June 27, 1933. A. BIZZARRI 1,915,512

HIGH PRESSURE LUBRICATING PUMP

Filed Oct. 10, 1931 3 Sheets-Sheet 1

Fig. 1.

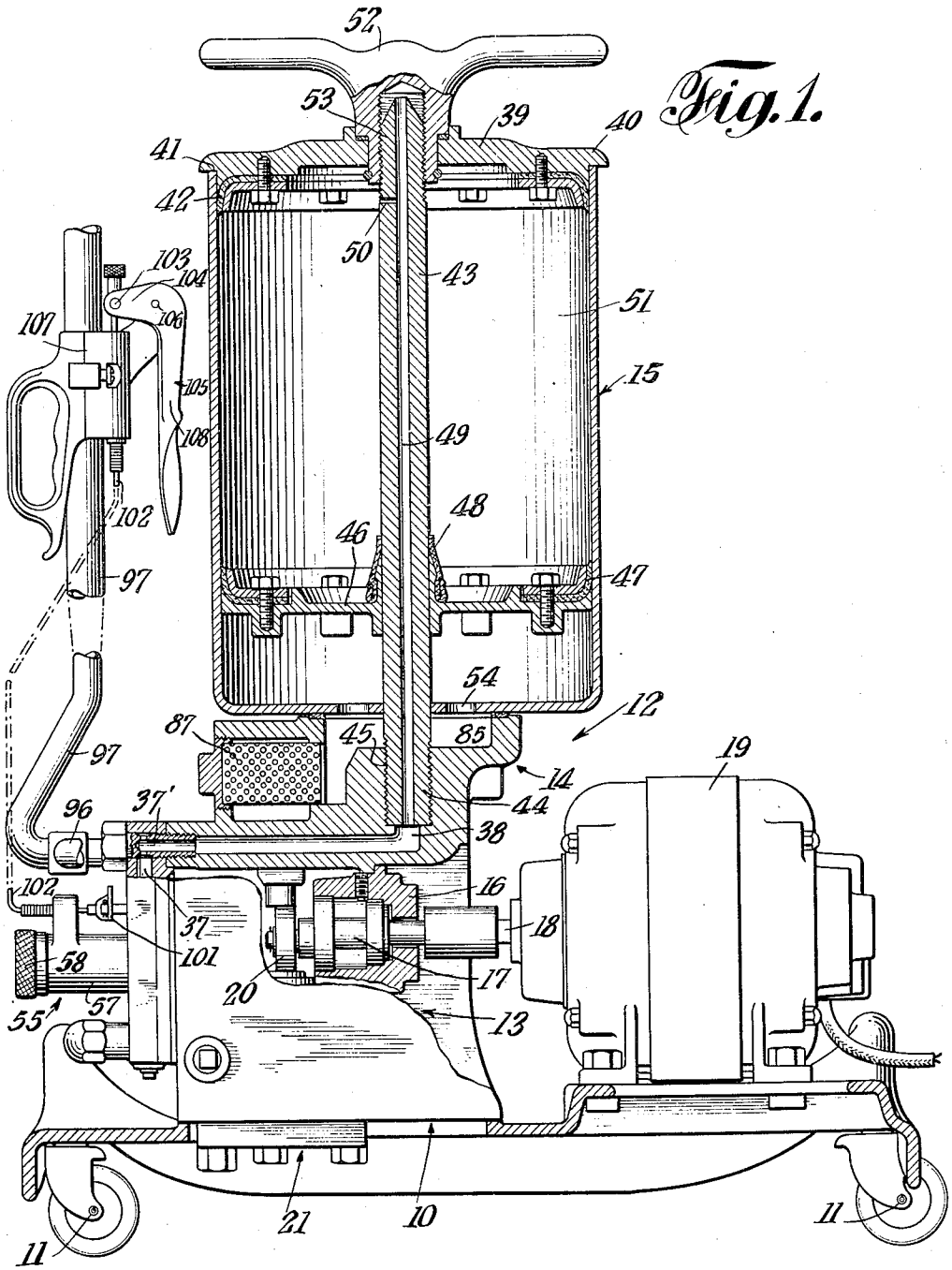

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Fig. 2.

