

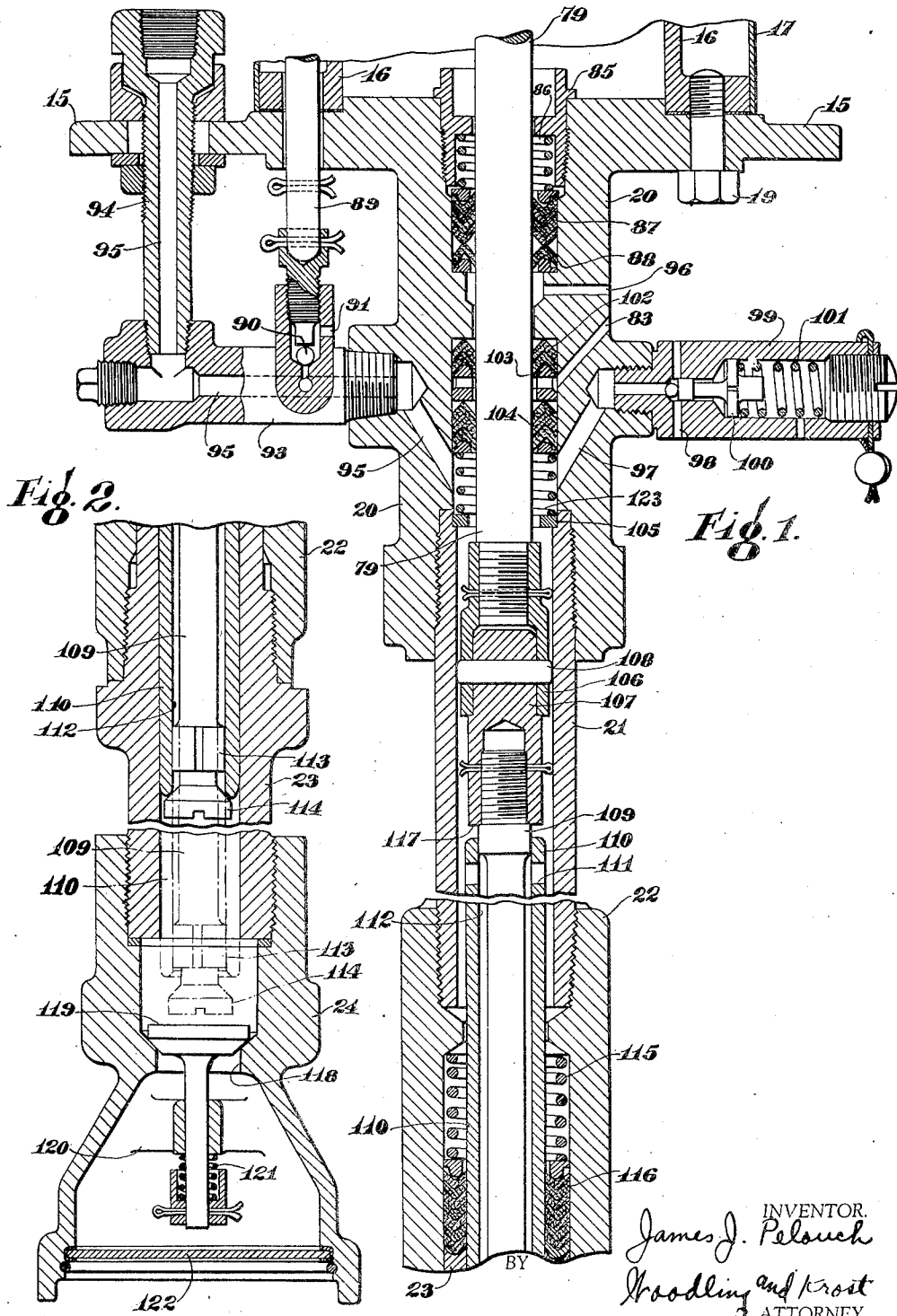
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PUMPING DEVICE

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PUMPING DEVICE

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My invention relates to pumping devices and more particularly to pumping devices for pumping fluid from a container.

