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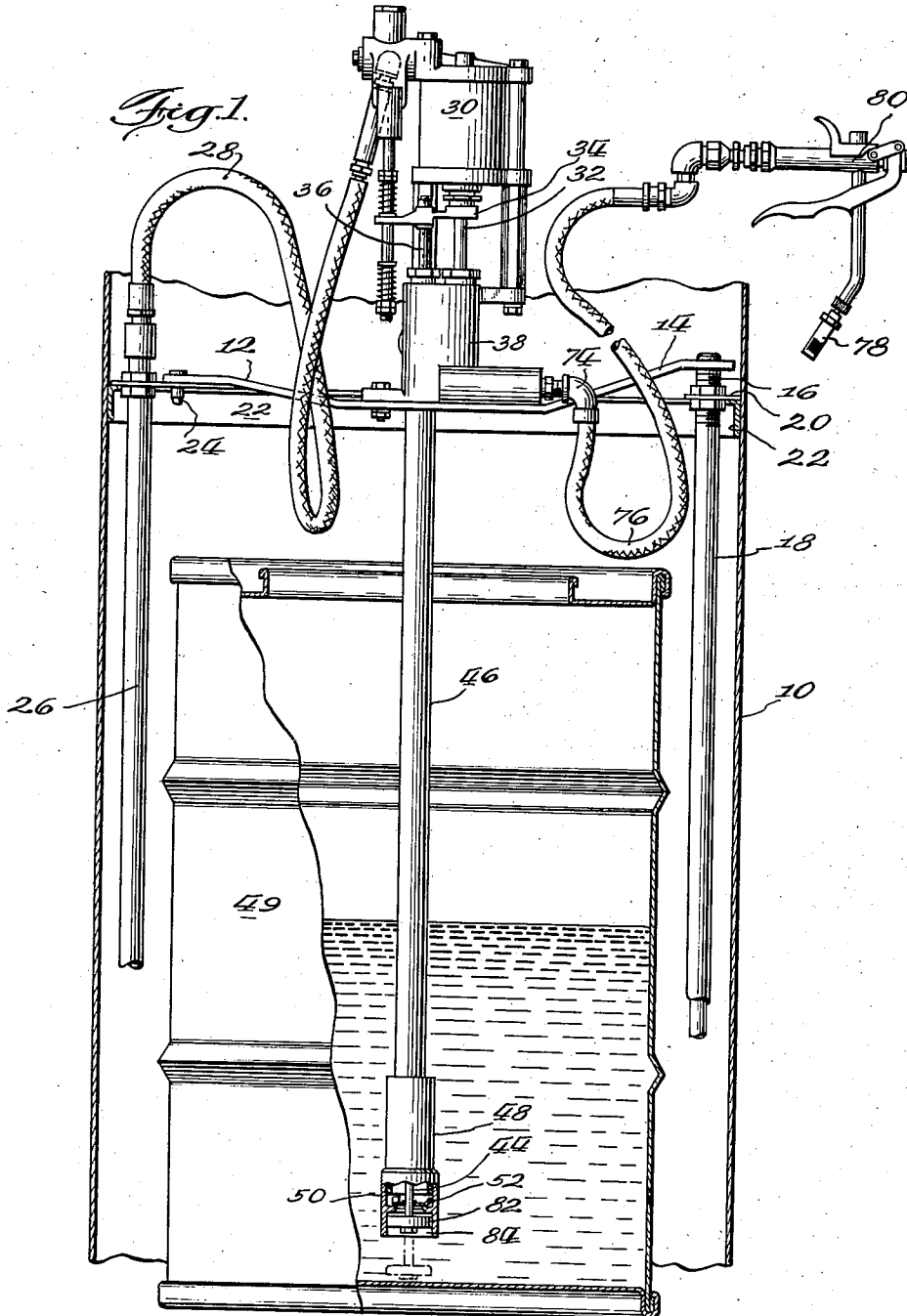
R. WEDEBERG

