May 10, 1932. C. HARRIS 1,858,155

GREASING APPARATUS

Filed April 29, 1930 3 Sheets-Sheet 1

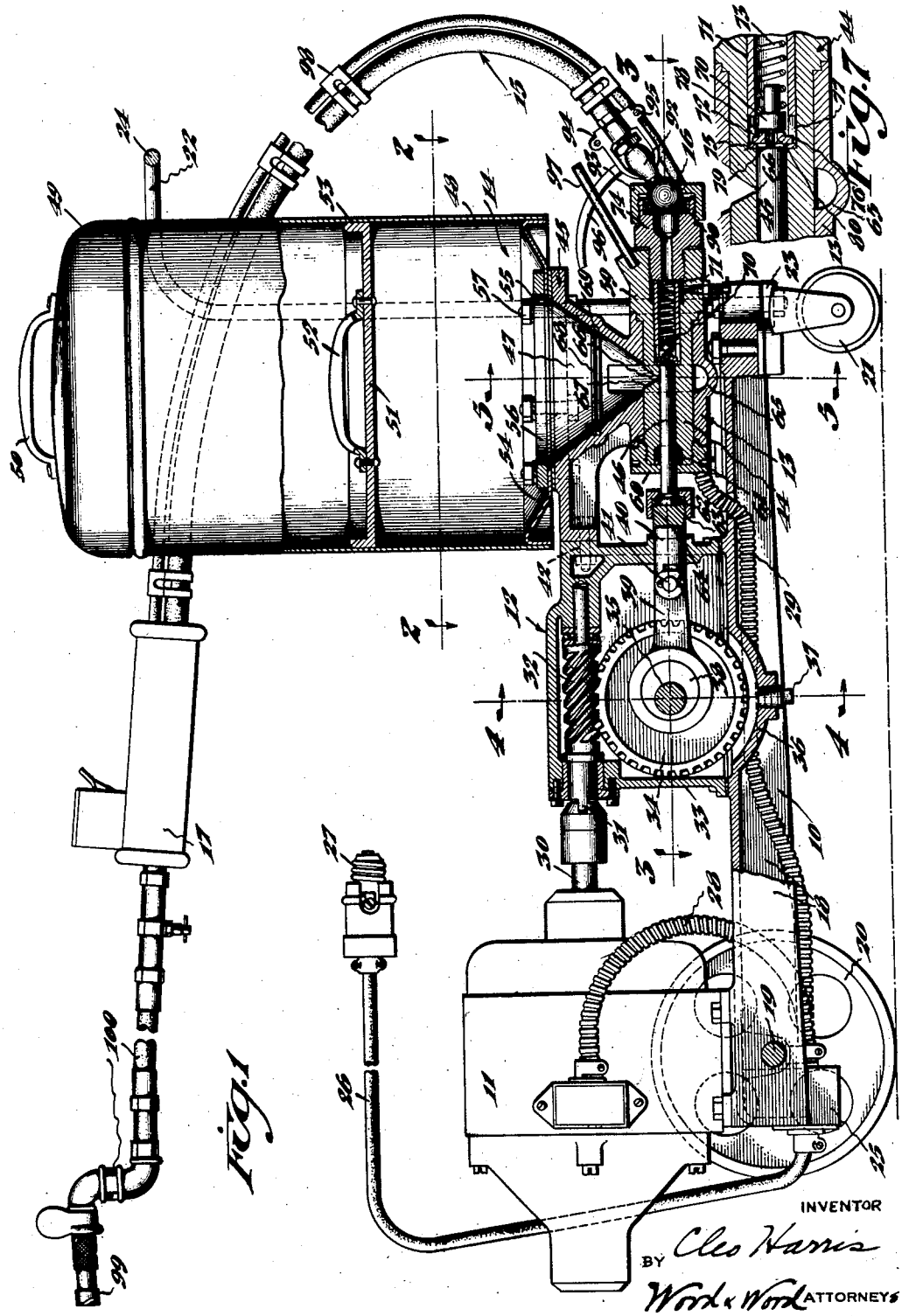

