

Feb. 12, 1935.

J. BYSTRICKY
LUBRICATING APPARATUS

1,990,524

Filed Feb. 24, 1932

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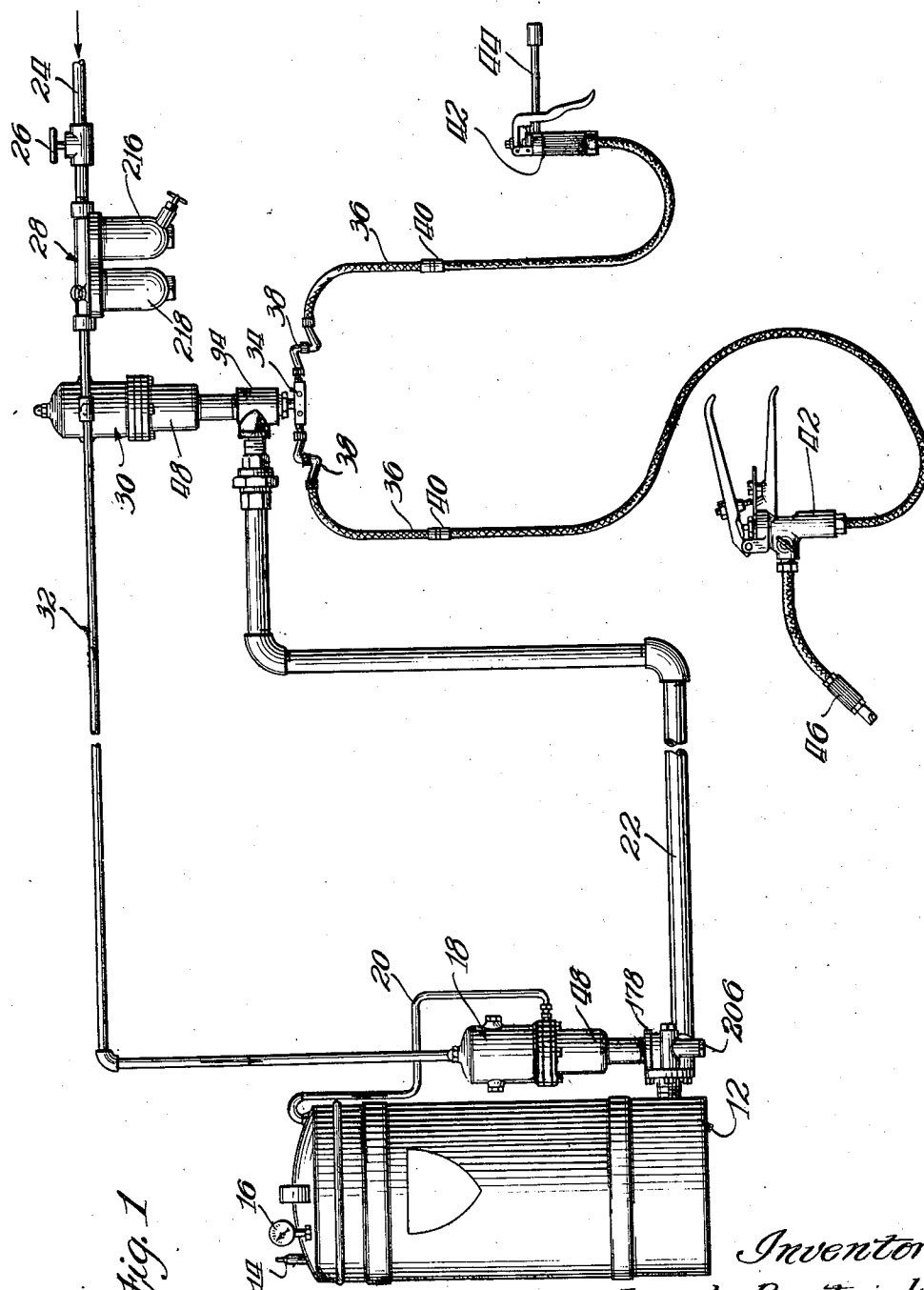