2,294,705

BARREL PUMP

Filed Nov. 15, 1940

2 Sheets-Sheet 1



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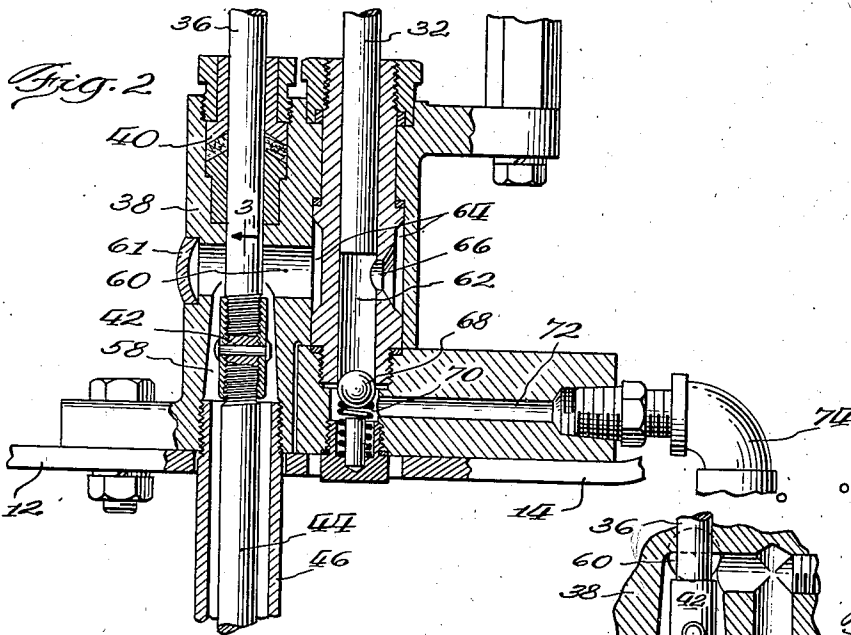
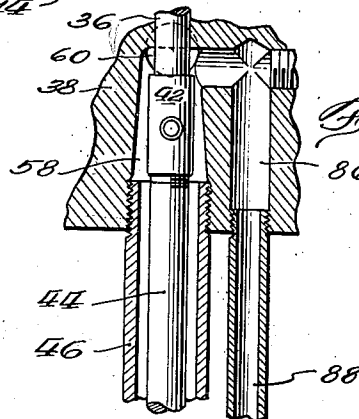
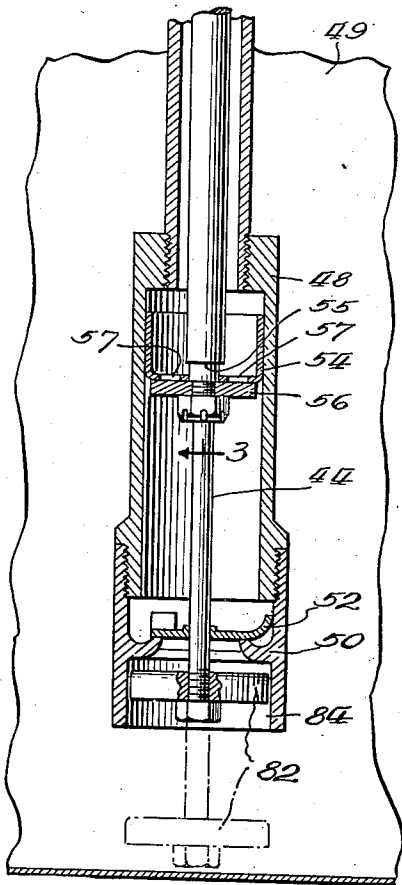
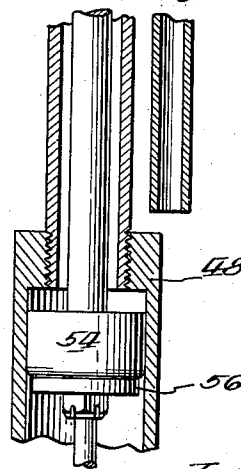
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2,294,705

BARREL PUMP

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,294,705

BARREL PUMP

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Application November 15, 1940, Serial No. 365,754

7 Claims. (Cl. 103—195)

My invention relates to barrel pumps and more particularly to pumps designed for use with the steel barrels or drums in which lubricants are commonly shipped.