An object of my invention is to provide a pumping device adapted to be mounted over a container and having an end which may be inserted through an opening in the container for pumping fluid therefrom.

Another object is to provide a pumping device which discharges fluid therefrom upon both reciprocal movements of the pump plunger.

Another object is to provide a pumping device for discharging a substantially balanced flow of fluid from the pumping device during each reciprocal movement of the pump plunger.

Another object is to provide a pumping device in which fluid is drawn inwardly of the device and raised therein to discharge fluid upon the upward movement of the plunger and in which fluid entrapped therein is displaced by the downward movement of the plunger to further discharge the fluid.

Another object is to provide a pumping device for entrapping air liberated from the fluid in the device and for discharging the entrapped air to provide a flow of fluid substantially free of air.

A still further object is to provide an improved pumping device efficient in operation and economical in maintenance.

Another object of my invention is to arrange the valve of a pump so that it may be readily accessible for inspection and cleaning.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which:

Figures 1 and 2 are cross-sectional views taken lengthwise and vertically along the longitudinal center of a pump embodying the features of my invention, Figure 1 showing the upper portion of the pump and Figure 2 the lower portion thereof, the two figures comprising the complete pump.

My pump is particularly adapted to be mounted to or mounted over a fluid container having an opening in the top thereof so that the lower end of the pump extends down into the container for the pumping of the fluid therefrom. This method of pumping fluid is especially used when grease or other lubricating fluid is to be withdrawn from the fluid container and applied to the parts to be lubricated, the fluid after leaving the pumping device passing through a hose attached thereto having a suitable nozzle attached to the end thereof. The pump may be operated by a fluid

motor such, for example, as shown in my Patent No. 2,268,898, issued January 6, 1942, for Fluid motor, of which this application is a division. In Figure 1 of the drawing, the reference character 16 represents the side walls of the cylinder of the fluid motor and the reference character 20 represents a casing member constituting one end of the cylinder. The piston which is reciprocally mounted within the cylinder wall 16 is adapted to operate the pump plunger 79. The casing member 20 has a ledge portion 15 extending therefrom and this ledge portion is adapted to be mounted to a suitable support for supporting the top in proper position relative to the fluid container so that the pump is directed downwardly into the container. The cylinder 16 of the fluid motor is secured to the ledge 15 by means of screw bolts 19. A cylindrical metal cover 17 is secured by suitable means to the cylinder wall 16 to provide good appearing and round outside surface to the fluid motor.

The pump is connected to the casing member 20 and comprises a connecting nipple portion 21, a pump cylinder portion 22, a lower extension cylinder portion 23, and a lowermost end portion 24. The plunger 79 of the pump which is reciprocally operated by the fluid motor extends downwardly from the fluid motor into the central opening or bore of the casing member 20. To secure the upper plunger 79 to a lower pump plunger 109, there is provided a coupling 106 which secures the adjacent ends of the two plungers together. The coupling 106 is secured at its upper end to the plunger 79 by the illustrated threads and is connected at its lower end to a connecting portion 107 by means of a transverse pin 108. The connecting portion 107 is threadably joined to the pump plunger 109 by the illustrated threads. In this manner, the reciprocal movements of the plunger 79 are transmitted to the pump plunger 109.

The plunger 109 is reduced in diameter for a distance intermediate of its ends as is illustrated in Figures 1 and 2. A sleeve 110 is carried upon and surrounds the plunger 109 and is adapted to slide axially of, and relative to, the plunger 109. The space between the interior of the sleeve 110 and the plunger 109 having the reduced diameter forms a passageway 112 extending up around the plunger 109 and within the sleeve 110. The plunger 109 below the reduced diameter portion at 113 is square or otherwise formed so as to provide bearing surfaces engaging the interior wall of the sleeve 110 and allows other portions withdrawn from the interior walls of the sleeve 110

to provide communication between the passageway 112 with the space below the plunger 109. There is an enlarged valve head 114 secured to the bottom end of the plunger 109. This head 114 may be integral with the plunger 109 or may be a bolt or otherwise threadably secured to the plunger 109. The diameter of the valve head 114 is larger than the inside diameter of the sleeve 110 so that when the valve head 114 is drawn upwardly against the sleeve 110, the head 114 acts as a valve to close the lower end of the sleeve 110. When the head 114 is pushed downwardly then there is communication established between the passageway 112 and the space below the enlarged head 114.

