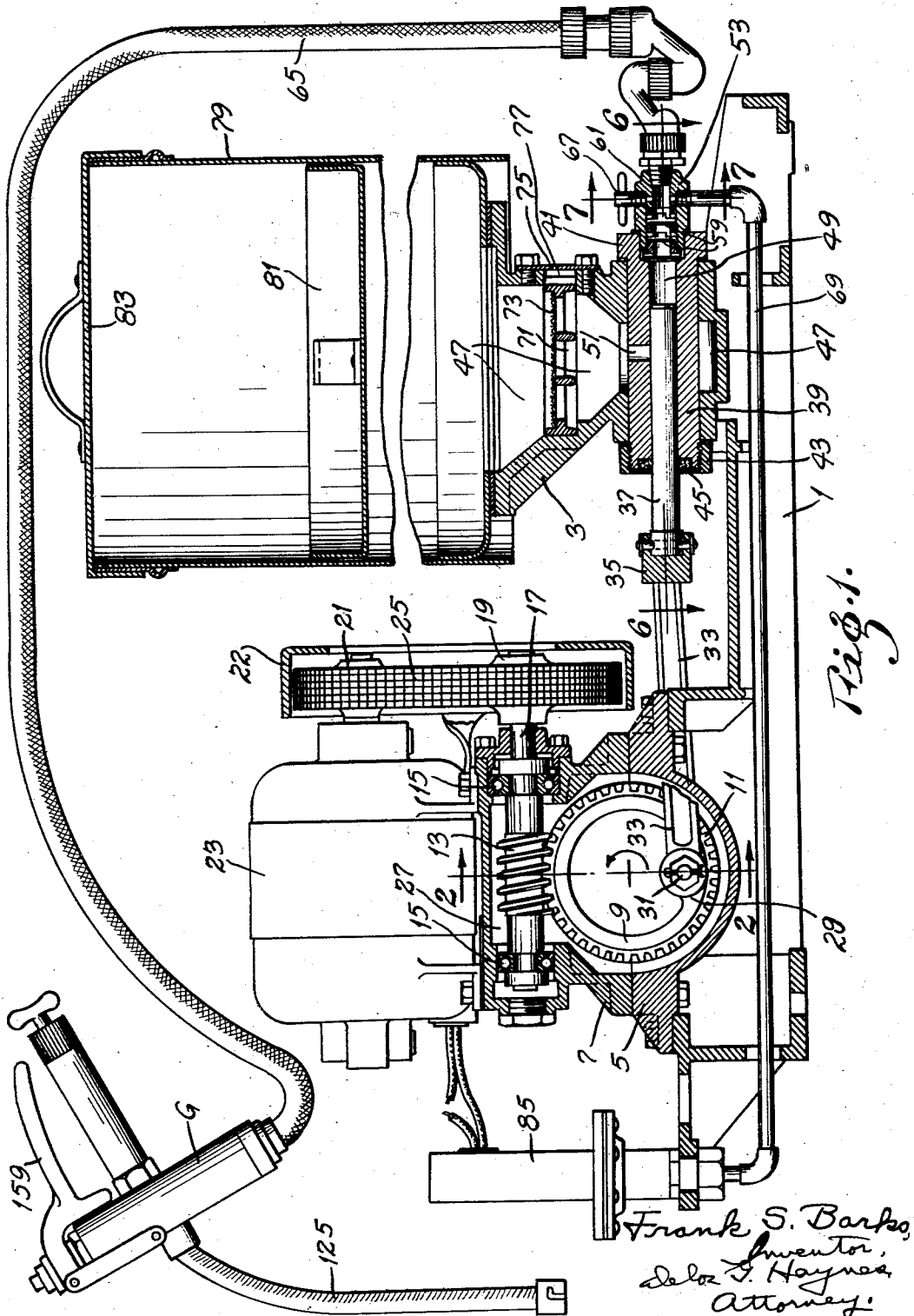


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March 21, 1933.

