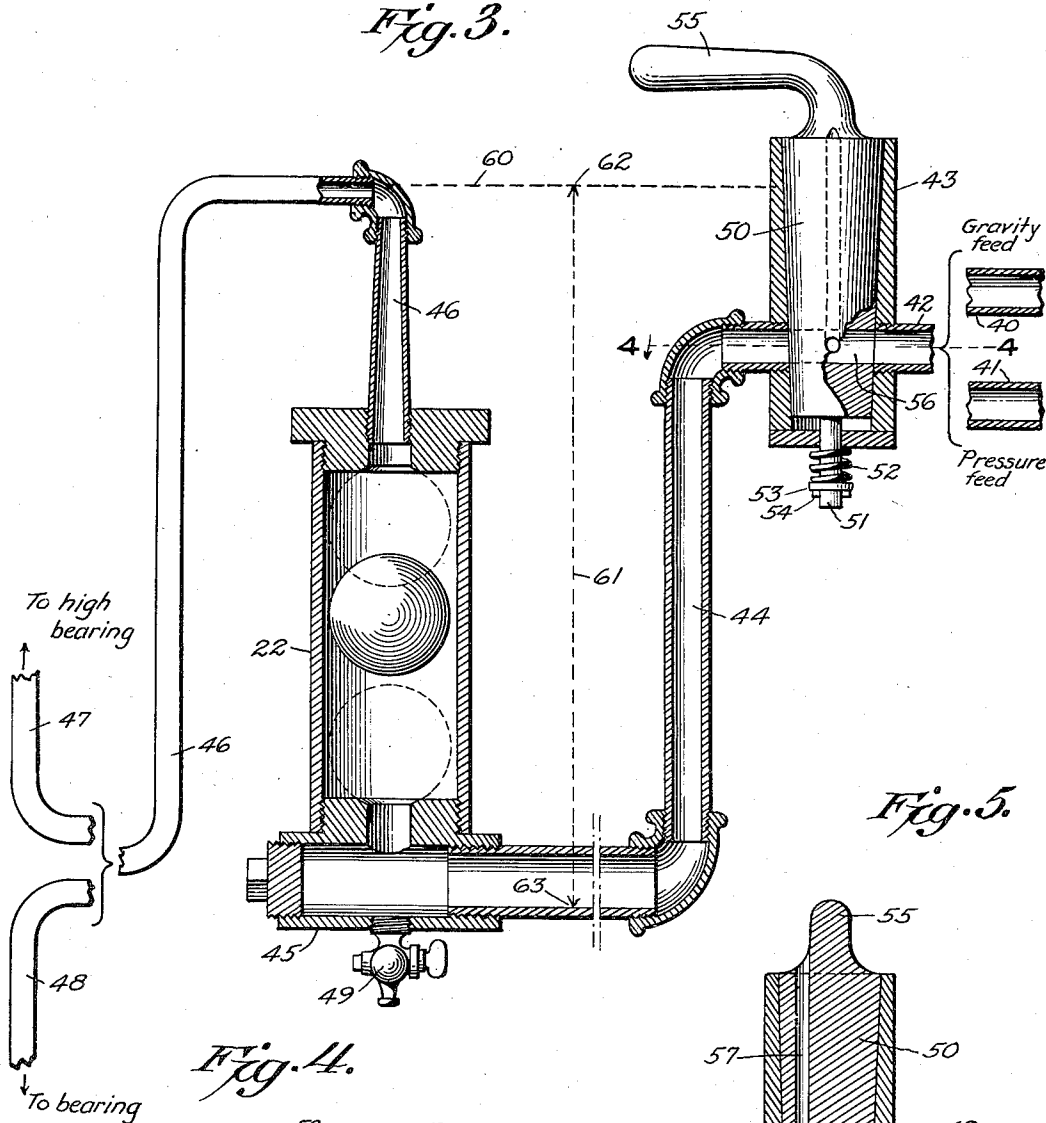


Fig. 4.

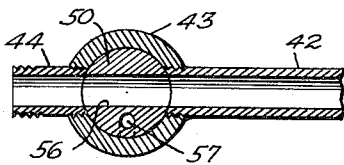
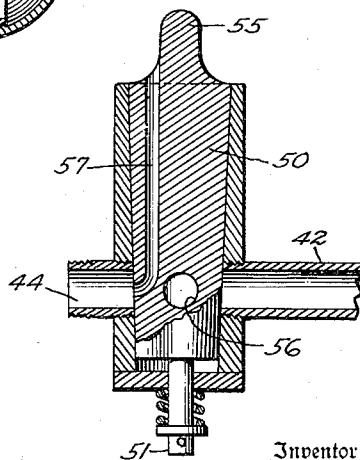


Fig. 5.



