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PUMPING APPARATUS

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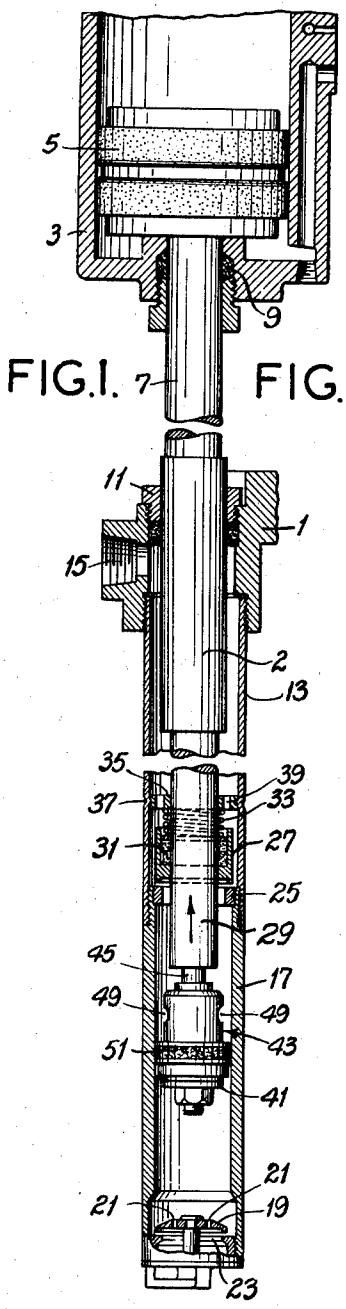


FIG.1.

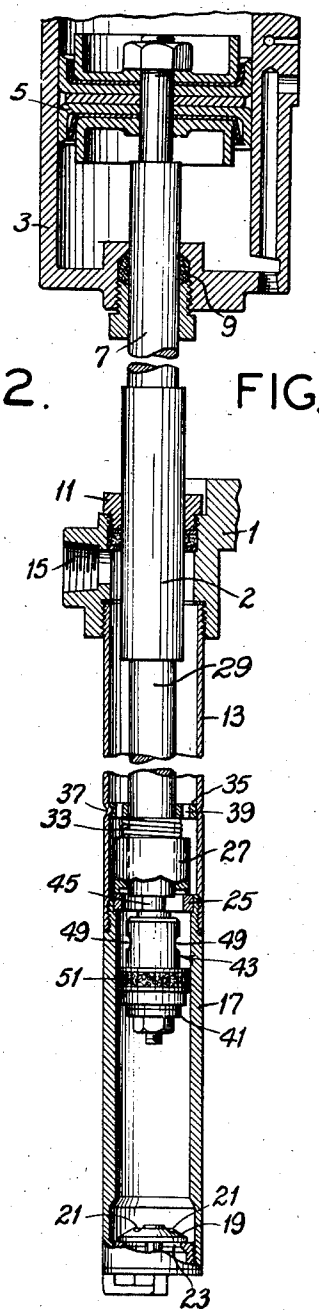


FIG.2.

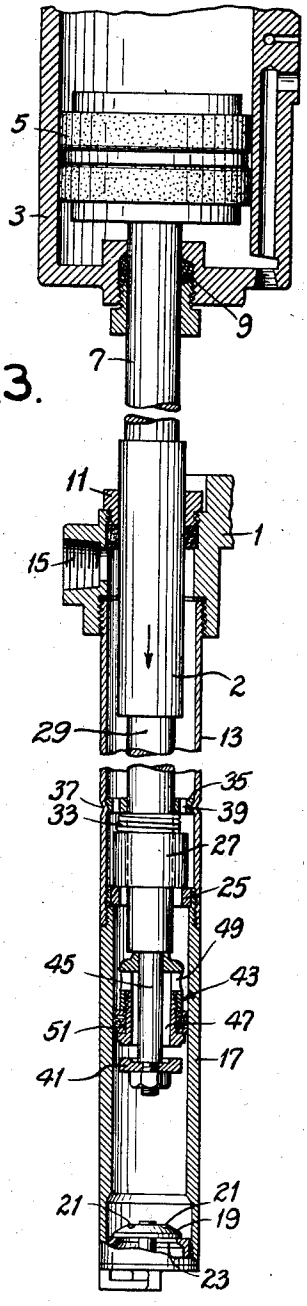


FIG.3.

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PUMPING APPARATUS

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7 Claims. (Cl. 103—195)

This invention relates to pumping apparatus, and with regard to certain more specific features, to pumping apparatus for pumping lubricant and the like from containers such as barrels and the like.

