

April 27, 1948.

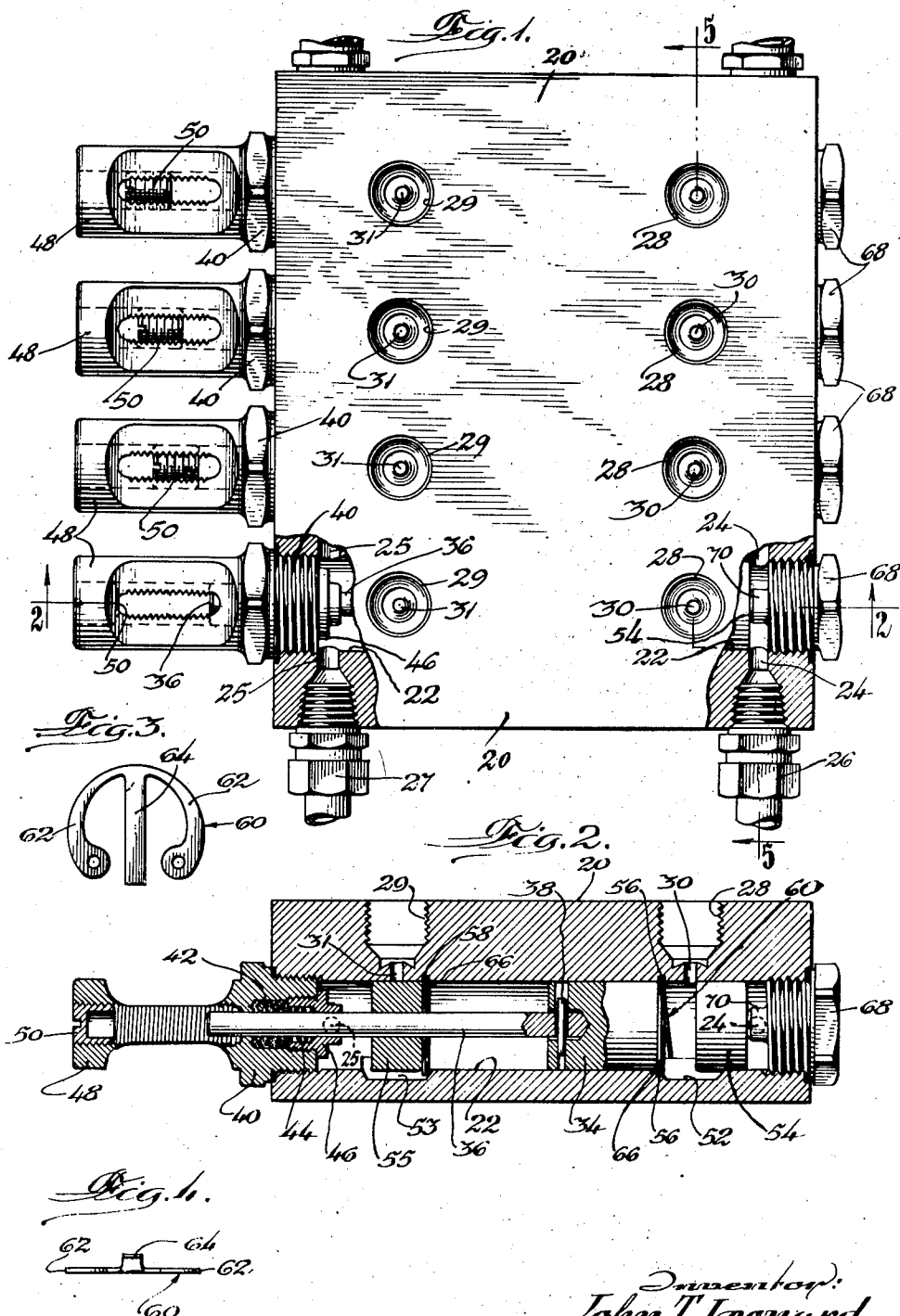
J. T. LEONARD

2,440,410

LUBRICATING APPARATUS

Filed Aug. 12, 1944

3 Sheets-Sheet 1



Inventor:
John T. Leonard
By William Bradbury & Hinkle
Attorneys

April 27, 1948.