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UNITED STATES PATENT OFFICE

2,048,323

SYSTEM FOR METERING LIQUIDS

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Application March 2, 1932, Serial No. 596,377

9 Claims. (Cl. 184—7)

This invention relates to the metering of liquids and has for its object to provide a system for metering and dispensing which is more efficient in operation, and cheaper in manufacturing costs than those heretofore proposed.

With these and other objects in view the invention resides in the novel details of construction and arrangements of parts as will appear more fully hereinafter and be particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all the views,

Fig. 1 is a diagrammatic showing, partly in section, illustrating a method of carrying out this invention;

Fig. 2 is a sectional view of the air control valve illustrated in a different position from that shown in Fig. 1;

Fig. 3 is a diagrammatic showing, mostly in section, illustrating a modified form of this invention;

Fig. 4 is a horizontal section through the feed control valve shown in Fig. 3, taken as on the line 4—4 thereof and looking in the direction of the arrow; and

Fig. 5 is a partial sectional view of the feed control valve illustrated in a different position from that shown in Fig. 3.

This invention is particularly directed to a system wherein a liquid from a single source is dispensed in a measured quantity into a container especially intended to hold said quantity and such, for example, as those for containing well known bottled commodities.

The system further contemplates the repeated dispensing of a predetermined or measured quantity of a liquid into any container whether intended solely to hold said liquid or to receive the said measured quantity in addition to other liquid, semi-liquid, or solid ingredients. Also, this invention includes either manual or automatic manipulation of the valve for controlling the feed of the liquid being dispensed, the former being particularly shown in the drawings for the sake of clearness, the automatic control including any well known electric or mechanical device of clock, coin or other operating design as best suits the needs of the system.

In addition to filling bottles and other similar containers, either wholly or in part, this system is admirably adapted to the regulated and repeated feeding of a lubricant to a bearing or to a plurality of bearings in an assemblage of moving mechanisms. In such cases the lubricant

would be fed preferably from a single source to the bearings in the system, the feeding of the lubricant being initiated at stated time or other periods, each initiation sending lubricant to all the bearings, and each bearing receiving a predetermined quantity of lubricant sufficient for that period of lubrication. Also, this system is applicable to machinery in general, that is to a single machine having plural bearings or to a machine shop or factory containing many individual machines or units thereof.

From the foregoing it will be apparent that this system contemplates the filling of bottles, etc. or the lubrication of bearings which may be at different elevations with respect to the liquid supply reservoir and therefore this system contemplates a construction and operation which will adequately supply the higher bottles and/or bearings with their required liquid and/or lubricant while the lower bottles and/or bearings are receiving theirs. Not only this, but provision is made herein to prevent syphoning and/or gravity return of the liquid and/or lubricant in a direction toward said reservoir, thereby preventing entry of air into the delivery ends of the service conduits, and in turn preventing the possibility of a bottle and/or bearing never receiving an intended subsequent delivery of liquid and/or lubricant, as well as preventing a partial delivery thereof. In the following, for clearness, this system, its construction of parts, and its operation will be described with relation to its employment for dispensing a lubricant to bearings.

This invention is directed to a system well adapted to employ the measuring valve forming the subject matter of my copending application Serial No. 251,396 filed February 2, 1928, issued Sept. 13, 1932 as Patent No. 1,877,124.

Referring to the drawings, 1 indicates a tank or any suitable container for air under pressure which air is admitted thereto as through the inlet valve 2. The tank 1 is connected by a pipe 3 to a three-way master control valve generally indicated by the numeral 4, which valve, when in the position shown in Fig. 1, will reduce to atmospheric the pressure in the system, and when in the position shown in Fig. 2 will admit to the system air under pressure from said tank. In the pipe 3 there is provided a branch 5 leading to a suitable pressure gauge 6 whereby the amount of pressure in the air tank 1 may be determined at any time.

In the case of portable machines, such as an automobile, the air tank can be "filled" at any service station, or it may be "filled" by employing

the usual pump, in which case the valve 2 is preferably of the automobile tire valve type. In large factories the master control valve 4 may be connected at any suitable point in an existent air line or, lacking this air line, the tank 1 may be directly connected to a compressor through the inlet valve 2.

A pipe 7 connects the master control valve with the top of a tank or reservoir 8 for the lubricant supply, said tank having a removable cover in which is located a suitable filler opening closed by any suitable tight fitting cap 9, said cover preferably sealed as by a gasket to the main body portion of the tank to prevent escape of air pressure therefrom. The bottom wall of the tank is provided with a clean-out plug 10, and a suitable screen 11 is disposed across the tank near its bottom for collecting any foreign matter or sediment that may be in the lubricant and which might otherwise be forced into the main line and service conduits of the system preventing proper operation.