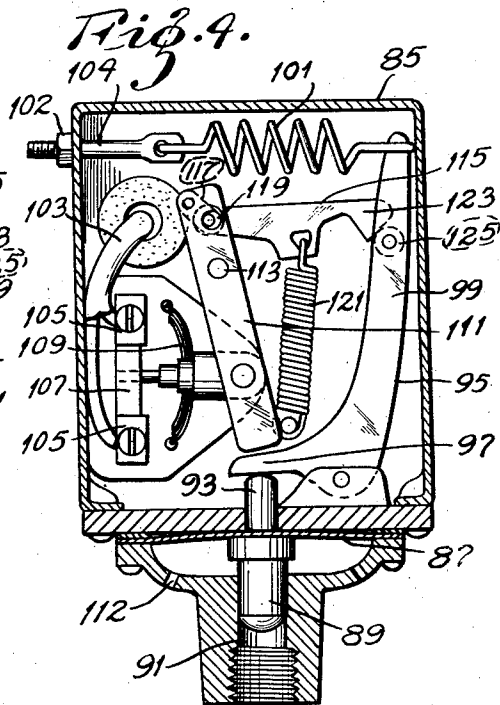
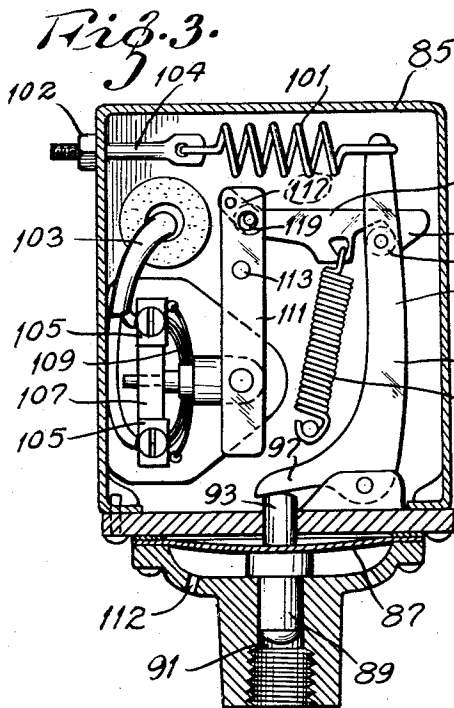
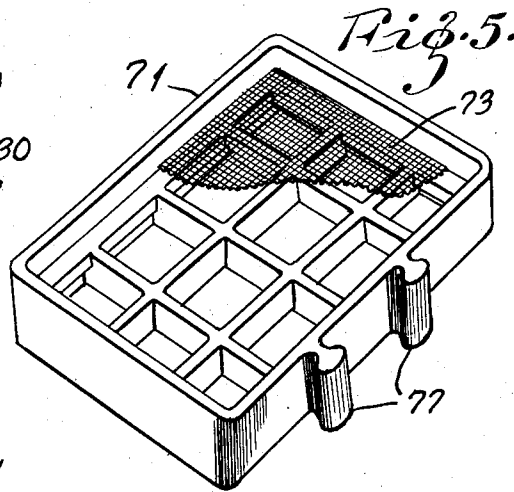
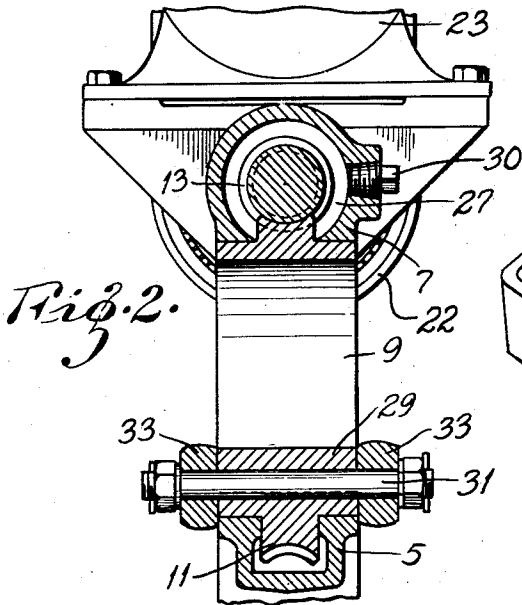
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1,902,750

DISPENSING APPARATUS

Filed Sept. 8, 1928

3 Sheets-Sheet 2



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1,902,750

DISPENSING APPARATUS

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Fig. 6.