An object of my invention is the provision of an improved high pressure lubricant compressor which may be inserted in a lubricant containing drum and which will be effective in withdrawing viscous and fibrous as well as more fluid lubricants from their drums.

Another object of my invention is the provision of a high pressure lubricant compressor having novel priming means.

Still another object of my invention is to provide an improved lubricant compressor having priming means and novel relief means operating without moving parts to prevent over-priming of the compressor.

Yet another object of the present invention is to provide a lubricant compressor having novel priming means which maintain the compressor inlet opening at subatmospheric pressure over a longer time interval than pumps heretofore known.

An additional object is the provision of a high pressure lubricant compressor which is simple in construction, inexpensive to manufacture, and economical and durable in operation.

Other objects and advantages will appear from the following description and the accompanying drawings, in which:

Fig. 1 is a side elevational view of a lubricant compressor embodying the present invention, the lubricant drum, the housing therefor, and a portion of the pump being broken away better to show the operating mechanism;

Fig. 2 is a longitudinal sectional view through the compressor shown in elevation in Fig. 1; and

Fig. 3 is a fractional longitudinal sectional view taken in the direction of the arrows substantially along the line 3—3 of Fig. 2.

In Fig. 1 of the drawings, I have shown a lubricant compressor embodying the present invention with the parts in assembled relation. The compressor is preferably enclosed in a decorative and protective housing 10, more completely disclosed in the application of Charles A. Fine, Serial No. 289,209, filed August 9, 1939.

The compressor unit and associated parts are supported within the housing above the lubricant drum on a pair of radially extending arms 12 and 14. Arm 14 is secured to a rod 16 which telescopes within a vertically extending tube 18. Tube 18 is attached at its lower end to the base of the housing 10 and is supported at its upper

end in a plate 20 attached to an annular flange 22 which is located on the inner surface of the fixed part of the housing 10. The end of the other arm 12 rests upon another plate secured to the annular flange 22 and has a downwardly extending pin 24 which projects through a hole in this plate to prevent rotation of the compressor relative to the tube 18.

The housing 10 is provided with a vertically extending air pipe 26 connected at its lower end to a source of compressed air, not shown, while the upper end of this pipe 26 is connected by a flexible hose 28 with the inlet side of a reciprocating air motor 30. This air motor, which may be the type shown in U. S. Patent No. 2,022,232 issued to Ernest W. Davis, causes a piston rod 32 to reciprocate as air under pressure is alternately admitted to and discharged from opposite sides of a piston, not shown, confined within a cylinder forming a portion of the air motor. The reciprocable rod 32, which also forms the pump rod for the high pressure stage of the compressor, is secured to a crosshead 34 which, in turn, is secured to a second pump rod 36. The two rods 32 and 36, therefore, reciprocate together as the piston of the air motor 30 is reciprocated.

The rod 36 extends vertically into a casting 38, the opening in the casting through which this rod extends being sealed by a suitable packing gland 40. Within the casting 38, the lower end of the rod 36 is connected by a threaded coupling member 42 to a similar pump rod 44 which extends downwardly through a suitable tube 46, the upper end of which is threaded into the casting 38. At its lower end, the tube 46 is threaded into a priming cylinder 48 positioned near the bottom of the lubricant drum indicated by the numeral 49. A cap 50 containing a foot valve 52 is threaded to the lower end of the priming cylinder 48 to close the same.