Just below the screen 11, the tank is provided with an outlet communicating with a pipe 12 leading to a main line check valve containing the weighted valve member generally indicated by the numeral 13. The top of this valve casing is adapted to prevent any "sticking" thereto of the valve member 13 and in the drawings is shown to comprise a threaded plug 14 castellated on its under, valve engaging side. The delivery side of this check valve is connected to the main delivery conduit or line 15 which is of any desired length and supplied at suitable and necessary points with T's furnishing means for connecting the main line with the branch or service conduits leading to the various bearings. Only two such branches have been illustrated for the sake of brevity, one leading upwardly and the other leading downwardly to bearings appreciably out of the horizontal plane of the reservoir 8, it being understood that no complications would arise in the feeding of lubricant to bearings in said plane.

Thus it will be seen that the branch conduit 20 leads upwardly from the main line conduit to a bearing which is disposed at an elevation above that of the lubricant supply tank 8, and the branch conduit 21 leads downwardly from said main line conduit for conducting the lubricant to a bearing which is disposed at an elevation below that of said lubricant supply tank, but in both instances there is provided a metering valve between the main line and each bearing, said metering valve being generally indicated by the numeral 22 and forming the subject matter of said copending application.

From what has been heretofore described, it will be apparent that when the main control valve 4 is in "open" position, as illustrated in Fig. 2, air under pressure will be admitted to the upper region of the lubricant supply tank 8, forcing lubricant therefrom through the valve 13 into the main line conduit 15 and into each branch conduit such as 20 or 21 to ultimately reach and flush the bearing connected with each branch conduit. These bearings have not been shown in the drawings since they will be readily understood. When all of the bearings have been lubricated the valve 4 is turned to "closed" position, as shown in Fig. 1, whereupon flow of air under pressure from the tank 1 will be shut off and the pressure in the lubricating system will be relieved due to the connection of the pipe 7 with the atmosphere through the port 31 of said valve.

A metering chamber 22 is provided for each

bearing and is designed to permit passage of the necessary amount of lubricant to its bearing in each lubricating period, after which the lubricant supply to that bearing is cut off or stopped and no more lubricant will reach said bearing until the next lubricating period. Each metering valve comprises a cylindrical chamber of a length to hold the necessary amount of lubricant for its particular bearing. A ball or similar member is located within the cylinder and is adapted to close alternately the inlet and outlet orifices of the cylindrical chamber, said ball being free to move within the cylinder with the lubricant flow therethrough; that is to say there is no spring or other structure to retard or hinder the movement of said ball from one end to the other of the cylinder.

When pressure is applied to the system the lubricant will flow into the metering chamber and cause the ball therein to move upwardly from its lowermost position shown in full lines in Fig. 1 with the lubricant flow, said ball being of a diameter less than the diameter of the metering chamber, the clearance thus established being dependent in amount in accordance with the average viscosity of the lubricant to be metered, the clearance being less as the viscosity is lowered. This clearance permits the instant establishment of the hydrostatic pressure of the incoming lubricant to the lubricant in the chamber above the ball. The velocity impact, of the incoming lubricant flow, is delivered against the large under surface area of the ball with a unit value greater than the unit value of the excess specific gravity of the ball over that of the lubricant, whereupon the ball will rise. Under the above conditions, and when the diameter of the ball is properly proportioned and calibrated to the diameter of the chamber, under quite wide temperature, velocity, and viscosity variations, substantially no liquid, or only an infinitesimal amount, will flow around the ball to the chamber above the ball, wherefore the ball truly becomes a separating member between the main lubricant supply and the lubricant in the chamber above the ball which latter, when the ball is at the lowermost chamber position, is the "predetermined" amount of lubricant necessary for and to be fed to the bearing. When the ball comes to rest in the dotted line position shown in Fig. 1 and closes the outlet opening of said metering chamber, there will be no further flow of lubricant into the chamber and the "predetermined" amount of lubricant will have been forced toward the bearing.

