March 3, 1931. H. J. MURPHY 1,795,034

LUBRICATING APPARATUS

Filed Jan. 9, 1926 2 Sheets-Sheet 1

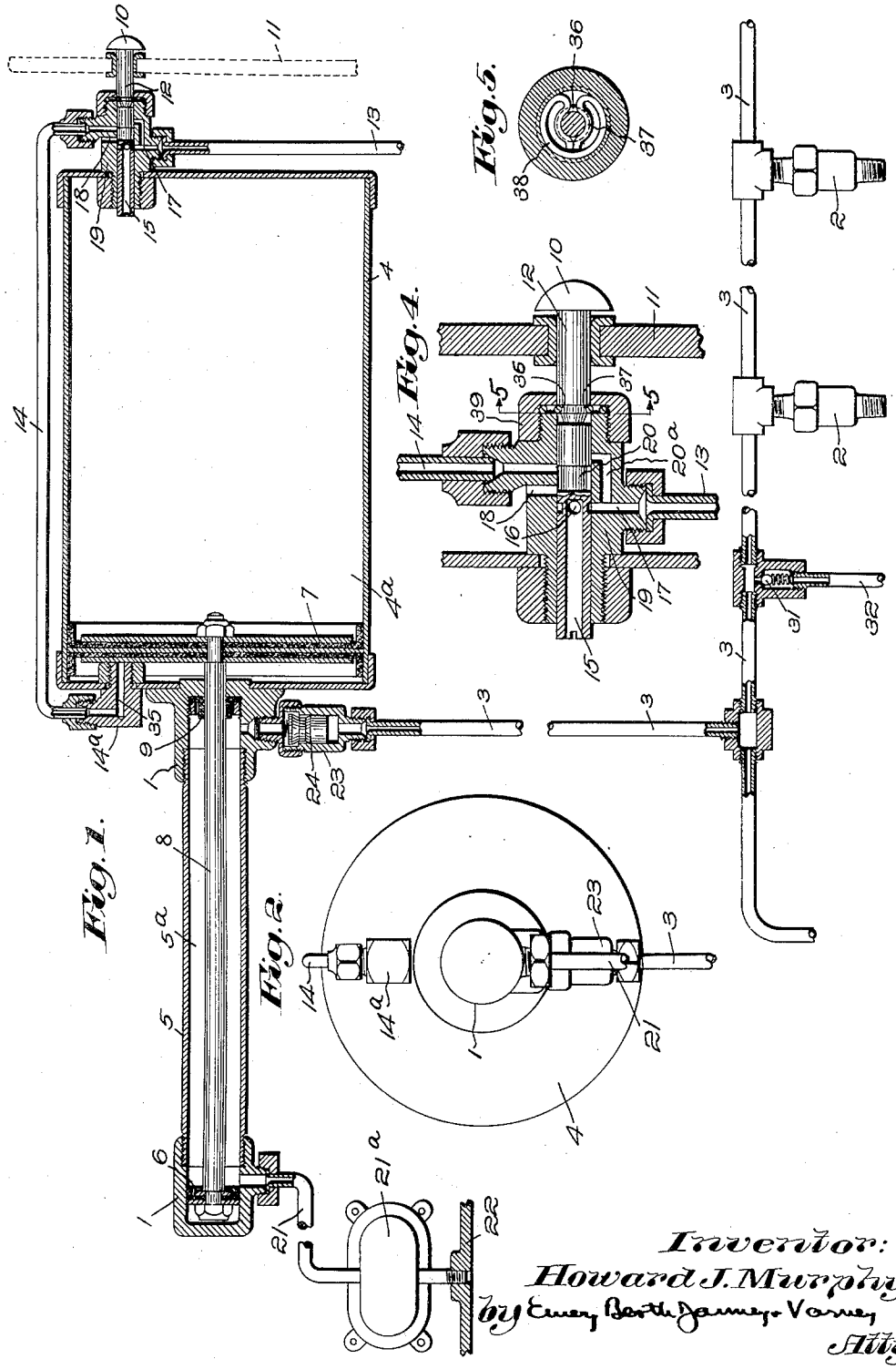


Fig. 1.