Fig. 1

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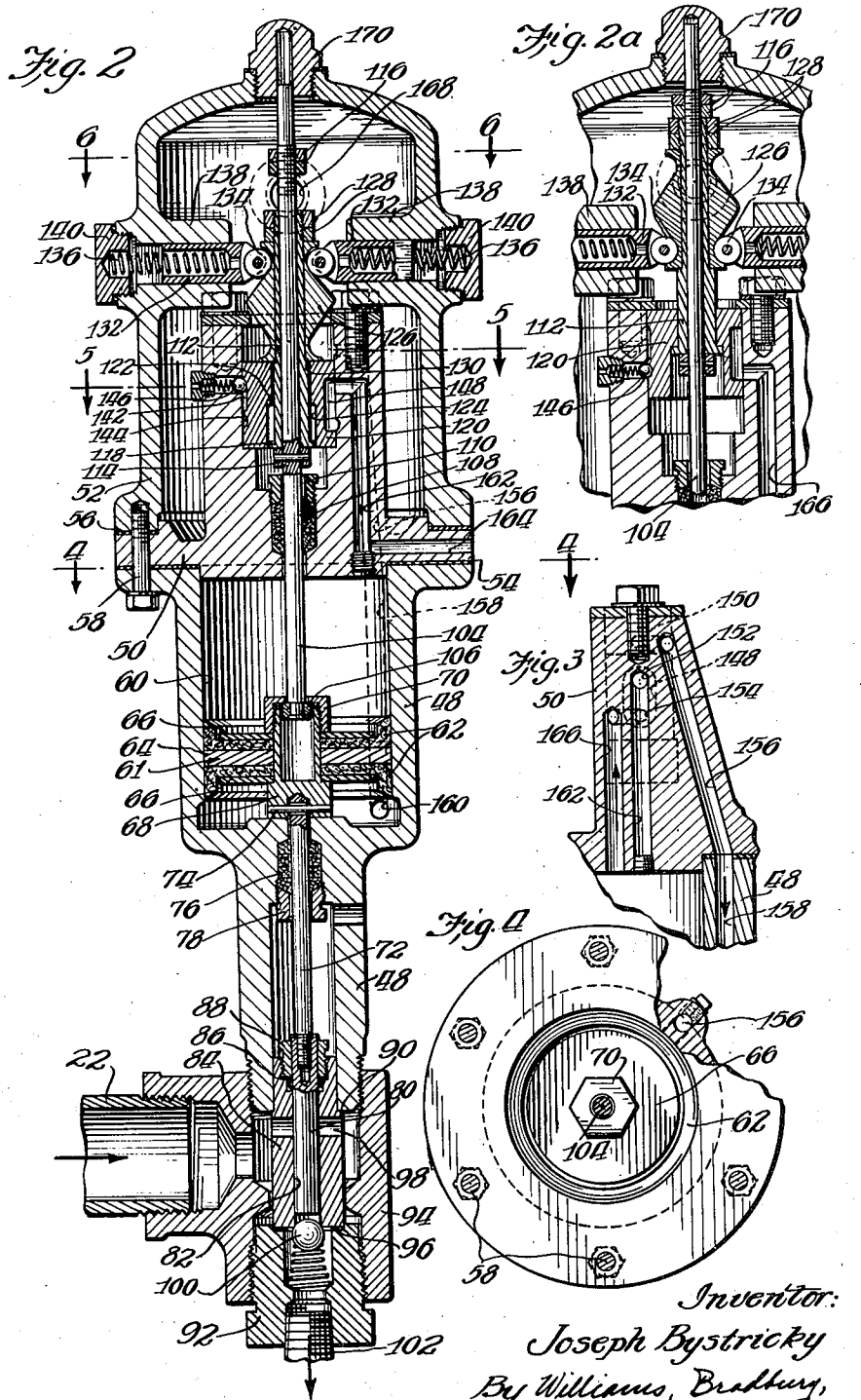
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5 Sheets-Sheet 2