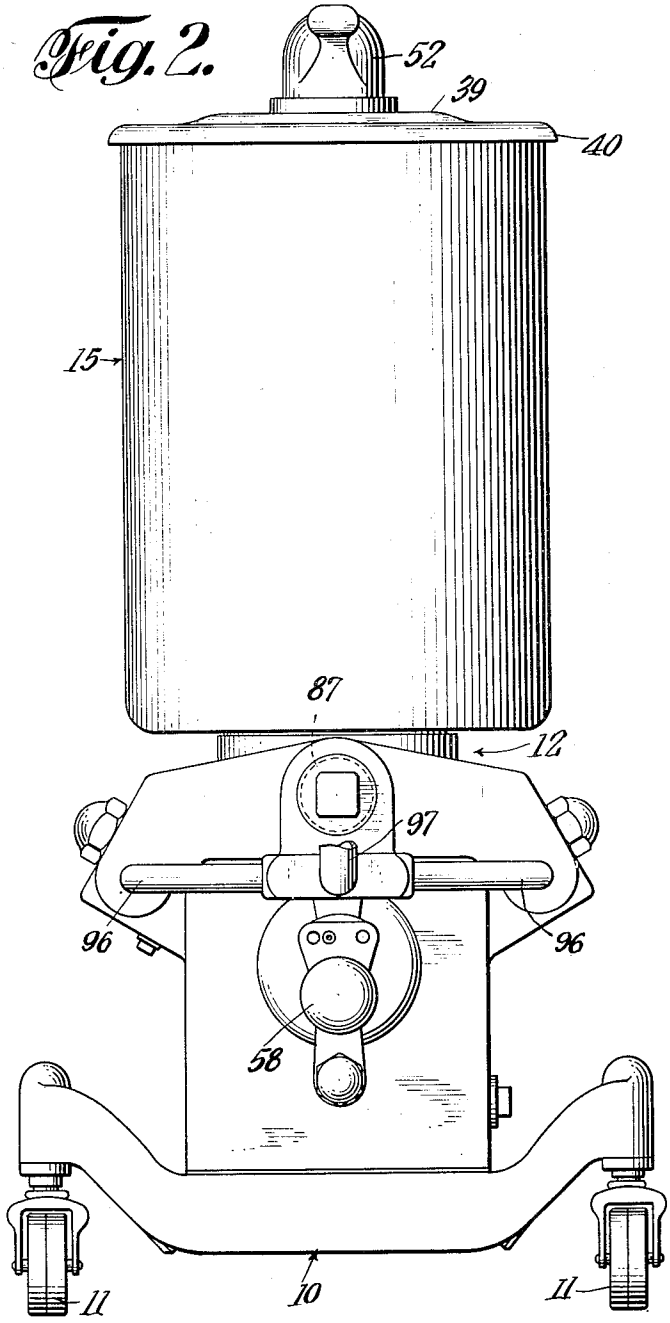

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Fig. 3.