There are openings 111 in the sleeve 110 positioned adjacent to its upper end. These openings 111 are adapted to place the passageway 112 in communication with the interior of the pump housing and more particularly with the interior of the connecting portion 21 wherein there is a space between the plungers and the interior inside walls of the connecting nipple portion 21. The sleeve 110 slides up and down relative to the plunger 109 but this up and down sliding movement is limited. The downward movement of the plunger 109 relative to the sleeve 110 causes the shoulder 117 on the bottom of the connecting portion 107 to engage the top of the sleeve 110 and to move the sleeve 110 downwardly therewith. Upward movement of the plunger 109 relative to the sleeve 110 causes the valve head 114 to engage the bottom end of the sleeve 110 and to raise the sleeve 110 therewith. Therefore, in the downward movement of the plunger 109, the opened sleeve 110 is merely displaced downwardly in the fluid. In the upward movement of the plunger 109, the valve head 114 closes the end of the sleeve 110 and raises the sleeve 110 which functions as a piston identified generally by the reference character 109. The length of the plunger 109 between the shoulder 117 and the valve head 114 is proportioned relatively to the length of the sleeve 110, so that there is just sufficient play therebetween to permit the opening and the closing of the bottom end of the sleeve 110 as the sleeve 110 is carried up and down within the lower extension cylinder portion 23.

A check valve 119 is positioned within the end portion 24 of the pump housing and is adapted to close the inlet opening 118. The stem of the check valve 119 is slidably carried by supporting arms 120 extending out from the end portion 24. A spring 121 presses against the bottom of the arm 120 and resiliently biases the check valve 119 to its closed position. The resiliency of the spring 121 is overcome by the sucking action of the pump mechanism raising fluid upwardly through the pump housing so that when fluid is being drawn upwardly through the pump housing the check valve 119 is opened and so that when fluid is not being drawn upwardly, the check valve 119 prevents the fluid in the pump housing from escaping out through the inlet opening 118. To prevent the drawing in of foreign matter with the fluid being pumped, there is a screen 122 which extends across the bottom of, and is carried by, the end portion 24 so that fluid may pass through the screen 122 and foreign matter is barred from being withdrawn through the inlet opening 118.

The lowermost reciprocal position of the sleeve 110 and the valve 114 is shown by the dash and dot lines in Figure 2. Since the sleeve 110 and

the valve 114 extend below the surrounding member 23, in its lowermost position, the valve may be readily inspected and cleaned by threadably removing the lower part 24. The inspection and cleaning become important when heavy lubricants are used as in this case the screen 122 is preferably removed so that the heavy lubricants can flow easily up to the pump. Upon removing the screen the foreign matter is not removed from the lubricant and thus may become lodged between the valve 114 and the seat in the sleeve 110.