This invention is an improvement upon the apparatus disclosed in the United States Patent application of Frank S. Barks, Serial No. 101,031, filed September 16, 1936, for Pumping apparatus.

Among the several objects of the invention may be noted the provision of pumping apparatus in which is obtained the advantage of a positive prime by the use of a simplified structure having a low number of parts and which lends itself to easy adaptations to various requirements; the provision of apparatus of the class described in which the priming effect is positive for various consistencies of lubricant; and the provision of apparatus of the class described which is economical to make and reliable in operation. Other objects will be in part obvious and in part pointed out hereinafter.

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

In the accompanying drawing, in which is illustrated one of various possible embodiments of the invention,

Fig. 1 is a vertical section showing the apparatus with its piston starting upward from the lower end of a stroke;

Fig. 2 is a view similar to Fig. 1 showing the piston at substantially the upper end of its stroke; and,

Fig. 3 is a view similar to Fig. 1 showing the piston descending.

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

Referring now more particularly to Fig. 1, there is illustrated at numeral 1 a body portion adapted to be attached to or rest upon the top of a lubricant-container such as a barrel. Associated with this body 1 is the cylinder 3 of a pumping engine. It should be understood that the members 1 and 3 are suitably articulated, but inasmuch as the combination of these is known, such articulation is not detailed in the drawing. Neither has the pumping engine been shown in full.

The engine includes a piston 5 from which extends a piston rod 7, the latter passing through a packing gland 9. The piston rod also passes through a packing gland 11 in the body 1 and passes downwardly into the inside of said body 1.

Screwed into the lower side of the body 1 and extending downwardly therefrom is a pump cylinder 13. The interior of this cylinder communicates by way of the interior of the body 1 with an outlet 15 of said body 1. The outlet 15 is adapted to have fastened thereto the usual outlet communication, such as a lubricant hose and a suitable outlet control valve.

The cylinder 13 partakes of the nature of a lubricant-transmitting extension as well as of a pump cylinder. To the lower end of the cylinder 13 is fastened a priming cylinder 17. This cylinder 17 partakes of pumping as well as of priming functions, as will be shown.

At the lower end of the cylinder 17 is an inlet check valve 19 in which are a plurality of relatively small openings 21, for purposes to be described.

The check valve 19 permits flow upwardly through an inlet opening 23 but, with the exception of the small flow that may take place through the small openings 21, resists return flow downwardly therethrough.

At the upper end of the cylinder 17 is held a valve seat 25 with which cooperates a check valve 27, the latter surrounding an extension 29 of the piston rod 7. Packing 31 effects a seal between the slidable valve 27 and the extension 29.

A spring 33 insures normal seating of the valve 27 on its seat 25. The spring 33 reacts from a diaphragm member 35 which is held in position by a crimped portion 37 of the cylinder 13. Extension 29 passes slidably through said diaphragm 35. The diaphragm has openings 39 therein permitting the transmission of lubricant.

On the lower end of the extension 29 is carried a seat 41 for a piston valve or valved piston 43, the latter being slidable on a stub end 45 of the extension 29. The seat 41 is carried on said stub end 45. A longitudinal hollow portion of the piston valve is shown at 47 and lateral outlets at 49. The piston valve is packed with respect to the inside wall of the cylinder 17 as shown at 51.

The lance-like combination of parts shown below the body 1 is inserted through an opening in the head of a barrel which carries lubricant, thus placing said check valve 19 and opening 23 out or near the bottom of the barrel and below the surface of the fluid therein.

The operation of the apparatus with thin lubricant, assuming that an up-stroke is being started in Fig. 1, is as follows:

A charge of lubricant, assumed to be above the closed piston valve 43 and in the upper end of cylinder 17, forces the valve 27 from its seat 25 so that said lubricant is forced up into and through the cylinder 13, and ultimately out of the opening 15 to the point of use. The net displaced volume above the piston valve 43 in cylinder 17 is greater than the difference between the volumetric displacements of the rod 7 (which recedes from cylinder 13) and the exten-

sion 29 (which enters cylinder 13). Thus, on the up-stroke of charge is forced by the piston valve 43 through the outlet 15.

Also, upon the up-stroke, a fresh charge of lubricant is drawn into the opening 23 by the suction effect of the rising, closed piston valve 43.

After the up-stroke has been completed, the condition of the apparatus is as shown at Fig. 2, wherein the check valve 19 had re-seated, as well as the valve 27.