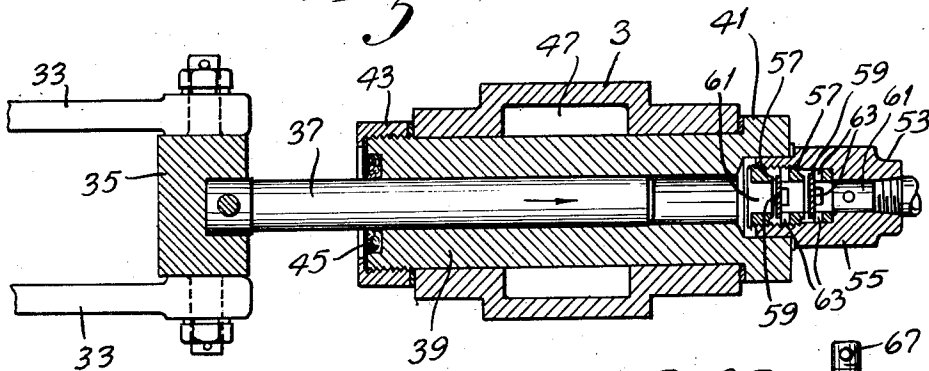


Fig. 7.

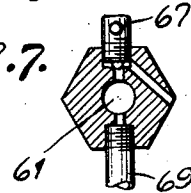


Fig. 8.

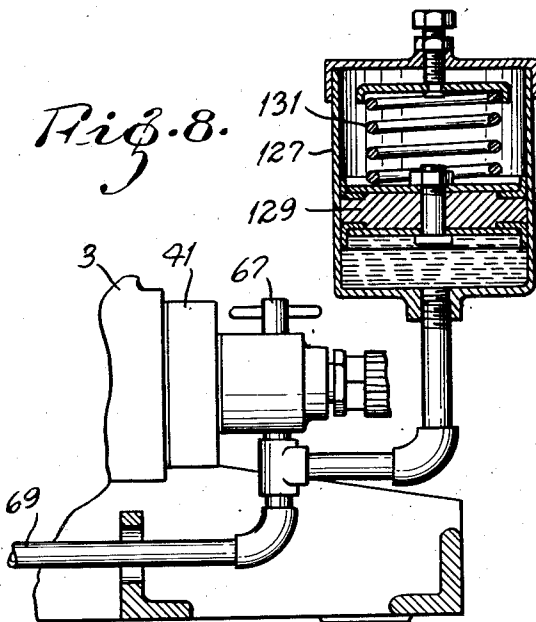
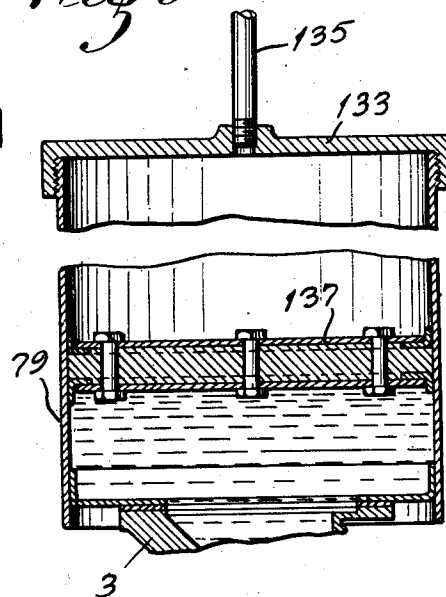


Fig. 9.



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UNITED STATES PATENT OFFICE

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DISPENSING APPARATUS

Application filed September 8, 1928. Serial No. 304,831.

This invention relates to dispensing apparatus and with regard to certain more specific features, to electrical lubricators.

Among the several objects of the invention may be noted the provision of an electrical dispensing apparatus in which full pressure is instantaneously available for delivery purposes whenever a control valve is operated to release position; the provision of a device of the class described including means for automatically and economically maintaining said full pressure; and the provision of a device of the class described which is rugged in form and simple in operation. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which are illustrated several of various possible embodiments of the invention,

Fig. 1 is a longitudinal section of one form of the lubricator, certain portions being shown in full;

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

Fig. 3 is a cross section of a pressure controlled switch, showing the switch in closed position under low pressure conditions;

Fig. 4 is a view similar to Fig. 3 showing the switch in open position and under high pressure conditions;

Fig. 5 is a perspective view of a strainer and a strainer supporting grid, the strainer being partly broken away;

Fig. 6 is a fragmentary view taken on line 6—6 of Fig. 1, except that it shows a compressing operation of a certain plunger;

Fig. 7 is a cross section taken on line 7—7 of Fig. 1;