Since the plunger 79 moves between the air cylinder and the interior chamber of the pump housing through which fluid flows, it is necessary to provide sealing means in the casing member 20 for separating the compressed air from the fluid being pumped. The sealing means is in the form of chevron seals 87 and 88, positioned tightly against the plunger 79 so that air or fluid does not pass along the reciprocating plunger 79. The chevrons 87 are disposed at an angle in one direction and the chevrons 88 are disposed in the opposite direction, and in this manner forms a more perfect seal. The chevrons 87 prevent air from escaping down from the air cylinder and the chevrons 88 prevent fluid from escaping upwardly along the plunger 79 through the casing 20. The coil spring 86 held down tightly by the threaded plug 85 constrains the chevrons in good packing position to seal the bottom of the air cylinder. Suitable washer elements are superimposed above and below the chevrons 87 and 88 to hold them in a firm position. To seal the fluid chamber within the pump housing, there is provided additional sealing means. This sealing means is also in the form of chevrons 102 and 104 disposed on both sides of the washer 103 and tightly around the plunger 79. The coil spring 123 tightly presses the chevrons 102 and 104 together so as to provide a good seal around the plunger 79. The bottom end of the coil spring 123 engages the washer 105 which is secured in position by the connecting portion 21 threadably secured to the casing member 20. Should the fluid escape past the chevrons 104, a small inclined opening 83 is provided in the casing member 20 so that such small excess of fluid escaping along the plunger 79 may flow outwardly of the casing member. In the event that fluid escapes past the seal formed by the chevrons 102 and the washer 103, a small opening 96 is provided at a higher level in the casing member 20 so that such small excess of fluid escaping along the plunger 79 may flow outwardly of the casing member. Since only minute quantities could escape past the seal only a small portion of fluid will escape through the small openings. The escapement of this small amount of fluid, however, will keep it from working upwardly through the chevrons 87 and 88 into the air cylinder.

It sometimes happens that there is a back pressure upon the fluid within the pump housing such as may be caused by the expansion of fluid within the hose connected to the pump housing when the hose is situated in a hot sun. To provide a safety valve for taking care of such back pressure, a safety plug 99 having a valve 100 is threadably engaged to the casing member 20, and a conduit 97 is provided in the casing member 20 so as to provide communication between the interior bore of the casing 20 with the safety plug 99. The safety valve 100 is resiliently biased closed by the coil spring 101. The tension of the spring 101 is predeterminedly set so that the con-

duit 97 is normally closed by the valve 100 but when the pressure of the fluid within the conduit 97 is sufficient to overcome the resilient action of the coil spring 101, then the valve 100 permits the fluid under such pressure to flow out through the openings 98, thus relieving the excess pressure.

An outlet conduit 95 is provided for the discharge of the fluid pumped through the pump housing. The outlet conduit 95 extends from the longitudinal bore of the casing member 20 out through the side of the casing member 20 and into the outlet plug 93 and then upwardly through the outlet hose connection 94. The outlet plug 93 is threadably engaged to the casing member 20 and in turn the outlet hose connection 94 is threadably engaged to the plug 93, the outlet conduit 95 extending therethrough so as to provide communication between the internal bore of the casing member 20 and the hose attached to the open end of the hose connection 94.

When the pumping device is first started, there may be air mixed with the fluid, which may prevent the pump from building up sufficient pressure to expel the fluid through the discharge opening 95 and the hose connected thereto. To obviate this difficulty, I provide for releasing the fluid and air directly to atmosphere. To provide for venting the air and the first flow of fluid which may contain air, there is provided a vent valve 90 which is in communication with the outlet conduit 95. The valve 90 upon being turned by the rod 89 extending up along side the air cylinder permits a diversion of the air and the fluid in the outlet conduit 95 so as to vent the air. Therefore, when first starting the pumping device, the rod 89 is turned so as to open the valve 90 thereby permitting the air and the first flow of fluid which may contain air to escape out through the opening 91. After the fluid begins to flow free of air, then the valve is operated by turning the rod 89 to close the opening 91 and to cause the fluid to pass out the outlet conduit 95 through the outlet hose connection 94.

In the lower portion of the pump housing and within the pump cylinder portion 22, there is provided chevron sealing means 116 around the sleeve 110. The coil spring 115 pressing down upon the washer imposed over the chevrons 116 provides a good seal between the cylinder portion 22 and the sleeve 110, so that fluid passing up through the pump cylinder portion 22 is confined therein.