Fig. 2.

Fig. 5.

Fig. 4.

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LUBRICATING APPARATUS

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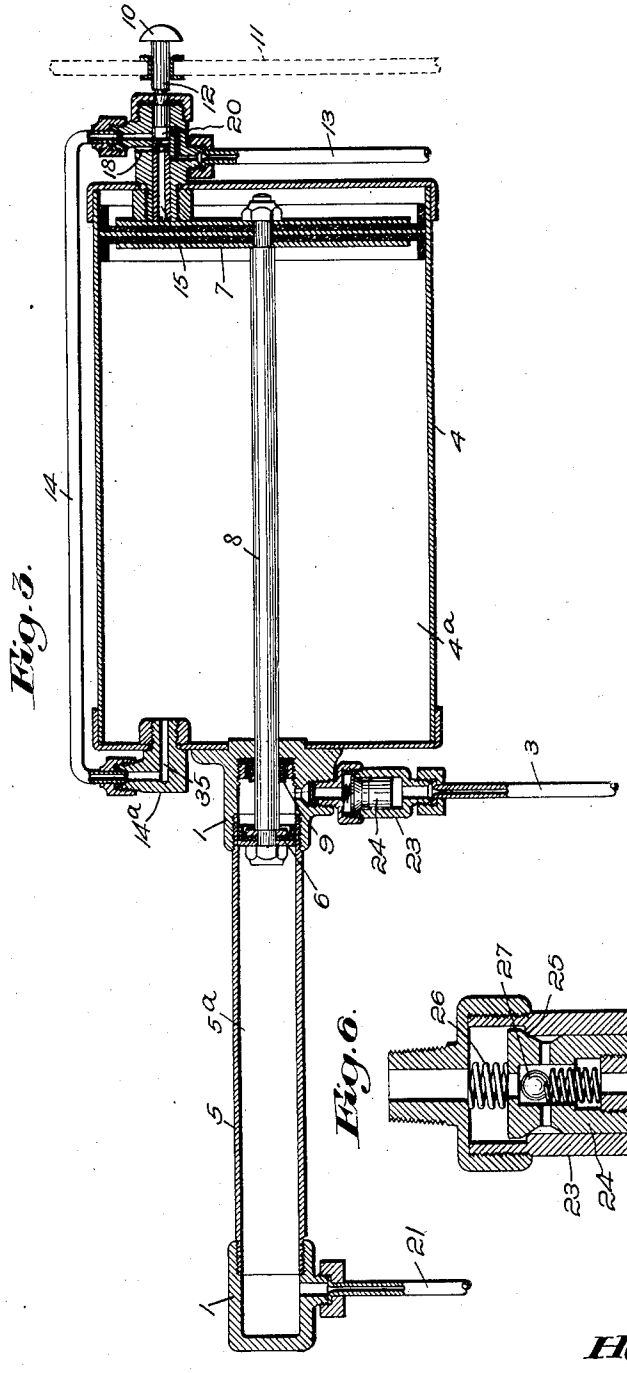


Fig. 5.

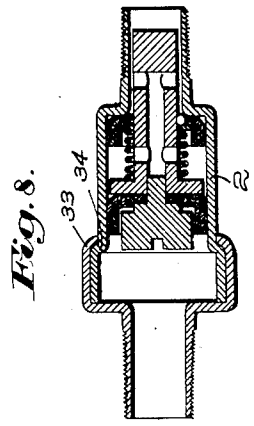


Fig. 8.