Fig. 1

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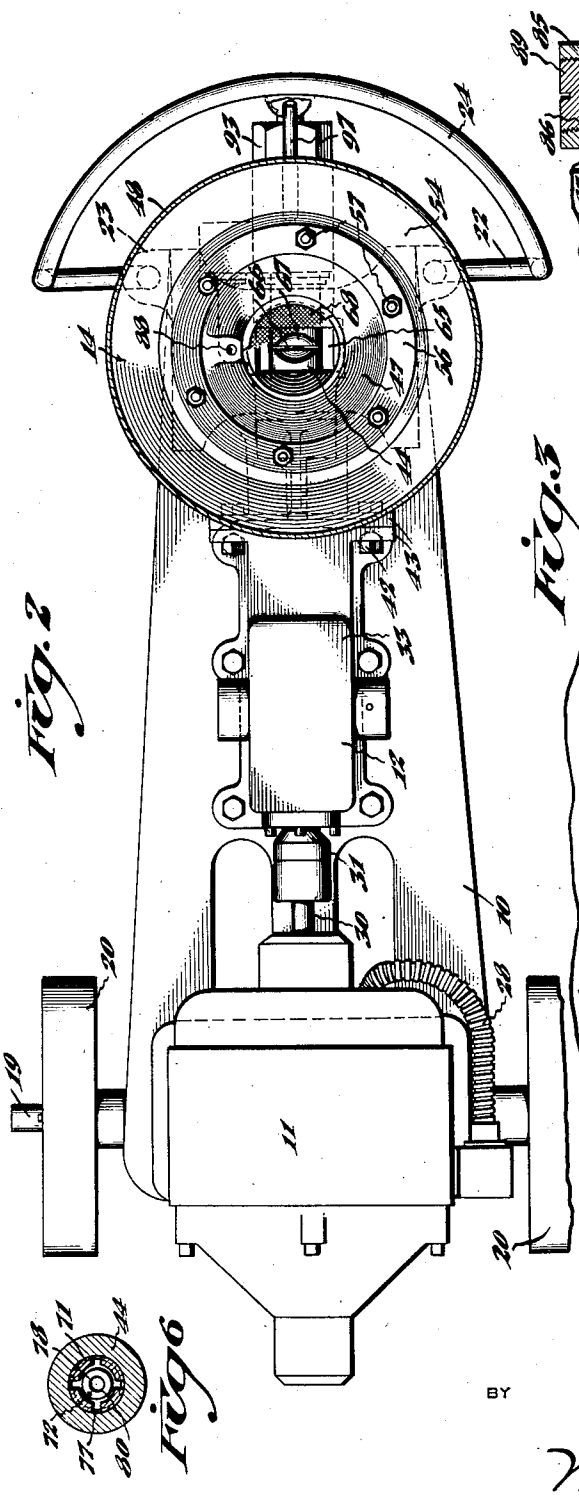