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Fig. 5

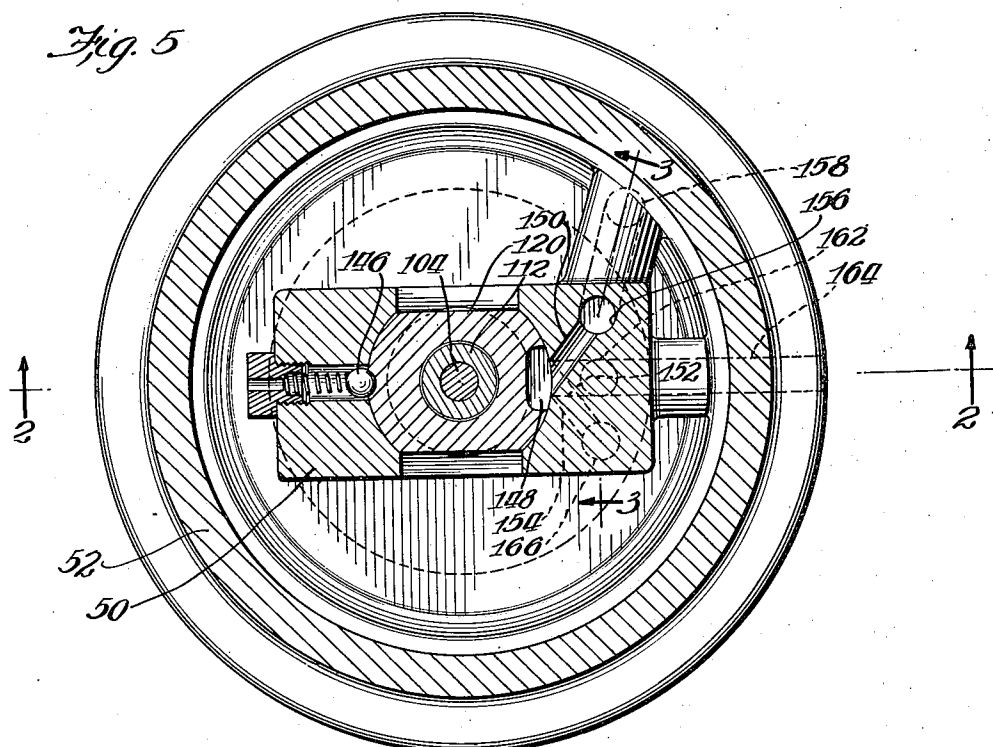
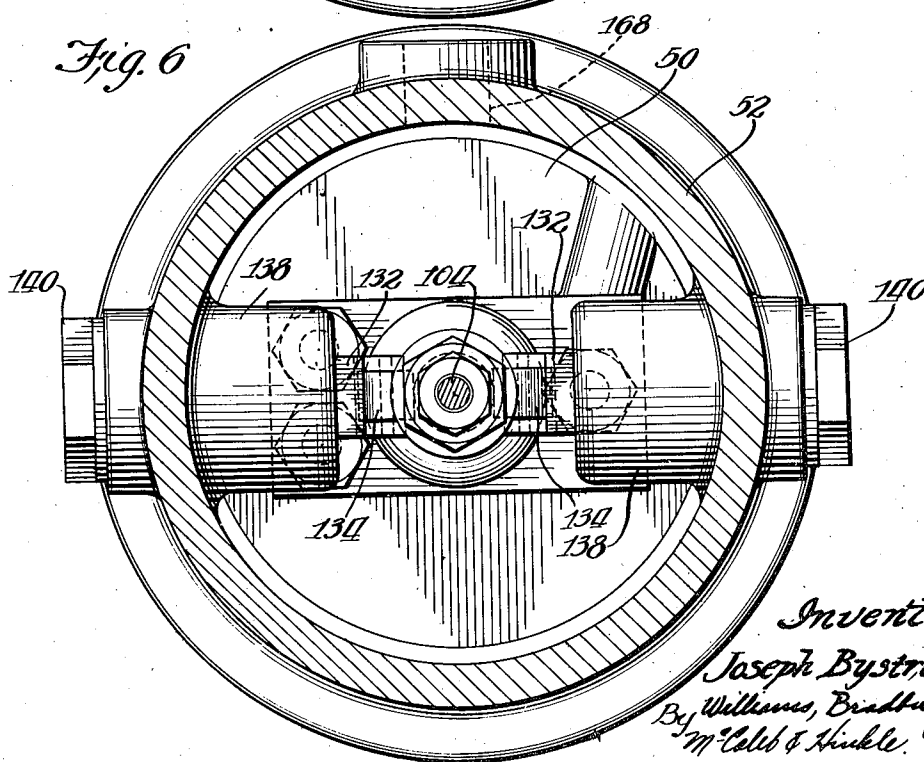