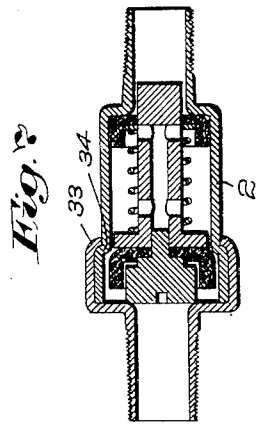


Fig. 7.

Fig. 6.

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UNITED STATES PATENT OFFICE

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LUBRICATING APPARATUS

Application filed January 9, 1926. Serial No. 80,246.

This invention aims to provide improvements in lubricating apparatus.

In the drawings which illustrate a preferred embodiment of my invention,

Fig. 1 is a layout of a central lubricating system showing parts thereof in cross-section;

Fig. 2 is an end elevation of the vacuum operated pump;

Fig. 3 is a longitudinal section through the vacuum-operated pump showing the relation of the parts associated with the pump prior to the return stroke of the piston;

Fig. 4 is an enlarged section of the valve means for controlling admittance of air and suction to opposite sides of the suction-operated piston in the pump;

Fig. 5 is a section on the line 5—5 of Fig. 4;

Fig. 6 is an enlarged section of the valve means located adjacent the outlet end of the pump for controlling the flow of lubricant into and out of the lubricant chamber of the pump; and

Figs. 7 and 8 include longitudinal sections through one of the lubricant-measuring devices showing the operation of the piston and by-pass means located therein.

Referring to the drawings, I have illustrated a central lubricating system particularly, though not exclusively, useful in connection with lubricating various parts of a motor vehicle.

The lubricant system shown in the drawings includes a vacuum operated lubricant pump 1, a plurality of lubricant-measuring devices or cups 2, located at or adjacent to the parts to be lubricated (not shown) and a pipe system 3 connecting the cups 2 and the pump 1, so that lubricant may be forced from the pump to all of the parts to be lubricated. Various valves are shown for controlling the system in the manner more fully hereinafter described.

The pump, as illustrated in Figs. 1 and 2, includes two cylinder portions 4 and 5 aligned with each other and presenting chambers 4^a and 5^a respectively, the chamber 5^a being substantially smaller in cross-sectional area than the chamber 4^a so that lubricant may be forced therefrom under substantial pressure. In the chamber 5^a is provided a piston 6 and in the chamber 4^a a piston 7. Both pistons are connected by a rod 8 which passes through a packing in the form of a hat washer 9 held in position between the two chambers to prevent leakage around the stem 8. The piston 7 may be operated in the chamber 4^a by admitting suction to one side of the piston to create a partial vacuum in the chamber 4^a, while atmospheric pressure is admitted at the opposite side of the piston. The suction may be obtained from any suitable source, as for instance from the intake manifold (not shown) of the motor which drives the vehicle. A slide valve device is secured to the rear end of the cylinder 4 and has a button 10 located at the dash 11 (shown in dotted lines) of the vehicle for operation of the sliding portion 12 of the device. A conduit 13 leads from the slide valve device to the source of suction supply and a second conduit 14 leads from the valve device to an elbow 14^a located at the forward end of the cylinder 4 as viewed in Figs. 1 and 2. The slide portion 12 is hollow at its inner end to provide a passage 15 which opens directly into the chamber 4^a and connects three ports 16, (Fig. 4), with a passage 17 leading to the conduit 13. The chamber 15 may also communicate with a vent 18 in the casing 19 of the valve device as illustrated in Fig. 3. Rearwardly of the passage 15, the slide part 12 has a groove 20 which may connect the conduit 14 with a passage 20^a leading into the passage 17 or with the vent 18 as shown in Figs. 1 and 4.

Lubricant may be supplied to the chamber 5^a through a pipe 21 which connects the cylinder 5 with any suitable lubricant supply, such, for instance, as with the usual gear pump 21^a (Fig. 1) which draws lubricant from the crank case 22 of the motor, a portion of which is shown in cross-section.