Fig. 2

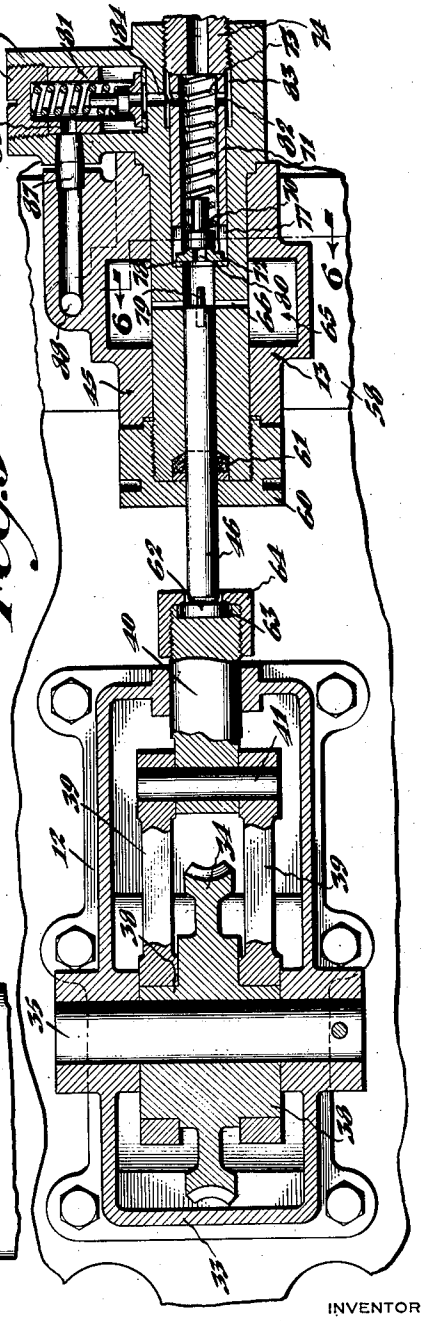

Fig. 3

Fig. 6

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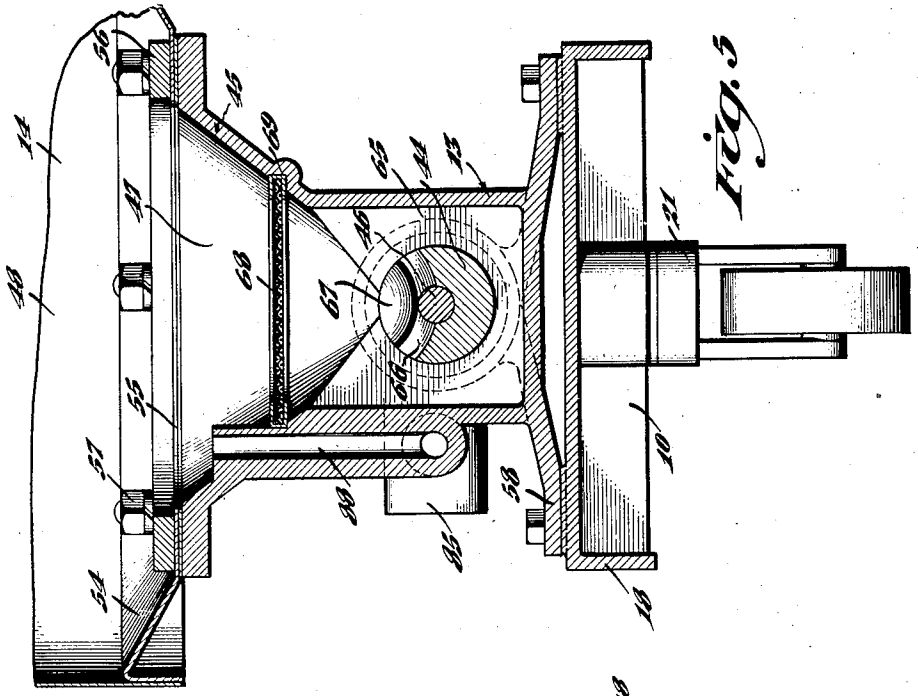

Fig. 3

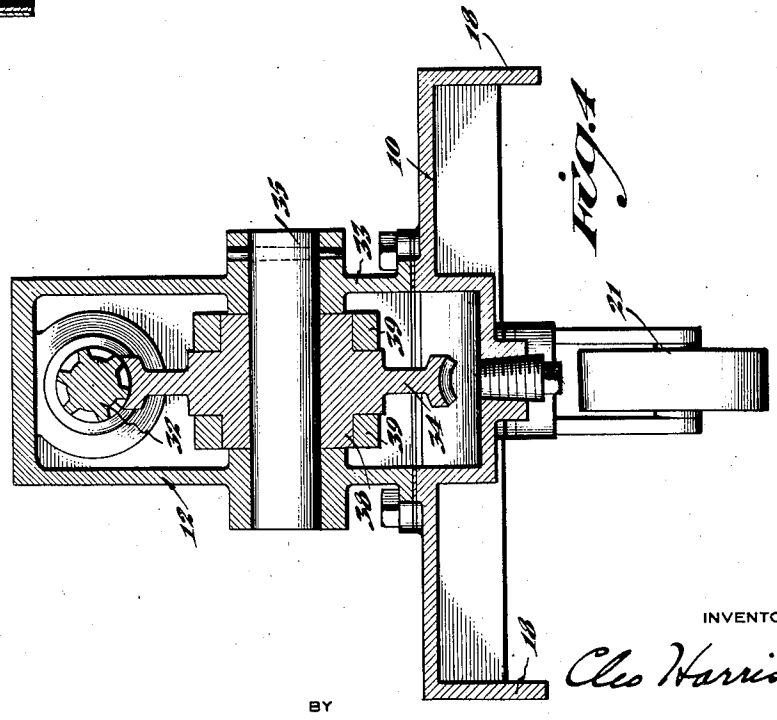

Fig. 4

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UNITED STATES PATENT OFFICE

CLEO HARRIS, OF CINCINNATI, OHIO, ASSIGNOR TO THE CINCINNATI BALL CRANK COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO

GREASING APPARATUS

Application filed April 29, 1930. Serial No. 448,368.