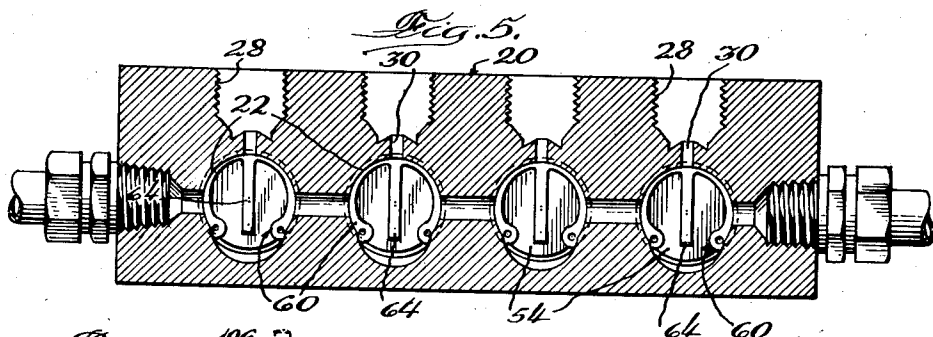
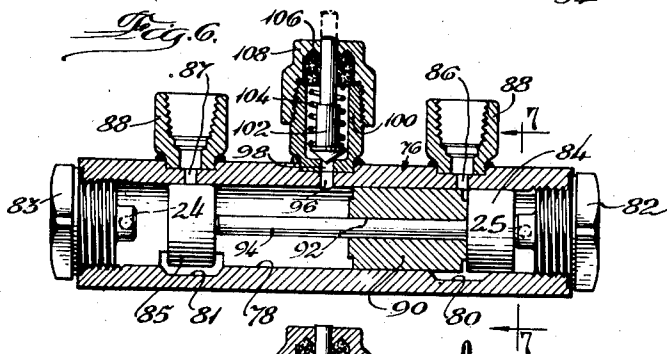
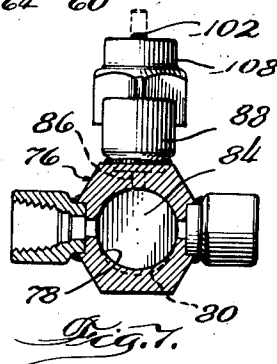
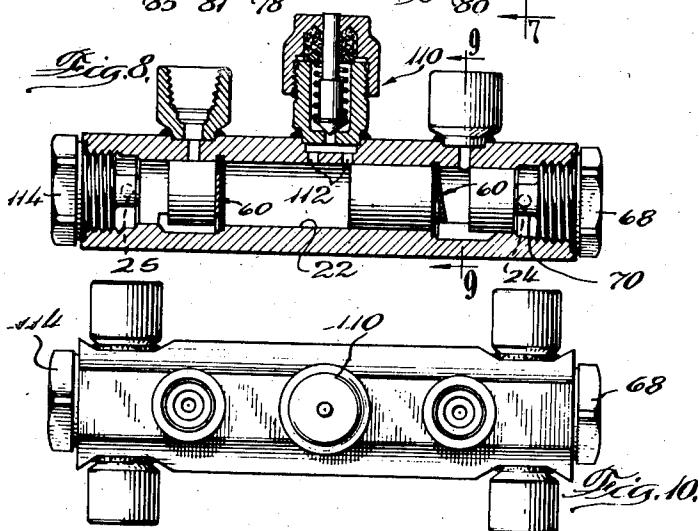
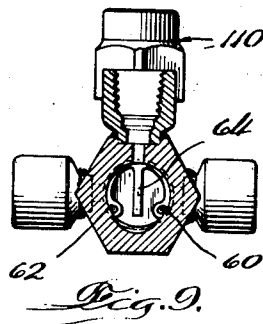
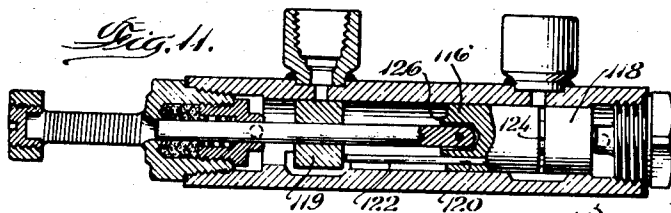
J. T. LEONARD