A two-way valve device 23 is secured to the pump 1 at the rear end of the cylinder 5 and the pipe system 3 is connected with the device as illustrated in Figs. 1 and 3. This valve device 23 has a valve part 24 which is normally held against a seat 25 by a light spring 26. A ball check valve 27 is normally pressed against a seat provided by the

valve part 24, thereby to close a passage through the valve part.

A suitable relief valve 31 is located in the pipe system (Fig. 1) and a pipe 32 may connect the relief valve with the source of lubricant supply for purposes more fully hereinafter described.

The lubricant-measuring cup 2, which I have illustrated in Figs. 7 and 8, is substantially the same in construction and operation as fully described in my co-pending application Serial No. 80,244 filed herewith, the only difference being in the construction of the body or casing of the cup. In this instance I have provided a cup having a casing made from two relatively thin pressed metal parts secured together by spinning or rolling the edge 33 of one part over a shoulder 34 of the other part, thereby to secure the parts together in such a manner as to prevent tampering with the inner workings of the cup.

Normally all of the valves are closed, the means in each cup is in the position shown in Fig. 7, the piston 7 is at the forward end of the cylinder 4 closing the passage 35 in the elbow 14^a and the slide valve device is held in a position to normally admit suction into the passage 35 to hold the piston 7 against the end of the elbow 14^a as shown in Fig. 1. The pipe 13 is preferably connected directly to the source of suction without providing a shut-off valve, because the piston 7 acts as a valve for closing the passage 35. The slide part 12 of the slide valve device is provided with a groove 36 into which fits the opposed resilient fingers 37 of a spring 38 held between the outer end of the casing 19 and a screw cap 39. The spring fingers cooperate with the irregular surface at the bottom of the groove 36 to hold the slide part 12 in its two operating positions, as shown by Figs. 4 and 5, while permitting movement of the slide part from one position to the other.

By pressing the button 10 located at the dash 11, the slide part 12 may be pressed from its normal position to the position shown in Figs. 1 and 4 so that the end of the slide part extends beyond the casing 19 into the chamber 4^a. Suction is then admitted through the pipe 13, passage 17, ports 16 and chamber 15 to draw the air from the chamber 4^a and form a partial vacuum in the chamber 4^a at the rear of the piston 7. At the same time the vacuum is being formed, atmospheric pressure is admitted to the forward side of the piston 7 through the vent 18, groove 20, conduit 14 and passage 35 in the elbow 14^a. The combination of the atmospheric pressure and the partial vacuum cooperate to drive the piston 7 toward the rear end of the cylinder 4. Thus the piston 7 through the rod 8 operates the piston 6 in the cylinder 5. Assuming that the chamber 5^a has been previously filled with lubricant by operation of the pump in the manner hereinafter described with regard to filling the chamber, the lubricant will be forced past the check valve 27 through the pipe system 3 to the lubricant cups 2. As the lubricant reaches the cups 2 it flows into and fills them, and then a predetermined quantity is forced from each cup to the part to be lubricated in the same manner as described in the above mentioned co-pending application.

When the piston 7 nears the end of its stroke, after forcing lubricant to the cups and after the excess lubricant in the chamber 5^a has been taken care of, as in the manner hereinafter described, it strikes the projecting end of the slide part 12 and automatically moves it into its other operating position, as shown in Fig. 3. Thus the suction is automatically shut off from the rear side of the piston 7 and admitted to the forward side of the piston 7 through the passage 20^a, groove 20, conduit 14 and passage 35. At the same time the admittance of atmospheric pressure is reversed and admitted to the rear side of the piston 7 through the vent 18, ports 16 and chamber 15. Thus the pistons 6 and 7 may be driven back to the positions shown in Fig. 1 where the piston 7 closes the passage 35 and stops further suction until the button 10 is again pressed, when it is desirable to lubricate the bearings of the motor vehicle.