Fig. 8 is a fragmentary side elevation, partially in section, showing a modified form of the invention; and

Fig. 9 is a cross section showing another modification.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

In prior attempts to provide electrically operated apparatus for dispensing fluids such as lubricants (grease, for example) a difficulty has been met that complications arise when a motor switch and a control valve must be manually coordinated when starting. The word fluid is used in this specification and in the accompanying claims as including conductible substances such as grease. A solution has been attempted by permitting a driving motor to run continuously to drive a pump so that it pumps into a line. When the line is open the fluid (grease, for example) is delivered to a predetermined point. To provide for shutting the line and maintaining pressure, a by-pass to the source of supply of the pump is provided which functions against a spring at a predetermined pressure so that by-passage to the supply is had at predetermined line pressure. The disadvantage of thus maintaining a line pressure is that the motor is wastefully running at all times.

The present invention overcomes the above wasteful operation and provides the advantages of a constantly available line pressure.

Referring now more particularly to Fig. 1 there is illustrated at numeral 1 a base or frame, to the forward end of which is bolted a pump casting 3 and to the rearward end of which is bolted a pillow block 5. The pillow block 5 has bolted thereto and supports a cap 7 in such fashion that the block 5 and cap 7 form a complete bearing adapted to be assembled around a rotatable, hollow journal piece 9 (see also Fig. 2).

The journal 9 carries centrally thereof a worm wheel 11 engaged by a worm 13, the worm being supported by suitable bearings 15 in said cap 7. A spindle 17 extends outwardly from the worm 13 and carries a sprocket 19 which is chained to a second sprocket 21 of a driving motor 23. The chain 25 used to accomplish the driving connection between sprockets 19 and 21 is pref-

erably of the silent type. The motor 23 is bolted to the top of the cap 7 (Figs. 1 and 2) and a guard 22 is similarly bolted to enclose the chain drive.

5 The construction above described is novel per se in that the wheel 11 is housed in a compartment 27 in which grease (for example) may be maintained for oiling purposes and yet the said wheel is hollow and
10 provides an opening through the housing which supports it, in which opening is carried a lug 29. This lug 29 has a gudgeon pin 31 extending outwardly on each side for the purpose of forming pin connections to
15 connecting rods 33, the latter comprising a pitman connection. The construction is of the simplest. The plug is illustrated at numeral 30 for permitting application of grease to the compartments 27.

20 One of each of the connecting rods 33 extends forwardly on each side of the pillow block 5 and cap 7 to a cross head 35 (see also Fig. 6). The cross head 35 is fastened to a plunger or ram 37, the latter slidably engaging a plunger cylinder or bushing 39
25 positioned in the pump casting 3. The bushing 39 is removable from the casting 3 for repair purposes, being held in place by a shoulder 41 and a nut 43. It will be seen that should the bushing 39 be scored that it can be readily replaced without the necessity for replacing a complete casting 3. A
30 suitable wiper 45 prevents entrance of grit at the rear of said bushing 39.

35 As will be seen from Figs. 1 and 6, the casting 3 has a hollow chamber 47 formed around the bushing 39 and communicating with the interior cylinder 49 of the bushing 39 by way of one or more ports 51. Reciprocation of the plunger 37 is adapted to
40 take place across the ports 51 and by the addition of the check valve 53 at the cylinder outlet is, upon its return stroke, caused to suck grease from a chamber 47 and, upon
45 forward stroke to compress the grease out through the valve 53.

The valve 53 is new per se and comprises a body 55 within which are formed a plurality of serially arranged annular valve seats 57
50 adapted to be engaged by loose or floating discs 59 upon a suction stroke of the plunger 37 so as to prevent return of grease through the valve bore 61. At a compression stroke of the plunger 37 the discs 59
55 are forced forwardly against castellated peripheral portions 63 around the bore 61, said castellated portions being spaced from the seats 57 a distance adapted to permit enough movement of the discs 59 so that
60 grease may pass upon a compression stroke. Upon compression, the grease passes through the passage 61, finding its way out around the valve seats 57 behind the discs 59 and passing around said discs and
65 through the castellated portions. The ad-

vantage of this construction is its simplicity and positive action, inasmuch as the discs 59 are not both apt to get dirt under them at the same time, so that one acts as a safety device for the other. A greater number of discs, seats and castellated elements
70 may be used if desired or only one set may be used.