When the pressure comes off the system the ball will be free to move, under the urge of gravity, downwardly through the lubricant in the metering chamber and to assume its original position as shown in full lines in the drawings, the time for the descent of the ball being regulated by its excess specific gravity over that of the lubricant, and the viscosity of the latter. Since each bearing does not require substantially constant lubrication but, on the other hand, there may be several hours or longer time between the applications of the lubricant to the bearing, the ball will have more than enough time to assume its position at the inlet end of the metering chamber. When all of the balls are in their uppermost positions, flow of lubricant in the system ceases and, regardless of the pressure in tank 8, main line check valve 13 will close. In this respect it should be stated that the member 13 must be of sufficient weight to retain its seat

against the effective weight of a column of oil extending from it to the lowermost bearing in the system thereby avoiding any syphoning effect from the tank 8. The metering valves, of course, will be dimensioned in accordance with the necessary amount of lubricant for the bearings which they control, and this has been represented in the drawings by showing the two metering valves of slightly different diameter, but of equal height.

It is to be understood that some of the bearings to be lubricated may be tighter than others, thus creating a difference in resistance which must be overcome by the lubricant. This is accomplished in what might be termed an automatic manner since the looser bearings will receive their supply of lubricant first regardless of their position in the system but, so long as the pressure remains on the lubricant in the tank 8, lubricant will be ultimately forced to and through the tighter bearings, there being present in this respect merely the factor of time. When the last bearing has received its shot of lubricant, then all of the balls of the metering valves will be in a position closing the outlet ports, and said balls will remain in said position so long as the pressure stays on the line, being released from said position when the pressure is relieved from the system.

As above stated, the main line check valve 13 will seat when the ball in the last metering chamber to function reaches its uppermost position, thereby stopping all lubricant flow in the system, but the seating of valve 13 normally would trap the applied pressure in the main line conduit 15 and hold it even after releasing the pressure from tank 8 through main control valve 4. This trapped pressure, however, would prevent the balls in the metering chambers from dropping and thereby cause a failure of said chambers since they would not become recharged for the next application of lubricating pressure. Since the total release of pressure from the main line conduit 15 is absolutely essential to the recharging function of the metering chambers, there is provided a pressure release valve generally indicated by the numeral 23 communicating on one side with the main line conduit and connected on the other side to the pipe 12 through the provision of the by-pass 24.

For convenience this pressure release valve 23 is shown as comprising a chamber whose lower end is threaded into the plug or cap 14 of the main line check valve and whose upper end is connected to the by-pass 24, the parts 23 and 24 so arranged that they constitute a passage whose extremities are on opposite sides of the main line check valve member 13. Within the chamber of the pressure release valve is a ball for closing the lower end of the chamber thereby preventing a flow of lubricant through this valve in a direction from the tank 8 to the main line conduit 15, said ball being prevented from closing the upper end of said chamber by any suitable means such as the transverse pin illustrated. This ball must be less in weight than any ball in the metering chambers 22 for otherwise the latter would not leave its uppermost position and the former would not be forced from its seat when the pressure was released from tank 8.

In other words, the pressure release valve ball is lifted by the force of the trapped pressure in the main line conduit 15 above mentioned, and this permits enough lubricant (a drop or two)

to escape back into the tank 8 to relieve the trapped pressure. The pressure in the main line 15 being relieved, the pressure release valve ball will again seat, and the balls in the metering chambers will fall to their lower seats due to their weight. The valve 23 and by-pass 24 are both made very small thereby increasing the amount of surface tension or resistance with respect to the contained lubricant, as a result of which there is substantially no flow through these parts at any time. Also the main line conduit 15 is of comparatively small diameter, even when heavy oils are used, to impose a heavy resistance to the lubricant flow which causes a well defined progressive high pressure to exist in this line, bringing in turn each metering chamber successively under high pressures. With all bearings in proper condition it will be understood that normally each metering chamber completes its feed to a bearing before the extreme peak of this high pressure reaches the next metering chamber in the line. However, this last mentioned theoretical functioning will change under various conditions as will be readily apparent, but it remains a fact that so long as there is pressure in the main line 15 the balls of the metering chambers will be forced to and kept at their upper seats regardless of sequence of metering functioning.

Because some of the bearings may be disposed at an elevation above the main supply tank 8 it is necessary to make provision against gravity return or retrograde flow of lubricant in the branch conduits 20 when the pressure comes off the line. This may occur owing to accidental leakage in conduit 20, a general retrograde movement of the lubricant being prevented by the seating of valve 13, and later seating of ball in valve 22 on its lower seat. This is accomplished by the insertion, in the branch line conduit 20, of a leakage preventer and pressure trap valve generally indicated by the numeral 25 and comprising a chamber containing a ball which in its lowermost position seats upon and closes the lower orifice of its chamber and which is prevented from closing the upper orifice thereof as by a stop pin as illustrated. The lubricant flow through the metering chamber will cause simultaneous flow through the branch line conduit 20 and pressure trap valve 25 to and into the bearing to be lubricated, but when this flow ceases by the metering chamber ball assuming its upper seat then the ball in the pressure trap valve 25 falls into and holds its seat.