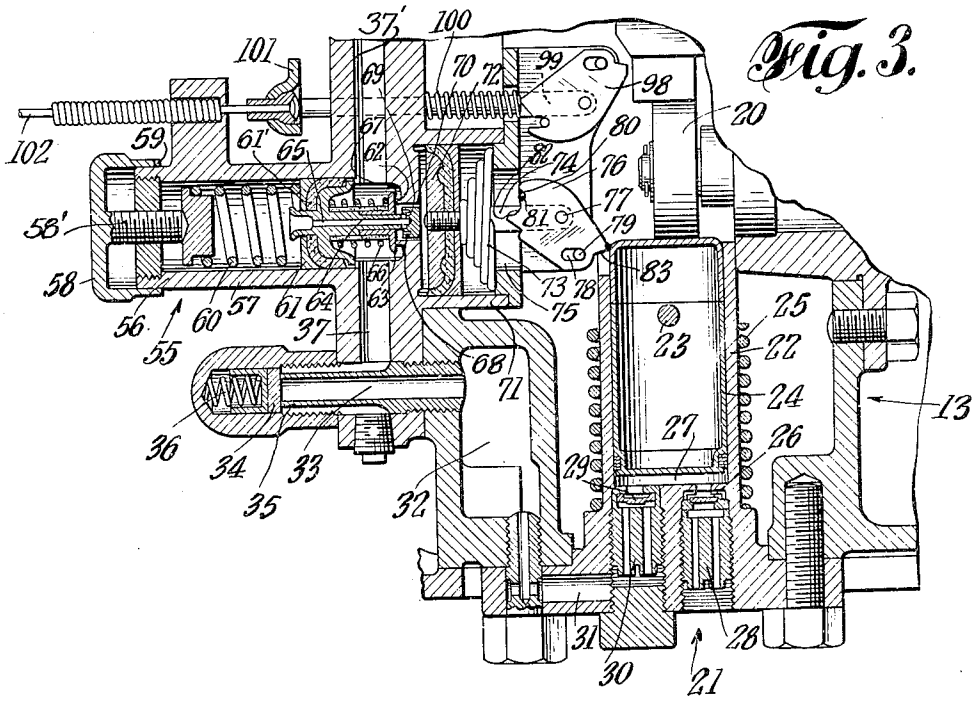


Fig. 5.

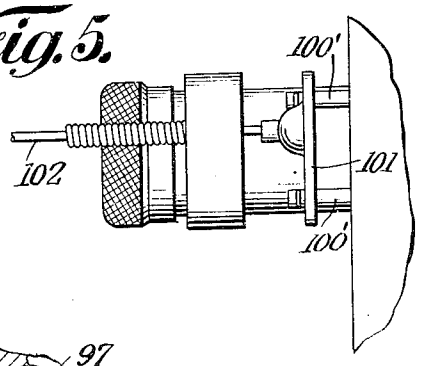
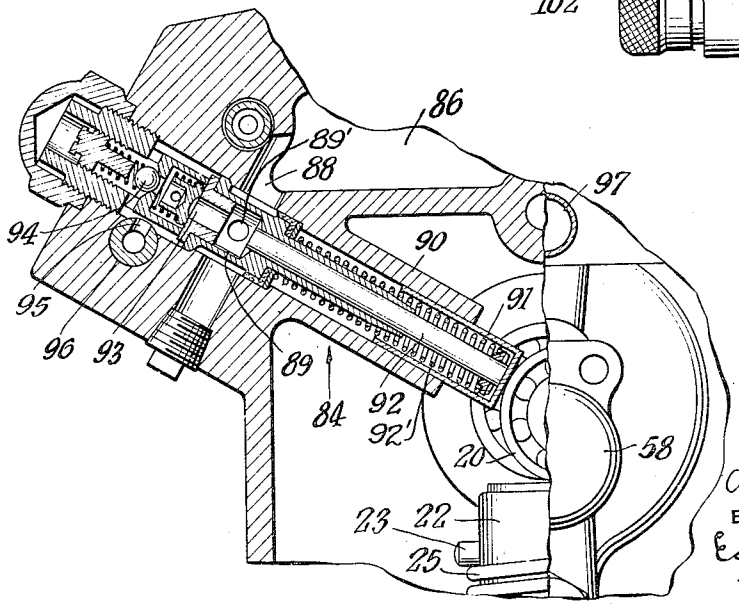


Fig. 4.



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Patented June 27, 1933 1,915,512

UNITED STATES PATENT OFFICE

ANTHONY BIZZARRI, OF NEW YORK, N. Y.

HIGH PRESSURE LUBRICATING PUMP

Application filed October 10, 1931. Serial No. 568,054.

My present invention relates to pumps, particularly high pressure pumps, especially such as are adapted to deliver lubricants, such as greases, particularly heavy greases, such as "Marfax", and aims to devise articles of the general character specified which are simple in construction, which may be readily and economically fabricated and assembled, and which are highly efficient in operation, the devices of the present invention being characterized by the high pressures which are readily obtainable by their use, their mechanical efficiency, their ready controllability and the ease with which they may be operated and regulated. Other objects and advantages of the devices of the present invention, particularly as exemplified in the following illustrative embodiments of the same, will in part be pointed out in detail hereinafter and will in part be obvious to those skilled in the art to which the present invention relates.

In the accompanying specification I shall describe, and in the annexed drawings show, an illustrative embodiment of the present invention. It is, however, to be clearly understood that my invention is not limited to the specific embodiment thereof herein shown and described for purposes of illustration only.

Referring to the drawings, in which I have shown the aforesaid illustrative embodiment of the present invention:

Fig. 1 is a side elevation, with parts shown in section;

Fig. 2 is a front elevation of the same;

Fig. 3 is a transverse sectional view taken through the pneumatic control device intended to be utilized in connection with the aforesaid illustrative embodiment of the present invention; and

Fig. 4 is a similar view, in detail, of the grease pump or pumps, likewise intended to be used in connection with the aforesaid illustrative embodiment of the present invention.