Fig. 6



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Fig. 7

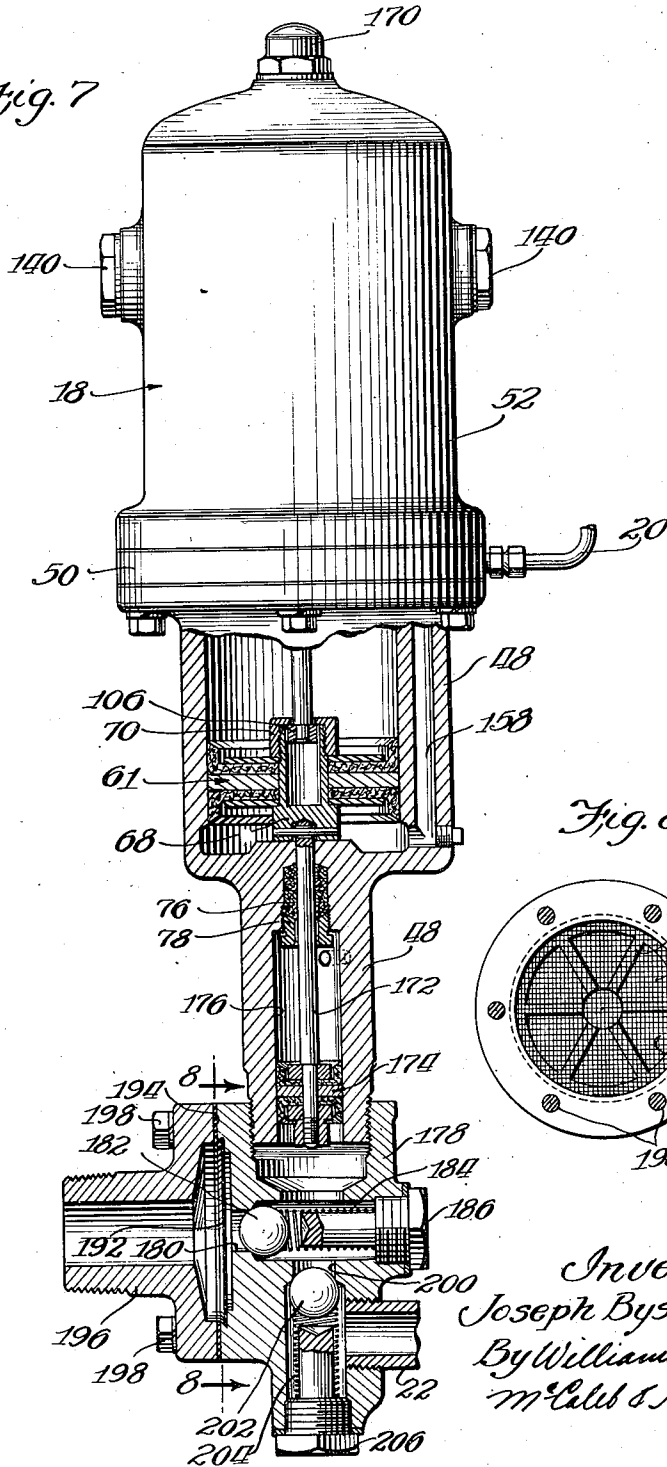
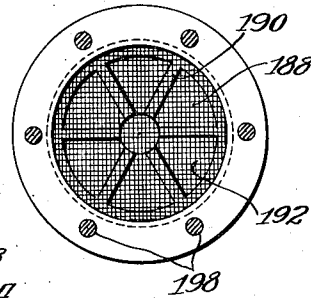


Fig. 8



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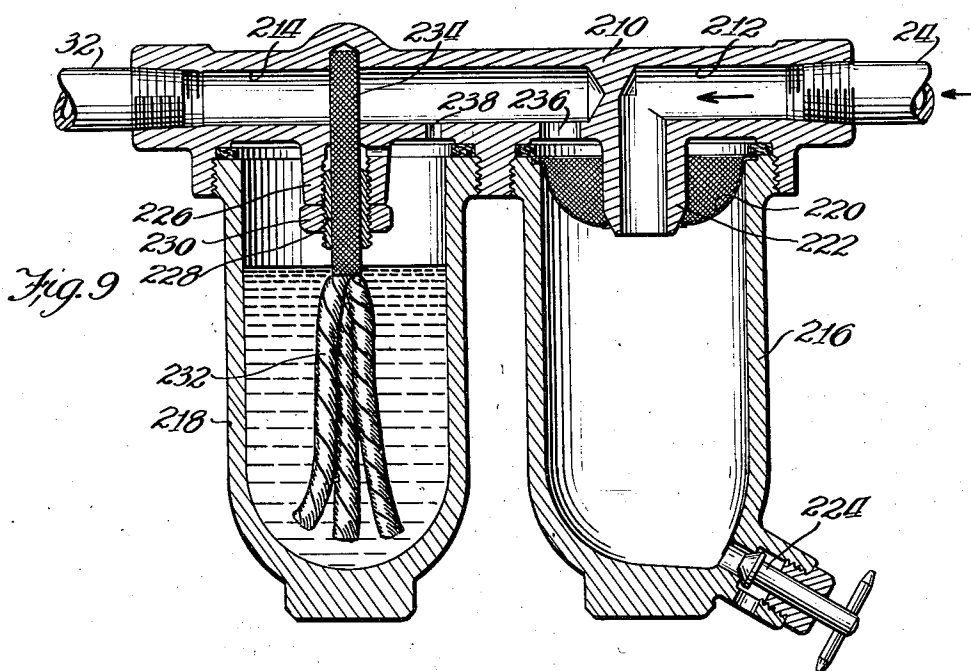
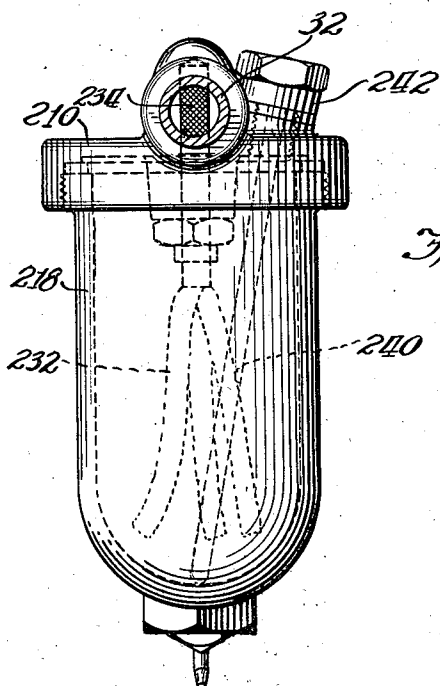
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

1,990,524

LUBRICATING APPARATUS

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Application February 24, 1932, Serial No. 594,781

6 Claims. (Cl. 221-47.1)

My invention relates generally to lubricating apparatus, and more particularly to the provision of improvements in apparatus of this type usable by service stations in connection with the greasing of automotive vehicles.