When the pressure is relieved from the main line 15, the metering chamber ball will fall to its lower seat, but the ball of valve 25 will prevent any flow back or retrograde movement of the lubricant in the branch line conduit, and loss of lubricant from this conduit in case of leaky joints between valve 22 and valve 25, as before stated, with consequent disturbance of exact metering. The surface tension of lubricant will permit no considerable amount of lubricant to flow in retrograde, until the ball in valve 22 has reached its lower seat definitely stopping that movement. The action of these valves above, together with the closing of valve 13, will prevent loss of lubricant due to leaks or bad joints in conduit 15, all conduits being definitely closed at each end. The valve 25 traps a certain amount of pressure in the branch line depending upon the weight of its ball, because said ball seats practically simultaneously with the upper seating of the metering chamber ball.

Therefore, when the pressure is relieved from the main line 15 this trapped pressure in the branch line permits the ball in the metering chamber to descend immediately. It might be stated that the branch line conduits 20 are of very small diameter thus establishing a relatively large amount of resistance to the flow of lubricant therethrough. Hence the low atmospheric pressure would hardly be sufficient to cause any retrograde flow in the system until all preventive valves heretofore mentioned have seated.

In the case of bearings disposed at elevations below that of the lubricant supply tank 8, it is not absolutely necessary to employ, in the branch line conduit such as 21, a valve of the nature of valve 25 above described. However, in the drawings there is disclosed a valve generally indicated by the numeral 26 which is a pressure trap valve and in no sense of the word to be confused with a check valve. The valve 26 has no necessary action in preventing the flow of oil in either direction, this being taken care of by the closure of valves 13 and 23 and the balls in the metering chambers 22. Valve 26 need only be installed when the weight of the effective oil column in the branch conduit 21 is greater than the weight of the ball in the metering chamber associated with said branch conduit. In fact use of the valve 26 may be obviated within a wide range, by increasing the weight of the ball in the associated metering chamber.

However, various weights of balls for differently located metering chambers would tend to cause errors in installations, and the use of the pressure trap 26 permits all balls in all the metering chambers to be the same in weight and uniform in dimension. In other words, as hereinbefore suggested, certain bearings may require more lubrication than others and therefore it is desirable to provide metering chambers of differing volume, which may be accomplished in various ways; for example all chambers could have the same diameter but have differing lengths, or all the chambers could have the same length with differing diameters, or the chambers could be provided with elongated balls or separating members such that their lesser dimensions would be equal but their lengths would be different thereby creating a difference in volumetric capacity of the associated chambers.

The pressure trap or valve 26 contains a ball 27 seating upward against the normal oil pressure by virtue of a coil spring 28, the lower end of the latter being disposed about an internal boss 29 provided in its sides with suitable openings 30, the construction being such that the ball 27 may close the upper opening of the valve chamber but not the lower openings. The spring 28 must have an initial compression in power slightly in excess of the effective weight of the oil column from the ball seat in the metering chamber to the bearing to be lubricated. After the closure of the metering chamber, by its ball reaching its upper seat, lubricant flow ceases through the branch conduit 21.

When the pressure in the branch line has dropped to a value equal to the excess power of the compression of the spring 28 over the effective weight of the oil column in the entire branch line, the ball 27 will close and trap a pressure in the branch line between the valve 26 and its associated metering chamber, which pressure will be equal to this spring power. When the pressure in the main line 15 is reduced below the pressure

in the branch line 21 the metering chamber ball will leave its upper seat and pass to its lower seat to reestablish in the metering chamber a predetermined amount of lubricant to be subsequently fed to its associated bearing but, when this occurs, there will be no retrograde flow of oil because valve 13 has already seated, followed by the seating of the ball on its lower seat in valve 22, and valve 23 has too great a surface tension to permit any appreciable oil flow until the ball in valve 22 has definitely closed the conduit. Syphoning effect is prevented by closure of valves 13 and 23, the weight of the moving element in valve 13 always being greater than the weight of the column of oil from that valve to the lowest bearing to be lubricated. Loss of oil in conduit 21 due to possible line leakage, is prevented by seating of ball 27, thus definitely closing the conduit at both ends.

Referring particularly to the modification 20 shown in Figs. 3, 4 and 5, substantially the same principles are involved as disclosed above. That is to say, lubricant from the main supply tank may be fed by gravity, as through the pipe 40, or may be fed under air pressure from said tank, as through the pipe 41, to ultimately flow through the pipe 42 to a main feed control valve generally indicated by the numeral 43, and through said valve into the main line conduit 44 to ultimately reach a T 45 associated with which is one of the metering valves 22. Leading from the metering valve is a branch conduit 46 which may lead to a bearing in substantially the same horizontal plane with the metering valve or which may connect with the conduits 47 and/or 48 leading respectively to bearings above and/or below said plane. The T 45 is provided with a drain cock 49.