This invention relates to apparatus for supplying lubricant, such as grease, under high pressure, to various parts of an automobile such as the fittings, transmission cases, etc. The type of apparatus herein concerned is in the form of a unit which usually includes a reservoir, a power source and a high pressure pump mounted on a carriage, this pump adapted to discharge the grease through a conduit, which conduit includes a suitable control.

The primary object of this invention is to provide a high pressure grease supply apparatus which is exceedingly compact, therefore, taking little space and being relatively light for ease in moving the same about a greasing station and to further provide an apparatus in which the units as the power, transmission and pump are aligned for easy assemblage.

It is another object of this invention to provide a balanced and otherwise improved driving transmission for the apparatus between the power source and the pumping piston.

It is another object of this invention to provide an improved form of intake port between the reservoir and the high pressure cylinder for causing a positive feed of the grease into the path of the pumping piston after each retraction thereof. It is important that the replacement of displaced grease in the cylinder be exceedingly rapid since the pumping piston moves relatively fast.

Another object of this invention is to provide an improved piston for a pump of this nature which includes a forwardly extending tip or teat for unseating a check valve at the end of the active pumping stroke whereby if there is any air locked in the pumping cylinder tending to compress and remain therein and thus lock the gun, the valve will be positively unseated by engagement of the tip or teat therewith. Thus upon each retraction of the piston, it is arranged that any air locked in the pumping cylinder is permitted to escape via the discharge conduit.

Furthermore it is an object to provide a minimum area for the check valve seat so that the valve will seat and unseat relatively easily and quietly despite the constantly existing back pressure in the grease discharge line.

Another object is to provide a two piece piston permitting lateral floating thereof in case of disalignment of the transmission unit and the pump.

Another object of this invention is to provide an arrangement at the discharge end of the high pressure pumping cylinder for causing any particles tending to be lodged under the valve to be displaced rapidly by clearing the space around the valve permitting a direct lateral discharge of the grease from the region between the valve and its seat for thoroughly flushing any abrasive particles from the engaging surfaces.

It is another object of this invention to provide in combination with the grease dispensing apparatus, a check valve and a safety valve of improved design and of improved mounting for rapid insertion of the same into the apparatus.

Further objects and advantages will be more fully set forth in a description of the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of the pumping apparatus of this invention.

Figure 2 is a sectional view taken on line 2—2, Figure 1, looking downwardly into the interior of the reservoir and pump.

Figure 3 is an enlarged sectional view taken on line 3—3, Figure 1, illustrating the transmission and pump in detail.

Figure 4 is a sectional view taken on line 4—4, Figure 1, further detailing the transmission and also showing the construction of the carriage of the apparatus.

Figure 5 is an enlarged sectional view taken on line 5—5, Figure 1, showing the relation of the reservoir and pumping cylinder.

Figure 6 is a sectional view taken on line 6—6, Figure 3, detailing the construction of the valve container around the discharge port and check valve of the pump.

Figure 7 is an enlarged fragmentary view of a portion of Figure 1, illustrating the check valve in unseated position as positively moved by the pumping piston.

Broadly speaking, the apparatus comprises a carriage or truck 10, a power source such

as a motor 11, a transmission 12, and a pump 13, the last three mentioned mechanisms, or devices being mounted in alignment longitudinally of and on the carriage. A reservoir 14 is mounted on and above the pump and a discharge conduit 15 extends from the pump being in flexible connection therewith by means of a universal joint 16, this discharge conduit including a motor control switch 17 adjacent its outer end, which outer end is adapted to be coupled to a fitting (not shown).