Then, upon a down-stroke, the said valves 19 and 27 remain closed. Then seat 41 first advances away from the piston valve 43, thus opening the valve, so that upon the downward stroke, lubricant is transferred from beneath the piston 43 to the region above it. This is called "priming". The volume of fluid that may be accommodated above the piston 43 is less than that which has been drawn in below it, because of the intrusion of the extension 29 into cylinder 17 as the piston descends. The excess lubricant finds its way to the supply through the small openings 21 in the check valve 19. The excess cannot pass valve 27 at this time because the difference between the areas of extension 29 and rod 2 (in cylinder 13) is less than the effective areas of parts entering cylinder 17. Thus, upon the down stroke, more pressure is engendered above the valve 27 than below. Hence valve 27 remains shut.

During this down-stroke, fluid is forced from the cylinder 13 by reason of the intrusion of the relatively large rod 2. As stated, the above is the operation of the apparatus when pumping relatively thin lubricants which substantially fill the space below piston 43 upon an upstroke, and it will be noted that it is a double-acting function.

The purpose of arranging the parts of the apparatus as described is to permit it to pump heavy greases, as well as the thinner lubricants. Such heavy greases upon the reciprocation above described, are drawn in more slowly, and although they may fill only about fifty per cent. of the cylinder 17 upon an up-stroke (suction stroke), this supply is enough practically to fill or prime the volume of the cylinder 17 above the piston valve 43 when the latter has descended to the lower end of its stroke.

During the down-stroke pumping from cylinder 13 to the outlet takes place as for thin lubricant. Upon descent, there is at first a period during which the hollow valve element of piston 43 is on its seat 41. This is due to the fact that there is a partial vacuum below the said piston because it has not been possible upon the up-stroke to fill the space with heavy lubricant below the piston. But finally, when the piston valve 43 strikes the partial charge of heavy lubricant in cylinder 17, said charge is forced from the region below the piston valve 43 to the region above said piston valve 43. The design is such that for the heaviest lubricant this partial charge is enough to at least fill the smaller space above said piston valve 43. (The space above piston valve 43 is smaller than the space below by reason of the intrusion of the extension 29).

Although heavier lubricants send their excess with more difficulty through the openings 21, it will be remembered that they are more difficult to draw in through the opening 23, and hence there is less excess to be returned through said openings 21. The maximum excess to be returned is encountered in the case of the thinnest lubricant.

It is to be understood that the mushroom type of check valve such as shown at 19 is exemplary of any equivalent type. In any case the constricted outlet openings are to be used in conjunction therewith.

It will be seen that the restricted openings 21 in the valve 19 may be made to communicate the inside of the cylinder 17 with the supply otherwise than by passing through the valve 19. For example, they may pass through the wall of the cylinder below the region thereof which is traversed by the piston valve 23.

It is also to be understood that the valve 27 need not be positioned around the extension 29 but may be adjacent to the rod.

The term piston valve herein refers to any suitable piston having valve means associated therewith to perform the functions of said piston valve 43.

One advantage of the invention is the fact that no piston needs to cross any port in order to obtain the desired results. This is an advantage because packing which is desirable in a piston of the class for pumping lubricants is ordinarily scored by the edges of any port which is crossed. This is especially true of soft packings.

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

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

I claim:

1. A pump comprising a pump cylinder, pumping means therein, a priming cylinder, a check valve between said cylinders opening from the latter to the former, an inlet valve opening into said priming cylinder, a piston in the priming cylinder and located between said check and said inlet valves, valve means associated with said piston whereby upon movement in one direction a charge is transferred from one side of the piston to the other, said charge being forced through said check valve upon movement in the other direction, the volumetric displacement between the piston and the inlet valve being greater than the volumetric displacement between the piston and said check valve, the chamber formed by said priming cylinder and piston and inlet valve having a relatively restricting and fixed-size opening therefrom permitting return to the supply of such excess fluid as cannot enter said pump cylinder, the volumetric displacement of the pumping means in the pump cylinder being less than that above the piston in the priming cylinder during piston movement toward said inlet valve, said opening being of a size to permit ready flow to the source of relatively mobile fluids but substantially to resist flow of relatively thick fluids.

2. A pump comprising a pump cylinder, a priming cylinder, a check valve between said cylinders opening from the latter to the former, an inlet valve opening into said priming cylinder, a piston in the priming cylinder and located between said check and said inlet valves, valve means associated with said piston whereby upon movement in one direction a charge is transferred from one side of the piston to the other, said charge being forced through said check valve upon movement in the other direction, the chamber formed by said priming cylinder and piston and inlet valve having a relatively restricted and fixed-size opening therefrom permitting return to the supply of such excess fluid as cannot pass said piston

valve, and means in the pump cylinder for forcing fluid therefrom comprising an entering rod of one diameter and an extension therefrom of another diameter, said extension extending into said priming cylinder to reduce the volumetric displacement on the side of said piston valve adjacent the check valve to a value less than that on the other side of said piston, the difference between the areas of the extension and said entering rod in the pump cylinder being less than the area of the extension entering the priming cylinder, said opening being of a size to permit ready flow to the source of relatively mobile fluids but substantially to resist flow of relatively thick fluids.