2,440,410

LUBRICATING APPARATUS

Filed Aug. 12, 1944

3 Sheets-Sheet 2



Inventor:
John T. Leonard
By Williams, Brashers & Smith
Attorneys

April 27, 1948.

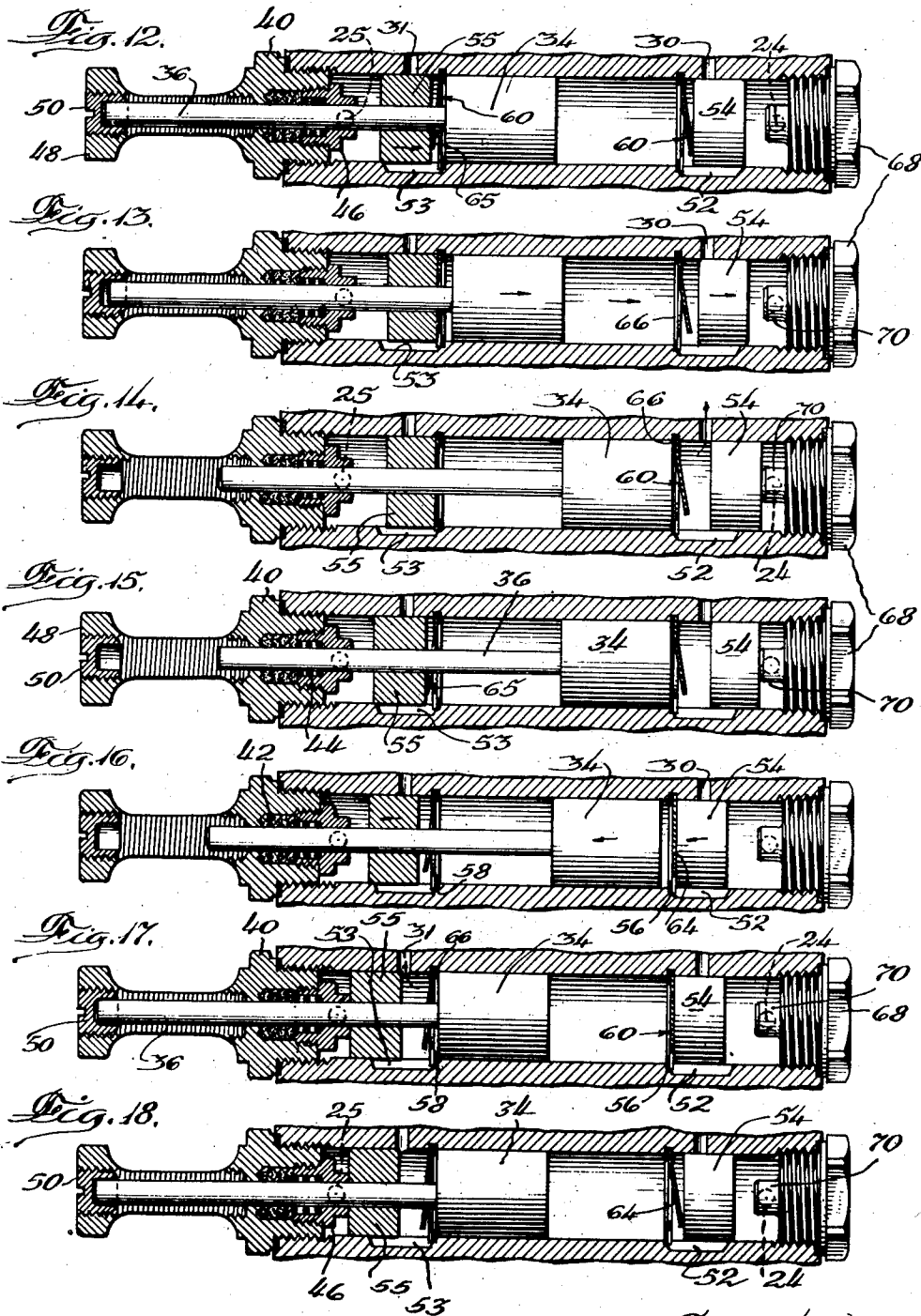
J. T. LEONARD

2,440,410

LUBRICATING APPARATUS

Filed Aug. 12, 1944

3 Sheets-Sheet 3



Inventor:
John T. Leonard
By Williams, Bradbury & Kunkle
Attorneys

UNITED STATES PATENT OFFICE

2,440,410

LUBRICATING APPARATUS

John T. Leonard, Evanston, Ill.

Application August 12, 1944, Serial No. 549,223

9 Claims. (Cl. 184-7)

1

My invention relates generally to lubricating apparatus, and more particularly to centralized lubricating systems and measuring valves used as parts of said systems.

It is an object of my invention to provide an improved high pressure lubricating system employing an improved form of measuring valve.

A further object is to provide an improved measuring valve which is reliable in operation, durable, may be economically manufactured, and which may be used with grease or oil as the lubricant.

Other objects will appear from the following description, reference being had to the accompanying drawings, in which

Fig. 1 is a plan view of a header block incorporating four measuring valves;

Fig. 2 is a transverse sectional view taken on the line 2-2 of Fig. 1;

Figs. 3 and 4 are plan and side elevational views of the valve operating spring;

Fig. 5 is a longitudinal sectional view taken on the line 5-5 of Fig. 1;

Fig. 6 is a central longitudinal sectional view of a modified form of the invention;

Fig. 7 is a transverse sectional view taken on the line 7-7 of Fig. 6;

Fig. 8 is a longitudinal sectional view of a further modified form of the invention;

Fig. 9 is a transverse sectional view thereof taken on the line 9-9 of Fig. 8;

Fig. 10 is a plan view of the measuring valve shown in Fig. 8;