The truck or chassis 10 of the apparatus provides a flat top and ribbed underside through which ribs 18, toward the forward end of the truck, an axle 19 is mounted. A pair of wheels 20 is mounted on this axle. A caster 21 is fixed beneath the rear end of the truck permitting steering thereof. A handle 22 is provided at the rear end of the truck consisting of a bent rod having its ends secured in lugs 23 cast at each side of the truck, this handle rising at each side of the reservoir and straddling the same, and providing a rearwardly extending reservoir encircling portion 24 at the top which the operator grasps for manipulating the equipment, this handle portion being at a convenient elevation.

The electric motor 11 in this case is bolted upon the forward end of the truck and a terminal box 25 is provided, attached to the truck and a terminal box 25 is provided, attached to the underside of the truck just beneath the motor. Electrical energy is supplied to the terminal box from any convenient source by means of encased electrical leads 26 extending from the terminal box and having a screw plug 27 fixed at the outer ends thereof. Appropriate encased electrical connections 28 extend from the terminal box to the motor and encased electrical connections 29 extend from the terminal box to the control switch at the outer end of the grease discharge line.

The stub shaft 30 of the motor has a universal joint 31 attached to its rearwardly extending end, this joint also being attached to the extending end of a worm shaft 32 journalled in the respective walls of a transmission casing 33. This worm shaft is aligned with the motor shaft longitudinally of the carriage. The transmission casing 33 is bolted to the carriage or truck and is open at its underside whereby the truck supporting surface forms a bottom closure for the transmission casing 33.

A worm wheel 34 is mounted immediately below and in mesh with the worm of the worm shaft 32 on a cross shaft 35 journalled in the respective side walls of the transmission casing. The surface of the truck is depressed or hollowed out as at 36 just below the worm wheel to provide ample clearance for the gear and a grease well, a plug 37 being provided at the bottom of the well for draining the same.

Referring to Figure 3, it will be observed that the worm wheel is eccentrically journalled on the shaft and provides a hub 38 at each side, each hub constituting a bearing stud for a respective link or pitman 39. The outer ends of these pitmen straddle the end of a plunger 40, being connected thereto by means of a cross pin 41 transversing the pitmen and the plunger. This plunger 40 is mounted in the rear wall of the transmission casing in the same vertical plane with the motor shaft, worm shaft and the worm wheel. The arrangement of the pitmen, one at each side of the worm wheel, provides a well balanced drive and there is no tendency for the worm wheel to twist on its shaft.

The transmission casing 33 is bolted to the pump casing as well as to the platform of the truck. The connection to the pump casing is by means of bolts 42 extending through flanges 43 on the adjacent ends of the castings. A cylinder element 44 is mounted in the pump casing 45 in alignment or substantial alignment with the plunger 40 of the transmission unit and contains a piston 46 attached to this plunger 40. A funnel-shaped intake opening 47 extends through the pump casing downwardly to a special passageway or port about the cylinder. The funnel-shaped intake opens into the reservoir 14 which is in the form of a circular metal bucket 48 bolted to the top of the pump casing. This reservoir casing or bucket has a lid 49 on its upper end for filling purposes and a handle 50 is provided on this lid.

A follower plate 51 rests under force of gravity on the top of the grease contained in the reservoir. It will be readily apparent that this follower plate can be either gravity urged or spring pressed depending upon the viscosity of the grease or lubricant being dispensed. The follower plate shown includes a handle 52 on its upper side for raising it and is a relatively flat circular plate with an upwardly extending rim 53. The function of this plate is to strip the grease or lubricant from the side walls of the container and to keep it uniformly distributed or packed, thereby preventing the formation of a pocket centrally of the reservoir, which might otherwise be formed by the extraction of grease from the central region thereof downwardly. The bottom of the grease reservoir is formed of a steel plate 54 conically inclined downwardly and having an opening 55 in its center. The margin of this plate opening rests upon the pump casing on the margin of the conical opening and the opening of the bottom is of the same diameter as the upper end of the conical opening.

A clamping ring 56 rests upon the upper surface of the margin of the bottom and is bolted to a circular upper flange of the pump

casing by means of bolts 57 traversing the flange of the casing, the marginal flange of the reservoir bottom and the ring. The pump casing is bolted to the truck platform and includes a pair of laterally extending legs 58 for this purpose.