During its return or forward stroke, the piston 6 uncovers a passage which communicates with the pipe 21 and permits the gear pump 21^a to fill the chamber 5^a so that it may be delivered to the cups when the pistons 6 and 7 are again set in operation. The lubricant cannot be forced through the double valve device. 23 by the gear pump 21^a because the pressure of the lubricant, forced from this pump, is not great enough to open the check valve 27. This valve 27 can only be unseated by lubricant forced from the chamber 5^a by the piston 6.

From the above description of the operation of the system it will be readily understood that I have provided a lubricating system which is simple in operation and requires only one stroke of the piston 6, in each direction, to supply each cup with lubricant and force it to the part to be lubricated thereby.

The quantity of lubricant which the chamber 5^a holds is slightly more than the total quantity of lubricant required to fill and operate the greatest number of cups to be used on a vehicle, thereby to insure proper filling and operation of all the cups. Any lesser number of cups may be used without changing the parts of the system. The excess of lubricant in the chamber 5^a would cause the pistons 6 and 7 to come to a stop before the slide part 12 could be operated by the piston 7. However, the stroke of the pistons may be finished by either providing the safety

valve 31 which opens to permit the excess lubricant to return to the supply reservoir after all of the cups have been operated or the safety valve may be omitted. When the safety valve 31 is omitted, the pistons 6 and 7 stop before they reach the end of their stroke because of the excess lubricant in the chamber 5^a. When the suction through the pipe 13 stops, as by stopping the motor of the vehicle, the springs 41 in the cups will force the piston and valve devices 42 back to their normal positions. The spring 41 in each cup being much stronger than the spring 26 which holds the valve part 24 seated will force the lubricant back from the cups past the valve part 24 into the chamber 5^a and move the pistons 6 and 7 to make room for the lubricant forced into the chamber 5^a from the cups 2. When the motor of the vehicle is again started, suction will be created to continue the operation of the discharge stroke of the piston 7 which will travel in the chamber 4^a until it shifts the slide part 12 to effect return of the pistons. This last part of the operation may take place because some of the lubricant has been discharged through the cups and not enough lubricant remains in the chamber 5^a to prevent completion of the stroke of the piston 6.

An important feature of this invention is the provision of the "one-stroke" lubricant pump rather than a pump which continues in operation until stopped either automatically or by hand.

If a pipe of the lubricant system breaks when a continuous stroke lubricant pump is in operation, the pump may drain the crankcase of the motor thereby subjecting the motor to serious damage. By using the "one-stroke" lubricant pump herein described, the crankcase cannot be drained of lubricant because the pump stops at the completion of a stroke of the piston in each direction regardless of whether or not a pipe is broken.

While I have shown and described a preferred embodiment of my invention, it will be understood that changes involving omission, substitution, alteration and reversal of parts and even changes in the mode of operation may be made without departing from the scope of my invention which is best defined in the following claims.

Claims:

1. A central lubricating system including a plurality of lubricant points, means for forcing lubricant through a pipe system to said points, said means comprising a lubricant pump having a cylinder, a piston reciprocable in said cylinder, a conduit through which lubricant may be supplied to said cylinder, an outlet from said cylinder through which lubricant may be forced to the pipe system and a two-way valve device between the outlet and the pipe system for permitting passage of lubricant either from said cylinder to the pipe system or from the pipe system to the cylinder when the lubricant pressures on opposite sides of said device reach predetermined amounts.

2. A central lubricating system including a plurality of lubricant points, means for forcing lubricant through a pipe system to said points, said means comprising a lubricant pump having a cylinder, a piston reciprocable in said cylinder, a conduit through which lubricant may be supplied to said cylinder, an outlet from said cylinder through which lubricant may be forced to the pipe system and a two-way valve device between the outlet and the pipe system for permitting passage of lubricant either from said cylinder to the pipe system or from the pipe system to the cylinder upon the creation of predetermined unbalanced pressures, a second cylinder aligned with said first cylinder and a piston in said second cylinder connected to said first piston, said second piston adapted to be reciprocated in said second cylinder to reciprocate said first-mentioned piston.