Fig. 11 is a central longitudinal sectional view of an additional modified form of the invention; and

Figs. 12 to 18, inclusive, are longitudinal sectional views of the measuring valve shown in Figs. 1 to 5, showing the parts in the different positions assumed during a complete cycle of operation.

Referring to Figs. 1 to 5, a multiple unit of four measuring valves is illustrated as comprising a header block 20 having four transverse bores 22 formed therein, these bores being connected by means of passageways 24 at one end of the bores and passageways 25 at the other ends of the bores. The passageways 24 and 25 constitute manifolds through which lubricant is supplied by connecting pipes 26 and 27.

The block 20 is provided with threaded outlets 28, 29 for the reception of conduits leading to the parts to be supplied with measured charges of lubricant, there being a threaded outlet 28 and a threaded outlet 29 for each measuring valve, the

2

outlets 28 each communicating with a port 30 and the outlets 29 each communicating with a port 31, the ports 30 and 31 communicating with the bore 22.

Within each of the bores 22 is a reciprocable piston 34 to which a piston rod 36 is attached by means of a taper pin 38, the taper pin fitting snugly in the piston 34 and loosely through the piston rod 36 so as to provide a floating connection between the piston and piston rod. The piston rod 36 is guided in a bushing 40 threaded in one end of the bore 22, this bushing being counterbored for the reception of a suitable packing 42 which is compressed by a spring 44 held in a packing gland 46. The bushing 40 has an extension 48 which is threaded to receive an adjustable stop set screw 50, the bushing being milled upon opposite sides to render the projecting end of the piston rod 36 visible, whereby the operator will have an indication of the position of the piston 34.