The pump cylinder 44 is headed as at 59 and is an inserted element, being inserted from the rear end of the pump casing through a bore thereof and has an inwardly flanged nut 60 engaged on its forwardly extending screw threaded end for clamping the element in the bore. The head is adapted to carry a universal conduit joint as will be later described.

The bore in the flange of the nut 60 provides a snug fit about the piston 46 extending from the plunger 40 and a packing 61 is held in position within the cylinder about the piston by means of the nut.

The piston and plunger are flexibly connected so that the piston and plunger may float laterally if the respective casings are not perfectly connected and the piston and plunger perfectly aligned. The piston 46 has a head 62 engaged in a recess 63 in the end of the plunger 40. An inwardly flanged nut 64 is engaged about the piston and screw threaded upon the end of the plunger. When the nut is screwed entirely down upon the plunger, the head is not positively clamped in the recess in the end of the plunger. A lateral clearance is provided between the head and recess sufficient to permit lateral floating of the head in the recess. This is accomplished by the provision of a greater diameter for the recess than for the head and a greater diameter for the bore in the flange of the nut, than that of the piston 46.

As will be seen in Figures 1 and 5, a groove 65 is provided in the pump casing encircling the cylinder 44. This groove is an extension of the conical passageway providing that the grease is distributed entirely around the cylinder at the point of grease intake. To provide a sufficient clearance for flow of grease into the bore of the cylinder in the path of the piston, the cylinder is radially slotted as at 66 adjacent the aforesaid groove. This slot may be of any circumferential dimension or spread desired, it being preferable to open the cylinder as much as possible. This slot is widened out by tapering its walls as at 67, (see Figure 1). It will readily be seen that the retardation of grease flow is reduced to a minimum. The grease enters the pump casing, moving into the funnel-shaped passageway and into the funnel-shaped port in the cylinder, movement into this port being possible from each side as well as from above by way of the groove 65.

A screen 68 is provided for filtering foreign matter from the grease as it passes through the funnel-shaped passageway, being mounted in an annular groove 69 formed in the wall of the conical opening.

As shown in Figures 1 and 3, the piston is retracted beyond the slot 66 by the action of the eccentric transmission at which time the grease rapidly moves into the bore ahead of the piston. To prevent sucking back or retraction of the grease in the discharge conduit upon the return stroke of the piston, a check valve 70 is inserted in the cylinder in front of the piston. This check valve comprises a sleeve casing 71 carrying a seat 72 at its forward end. The valve 70 is urged against the seat by means of a coil spring 73 under compression within the sleeve, the spring being maintained under compression and the sleeve or valve casing 71 in position by means of a nut 74 screwed into the head end of the cylinder.

A washer 75 is inserted under the check valve seat, lying against the shoulder between the check valve chamber and the pumping cylinder bore. The valve seat is in the form of a disc secured in an internal groove 76 in the extreme end of the sleeve by any conventional means. The sleeve end about the seat has a plurality of slots 77 extending inwardly past the seat a short distance. The engaged surface 78 of the valve seat or true valve seating surface is slightly raised from the surface of the disc and is of extremely small diameter.

The grease expelling end of the piston carries a stud or teat 79 axially disposed and extremely small in proportion to the size of the piston. This stud upon completion of a forward stroke of the piston passes through a central bore 80 in the seat and directly engages the valve for positively unseating it. The bore in the valve seat is relatively small and the stud is somewhat smaller for permitting passage of grease through the bore of the seat when the stud has entered the same as shown in Figure 7.

The engaged surface 78 of the seat is as small as possible for the following reason. The check valve, as has been stated, is urged against the seat by means of a spring, and it is further urged against the seat by the back pressure of grease which has been pumped past the valve.

The valve is a headed device with the body thereof surrounded by the coils of the spring engaging the shoulder between the body and the head. It will be apparent that the back pressure becomes quite considerable and tends to lock the valve upon its seat, its engagement only being broken by heavy pumping pressures or by direct contact of the stud or teat therewith. It is desirable to lessen the back pressure on the valve as much as possible and making the engaged seat surface of small area accomplishes this result. This surface is reduced to an area just sufficient to seal the discharge opening in the seat ele-

ment and is less in diameter than the piston.