It is an object of my invention to provide an improved system and apparatus for maintaining a plentiful supply of lubricant at high pressure in the various discharge conduits by which lubricant is conducted to the bearings of the vehicle being lubricated.

A further object is to provide an improved pneumatically operated booster for maintaining a predetermined pressure in the discharge conduits of the lubricating system.

A further object is to provide an improved automatic pneumatic booster apparatus.

A further object is to provide an improved valve mechanism for pneumatically operated lubricant compressors and boosters.

A further object is to provide an improved air cleaning and lubricating apparatus for pneumatically operated machines.

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

Fig. 1 is a diagrammatic view of a lubricating system illustrating the arrangement of the apparatus of my invention as it may be utilized in a service station;

Fig. 2 is a central vertical sectional view of a pneumatic booster;

Fig. 2^a is a fragmentary sectional view showing the valve mechanism in displaced position;

Fig. 3 is a vertical sectional view taken on the line 3-3 of Fig. 5;

Fig. 4 is a sectional view taken on the line 4-4 of Fig. 2;

Figs. 5 and 6 are horizontal sectional views taken on the lines 5-5 and 6-6 of Fig. 2;

Fig. 7 is an elevation of a pneumatic compressor, the lower section thereof being shown in central vertical section;

Fig. 8 is a vertical sectional view taken on the line 8-8 of Fig. 7;

Fig. 9 is a central vertical sectional view of my improved air cleaner and lubricator; and

Fig. 10 is a side elevational view of the cleaner and lubricator shown in Fig. 9.

In the system of my invention, a supply of lubricant is maintained in the tank 12, which is provided with a suitable filling opening (not shown), a safety valve 14 and pressure gauge 16. The exhaust air from a pneumatically operated compressor 18 is conducted through a

pipe 20 to the top of the tank 12, the compressor withdrawing grease from the tank 12 and ejecting it through a discharge main 22. Air under pressure for operation of the compressor 18 is supplied through a pipe 24 connected to any suitable source of compressed air, the flow being controlled by a suitable valve 26.

The air flows through a cleaning and lubricating device 28 (illustrated in detail in Figs. 9 and 10) and is supplied to boosters 30 and to the compressor 18 from the air line 32. While the system as illustrated is provided with only one booster 30, it is to be understood that a plurality of these devices will usually be employed and that each of the boosters will be connected to the air supply line 32 and to the lubricant main 22.

As will hereinafter appear, the boosters 30 are operative to discharge lubricant under very high pressures into headers 34, to which suitable flexible discharge conduits 36 may be connected. These conduits are preferably connected through swivels 38, 40, and adjacent their ends are provided with valves 42 to control the flow through the flexible discharge conduit. Suitable means are connected to the valves for making a quick detachable connection with the fittings which are customarily secured to the parts of the automotive vehicle to be lubricated.

One of the conduits is herein shown as having a nozzle 44 for making connection with the push type fitting in which the connection is made purely by pressure contact, and the other valve is provided with a short flexible lead and coupling 46 by which connection may be made to bearings equipped with so-called pin fittings. The headers 34 are provided with a large number of openings so that several of the flexible discharge conduits may be supplied with lubricant from a single booster. The connection of the flexible conduits to the header are preferably made by a screw-threaded plug and socket connection so that a pipe plug may be threaded in any of the openings to which a flexible conduit is not connected. With the system arranged as shown, the pressure in the lubricant main 22 need be only sufficient to supply lubricant under relatively low pressure to the boosters 30, and the latter are operative to eject the lubricant under extremely high pressures suitable for the lubrication of bearings of an automotive vehicle.