3. A central lubricating system including a plurality of lubricant cups, a lubricant pump for forcing lubricant through a pipe system connecting said cups with said pump, said lubricant pump comprising, a cylinder adapted to be supplied with lubricant, a piston for forcing the lubricant from said pump through said pipe system, a second cylinder aligned with said first cylinder, a vacuum-operated piston reciprocable in said second cylinder and connected to said first-mentioned piston for operation thereof and means associated with said pump for permitting lubricant to flow either from the first cylinder through the pipe system to the cups or from the cups through the pipe system to the first-mentioned cylinder upon the creation of predetermined differences in pressure.

4. A central lubricating system including a plurality of lubricant cups, a lubricant pump for forcing lubricant through a pipe system connecting said cups with said pump, said lubricant pump comprising, a cylinder adated to be supplied with lubricant, a piston for forcing the lubricant from said pump through said pipe system, a second cylinder aligned with said first cylinder, a vacuum-operated piston reciprocable in said second cylinder and connected to said first-mentioned piston for operation thereof and a two-way valve between the pipe system and the first-mentioned cylinder for permitting flow of lubricant into and out of the first-mentioned cylinder only when definite differences in pressure exist thereacross.

5. A central lubricating system including a plurality of charge-determining lubricant cups containing lubricant pressure-operated means for forcing the lubricant from said cups, a lubricant pump for forcing lubricant through a pipe system to said cups, said

pump comprising a lubricant chamber adapted to hold more lubricant than is required to fill and operate all of said cups, a piston in said chamber for forcing the lubricant therefrom, vacuum-operated piston means for operation of the piston in the lubricant cylinder and valve means associated with said cylinder and the pipe system to provide for completion of the operation of the vacuum-operated piston means during the discharge stroke of the piston in the lubricant cylinder.

6. A central lubricating system including a plurality of charge-determining lubricant cups containing lubricant pressure-operated means for forcing the lubricant from said cups, a lubricant pump for forcing lubricant through a pipe system to said cups, said pump comprising a lubricant chamber adapted to hold more lubricant than is required to fill and operate all of said cups, a piston in said chamber for forcing the lubricant therefrom, a larger cylinder aligned with said first-mentioned cylinder, a piston in said cylinder connected to said first-mentioned piston, a slide valve device associated with said large cylinder and having a sliding part manually operable in one direction to admit suction to one side of the piston in said second cylinder and admit atmospheric pressure to the opposite side of the piston to move said piston toward said valve, and adapted to be shifted in the opposite direction by said piston to reverse the atmospheric pressure and suction to drive said piston in the opposite direction whereby said piston closes the inlet at the opposite end of the cylinder to stop operation of the piston.

7. A central lubricating system including a plurality of charge-determining lubricant cups containing lubricant pressure-operated means for forcing the lubricant from said cups, a lubricant pump for forcing lubricant through a pipe system to said cups, said pump comprising a lubricant chamber adapted to hold more lubricant than is required to fill and operate all of said cups, a piston in said chamber for forcing the lubricant therefrom, vacuum-operated piston means for operation of the piston in the lubricant cylinder, and a double valve device associated with the pipe system and said lubricant cylinder so that lubricant may pass from the cylinder to the cups, said double valve device providing for passage of lubricant from the pipe system to the cylinder after the suction on said suction-operated piston means has been stopped, thereby permitting the means in each cup to return to its normal position and thereafter permitting completion of the discharge stroke of the piston when suction is again admitted.