The bore 22 is provided with a pair of by-passes 52 and 53 which are of slightly greater length than piston valves 54 and 55 which, as will be pointed out hereinafter, are arranged to be moved to a position permitting by-pass of lubricant around them through the by-passes 52, 53, during certain portions of the operating cycle.

The bore 22 is also provided with two annular grooves 56, 58 for the reception of leaf springs 60. Each of these springs comprises a pair of arcuate arms 62 which fit in the grooves 56, 58 and a central tongue 64 which is formed with a slight bend so as to project toward its adjacent valve 54, 55. Each of the leaf springs 60 is preferably backed up by a split ring washer 66, the latter reinforcing the springs 60, facilitating holding the springs in their respective grooves and forming fixed stops to limit the extent of reciprocation of the piston 34. A plug 68 is threaded in the right-hand (Figs. 1 and 2) end of each of the bores 22. These plugs 68 have reduced diameter stop projections 70 for limiting the strokes of their associated valves 54.

In the lubricating system in which these measuring valves are adapted to be used, there is provided a pumping mechanism and a suitable control valve structure whereby lubricant is alternately forced under pressure through the pipes 26 and 27. Such pumping and valve apparatus may be of the type shown in my copending application Serial No. 531,750, filed August 31, 1944, which has matured into Patent No. 2,399,277, or may be of any other suitable construction.

Figs. 12 to 18 show the positions assumed by

3

the various parts of the measuring valve structure during successive phases of a complete operating cycle. In Fig. 12, lubricant under pressure has just been admitted through the manifold passageway 25 and has moved the piston valve 55 into contact with the undeformed tongue 65 of the leaf spring 60. (The tongue 65 is similar to the tongue 64, but is sufficiently wide and is apertured to provide clearance for the piston rod 36.) The valve 55 thus covers the port 31. As the pressure builds up in the passageway 25, the valve 55 will flex the spring tongue 65 to the position in which it is shown in Fig. 13, at the same time uncovering the by-pass 53 to permit flow of lubricant into the bore 22 behind the piston 34. The piston 34 thus commences moving to the right, forcing the grease ahead of it against the valve 54 so that as shown in Fig. 13 the valve 54 is about to uncover port 30. Slight further movement of the piston 34 from the position shown in Fig. 13 will result in commencement of discharge of the lubricant ahead of the piston through the port 30 into the bearing to be lubricated. Such discharge of lubricant into the bearing will be continued until the piston 34 is arrested by the split washer 66, as shown in Fig. 14, the valve 54 having meanwhile been forced against its stop projection 70. One-half of the operating cycle of the valve is thereby completed. The completion of this portion of the operation of the measuring valves is indicated to the operator by the fact that the piston rods 36 of all the valves are in their innermost position as shown in Figs. 14 and 15. The operator will thereupon reverse the lubricant supply control valve, or in any other suitable manner discontinue supplying lubricant under pressure to the conduit 27, and instead commence supplying lubricant under pressure to the conduit 26.

As soon as the pressure on the conduit 27 is relieved, the spring tongue 65 will return to its unstressed position, as shown in Fig. 15, moving the valve 55 to the left and thereby cutting off the by-pass 53. When lubricant under pressure is supplied through the conduit 26, the valve 54 is first moved to the position shown in Fig. 16 against the resiliency of the spring tongue 64, thus cutting off the port 30 and moving the piston 34 a short distance to the left and at the same time uncovering by-pass 52. Continued supply of lubricant through the conduit 26 will thus flow through the by-pass 52 and move the piston 34 to the left, at the same time also moving the valve 55 to the left so as to uncover port 31. Therefore, as the piston 34 moves to the left, the lubricant will be discharged through the port 31 to the part to be lubricated. The leftward movement of the piston 34 is limited either by engagement of the piston with the split washer 66 or by the engagement of the end of its rod 36 with the adjustable stop set screw 50.