Each of the boosters 30 comprises a cylinder casting 48 to which are secured a valve body 50 and a cap 52, suitable gaskets 54, 56 being interposed between these parts to make an air tight

seal therebetween. The parts are drawn together by a plurality of cap screws 58. The cylinder casting has a cylindrical bore 60 formed therein to receive a piston 61 formed of a pair of oppositely facing cup leathers 62, a backing plate 64 and face plates 66, which are secured in assembled relation on an axially bored connector 68, being held thereon by a cap nut 70 threaded over the end of the connector. A connecting rod 72 has its upper end loosely joined to the connector 68 by means of a pin 74. The rod 72 is reciprocable through a suitable packing 76 held in place by a packing gland 78. A plunger 80 is threaded to the lower end of the connecting rod 72 and is reciprocable in the cylindrical bore 82 of a high pressure cylinder 84. The upper end of the cylinder 84 is counterbored to receive a hat-shaped sealing washer 86 held in place by a bushing 88. The cylinder 84 is provided with an external shoulder 90 which abuts against the lower end of the cylinder casting 48 and is held thereagainst by a bushing 92 which is threaded in an angle fitting 94, the latter being in turn threaded to the lower end of the cylinder casting 48. A gasket 96 is interposed between the end of the cylinder 84 and the bushing 92. Lubricant is supplied to the cylinder through the lubricant main 22, through the elbow fitting 94, inlet ports 98 formed in the cylinder 84, and is discharged past a spring-pressed ball check valve 100 which is held against the lower end of the cylindrical bore 82 by the bushing 92. The header 34 is connected to the bushing 92 by a suitable nipple 102.

The piston 61 is adapted to be reciprocated by the alternate admission and exhaust of air under pressure to the cylinder 60 at the opposite sides of the piston 61. The mechanism devised for this purpose will now be described.

A valve rod 104 has a collar 106 riveted to its lower end, the collar being reciprocable within the bore of the connector 68. The valve rod extends upwardly through a suitable bore in the valve body 50, the escape of air being prevented by packing 108 and packing gland 110. A tubular sleeve 112 is freely slidable upon the valve rod 104, such sliding movement being limited by a collar 114 pinned to the valve rod 104 and a pair of nuts 116 threaded adjacent the upper end of the valve rod. The sleeve 112 has an annular flange 118 formed at its lower end. A slide valve 120 is freely movable relative to the sleeve 112, movement in one direction relative thereto being limited by the engagement of a shoulder 122 formed at the end of a counterbore 124 formed in the valve 120 with the flange 118. Movement of the valve 120 on the sleeve 112 in the opposite direction is limited by engagement of the valve with the lower end of a snap-over cam 126.

The cam 126 is rigidly secured upon the tubular sleeve 112 by means of a pair of nuts 128 which hold the cam against an annular shoulder 130 formed on the sleeve. A pair of plungers 132, each having a freely rotatable roller 134 carried at its inner end for engagement with the cam 126, are resiliently held in their innermost positions by springs 136. The plungers 132 are suitably guided in the bores of bosses 138 formed integrally with the cap 52, the ends of the bores being closed by plugs 140 which also serve as seats for the ends of the springs 136.

The slide valve 120 is provided with a longitudinally extending groove 142 and a depression 144 in alignment with said groove, said groove and depression being adapted to be engaged by a spring-pressed ball detent 146. The slide valve

120 is also provided with a short relatively wide groove 148 which is adapted alternately to connect ports 150 and 152, and 152 and 154.

The port 150 forms the end of a duct 156 formed in the valve body 50, the duct 156 communicating with a passageway 158 formed in the cylinder casting 48 and terminating in a port 160 adjacent the lower end of cylinder 60. The port 152 forms the end of an exhaust passageway 162 communicating with a horizontal passageway 164 which is open to the atmosphere. The port 154 is connected by means of an elbow-shaped passageway 166 with the upper end of cylinder 60. It will thus be apparent that the valve 120 is adapted alternately to connect the opposite ends of cylinder 60 with the atmosphere. When one end of the cylinder is thus connected with the atmosphere it will be noted that the slide valve uncovers the port to the opposite end of the cylinder, thereby permitting inflow of air under pressure from the inside of the cap 52, air under pressure being supplied to this cap through inlet port 168 from the pipe 32.

A dome-shaped plug 170, bored to receive the end of valve rod 104, is threaded at the top of cap 52 and may be removed when it is desired to adjust the positions of the nuts 116.

The low-pressure pneumatic pump, shown in detail in Figs. 7 and 8, has a valve operating mechanism identical with that used in the booster pump. The lubricant compression plunger is, however, of slightly different construction and comprises a piston rod 172 having a double cup leather piston 174 secured to the lower end thereof, the piston being reciprocated in a cylindrical bore 176 formed in the cylinder casting 48.

A casting 178 is threaded over the lower end of the cylinder casting 48. An inlet opening 180 in the casting 178 is normally closed by a check-valve 182 held against its seat by a spring 184, the spring being supported by a plug 186. The casting has a plurality of segment-shaped recesses 188 (Fig. 8) formed in its face around the inlet opening 180, the ribs 190 intermediate these recesses forming a support for a screen 192 which is held in place by an undercut flange 194 formed integrally with the casting 178. A fitting 196 for connection with the tank 12 is secured to the casting 178 by means of cap screws 198. The casting 178 is provided with a discharge passageway 200 which is normally closed by a ball check-valve 202 held against its seat by a spring 204, the latter being retained in position by a plug 206. It will be noted that compression of the springs 184 and 204 beyond their elastic limits is prevented by suitable projections formed on the plugs 186 and 206. The lubricant supply main 22 is suitably connected beyond the outlet check-valve 202.