The pumping device is used to pump fluid from a container and for this purpose the housing is so mounted that the lower portion of the pump housing extends down into the fluid container with the lower end thereof immersed in the fluid. By connecting the air motor with a source of compressed air, the compressed air is supplied to the airmotor so as to reciprocate the pistons 79 and 109 up and down within the bore of the pump housing. The pistons 79 and 109 may be considered differential pistons since the area of the closed sleeve 110 is larger than the lower end of the plunger or piston 79. Upon the upward movement, the end of the sleeve 110 carried by the plunger 109 is closed by the enlarged head 114 and the raising of the plunger 109 together with the sleeve 110 sucks fluid up through the inlet opening 118 past the check valve 119 to within the pump housing. Fluid so sucked inwardly of the pump housing is prevented from flowing back out through the inlet opening 118 by the check valve 119. After the plunger 109 reaches the

upper limit of its movement, it then moves downwardly, carrying the sleeve 110 with it. The downward movement of the plunger 109 opens up the bottom of the sleeve 110 thereby permitting both the plunger 109 and sleeve 110 to move down into the entrapped fluid and to be merely displaced therein, the fluid passing through the passageway 112. Upon the next upward movement of the plunger 109 and sleeve 110, the process is repeated so that more fluid is drawn into the interior of the pump housing to fill it with fluid. When the pump housing is so filled with fluid, then the differential action of the pistons 79 and 109 produces a double pumping action so that fluid is discharged out through the outlet conduit 95 during both of the reciprocal movements thereof. Upon upward movement of the plunger 109 and the closed sleeve 110, fluid is raised by reason of the fact that the closed sleeve 110 has a diameter greater than the diameter of the plunger 79 being withdrawn up out of the fluid in the fluid chamber. Therefore, the closed sleeve 110 being raised up through the fluid chamber within the pump housing lifts up the fluid and raises it within the pump housing to cause it to be discharged out through the outlet conduit. The amount of fluid so raised and discharged upon upward movement of the plunger 109 depends upon the cross-sectional area of the closed sleeve 110 (that is the total area formed by the sleeve 110 when closed by the valve 114) over and above the cross-sectional area of the plunger 79 being withdrawn from the fluid in the fluid chamber in the housing. Upon downward movement, the bottom end of the sleeve 110 is opened and the sleeve 110 is therefore carried downwardly without producing a pumping action. Since the plunger 79 which was partially withdrawn from the fluid container within the pump housing is moved downwardly into the fluid, it displaces some of the fluid causing it to be discharged out through the outlet conduit 95. The amount of fluid discharged by this downward movement of the plunger 79 depends upon the cross-sectional area of the plunger 79 as this determines the amount of the fluid so displaced by the plunger. It is therefore seen that the amount of the fluid discharged by the pump upon the upward movement is dependent upon the differential cross-sectional area of the closed sleeve 110 over and above the cross-sectional area of the plunger 79 and the amount of fluid discharged upon downward movement depends upon the cross-sectional area of the plunger 79 moving downwardly into the fluid. By so proportioning the parts that the cross-sectional area of the closed sleeve 110 over and above the cross-sectional area of the plunger 79, is made substantially equal to twice the cross-sectional area of the plunger 79 itself, then the discharge of fluid is adjusted so that substantially the same amount of fluid will be discharged in both the upward and the downward movement of the plunger in the pump housing to give a balanced flow.

Although I have described my invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim as my invention:

1. A fluid pumping device comprising, in com-

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 bination, differential cylindrical means having a large cylinder portion and a small cylinder portion arranged substantially in straight alignment with each other, said cylindrical means having an intermediate portion which connects the adjacent ends of the large and small cylinder portions together, a differential piston having a large and a small piston means connected together and reciprocally mounted in the cylindrical means, said large cylinder portion having an inlet member removably connected thereto communicating with the large piston means, said inlet member having a check valve to admit fluid to the large cylinder portion, said cylindrical means having an outlet in communication with the intermediate portion thereof, said large piston means comprising a sleeve reciprocally mounted in the large cylinder portion, and valve means operatively associated with one end of the sleeve to open and close same for controlling the flow of the fluid therethrough, said small piston means comprising a plunger having substantially one-half the area of the closed sleeve, means for causing the valve means upon one directional movement of the piston means to close the sleeve and draw fluid into the large cylinder portion and expel fluid out through said outlet, and for causing the valve means upon the other directional movement of the piston means to open the sleeve and permit the large piston means to be replaced in the fluid of the large cylinder portion, said small piston means upon said latter directional movement expelling fluid out through said outlet, said removable inlet member extending beyond the large cylinder portion, said sleeve and valve means when occupying their position at the end of their travel in said other directional movement extending beyond the end of the large cylindrical portion to afford ready access to said valve means for inspection and cleaning upon removal of the removable inlet member.