The main feed control valve 43 may comprise a cylindrical chamber having a tapered valve stem or plug 50 therein, the lower end of which is provided with an integral stem 51 extending through an opening provided therefor in the bottom of the valve casing, with a spring 52 coiled about the external end of said stem and which is interposed between the outer surface of the valve casing and a disk 53 held by the pin 54 on said stem. Thus it will be seen that by virtue of the spring 52 the plug 50 is maintained in tight contact with the inner surface of the valve casing whenever the plug is turned as by the aid of the handle 55. The valve plug 50 is provided with a diametric bore 56 of approximately the same size as the internal diameter of the pipes 42 and 44, said bore being positioned for registry with said pipes when the valve is in "open" position as illustrated in Fig. 3.

The valve plug is also provided with a pressure release passage 57 comprising a long bore extending from the top of the plug longitudinally thereof with its lower end communicating with a short radial bore extending inwardly from the surface of said plug, the shorter bore disposed to register with the pipe 44 when the valve is in "closed" position, as clearly shown in Fig. 5. Further, the bores are so disposed that not only is there no communication between the passage 57 and the main feed bore 56, but also is there no communication between said passage 57 and the main feed pipe 44 until the feed bore 56 has positively moved out of registration with the feed line. The passage 57 is of extremely small diameter as compared with the other liquid conducting passages.

From the foregoing it will thus be clear that,

according to this modification, lubricant flowing either under the urge of gravity or under applied air pressure (the latter as disclosed in Fig. 1) will reach the main control valve 43 and, if the same be in "open" position as shown in Fig. 3, flow therethrough to the metering chamber 22 where the lubricant flow will cause the ball of the chamber to rise from its lowermost seat in a direction toward, and to ultimately close, the outlet port of said chamber. When the ball reaches its extreme uppermost position in the chamber, lubricant flow will cease but, in its movement from the bottom to the top of said chamber, the ball will rise, acting as a separator between the incoming lubricant and the lubricant already in the chamber above the ball, and without permitting the incoming lubricant to pass the ball while the feeding pressure is on, said ball will permit the predetermined amount of lubricant in that part of the chamber above the ball to pass through the branch service pipe 46, with full line pressure, to the bearing to be lubricated, all as hereinbefore described. After the last bearing has received its shot of lubricant there will be no more flow of lubricant in the system, but there will still be pressure therein as will be readily understood, and which pressure must be relieved before the balls of the metering chambers will fall to their lowermost positions to reestablish the predetermined amount of lubricant therein for their respective bearings.

When the last bearing has received its lubrication, the main control valve 43 is turned to its "closed" position, or that shown in Fig. 5, whereupon it will be impossible for any lubricant to pass through the valve and the pressure vent 57 will have been brought into registration with the main line conduit 44 as a result of which the pressure is immediately reduced in the main line to that of the atmosphere with which the vent passage is in open communication. As soon as the pressure has been released from the main line, the balls of the metering chambers will be free to fall to their lowermost positions within the chambers and, during their downward travel, no lubricant will be forced through the vent passage not only because of the small dimension thereof but because the uppermost extremity of said passage is normally disposed above the horizontal plane of the uppermost reach of the service or branch conduit 46 which plane is represented in the drawings by the dash line 60. The effective vertical column of oil being delivered is represented by the dashed line 61 terminating at the point 62 in the plane 60 and the point 63 in the horizontal plane of the lowermost reach of the main feed conduit 44.

When the bearing to be lubricated is disposed in a plane above the hand control valve 43, and to which the lubricant would be forced as through the pipe 47, then a pressure trap valve such as that disclosed at 25 in Fig. 1 is preferably employed, and which will serve to prevent any retrograde flow of lubricant back through the branch and main line conduits when the control valve 43 is closed and the pressure vent 57 is in communication with the main line conduit. It should be obvious that a bearing could be disposed at such a high elevation that the weight of the effective column of oil, between it and the uppermost extremity of the pressure vent 57, would be such as to cause a high pressure sufficient to force the ball in the metering chamber quickly to its lowermost seat which, in turn, would cause a squirting of oil

from the main line conduit through the pressure vent as well as interfere with accurate metering. This would not be so where the bearing to be lubricated was disposed between the horizontal planes containing the points 62 and 63, since, in that event, the metering chamber ball would move slowly through the lubricant in the chamber by virtue solely of its weight in the lubricant.