Inasmuch as particles of metal dust and other foreign matter in the supply of air to the boosters or to the primary compressor 18 may seriously interfere with the operation thereof, and since it is desirable to maintain the valve parts properly lubricated, I have provided a combination air cleaner and oiling device which is illustrated in Figs. 9 and 10. This device comprises a casting 210 having an elbow-shaped passageway 212 and a longitudinal passageway 214 formed therein. The lower surface of the casting 210 is provided with two enlarged threaded bores into which bowls 216 and 218 are screwed. The bowl 216 is recessed to receive the peripheral edge of a wire mesh strainer 220, the central portion of the latter engaging the beveled end of a projec-

tion 222 formed integral with the casting 210. The bowl 216 is also provided with a suitable drain cock 224.

The casting 210 has a depending boss 226 into which is threaded a sleeve 228, the latter being held in position by a locknut 230. A plurality of wicks 232 have their upper ends compressed in a wire mesh tube 234, the latter being pressed in the sleeve 228 and held thereby so as to project upwardly through the bore in the boss 226 into the passageway 214. The passageway 214 has an inlet opening 236 communicating with the upper portion of the bowl 216 and a port 238 communicating with the upper end of the bowl 218. An ullage rod 240 carried by a threaded cap 242 is provided for the bowl 218.

In the use of my invention the pipe 24 is connected to a suitable source of compressed air, the apparatus placed in condition for operation by opening the valve 26. The compressed air is thoroughly cleaned of foreign particles by means of the filter screen contained within the bowl 26, and moistened with a suitable fluid lubricant by means of the wicking 242 which depends into the oil filter reservoir 218.

The air supplied to the low pressure pump 18 leads directly into the space within the casting 52 and causes operation of the air motor in the following manner: Referring to Fig. 2, the upper portion of which illustrates an air motor identical with that used on the low pressure pump, with the parts in the position shown the air under pressure would flow through the passageway 156 to the lower end of cylinder 60 and force the piston 61 upwardly, the upper end of the cylinder being connected to the upper end of the lubricant tank 12 through the passageways 166, 148, 162, 164 and conduit 20. Shortly prior to the completion of the upward stroke of the air piston, the connector 68 will strike the lower end of the valve rod 104 and move the latter upwardly with it. Just prior to the completion of the upward stroke of the air piston 61, the central high portion of the cam 126 will be substantially in line with the axes of plungers 132 and the latter will ride over the high point of said cam and, due to the pressure exerted by the springs 146, force the cam 126 together with its sleeve 112 upwardly with a sudden snap action. During this sudden upward movement, the flange 118 of the sleeve 112 will abut against the shoulder 122 of the slide valve and shift the latter rapidly to its upper position, whereupon, as will be apparent, the upper end of the cylinder 60 will be placed in communication with the compressed air and the lower end thereof in communication with the lubricant tank 12. The spring pressed ball detent will hold the slide valve in its upper position until as the air piston 61 moves downwardly the cap 70 engages the collar 106 and moves the latter downward sufficiently to move the high point of the cam 126 past the center line of the plungers 132, whereupon the cycle will be repeated. The exhaust air which is discharged from the motor into the upper end of the lubricant tank 12 maintains the lubricant therein under a predetermined relatively low pressure, which is controlled by means of the adjustable safety valve 14.

Reciprocation of the air piston 61 causes corresponding reciprocation of the lubricant piston 174. As the piston 174 is retracted, lubricant will be forced from the lubricant tank 12 (by the air pressure within said tank) through the strainer 188 past the inlet ball check valve 182 into the lower end of cylinder 176. Upon the discharge

stroke, the lubricant within the cylinder 176 will be displaced and forced past the check valve 202 into the main lubricant pressure line 22.

Whenever one of the valves 42 connected to the discharge lines is opened, the air motor connected to the associated booster pump 30 will immediately commence operation in the manner as above described with reference to the air motor of the low pressure pump 18. The lubricant flowing under pressure in the conduit 22 will rapidly and effectively prime the high pressure cylinder 82 so that even though there should be some air mixed with the lubricant the plunger 80 will at each stroke discharge a quantity of lubricant substantially equal to its displacement. The air motor connected with the booster pump 30 will continue in operation until the valve 42 is closed and a sufficient pressure built up in the discharge line of the booster pump to balance the force of the air pressure exerted upon the piston 61. The booster pump 30 will therefore be effective at all times to maintain the lubricant in the discharge conduits 36 at high pressure. The pressure obtained will, due to the great difference in cross-sectional areas of the air piston 61 and plunger 80, be sufficiently high to force the lubricant into clogged or "frozen" bearings. The service station operators need merely connect the discharge conduit 36 to the lubricant receiving fitting attached to the bearing to be lubricated and open the valve 42, whereupon lubricant will flow into the bearing at high pressure as long as the valve is held open. The operation of the lubrication of the bearings of an automobile or similar machine is thus made comparatively simple and substantially effortless for the service station attendant.