Referring now more in detail to the aforesaid illustrative embodiment of the present invention, and with particular reference to the drawings illustrating the same, the numeral 10 generally designates a truck or carriage mounted upon castors 11 and adapted to carry a casing 12 in which is enclosed all of the various operative parts of the lubricating device of the present invention, such casing being divided into three portions, 13, 14 and 15, respectively, the eccentric and air pump control housing, the grease pump housing, and the grease containing housing.

The eccentric and air pump control housing 13 is provided in one of the rear walls thereof with a bearing 16, in which is journalled a shaft 17, constituting an extension of the shaft 18 of an electric motor 19. The end of the shaft 17, which is within the housing 13, has secured thereto an eccentric 20, which is adapted to operate upon an air pump piston and grease pump pistons hereinafter described in detail. While any desired form of air pump adapted to be operated by an eccentric arrangement, such as has here been described, may be employed in the present invention, I prefer to use the form of air pump illustrated in the drawings, and generally designated by the numeral 21.

This pump consists of a pump cylinder 22 formed with and rising from the bottom wall of the housing 13, and provided with a pair of oppositely disposed longitudinal slots (not shown) extending from the upper edge of the cylinder to a point approximately one-third of the distance between the upper edge of the cylinder and the lower edge thereof.

Slidable within the slots so as to be guided thereby is a pin 23 which passes through a piston 24 operable within the cylinder 22, the pin extending slightly beyond the outer periphery of the cylinder 22 and being engaged by the upper end of an expansion spring 25 coiled about the outside of the cylinder 22 and having its lower ends abutting the bot-

tom wall of the housing 13. It will thus be seen that by the arrangement just described, the pump piston 24 is retained normally in its uppermost position, that is, in contact with the eccentric 20.

The bottom wall of the housing 13 is provided with a port 26 communicating with the compression chamber 27 of the air pump 21 which port is provided with an inlet valve 28. Adjacent the inlet valve 28, the cylinder 22 is provided with an outlet port 29 controlled by a valve 30, the former communicating with a port 31 formed in the bottom and front walls of the housing 13.

The port 31 communicates with an air chamber 32, which in turn communicates with a passage 33 controlled by a check valve 34, normally urged against the seat 35 by an expansion spring 36, the passage 33 communicating with an air chamber 37 formed in the front wall of the housing 13. The chamber in turn communicates with a port 37′ formed in the upper wall of the housing 13 and continues through the upper wall of the housing 13 from where it enters the grease pump housing 14 by means of the port 38.

Before continuing the course of the port 38, it may be desirable to describe the grease container employed in the present invention and with which such port communicates. While any desired type of grease container may be employed, it is preferred that the type shown in the drawings be utilized, which consists of the housing 15 provided with a cover 39, having a flange 40 resting on the upper edge 41 of the housing 15. The cover carries a gasket 42 to make the same air-tight. Passing through the cover 39, and centrally through the casing 15, is a supporting rod 43 having its lower end 44 threaded to engage within the threaded portion 45 of the housing 14, and slidable on this rod is a follower 46 having its outer periphery snugly fitting the inner surface of the casing 15. The follower is provided with a gasket 47 engaging the inner surface of the casing 15 and another gasket 48 engaging the outer surface of the supporting rod 43. The rod 43 is provided with a central port 49 which communicates at its lower end with the port 38 of the housing 14, the upper end of the port 49 having the outlet 50 communicating with an air chamber 51 in the casing 15 intermediate the cover 39 and the follower 46. The cover is held in place by means of a handle 52 engageable with the upper threaded end 53 of the rod 43, the latter extending through the cover 39.

It will thus be seen that when the eccentric 20 is operated, the piston 24 will be actuated to take in air through the valve 28 into the cylinder compression chamber 27, which air is forced out of the chamber through the valve 30 into the port 31. From the port 30, the air enters the chamber 32, and then out of such chamber to the port 33 and thence to the chamber 37, from where the air continues into the ports 37′ and 38, rod port 49, out of the outlet 50, into the air chamber 51 to exert pressure upon the follower 46, it being understood that the follower 46 forces the grease below the same out of the casing 15 through the openings 54.