After the lubricant pressure on the conduit 26 has been relieved, the leaf spring tongue 64 will move the valve 54 a short distance to the right, thus again cutting off the by-pass 52. The valve is thus in condition for repetition of this cycle of operation upon supplying lubricant under pressure to the conduit 27.

In the modified form of the invention shown in Figs. 6 and 7, the valve body 76 has a bore 78, milled by-passes 80 and 81, and plugs 82 and 83 threaded in the ends of the bore 78. Piston valves 84 and 85 are adapted to control the flow of lubricant through the by-passes 80 and 81 as well as through ports 86 and 87, which are

4

adapted to be connected to parts to be lubricated by coupling fittings 88. A piston 90 is reciprocable in the bore, and has a longitudinal drilled hole 92 extending therethrough for reception of a closely fitting valve operating stem 94. The valve stem 94 may be formed integrally with one of the valves 84 or 85, or may be in the form of a pin separated from both of these valves.

Centrally of the valve body 76 is a port 96 which communicates with a valve port 98 formed in an indicator body 100. A poppet type valve 102 is reciprocable in the body 100, being pressed downwardly by a compression coil spring 104, the upper end of which presses a suitable packing 106 into a packing cap 108. Upon the application of sufficient lubricant pressure to the valve port 98, the valve 102 will be raised and its end project outwardly from the cap 108, as indicated by the dotted line position.

The valve of Figs. 6 and 7 operates in a manner similar to the valve of Figs. 1 to 5, the parts being shown in Fig. 6 as in condition to receive lubricant pressure at the right-hand end of the bore 78. Upon application of such lubricant pressure to this end of the bore, the valve 84 will be forced to the left carrying with it the valve 85 and piston 90. The valve 85 will cut off its by-pass 81 and uncover the port 87 leading to the bearing. After the valve 85 moves against the stop formed on the plug 83, the movement of the valve 84 will also be arrested, but lubricant will continue to flow through the by-pass 80 to force the piston 90 to the left and thereby discharge the lubricant at the left of this piston through the outlet port 87. When this portion of the cycle of operation has been completed, continued supply of lubricant under pressure to the right-hand end of the bore 78 will cause the pressure to build up in this portion of the bore, and since at this phase of the operating cycle the piston 90 will be near the left-hand end of its bore and the port 96 uncovered, the plunger valve 102 will be raised from its seat against the force of the spring 104 to cause its end to project from the cap 108, thus apprising the operator that this phase of the lubrication operation has been completed. The operator may observe that the end of the plunger valve 102 projects from the cap, or if the measuring valve is located in a place of poor visibility, the operator may hold his finger over the cap 108 and thus, when the valve plunger moves outwardly, receive a tactile signal that this part of the lubricating operation has been completed.

Thereafter, the operator will reverse the lubricant supply connections so as to relieve the pressure at the right-hand end of the bore 78 and to supply lubricant under pressure to the left-hand end thereof. From the foregoing, it will be apparent that the parts of the valve structure will be returned to the position in which they are shown in Fig. 6, and a measured charge of lubricant will be forced through the outlet port 86 to the part to be lubricated. When the second phase of the operating cycle is thus completed, the lubricant pressure in the bore 78 at the left of the piston 90 will again operate the visual and tactile signal plunger 102 to indicate to the operator that a complete cycle of operation of the apparatus has been completed.

Figs. 8, 9, and 10 disclose a modified form of the invention, which differs from that illustrated in Figs. 1 to 5 and 12 to 18 only in the addition of the visual and tactile indicator 110 which communicates with the bore 22 through a pair of ports 112 and by the elimination of the piston

rod 36 and the substitution of a plug 114 for the bushing 40. In other respects the construction and operation of this modified form of the invention is identical with that previously described.