The valve 53 is provided with an outlet communicating with a flexible hose 65 which
75 passes to a control valve or gun G. The valve G is for starting and stopping flow. The valve or gun G is operated by a handle so as to permit or block passage of grease. The details of the construction of the valve
80 G are set out more particularly in my Patent 1,633,304 and it suffices to say here that its function is to open and close the grease outlet line 65 of the present apparatus, that is, upon manual operation of the handle 159.
85

Referring again to the check valve 53 it will be seen that it includes a manually operable relief cock 67 (see also Fig. 7) for relieving air from the cylinder 49, should
90 its prime be lost. The valve 53 is also provided with a pressure control line 69 for purposes to be described.

Referring to the pump casting 3, it will be seen that the passage 47 is provided with an intersecting drawer-like grid 71 supporting a strainer 73 (see also Fig. 5).
95 The strainer and grid are slidably removable for cleaning purposes upon unbolting a cover plate 75. Finger pieces 77 on the grid aid in removing and replacing it. The grid construction supports the strainer without permitting sagging.
100

Fastened to the top of the casting 3 is a grease container 79 including a loosely fitting piston 81, the latter being adapted to
105 receive the atmospheric pressure and press down the grease as it is sucked out through the opening 51. The piston 81 prevents an undesirable crater formation of the grease which otherwise permits air instead of grease
110 to reach the pumping elements. The container 79 carries a hand cover 83.

Referring to Fig. 1, it will be seen that the pressure control line 69 from the outlet of the check valve 53 passes rearwardly
115 through the base 1 and to a pressure switch 85, the latter being shown more in particular in Figs. 3 and 4 and comprising a diaphragm 87 engaged from below by an adapter plunger 89, the latter being fitted slidably in a
120 chamber 91. The chamber 91 is in communication with said line 69 from the check valve 53. Upon increase of pressure in line 69 the diaphragm 87 rises and upon decrease of pressure it falls. A compression transmission link 93 joins the diaphragm 87 with a short arm 97 of a bell crank 95, the long arm
99 of which is normally held to the left by an adjustably regulable spring 101, that is, under conditions of low pressure in line 69

(see Fig. 3). When said pressure rises, the bell crank 95 is forced to the right (Fig. 4) against the reaction of spring 101. A nut 102 threaded to rod 104 provides the adjustment for predetermining the pressure at which the bell crank will reach a given position.

Line wires 103 engage with line terminals 105 mounted on an insulating base 107, said base 107 slidably supporting a contact brush 109. The brush 109 is held to a member which is pinned to an oscillable link 111, the latter being pivoted at pin 113. An over-centering link 115 is connected with the oscillable link 111 by a supporting link 117 and has a lost motion connection with said oscillable link 111 at a pin joint 119. The link 115 is normally held in a downward position by a spring 121 and its other end comprises an overcentering wedge 123 resting on a roller 125 rotatably mounted on the long arm 99 of the bell crank 95. The action is clear from Figs. 3 and 4. In Fig. 3 the pressure in the line 69 is low enough that the spring 101 holds the bell crank to the left. The switch is then closed and the circuit of the wires 103 is so arranged that the motor 23 is then running and driving the pump.

After pressure builds up in the line 69, the bell crank 95 is thrown into the Fig. 4 position. This means that the roller 125 has ridden over the wedge 123 and the reaction of the spring 121 throws the link 115 to the left, thereby rotating the link 111 counter-clockwise and opening the switch. The lost motion engagement, taken in connection with the over-centering action of the wedge 123, provides an exceedingly rapid or snap-acting opening. At this stage the motor circuit is open and the pumping action ceases. The snap-acting switch is advantageous in effecting a definite opening and closing of the circuit at predetermined pressures without indeterminate action and excessive contact burning.

At numeral 112 is indicated a relief port for permitting escape of such grease as may leak past the member 89 and below the diaphragm 87.

It will be seen that the adapter 89 prevents pressure from distributing itself over the entire area of the diaphragm 87 and thus adapts the switch to the high pressures used in greasing work, these being of the order of several thousand pounds per square inch.

The operation of the device and its advantages are as follows:

The handle 159 of the gun G is normally in such position that the gun is closed and blocks passage of grease from the line 65. The grease container 79 is filled. The pressure in the control line 69 is down and the switch 85 is closed so that upon applying

potential to the switch-motor circuit, the motor 23 starts. This results in the motor driving the plunger 37 to reciprocate (by way of the chain drive, worm and wheel drive and the connecting rods 33).