As stated in the introductory remarks of this specification, it is one of the main objects of this invention to provide means whereby heavy lubricating grease is fed under high pressure by high pressure pumps, and that the grease is fed into such high pressure pumps by means of supplementary air pressure exerted above the follower in the grease container, and it is desired that the arrangement be such that when the pressure above the follower reaches a certain maximum point, which maximum point is adjustable, as will hereinafter be described, then the air pump is to automatically discontinue supplying air above the follower, and when that pressure becomes decreased to a certain minimum, the reduction being brought about by using the grease within the grease container, then the pump is to automatically again supply the required air pressure above the follower.

While any number of arrangements for accomplishing this result might be utilized, I prefer to use the arrangement illustrated in the present drawings, and which I shall hereafter refer to as the air pump control mechanism.

This mechanism, generally designated by the numeral 55, consists of a horizontal cylinder 56 formed with and extending outwardly from the front wall of the housing 13. The outer surface of this cylinder is provided with markings 57, constituting designations of air pressure. Threadedly engaged over the outer end of the cylinder 56 is a cap 58 having a knurled portion by which the same may be adjusted and an indicating portion 59 which may be made to point to a designated air pressure on the graduations 57, by adjusting the cap 58. Formed with the inside of the cap 58 is an inward projection 58′ abutting the outer end of a pressure control expansion spring 60, the other end of which abuts a cam plunger 61 provided with a gasket 61′ to prevent air from passing beyond the plunger 61 and up into the cylinder 56.

Formed on the front wall of the housing 19 within the air chamber 37, is a valve seat 62 adapted to cooperate with a valve 63 slidable on an extension 64 formed on the cam plunger 61 and provided with a central port 65 which communicates at one end with the atmosphere, the valve 63 being normally maintained in engagement with the seat 62 by means of an expansion spring 66, one end of which abuts the cam plunger 61. The surface 67 of the valve 63, adjacent the extension 64 of the cam plunger 61, also constitutes a seat

with which cooperates a valve 68 controlling the communication of the port 65 and its associated outlet 69 with the opening 70, formed in the front wall of the housing 13. The latter opening communicates with an air chamber formed within a cylinder 71 likewise formed on the front wall of the housing 13 and within which there is slidable a plunger 72 normally maintained all the way to the left in the cylinder 71, by means of the expansion spring 73, one end of which abuts the plunger and the other end of which abuts the inner wall of the cylinder 71.

Extending from the plunger 72 is a rod 74 passing out of the cylinder 71 through the opening 75, the outer end of such rod being pivotally engaged with a cam 76 by means of the pintle or pivot point 77. The cam 76 is provided adjacent the lower edge thereof with a slot 78 in which is engageable a guiding pin 79, this slot being entirely enclosed, and near the upper end of the cam 76 is an open slot 80, in which is normally engaged a guiding pin 81. Adjacent the slot 80 is a cam surface 82 upon which rides the pin 81, as will hereinafter be described more in detail. The lower, forward end of the cam 76 is provided with a projection 83, constituting a plunger-engaging portion which is adapted upon the happening of certain events hereinafter set forth to engage the piston 24 of the air pump 21 to hold the latter away from the eccentric 20, thus discontinuing the operation of the air pump 21.

This completes the description of the air pump control mechanism and at this point it is deemed desirable to set forth the operation thereof. As stated, the eccentric 20 operates the piston 24 of the air pump 21, which operation causes air from the pump to pass out of the cylinder 22 into the ports 31, 32 and 33 and thence to the air chamber 37. From this point, the air continues through the ports 37', 38 and 49 out of the outlet 50 and into the air chamber 51 above the follower 46, thus pressing the follower against the grease contained in the casing 15. When the air pressure in the air chamber 37 becomes greater than the pressure exerted against the plunger 61 by the spring 60 which has been adjusted to maintain a predetermined maximum air pressure against the plunger by means of the cap 58, the cam plunger 61 will be moved forwardly in the cylinder 56 against the action of the spring 60. In so moving, the valve 68, which is a part of the extension 64 of the plunger 61, will close against the seat 67 formed by the surface of the valve 63 adjacent the center thereof, thus closing the communication through the port 65 and associated outlet 69 between the air chamber 37 and the atmosphere. Continued movement of the plunger 61 causes the valve 68 to move the valve 63 against the action of the spring 66, away from the valve seat 62, thus permitting a communication between the air chamber 37 and the chamber 71. Hence, the air from the chamber will pass between the valve 63 and the seat 62 through the opening 70 and into the chamber 71, causing the cam plunger 72 to move forward in the cylinder 71 against the action of the spring 73. This movement in turn causes the cam 76 to be moved forwardly until the pin 79 is at the extreme left end of the enclosed slot 78 in the cam and the pin 81 is at the extreme left end of the open slot 80, at which time the piston engaging portion 83 of the cam will be located over the piston 24 of the air pump 21. Continued movement of the plunger 72 causes the cam 76 to pivot about the pin 79 so that the pin 81 rides on the cam surface 82 and the piston-engaging portion 83 of the cam presses against the piston 24 of the air pump, moving the same out of the range of the rotating eccentric 20, thus discontinuing the operation of the air pump 21.