The modified form of invention shown in Fig. 11 is similar to that of Figs. 1 to 5 with respect to the means for indicating the position of its piston 116 and is similar to the modified form of Figs. 6 and 7 with respect to the mechanical operating connection between its two valves 118 and 119. In this form of the invention, the piston 116 has an eccentric drilled hole 120 in which a valve operating pin 122 is slidable, the fit of the pin in the bore 120 being sufficiently close to prevent leakage of lubricant past it. The operation of this valve of Fig. 11 is generally similar to that of the previously described embodiments, except that as lubricant under pressure is supplied to the right-hand end of its main bore the initial movement of the valve 118 to the left causes exactly corresponding movement of the valve 119, due to the mechanical connection provided by the pin 122. It will be noted also that the piston has central enlargements 124 and 126 at its ends for engagement with the valves 118 and 119, respectively, and to provide a space for the entry of lubricant so that the pressure may be exerted against the end faces of the piston.

While I have shown and described particular embodiments of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire, by the following claims, to include within the scope of my invention all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. A lubricant measuring valve comprising, a valve body having a bore extending therethrough, said bore having a bypass at each end thereof, a cylindrical valve at each end of said bore and operable to cut off its adjacent bypass when in one position and to uncover said bypass when in another position, resilient means associated with each of said valves for moving it to bypass cut-off position, a piston reciprocable in said bore between said valves, means for supplying lubricant under pressure alternately to the opposite ends of said bore, and discharge ports near the ends of said bore positioned to be covered respectively by said valves when the latter are in positions in which they are not in bypass cut-off position.

2. The combination set forth in claim 1, in which one of said valves has a bore extending therethrough, said piston being provided with a piston stem extending through the bore of said valve, and in which there is provided an apertured plug receiving said stem and closing one end of the bore in said valve body.

3. In a lubricant measuring valve having a measuring cylinder, a piston reciprocable in said cylinder, means for limiting the stroke of said piston, a bypass at each end of said cylinder for conducting lubricant to the portion of the cylinder in which said piston is reciprocable, a valve associated with each of said bypasses and operative to prevent flow of lubricant therethrough, a pair of outlet ports formed in said body and communicating with the opposite ends of said cylinder, each of said valves being operable to control the flow of lubricant through one of said bypasses and one of said outlet ports, and resilient means for moving said valves to a position in which they prevent flow of lubricant through their associated bypasses.

4. The combination set forth in claim 3, in which said stops for said piston comprise rings fitting in grooves formed in the wall of said cylinder, and in which said resilient means for moving said valves comprise resilient tongues engageable with the valves and secured in said grooves by said stops.

5. The combination set forth in claim 3, in which said cylinder has a port uncovered by said piston when the latter is at either end of its stroke, and in which a hydraulic pressure indicator is connected to said last named port.

6. The combination set forth in claim 3, in which said resilient means move said valve a sufficient distance to cut off their associated bypasses, but insufficient to cause said valves to uncover their associated outlet ports.

7. The combination set forth in claim 1, in which said discharge ports are located diametrically opposite said bypasses.

8. The combination set forth in claim 1, in which each of said bypasses is in the form of short grooves extending longitudinally of and in the wall of said bore, and in which each of said valves is shorter than its associated bypass groove.

9. The combination set forth in claim 1, in which one of said valves has a bore extending therethrough, a piston stem extending through the bore of said valve, an apertured plug receiving said stem and closing one end of the bore in said valve head, and means providing a relatively loose coupling between said piston and said stem.

JOHN T. LEONARD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,805,303	Barks	May 12, 1931
1,935,139	Barks	Nov. 14, 1933
2,284,799	Brownstein	June 2, 1942
2,300,330	Acker	Oct. 27, 1942