Assuming that the valve or gun G is not opened and that the whole device has been primed, due to previous operation or otherwise, the pressure in lines 65 and 69 builds up. This is because grease is pushed into them. The line 69 transmits pressure to the switch 85. After the pressure has reached a predetermined amount, the switch moves from its Fig. 3 closed position to its Fig. 4 open position, whereupon the switch-motor circuit is opened and the motor stops running. It will be seen that the pipe 69, switch 85 and the electrical circuit to the motor comprise in combination a controlling means.

It will thus be seen that pressure is built up in line 65 so that when the outlet 125 of the gun is fastened to a grease fitting and the gun opened from handle 159, that full pressure automatically and immediately flows to the fitting. It has been found that this is of advantage in loosening frozen bearings and the like and performs a better greasing operation than if pressure is built more gradually. Pressure is supplied instantaneously and advantage is thus taken of the kinetic effects of the fluid.

It is clear that when the gun G is opened that pressure in the line 65 and 69 immediately drops. This means that the switch 85 returns from its Fig. 4 open position to its Fig. 3 closed position and the motor starts up to again raise the pressure by operating the grease pump. Pumping will continue, at least intermittently, as long as grease is permitted to flow out of the gun. It will also continue such time after the gun is closed that it takes to build up enough pressure in the lines to reach the predetermined value at which the switch 85 will open.

It will be noted that after the motor 23 has ceased running under closed conditions of the gun G and high pressure in the lines 65, 69 that the plunger 37 will not be forced backward even though the valve 53 leaks, because the worm and wheel gear reduction will not operate backwards. Inasmuch as the motor will usually be stopped upon a compression stroke which raises the pressure to a predetermined value, the plunger 37 is thus in closed position across port 51 so that a double precaution is had against losing pressure into the tank 79.

It will be understood that if inadvertent leakage occurs upon standing, with pressures in the lines 65, 69, that said pressure will decrease but that an incipient decrease will close the switch 85 by the methods above set out, so that the motor will again start and cause an incipient increase with

the consequent shutting off of the motor. Thus the motor starts and stops to hold up the pressure to the predetermined value.

Under conditions where leakage is expected to be high, the modified feature shown in Fig. 8 may be used in which a chamber 127 is put into communication with the pressure line 69, whereupon grease may pass to said chamber 127. A floating piston 129 is provided in the chamber 127 acting against an adjustably regulable spring 131. The purpose of this is to provide a greater volume change in the pressure pipes for a given pressure change so that more grease may be lost without affecting the pressure to such a great degree. This means that the motor will have fewer starts and stops in order to keep up the pressure under idle conditions. It is evident that when leakage is high and only the compressible grease is had in the pressure system, that for a small leakage a great decrease in pressure is had. This modified feature overcomes this difficulty. It is to be understood that the spring 131 may also be removed and the resiliency of the air trapped behind piston 129 in chamber 127 may be depended upon to provide increased change in volume; air, like the spring 131 being more compressible than the fluid in the pressure pipes. Or chamber 127 may be vented and the spring be alone depended upon. It is to be understood that the chamber 127 may be placed anywhere in the communicating elements of the pressure system, such as in the line 65 or any piping leading from the pump to said line.

In Fig. 9 is shown a modified form of fluid container 79, in which a pressure tight head 133 is used having a connection 135 with a suitable source of air supply for pressing a piston 137 down upon the grease in the container, thereby making the device capable of pumping greases of heavier consistency.

Reference to Fig. 1 will show another point which it is desired to make clear, namely, that the center of rotation of the journal 9 is placed above the center line of the plunger 37, so that with counterclockwise rotation of the journal, the side thrusts on the walls of the cylinder 49 are negligible or greatly reduced upon the heavy compression strokes. The connections of the motor 23 are so made that it rotates in a direction adapted to always provide counterclockwise rotation of the journal 9. It will be seen that the side thrusts upon return of the plunger are not excessive even though the angularity of the connecting rods is increased upon return. This is because the forces during the suction strokes are low.