8. A central lubricating system including a plurality of lubricant points, means for forcing lubricant through a pipe system to said points, said means comprising a lubricant pump having a cylinder, a piston reciprocable in said cylinder, a conduit through which lubricant may be supplied to said cylinder, means for positively forcing lubricant under pressure through said conduit to said cylinder, an outlet from said cylinder through which lubricant may be forced to said points, means for reciprocating said piston in said cylinder and valve means in the outlet of said pump and loaded to a pressure higher than that delivered by said forcing means for preventing direct passage of lubricant from said inlet conduit through said cylinder and into the pipe system while permitting the lubricant to be forced from the cylinder to the pipe system by said piston.

9. A central lubricating system including a plurality of charge-determining lubricant cups containing lubricant pressure-operated means for forcing the lubricant from said cups, a lubricant pump for forcing lubricant through a pipe system to said cups, said pump comprising a lubricant chamber adapted to hold more lubricant than is required to fill and operate all of said cups, a piston in said chamber for forcing the lubricant therefrom, means for forcing lubricant through a conduit to said chamber from a source of supply, a discharge passage connecting the chamber with the pipe system and a two-way valve device for preventing the direct passage of lubricant from the source of supply to said pipe system while permitting passage of lubricant from the chamber to the pipe system when said piston is operated and also permitting return of lubricant from the pipe system to the chamber prior to completion of the discharge stroke of the piston.

10. A central lubricating system including a plurality of charge-determining lubricant cups having pistons operated in one direction by lubricant pressure and in the other direction by a spring, a lubricant pump, a pipe system connecting said pump with said cups, and two-way check valve means in said pipe system for normally maintaining said system disconnected from said pump but permitting said pump to force lubricant through said system and the springs in said cups to force lubricant from said system into said pump and reverse the direction of movement thereof.

11. A central lubricating system including a plurality of charge-determining lubricant cups having plungers spring operated in one direction, power driven pump means operating in one direction to force lubricant through a pipe system to said cups, a valve in said pipe system actuated by back pressure of lubricant therein to permit operation of said pump means in the reverse direction when said springs operate said plungers.

12. A lubricating system including a plurality of devices for controlling the quantity of lubricant supplied to the bearings to be lubricated, lubricant pumping mechanism,

a system of piping connecting said mechanism and said devices, a power operated pump having a moving part and means operated by said moving part, for automatically stopping said mechanism at a predetermined point in its operation, said means acting irrespective of the pressure in said pipe system.

13. A central lubricating system including a plurality of devices adjacent the bearings to be lubricated for controlling the quantity of lubricant supplied thereto, a vacuum operated lubricant pump, a pipe system connecting said pump with said devices, and means associated with said pump and automatically actuated upon reciprocation of the piston thereof for stopping the operation of the pump at a predetermined point, said means serving to prevent unnecessary waste of lubricant should a leak occur in said pipe system.

14. In a central lubricating system, a lubricant reservoir, a branched conduit system having a plurality of outlets and an inlet, intermittently operable pressure means to deliver lubricant from the reservoir to the inlet, reciprocable valve means at each outlet including a spring pressed member movable to closed position against the pressure of the spring by a pressure impulse to discharge a predetermined quantity of lubricant and arranged to be held in closed position by the pressure, and means to relieve the pressure comprising a member reciprocable between the pressure means and the inlet of the system, and a check valve carried by said member.

15. In a chassis lubricating system, a measuring valve, an intermittently operable pressure means, conduit means connecting the pressure means and the measuring valve, and means to relieve the pressure in the system comprising a member reciprocable in said conduit means, and a check valve carried by said member.

16. In a lubricating system of the character described including self-restoring devices at the bearings for shutting off flow to the latter after delivery to each thereof of a substantially given charge of oil, a pump and piping associated with said devices capable of delivering oil in excess of the aggregate charges for the bearings, means associated with the pump for limiting the maximum attainable pump pressure, and fluid pressure responsive means associated with the pump and piping for trapping oil in the latter and permitting relief of pressure therein to effect self-restoring of said devices upon relief of pump pressure.

In testimony whereof, I have signed my name to this specification.

HOWARD J. MURPHY.