As the grease from the casing 15 is utilized in a manner which will hereinafter be set forth, the pressure in the chamber 51 above the follower 46 will become decreased and similarly the pressure in the chamber 37 will also become decreased. When this pressure drops to the minimum, which has been determined by the adjustment of the cap 58 along the graduations 57 on the cylinder 56, the pressure exerted by the spring 60 will again be in excess of the pressure of the air in the chamber 37, so that the plunger 61 will be moved back towards its original position. Such movement causes, first, the valve 63 to engage the seat 62, thus sealing the communication between the chamber 37 and the chamber 71, so that no further air pressure will be exerted against the cam plunger 72. Continued movement of the plunger 61 causes the valve 68 to move away from the seat 67 formed by the surface of the valve 63 adjacent the center thereof, thus opening the communication between the chamber 71 and the atmosphere by way of the port 65 and associated outlet 69. As a result, the air in the chamber 71 will pass between the valve 68 and its seat 67 through the outlet 69 and port 65, to the atmosphere, so that the spring 73 will move the cam plunger 72 back to its normal position at the extreme left, thus returning the cam 76 to its original position and permitting the piston 24 again to be engaged by the eccentric 20. Thus, the air pump 21 will again begin to operate and the cycle of operations just set forth will be repeated.

This completes the description of the construction and operation of the air pump control mechanism, and I shall now describe the grease pump or pumps proper which are used with the lubricating device of the present invention. While any type of pump capable of discharging heavy lubricating grease under

high pressure may be employed, I prefer to use the form of grease pump illustrated in the drawings and which is there generally designated by the numeral 84. The casing 15 is provided with openings 54, in the lower wall thereof, communicating with a grease chamber 85 formed in the housing 14. The chamber 85 communicates with a horizontal chamber 86 in which there is fixed a filter 87, and the chamber 86 in turn communicates with one or more, such as two, ports 88. The ports 88 communicate with chambers 89 formed in pump cylinders 90 by way of inlets 89'.

Both of the cylinders 90 and associated pump mechanism are similar to each other so that only one of the same need be described in detail at this point. Each of the cylinders 90 has slidable therein a sleeve 91 which is closed at one end to abut the eccentric 20. Fixed within the sleeve is a plunger 92, the plunger and sleeve being maintained in contact with the eccentric by an expansion spring 92'.

The chamber 89 communicates by way of a passage 93, which is controlled by a check valve 94, with an outlet 95, in turn communicating with a pipe 96. Each of the pipes 96 communicates with a main conduit 97, the outer end of which carries a nozzle (not shown).

Each of the pump sleeves 91 is controlled by a cam 98 similar in all respects to the cam 76 which controls the piston 24 of the air pump 21, the cams being carried by rods 99 and being normally urged to an inward position to maintain the pump sleeves 91 out of engagement with the eccentric 20 by means of expansion springs 100. Each of the rods 100' is pivotally connected to a cross bar 101 to which there is fixed, to one side of the center thereof, one end of a Bowdin cable 102. The outer end of the Bowdin cable is fixed at 103 to one arm 104 of a lever 105 pivotally secured at 106 to a bracket 107 carried by the hose or conduit 97 adjacent the outlet nozzle thereof. The lever 105 is provided with a handle portion 108, the operation of which will later be described.