It should also be obvious that when there is a bearing to be lubricated which is at an elevation appreciably below the horizontal plane including the point 63 and to which lubricant would flow as through the service conduit 48, then there should be incorporated in said conduit a pressure trap of the nature of that shown at 26 in Fig. 1, and having a spring of a strength greater than the weight of the effective column of oil between the ball of said trap and the top of the pressure vent 57, thereby trapping a pressure in line 46 greater than the weight of the oil in that line, to insure the unseating of the ball from its upper seat in valve 22 as well as preventing any syphoning of oil to and through the bearing when the pressure vent 57 is in open communication with the main line conduit. When the pressure trap valves such as 25 and/or 26 are used, it is then not necessary that the dimension of the pressure vent 57 be of relatively small diameter since the closing of said valves would be effectual in preventing any passage of lubricant through the pressure vent and/or prevent any syphoning of the lubricant from the main line conduit to a lower bearing. On the side of safety, however, the preferred installation would include the two pressure trap valves 25 and 26, except in the general metering of liquids such as filling bottles, metering flavoring extracts, etc., where the plane of operations may easily be comprehended between points 62 and 63 on line 61. By lengthening conduits 44 and 46 in proportion, this plane may be increased to include nearly all working limits, for these operations.

The cock 49 is provided for draining the system as when there is desired a change of liquids, or for cleaning the system, or for removing any sediment or foreign particles that may be in the delivery line, etc. The draining of course, is accomplished by opening the cock and inserting a wire which will pass upwardly through the T and raise the ball of the metering chamber off its lowermost seat. Another important feature of this invention, whether the system according to Fig. 1 or that according to Fig. 3 is used, lies in the fact that the air pressure used may be in any amount above atmospheric. This is so because there is no waste either of air or oil since the balls of the metering chambers 22 positively shut off lubricant flow after the predetermined amount of lubricant has been delivered from the metering chambers into the service conduits and therefore to the bearings. Another reason is the fact that the air under pressure travels no farther than the space in the top of the lubricant tank 8 unless, of course, inadvertently the lubricant level in the tank fell below the horizontal plane of the tank outlet, but since this is a condition never intended to occur the tank would be provided with a sight gauge or other liquid level indicating device of any well known type.

Also it is to be particularly observed that by this invention there is provided a system which is applicable not only to the dispensing of liquids including lubricants, but which can be ap-

plied to the handling of many fluids including gases, and in which the air pressure supply may be replaced by a pump of any suitable character. In such a system there would be provided a metering chamber or valve preferably employing a ball as shown which, as is well known, is freely movable in all directions about its center of gravity while traveling between the ends of the metering chamber, to the end that the ball is an independently and automatically movable member in its intended functions, devoid of springs or other contacting and attaching elements which would tend to create additional resistance to the movement of the ball. Further, the ball, in order to operate as intended, and therefore to be truly operative, is positively responsive to the fluid flow only when moving in its upward direction as shown in the drawings, and is quantitatively, independently, and repeatedly operative in response solely to its weight in the fluid and its displacement in the metering chamber in its opposite movement. That is to say, the ball is given a diameter with relation to the diameter of the chamber so that the ball is truly calibrated with respect to the chamber thereby permitting a definite volume of fluid to pass said ball. Therefore the measuring chambers may have different diameters with balls to correspondingly operate therein with such fixed ratio of diameters to bring about the true calibration and cause the correct functioning of the chambers.

In the absence of proper terms or language it is said that by the term "fluid pressure" used in the following claims, as applied to the actuation of the separating element in the metering valve chamber by the fluid being metered, is meant the velocity impact value of the rate of feeding the liquid flow as established by the hydrostatic pressure, and as effectively delivered in the form of pressure against the aforesaid separating element or ball.

In general, this pressure or impact value against the separator or ball will vary in value, in proportion to the square of the velocity of the feeding liquid, while the resistance of the separator element or ball is its weight in the liquid, which latter always remains a constant.

It is obvious that those skilled in the art may vary the details of construction as well as arrangements of parts without departing from the spirit of the invention, and therefore it is not desired to be limited to the foregoing except as may be required by the claims.

What is claimed is:—

1. A system for dispensing liquids including a liquid supply and a conduit for conveying the liquid from said supply; pressure means for establishing liquid flow in said conduit; a metering chamber in said conduit; a separating member in said chamber for establishing a predetermined quantity of liquid to be forced from said chamber upon the following application of pressure causing liquid flow; a check valve in said conduit between said supply and said chamber; and pressure relieving means for permitting said member to reestablish said predetermined quantity, said means including a restricted by-pass around said check valve, said by-pass adapted to offer a resistance to liquid flow-back thereby insuring said predetermined quantity being reestablished.