Examination of the drawings indicates the compact arrangement effected by the elongated frame having the grease cham-

ber positioned substantially in an upright manner above a pump at one end thereof and having the motor mounted with its shaft longitudinally above the worm-and-wheel reducer and associated driving mechanism at the other end, so that the worm is positioned with its axis longitudinal. At the same time the wheel of the worm-and-wheel reducer is in position for applying the pitman connection.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In lubricating apparatus, a supply chamber, a delivery line leading from said supply chamber, pumping means for forcing lubricant from the supply chamber to the delivery line, an electric motor for driving said pumping means, a pressure switch controlling said motor, a pressure control line communicating material from the delivery line to said switch to effect operation of the same and a chamber communicating with the delivery line and pressure control line, said chamber being adapted to apply the line pressure to an element which is more resilient than said lubricant, whereby the amount of intermittent operation of said motor is decreased.

2. In lubricating apparatus, a supply chamber, a delivery line leading from said supply chamber, pumping means for forcing lubricant from the supply chamber to the delivery line, an electric motor for driving said pumping means, a pressure switch controlling said motor, a pressure control line communicating material from the delivery line to said switch to effect operation of the same, and means communicating with the said lines adapted to introduce resiliency into the aggregate of fluids in the lines which resiliency is greater than that of the lubricant being forced.

3. In lubricating apparatus, a supply chamber, a delivery line leading from said supply chamber, pumping means for forcing lubricant from the supply chamber to the delivery line, an electric motor for driving said pumping means, a pressure switch controlling said motor, a pressure control line communicating material from the delivery line to said switch to effect operation of the same, and means communicating with the said lines adapted to introduce resiliency into the aggregate of fluids in the lines which resiliency is greater than that of the

lubricant being forced, said communicating means comprising a movable element contacted by the lubricant and resilient means behind the movable element.

4. In lubricating apparatus, a supply chamber, a delivery line leading from said supply chamber, pumping means for forcing lubricant from the supply chamber to the delivery line, an electric motor for driving said pumping means, a pressure switch controlling said motor, a pressure control line communicating material from the delivery line to said switch to effect operation of the same, and means communicating with the said lines adapted to introduce resiliency into the aggregate of fluids in the lines in which resiliency is greater than that of the lubricant being forced, said communicating means comprising a movable piston contacted on one side by the lubricant and a spring reacting against the other side thereof.

5. In lubricating apparatus, a supply chamber, a delivery line leading from said supply chamber, pumping means for forcing lubricant from the supply chamber to the delivery line, an electric motor for driving said pumping means, a pressure switch controlling said motor, a pressure control line communicating material from the delivery line to said switch to effect operation of the same, and means communicating with the said lines adapted to introduce resiliency into the aggregate of fluids in the lines in which resiliency is greater than that of the lubricant being forced, said communicating means comprising a movable piston contacted on one side by the lubricant and a spring reacting against the other side thereof, and means for adjusting the tension of said spring.

6. In a high pressure lubricating apparatus, a lubricant supply chamber, a delivery line leading from said supply chamber, means for forcing lubricant from said supply chamber to the delivery line whereby high pressure is effected in said line, electric motivating means for actuating said forcing means, an electric circuit for energizing the electric motivating means, a pressure-operated and snap-acting switch in said circuit, means placing said delivery line and said pressure switch in communication, said switch being operable to instantaneously start and stop said motivating means at predetermined pressures in said delivery line.

7. In high pressure lubricating apparatus, a lubricant supply chamber, a delivery line leading from said supply chamber, means for forcing lubricant from said supply chamber to the delivery line whereby high pressure is effected in said line, an electric motor for actuating said forcing means, an electric circuit for energizing the electric

motor, a pressure-operated and snap-acting switch in said circuit, means placing said delivery line and said pressure switch in communication, whereby said controlling means becomes operable to instantaneously start and stop said motivating means at predetermined pressures in said delivery line, and means for adjusting said snap-acting switch to respond at various pressures in said delivery line.

8. In lubricating apparatus, a lubricant supply chamber, a delivery line leading from said supply chamber, a control valve in said line for permitting and stopping flow therethrough, pumping means for forcing grease from said supply chamber to the delivery line whereby a substantial pressure is maintained in said line when the control valve is shut and flow is effected in said line when the valve is opened, an electric motor driving said pumping means, a circuit for said motor, a pressure-operated and snap-acting switch adapted to open and close said circuit, and pressure communicating means between the delivery line and said switch.

In testimony whereof, I have signed my name to this specification this 5th day of September, 1928.

FRANK S. BARKS.