This completes the description of the aforesaid illustrative embodiment of the present invention. While the operation thereof is believed to clearly appear from the foregoing description, the same may be, for the sake of clarity, briefly summarized as follows:

The cap 58 of the pneumatic control 55 is adjusted so that the spring 60 exerts a predetermined force upon the plunger 61 for the purpose of controlling the operation of the air pump 21. The container 15 is filled with grease, after which the follower 46 is positioned within the container on the rod 43 and then the cap or cover 39 is positioned in place and held there by means of the handle 52. The motor 19 is now started. Assuming that the pneumatic control 55 has been so adjusted that the air pump 21 will operate should the pressure in the system as a whole drop below 75 pounds, and stop when the pressure in the system as a whole reaches 100 pounds, the eccentric 20 will drive the piston 24 of the pump 21 to take in air by way of the inlet 28 and force the same out by way of the outlet 30 into the passage 31. From this point, the air will pass through the chamber 32, port 33, past the valve 34 and into the air chamber 37. From this point the air will pass out of the chamber by way of the port 37', into the passage 38 from where the air will travel through the port 49 of the hollow rod 43 and out of the same by way of the outlet 50 into the interior 51 of the casing 15 above the follower 46. Here it will exert a downward pressure upon the follower to feed the grease in the casing 15 beneath the follower out of such casing by way of the outlets 54 into the chamber 85. From the chamber 85 the grease will pass through the filter 87, into the passage 88, thence into the pumps 84, from where the grease, as will later be seen, will be forced into the pipes 96 and conduit 97 and out of the same by way of the outlet nozzle (not shown) to lubricate whatever device the nozzle is connected with. As soon as the pressure within the system, and particularly within the chamber 37, reaches 100 pounds, it will be sufficient to overcome the strength of the expansion spring 60, so that the piston 61 will be urged outwardly in the cylinder 56 through the cap 58. This will cause the valve 68 to close against the seat 67, thus sealing the communication between the chamber 71 and the atmosphere by way of the port 69 and passage 65. Continued movement of the piston 61 will cause the valve 63 to move away from its seat 62, thus opening the communication between the chamber 37 and the chamber 71. This will cause the air in the chamber 37 to pass between the valve 63 and its seat 62 through the passage 70 into the chamber 71. This will cause the piston 72 to be moved against the action of the spring 73 to operate the cam 76 into the position shown in Fig. 3 of the drawings, thus holding the piston 24 of the pump 21 out of the path of the eccentric 20. Hence, the air pump will cease to operate.

In utilizing the grease pumps, the same may be used one at a time to deliver a certain volume of grease, or if double the volume is required, both of the grease pumps may be operated simultaneously. This can be done as follows: By depressing the handle portion 108 of the lever 105 half of the distance that it can be depressed, the Bowdin cable 102 will be pulled to move the cross bar 101 away from the device as a whole. Inasmuch as the Bowdin cable is connected to the cross bar at a point a bit off the center of the cross

bar, only one side of the cross bar will be moved. The rod 100, pivotally connected to the cross bar on the side that has been moved, will likewise be operated to disengage the cam 98 from the pump sleeve 91. This will permit the pump sleeve to come in contact with the rotating eccentric 20 to operate that particular pump. If the handle portion 108 is released, the cam 98 will assume its normal position to hold the pump sleeve out of engagement with the eccentric. However, should it be desired to deliver double the quantity of grease, the handle portion 108 may be depressed all of the way. This will cause first one of the pumps to be operated as just described and then because of the continued movement of the Bowdin cable, the longer side of the cross bar 101 will now be moved so as to actuate the remaining bar 100 and cam 98, thus permitting both pumps 34 to be operated by the eccentric 20.

As the grease is used, the air pressure in the entire system will decrease and as it decreases, the spring 60 will start to return the piston 61 to its normal position. By the time that the pressure in the system has dropped to 75 pounds, the valve 63 will engage its seat 62, thus sealing the communication between the chamber 37 and the chamber 71. Continued movement of the piston 61 toward its normal position will cause the valve 68 to disengage itself from its seat 67, thus opening the communication between the chamber 71 and the atmosphere, the air within the chamber 71 passing out of the same by way of the port 70, port 69 and passage 65. The release of the air from the chamber 71 will permit the expansion spring 73 to return the piston 72 to its normal position, which return will cause the cam 76 to become disengaged from the piston 24 of the pump 21, again permitting the eccentric 20 to operate the pump 21. Thereafter the cycle of operations just described will be repeated and the same will continue to be repeated each time that the pressure in the system reaches a maximum of 100 and a minimum of 75, or any other maximums and minimums that may have been selected by the adjustment of the cap 58.