The grease under back pressure being free to pass into the slots of the sleeve adjacent the valve seat, engages a portion of the outer area of the valve head on its seating side. Lessening this pressure eliminates the detrimental pounding of the valve and the clicking which is usually apparent in a high pressure valve. The forced engagement or displacement of the valve by means of the stud positively releases any air pocketed between the valve and the pumping piston in spite of any great back pressure. If the air continued to be present in the pumping cylinder, the result would be that the pocket of air would preclude the entrance of grease and the air would merely be compressed each time the piston reciprocated without any grease discharge.

A by-pass or safety valve, generally shown at 81, is disposed in the line beyond the check valve so that clogging of the line or any other cause normally creating pressure of dangerous proportions does not harm the apparatus. As shown in Figures 3 and 5, this by-pass valve permits the escape of the pumped grease back to the reservoir. This by-pass valve 81 is of exactly the same construction as the check valve.

The check valve sleeve 71 has radial passageways 82 toward its rear or discharge end entering an annular space or clearance groove 83 around the valve sleeve and a radial passageway 84 extends from this annular clearance into a bored boss 85 extending laterally from the head of the cylinder. From this point the passageway extends through the central bore of the valve seat of the safety valve against the head of the safety valve. When a predetermined pressure, approximating 4000 pounds per square inch, is reached in the grease discharge line, this valve opens and the grease flows around the same and passes through a radial opening 86 in the sleeve of the safety valve through a tube 87 and into the pump casing through the passageway 88 extending parallel with the pumping cylinder for a distance and then upwardly as shown in Figure 5 into the reservoir, or more specifically, into the intake opening of the pumping casing. The sleeve and spring of the safety valve is held in position in its socket or bore by means of a nut 89 threaded into the bore and against the end of the sleeve.

The head of the nut 74 which is screwed against the sleeve of the check valve carries a concave packing 90 in a large bore in its outer face and the ball end of the discharge conduit coupling element 92 is held in this concave packing by means of an internally flanged nut 93 screwed onto the end of the previously described nut.

To prevent rotation of the hose 15 and coupling element 92 by way of the ball connection, a split casing 94 surrounds the coupling element, the sections of this casing being held together and clamped on the coupling element by means of screws 95. Each section has a forwardly extending arm 96, which arms straddle a pin 97 protruding from the pump casing. A slight amount of rotation is permitted in this connection which rotation is necessary with the lateral movement of the hose and coupling in the socket. The purpose of the device for preventing rotation of the hose is to preclude entanglement of the electrical connectors 29 attached parallel to the hose by means of clips 98 and extending to the switch 17 mounted on the outer end of the hose. Appropriate coupling devices 99 and further flexible connections 100 may be provided beyond the switch as illustrated. These devices are of common construction and are not herein described.

Having described my invention, I claim:

1. In a pumping apparatus, a support, a motor, a transmission unit including a piston rod slidably mounted therein, and a pump mounted on said support, the motor shaft and pumping piston connected to respectively opposite sides of the transmission unit and mounted in the same vertical plane and disposed longitudinally of the support, the pumping piston being flexibly connected to the piston rod extending from the transmission unit, and draw bolts connecting the transmission unit to the pump, said bolts disposed in parallelism with the motor shaft and pumping piston.

2. In a device of the class described, a pump casing, a pump cylinder element mounted therein, a reservoir in communication with said cylinder, a piston in the cylinder, means for reciprocating said piston, a funnel-shaped intake opening in said pump casing extending from the reservoir to the cylinder, and a passageway extending from the intake opening entirely around the cylinder, said cylinder having a transverse slot therein defining a passageway from the encircling passageway to the bore of the cylinder and to the path of reciprocation of the pumping piston.

3. A lubricating apparatus, comprising, a pump casing, a cylinder mounted therein, a piston in said cylinder, means for reciprocating said piston, a shoulder formed in the bore of said cylinder toward the discharge end thereof, a valve seat engaged against said shoulder, a sleeve engaged against said seat, a valve engaged against the contact surface of said seat, a spring engaging said valve and a nut screw threaded onto the discharge end of the cylinder bore engaging said sleeve and said spring.

In witness whereof, I hereunto subscribe my name.

CLEO HARRIS.