2. A pumping device comprising, in combination, a pump cylinder having an inlet member removably connected thereto, a first piston plunger reciprocal in said pump cylinder, a sleeve member reciprocal in said pump cylinder and slidably carried on said piston plunger, the lower end of said sleeve member being adapted to be closed by the said first piston plunger upon the updraft and to be opened upon the downdraft, a check valve mounted in said removable inlet member and adapted to close said inlet opening upon downdraft of the said first piston plunger and to open said inlet opening upon updraft of the said first piston plunger, said removable inlet member extending beyond the pump cylinder, the lower end of said sleeve member and said first piston plunger when occupying their position at the end of their travel upon the downdraft extending beyond the said pump cylinder to afford ready access to said piston plunger for inspection and cleaning upon removal of the removable inlet member.

3. A pumping device comprising, in combination, a pump cylinder having an inlet member removably connected thereto, a first piston plunger reciprocal in said pump cylinder, a sleeve member reciprocal in said pump cylinder and slidably carried on said piston plunger, the lower end of said sleeve member being adapted to be closed

by the said first piston plunger upon the updraft and to be opened upon the downdraft, a check valve mounted in said removable inlet member and adapted to close said inlet opening upon downdraft of the said first piston plunger and to open said inlet opening upon updraft of the said first piston plunger, the reciprocal movement of the piston plungers being such that said first piston plunger and the sleeve member closed by said first piston plunger move upwardly to draw fluid from the container up past said check valve and through said pump cylinder and such that said first piston plunger and the sleeve member opened by the said first piston plunger move downwardly through said pump cylinder into the fluid entrapped in said pump cylinder into position for raising said entrapped fluid in the pump cylinder upon the succeeding upward movement of the first piston plunger and sleeve carried thereon, said removable inlet member extending beyond the pump cylinder, the lower end of said sleeve member and said first piston plunger when occupying their position at the end of their travel upon the downdraft extending beyond the said pump cylinder to afford ready access to said piston plunger for inspection and cleaning upon removal of the removable inlet member.

4. A pumping device comprising, in combination, a housing having an inlet member removably connected to one end thereof and a check valve in said inlet member to prevent escape of fluid drawn into the housing, the said housing having a fluid chamber intermediate of its ends and having an outlet conduit in communication with said chamber, a plunger slidably mounted within said housing and adapted to reciprocally move therein, and a sleeve slidably carried on the lower end of said plunger and within said housing and forming a passageway for the fluid between said plunger and said sleeve, the lower end of said plunger having a head adapted to engage said sleeve to close said passageway upon upward movement of the plunger, and the said plunger having a shoulder portion adapted to engage said sleeve upon downward movement of the plunger, the said sleeve being movable between said head and said shoulder portion, the reciprocal movement of the plunger being such that upon upward movement of the plunger and sleeve raised therewith by the said head, fluid is drawn into said housing and is discharged through the outlet conduit by the said sleeve rising in the fluid chamber, and being such that upon downward movement of the plunger into the fluid chamber fluid entrapped therein by the closing of the check valve at the said inlet is displaced and discharged through the outlet conduit and such that the said head disengages the sleeve to open said passageway and the said shoulder portion carries said sleeve downwardly in the housing into the entrapped fluid, said removable inlet member extending beyond the housing, the lower end of said sleeve and said head of the plunger when occupying their position at the end of their travel upon the downward movement extending beyond the said housing to afford ready access to said head for inspection and cleaning upon removal of the removable inlet member.

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