3. A pump cylinder having an outlet and a priming cylinder, a foot valve in the priming cylinder, an outlet check valve therein, a piston in said priming cylinder between said valves, valve means associated with the piston permitting transfer of fluid from one side of the piston to the other, pumping means in said pump cylinder comprising a rod passing therethrough and having sections of different diameters therein, the section of smallest diameter passing into said priming cylinder and reciprocating said piston, the chamber formed by said piston and foot valve and priming cylinder having a fixed-sized restricted communication to the outside, the volumetric displacement of the pump means in said pump cylinder being less than the volumetric displacement of the section of the rod in said priming cylinder, whereby said outlet check valve closes during one stroke and fluid passes when necessary outwardly through said communication, said communication being of a size to permit ready flow to the source of relatively mobile fluids but substantially to resist flow of relatively thick fluids.

4. A pump cylinder having an outlet and a coaxial priming cylinder, a foot valve in the priming cylinder having restricted openings therein, a check valve thereabove, a piston in said priming cylinder, valve means associated with the piston permitting transfer of fluid from one side thereof to the other, pumping means in said pump cylinder comprising a rod passing therethrough and having sections of different diameters, the section of smallest diameter passing into said priming cylinder and reciprocating said piston valve, the volumetric displacement of the priming cylinder above the piston valve being greater than the difference between the volumetric displacements of the rod sections in the pump cylinder, and the volumetric displacement of the priming cylinder below said piston being greater than its volumetric displacement above said piston by an amount adapted to insure positive priming above said piston with the most sluggish fluids, the chamber formed by the region between said piston and foot valve having communication with the outside of the cylinder through said relatively restricted openings, said openings being of sizes to permit ready flow to the source of relatively mobile fluids but substantially to resist flow of relatively thick fluids.

5. A pump comprising a pump cylinder, a priming cylinder, a check valve between said cylinders and opening from the latter to the former, a piston reciprocating in the priming cylinder, valve means associated with said piston permitting transmission of fluid from one side to the other of said piston, an inlet check valve in the priming cylinder, the space formed between said inlet check valve, priming cylinder and piston having an opening to its exterior of so restricted a fixed size as to permit ready flow of relatively mobile fluids, but substantially to resist flow of relatively thick fluids, and means whereby said check valve is positively closed during each movement of fluid in the priming cylinder toward escape through said opening.

6. A pump comprising a pump cylinder having an outlet, a priming cylinder associated therewith, a rod of a given diameter reciprocating in said pump cylinder, a smaller extension from said rod and emerging from said pump cylinder and passing into said priming cylinder, a check valve between the priming cylinder and the pump cylinder permitting only flow from the former to the latter, a piston in the priming cylinder driven by said extension, valve means associated with the piston, the difference between the volumetric displacements of said rod and said extension within said pump cylinder being adapted to effect pumping on one stroke, the volumetric displacement above said piston in said priming cylinder being greater than said difference of volumetric displacements, whereby pumping may be effected upon the reverse stroke, the volumetric displacement below said piston in said priming cylinder also being greater than the volumetric displacement in the priming cylinder above said piston to effect priming, said priming cylinder having an inlet, a check valve in said inlet, and fixed-size restricted openings in said check valve, said openings being of sizes to permit ready flow to the source of relatively mobile fluids but substantially to resist flow of relatively thick fluids.

7. Pumping apparatus comprising a pump cylinder, a priming cylinder, said pump cylinder having an outlet, a reciprocating rod having two different diameters within the pump cylinder, its portion of smallest diameter extending into the priming cylinder, a valved piston in said priming cylinder attached to said extension, an inlet check valve in the priming cylinder and an outlet check valve therefor leading to said pump cylinder, the space between said piston and said inlet check valve having a restricted outside communication of fixed size, the intrusive effect of the large-diametered portion of the rod in the pump cylinder closing said outlet check valve and forcing fluid from the outlet while said valved piston opens and transfers fluid from its inlet to its outlet side and the intrusive effect of said extension into the priming cylinder being adapted simultaneously to force any excess priming fluid through said restricted opening back to the supply, said piston upon the return stroke forcing fluid from the priming cylinder to the outlet through said pump cylinder, the volumetric displacement above said piston in the priming cylinder being greater than the difference in volumetric displacements between said different-diametered rods in said pump cylinder, said outside communication being of a size to permit ready flow to the source of relatively mobile fluids but substantially to resist flow of relatively thick fluids.

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