The above described apparatus of my invention is, considering the results attained, of extremely simple construction and may be economically manufactured. The primary low pressure pump 18 is preferably made of sufficient pumping capacity that a number of booster pumps 30 may be supplied thereby, and the booster pumps 30 are of sufficient capacity so that a number of bearings may be simultaneously supplied with lubricant.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A lubricating system comprising a lubricant reservoir, a source of air under pressure, a pneumatically operated pump for supplying lubricant from said reservoir to a lubricant main, means for connecting the exhaust of said pump to said reservoir to exert pressure upon the lubricant therein to aid in priming said pump, auxiliary automatically operable lubricant booster pumps supplied with lubricant from said main and capable of ejecting lubricant at high pressures, all of said pumps being connected to said source at all times whereby their operation will be governed solely by the relative pressure of the air from said source and the lubricant pressure at their respective discharge outlets, and a plurality of valve-controlled lubricant discharge conduits connected to the discharge of said booster pumps, respectively.

2. In a system of high pressure lubrication, the combination of a lubricant reservoir, a source of air under pressure, an automatic compressed air operated pump receiving a supply of lubricant from said reservoir and arranged to discharge the lubricant under relatively low pressure, a

- lubricant main connected to receive the discharge of said pump, a plurality of automatic compressed air operated booster pumps connected to said main and receiving lubricant therefrom and operable to eject lubricant under high pressure, all of said pumps being connected to said source at all times, whereby their operation will be governed solely by the relative pressure of the air from said source and the lubricant pressure at their respective discharge outlets, and a plurality of flexible lubricant conducting conduits connected to receive lubricant from said high pressure pumps, said conduits having valves to control the flow of lubricant therethrough and having means at their extremities for making a quick detachable connection with a part to be supplied with lubricant.
3. A high pressure lubricant supply installation comprising, a source of air under pressure, a lubricant container, means to maintain the lubricant therein under pressure, a pneumatically operated low pressure pump supplied with lubricant therefrom, a lubricant main for receiving lubricant from said pump, an automatically operating booster pump located remote from said pressure pump and supplied with lubricant from said main, all of said pumps being connected to said source and being automatically startable whenever the lubricant pressure at the discharge outlets thereof, respectively, bears less than the predetermined ratio to the pressure of the air supplied from said source, and valve controlled lubricant discharge conduits having means for making a detachable connection with lubricant receiving fittings on parts to be lubricated, said conduits being connected to the outlet of said booster pump to be supplied with lubricant thereby.
4. A lubricating system comprising a lubricant reservoir, a source of air under pressure, a lubricant main, an automatically starting and operating pump receiving lubricant from said reservoir and supplying it under relatively low pressure to said main, a plurality of automatically starting and operating booster pumps receiving lubricant from said main and discharging it under relatively high pressure, all of said pumps

being connected to said source and operable whenever the pressure at their respective discharge outlets falls below a predetermined pressure bearing a definite ratio to the pressure of the air supplied from said source and a plurality of valve controlled lubricant discharge conduits connected to receive the discharge from each of said booster pumps and each conduit being provided with means at its extremity for making a quick detachable connection with a lubricant receiving part.

5. A pneumatically operated lubricant compressor comprising an air motor having a reciprocating element, a plunger stem secured to said reciprocating element, a cylindrical housing about said stem, an elbow secured to the end of said housing, a supply conduit connected to the lateral opening in said elbow, a cylinder for said plunger projecting partially within said housing and having a shoulder abutting against the end thereof, a diametral passageway through said cylinder forming a double inlet port therefor, a bushing threaded in said elbow and engaging the end of said cylinder to clamp the shoulder of the latter against the end of said housing, and an outlet check valve pressed against the end of the bore in said cylinder by a spring seated within said bushing.

6. In a high pressure lubricant compressor, the combination of an air motor having a reciprocating piston and a cylinder casting for said piston, an axially bored cylindrical projection in axial alignment with said cylinder casting and formed integrally therewith, a plunger stem secured to the piston of said air motor and extending into the bore of said projection, a vent port in the wall of said projection connecting the bore thereof with the atmosphere, a high pressure cylinder having a part received in the bore of said projection and a shoulder abutting against the end thereof, a plunger secured to said stem and reciprocable in said cylinder, means for supplying lubricant to said cylinder, and an outlet check valve resiliently held against the end of the bore of said cylinder.

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