This completes the description of the mode of operation of the aforesaid illustrative embodiment of the present invention. It will be noted that the present invention is admirably adapted to deliver lubricants, particularly heavy greases, at high pressures, is simple in construction, may be readily and economically fabricated and assembled, and is highly efficient in operation. Other objects and advantages of the devices of the present invention will readily occur to those skilled in the art to which the present invention relates.

What I claim as my invention is:

1. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, means to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and said first-named means, and means to actuate one or more of said grease pumps at a time.

2. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, means to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and such first-named means, and means to actuate one or more of said grease pumps at a time.

3. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, an air pump to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and said air pump, and means to actuate one or more of said grease pumps at a time.

4. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, an air pump to generate air pressure above the follower

in said container to force the grease from said container to said grease pumps, means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and such air pump, and means to actuate one or more of said grease pumps at a time.

5. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, means to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, pneumatic means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and said first-named means, and means to actuate one or more of said grease pumps at a time.

6. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, means to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, pneumatic means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and such first-named means, and means to actuate one or more of said grease pumps at a time.

7. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, an air pump to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, pneumatic means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and said air pump, and means to actuate one or more of said grease pumps at a time.

8. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, an air pump to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, pneumatic means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, means to actuate said grease pumps and such air pump, and means to actuate one or more of said grease pumps at a time.

9. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, means to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, said latter means including a plurality of pneumatically operated cooperating valves, means to actuate said grease pumps and said first-named means, and means to actuate one or more of said grease pumps at a time.

10. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, means to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, said latter means including a plurality of pneumatically operated cooperating valves, means to actuate said grease pumps and such first-named means, and means to actuate one or more of said grease pumps at a time.

11. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, an air pump to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, said means including a plurality of pneumatically operated cooperating valves, means to actuate said grease pumps and said air pump, and means to actuate one or more of said grease pumps at a time.

12. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, an air pump to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, said means including a plurality of pneumatically operated cooperating valves, means to actuate said grease pumps and such air pump, and means to actuate one or more of said grease pumps at a time.

13. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, means to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, an eccentric drive to actuate said grease pumps and said first-named means, and means to actuate one or more of said grease pumps at a time.

14. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, means to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, an eccentric drive to actuate said grease pumps and such first-named means, and means to actuate one or more of said grease pumps at a time.

15. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, an air pump to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, an eccentric drive to actuate said grease pumps and said air pump, and means to actuate one or more of said grease pumps at a time.

16. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, an air pump to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, an eccentric drive to actuate said grease pumps and such air pump, and means to actuate one or more of said grease pumps at a time.

17. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, means to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, pneumatic means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pres-

sure in the system reaches a predetermined maximum, an eccentric drive to actuate said grease pumps and said first-named means, and means to actuate one or more of said grease pumps at a time.

18. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, means to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, pneumatic means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, an eccentric drive to actuate said grease pumps and such first-named means, and means to actuate one or more of said grease pumps at a time.

19. In a lubricating device of the class described, a portable carriage, a grease container, a plurality of grease pumps, means to generate air pressure above the grease in said container to force the grease from said container to said grease pumps, means to start the operation of said first-named means when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, said latter means including a plurality of pneumatically operated cooperating valves, an eccentric drive to actuate said grease pumps and said first-named means, and means to actuate one or more of said grease pumps at a time.

20. In a lubricating device of the class described, a portable carriage, a grease container, said container comprising a cylindrical casing closed at one end and open at the other, said closed end having outlets for grease, a hollow rod passing centrally through and supporting said casing, a cover having a self-sealing gasket to close the open end of said casing, a handle engageable with the upper end of said rod to hold said cover in place, and a follower having self-sealing gaskets slidable on said rod within said casing, a plurality of grease pumps, an air pump to generate air pressure above the follower in said container to force the grease from said container to said grease pumps, means to start the operation of said air pump when the pressure in the system reaches a predetermined minimum and stop the operation of the same when the pressure in the system reaches a predetermined maximum, said means including a plurality of pneumatically operated cooperating valves, an eccentric drive to actuate said grease pumps and such air pump, and means to actuate one or more of said grease pumps at a time.

In testimony, whereof, I have signed my name to this specification this 24th day of Sept., 1931.

ANTHONY BIZZARRI.