2. A system for dispensing liquids including a liquid supply and a conduit for conveying the liquid from said supply; pressure means for establishing liquid flow in said conduit; means to

maintain the applied pressure in a portion of said conduit, said means including a metering chamber and a check valve disposed between said chamber and said supply; a separating member in said chamber for establishing a predetermined quantity of liquid to be forced from said chamber upon the following application of pressure causing liquid flow; and means for relieving the pressure in said portion of said conduit thereby permitting said member to reestablish said predetermined quantity, said means including a restricted passage and a valve associated therewith, said passage by-passing said check valve and adapted to offer a resistance to liquid flow-back thereby insuring said predetermined quantity being reestablished.

3. A system for dispensing liquids including a liquid supply and a conduit for conveying the liquid from said supply; pressure means for establishing liquid flow in said conduit; a metering chamber in said conduit; a separating member in said chamber for establishing a predetermined quantity of liquid to be forced from said chamber upon the following application of pressure causing liquid flow; and pressure relieving means for permitting said member to reestablish said predetermined quantity, said means including a restricted passage parallelly connected with said conduit, said passage by-passing a check valve disposed between said chamber and said supply, said passage adapted to offer a resistance to liquid flow-back thereby insuring said predetermined quantity being reestablished.

4. A system for dispensing liquids including a liquid supply and a conduit for conveying the liquid from said supply; pressure means for establishing liquid flow in said conduit; means to trap the applied pressure in a portion of said conduit, said means including a metering chamber and a check valve disposed between said chamber and said supply; a separating member in said chamber for establishing a predetermined quantity of liquid to be forced from said chamber upon the following application of pressure causing liquid flow; and means for relieving the pressure in said portion of said conduit thereby permitting said member to reestablish said predetermined quantity, said means including a restricted passage parallelly connected with said conduit and a valve associated therewith, said passage by-passing said check valve and adapted to offer a resistance to liquid flow-back thereby insuring said predetermined quantity being reestablished.

5. A fluid dispensing system in which the fluid under pressure is caused to flow from a supply to and through a metering chamber as well as a check valve disposed between said chamber and said supply, said chamber provided with a separating member for establishing a metered quantity of fluid to be forced from said chamber upon the following application of pressure, said member stopping fluid flow through said chamber when said predetermined quantity has passed therefrom; and in which the pressure is positively relieved from between said chamber and said valve to permit movement of said member for establishing the next metered quantity of fluid to be dispensed, said relief brought about by a restricted passage and a valve therein, said passage by-passing said check valve.

6. A system for metering liquids including means for separating predetermined quantities of the liquid from the liquid supply; pressure means for establishing liquid flow of the predetermined quantities from the system; means for

reestablishing the predetermined quantities ready for dispensing upon a subsequent application of pressure in the system; and means for relieving the pressure between said dispensations, said means including a liquid passage around a check valve, said passage parallelly connected to the main line of liquid supply and offering a resistance to liquid flow back.

7. A system for dispensing liquids including a liquid supply and a conduit for conveying the liquid from said supply; pressure means for establishing liquid flow in said conduit; a metering chamber in said conduit; a separating member in said chamber and devoid of spring tension for establishing a predetermined quantity of liquid to be forced from said chamber upon the following application of pressure causing liquid flow; and pressure relieving means for permitting said member to reestablish said predetermined quantity, said means including an element in said conduit to prevent liquid flow-back toward said supply and a restricted passage parallelly connected with said conduit around said element, said passage adapted to offer a resistance to liquid flow-back thereby insuring said predetermined quantity being reestablished.

8. A fluid dispensing system in which the fluid under pressure is caused to flow from a supply to and through a metering chamber as well as a check valve disposed between said chamber and

said supply, said chamber provided with a separating member for establishing a metered quantity of fluid to be forced from said chamber upon the following application of pressure, said member stopping fluid flow through said chamber when said predetermined quantity has passed therefrom; and in which the pressure is positively relieved from between said chamber and said valve to permit movement of said member for establishing the next metered quantity of fluid to be dispensed, said relief being brought about by a restricted passage and an element associated therewith to prevent liquid flow from said supply, said passage by-passing said check valve.

9. A system for metering liquids including means for separating predetermined quantities of the liquid from the liquid supply; pressure means for establishing liquid flow of the predetermined quantities from the system; means devoid of spring tension for reestablishing the predetermined quantities ready for dispensing upon a subsequent application of pressure in the system; and means for relieving the pressure between said dispensations, said means including a liquid passage around a check valve disposed between the liquid supply and the separating means, said passage offering a resistance to liquid flow toward the supply.

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