The pump rod 44 extends into the priming cylinder 48 and has a portion of reduced diameter that passes through a cup-shaped piston 54 positioned therein. This piston is free to move longitudinally a short distance upon the rod 44 between a shoulder 55 above the piston and a circular plate 56 that underlies the piston and is fixed to the rod 44. The lower flat surface of the cup-shaped piston 54 that rests against the circular plate 56 is perforated as at 57. Thus, as the rod 44 moves downwardly, the piston 54 will move upwardly slightly relative to the plate 56, thereby permitting lubricant in the lower portion of the cylinder to flow around the edges of the plate 56, through the perforations in the pis-

ton 54 and into the upper portion of the priming cylinder. Upon upward movement of the rod 44, the piston 54 will rest against the plate 56, thus sealing the perforations in the piston with the result that lubricant in the upper portion of the priming cylinder is forced to move through the tube 46 and into a chamber 58 provided in the casting 38 at the upper end of the tube.

Meanwhile, as the priming piston moves upwardly, lubricant in the drum and surrounding the lower end of the pump cylinder will be forced by the atmospheric pressure upon the lubricant into the lower portion of the cylinder through the foot valve 52. Upon a downward stroke of the piston 54, the foot valve 52 will close and in the manner previously described, the lubricant in the lower portion of the priming cylinder 48 will be transferred through the perforations in the piston 54 to the upper portion of the priming cylinder. Lubricant thus forced upwardly through the tube 46 and into the chamber 58 is conveyed by a passage 60 into an annular space 64 surrounding a high pressure cylinder 62. The passage 60 is formed by drilling the casting 38, from the lefthand side as seen in Figure 2, the outward end of this passage being closed by a plug 61. From the annular space 64, the lubricant passes into the high pressure cylinder through a port 66 in the cylinder side wall located below the upper position of the piston 32.

The discharge end of the high pressure cylinder 62 is sealed by a normally closed spring pressed ball valve 68. This ball valve is positioned in a chamber 70 at the lower end of the cylinder 62 which communicates by means of a passage 72 with pipe fittings 74. A flexible hose 76 is connected at one end to the fittings 74 and at its opposite end communicates with a lubricant coupler 78 through a manually controllable valve 80.

The rod 44 projects downwardly beyond the piston 54, a distance somewhat greater than the length of stroke of the priming piston and is secured at its end to a second piston 82 which fits within a cylindrical recess 84 provided in the end cap 50 beneath the foot valve 52. The recess 84 is short in depth compared to the stroke of the piston 82 which reciprocates with the piston 54 and thus, as the piston 82 nears the upper end of its stroke, it will enter the recess 84, but at other times the piston 82 will be beyond the lower end of the cap 50. This piston which is larger in area than the priming piston 54 is fitted comparatively loosely with respect to the side walls of the recess 84 so as to provide an annular space between the two of approximately .045 to .050 of an inch.

The purpose of the piston 82 is to aid the priming piston 54 in its function of filling the lower portion of cylinder 48. That is, in barrel pumps of the general type shown, wherein the inlet opening of the pump is surrounded by a large mass of lubricant, the lubricant is likely to fail to flow into the inlet opening during the short interval of time taken by the priming piston 54 in moving upwardly. This difficulty is particularly troublesome with what are known as fibrous lubricants. The piston 82 in conjunction with the recess 84 overcomes the above mentioned difficulty in a manner to be pointed out subsequently.

Referring to Fig. 3, it will be seen that the chamber 58 in the casting 38 is connected through a downwardly extending passage 86 to a tube 88 of comparatively small diameter. This tube ex-

tends downwardly nearly to the priming cylinder 48 and permits lubricant, fed by the priming cylinder in excess of that required by the high pressure cylinder 62, to flow back to the lubricant container. However, since this tube is of comparatively small diameter and of considerable length, it offers sufficient resistance to the flow of lubricant therethrough so that lubricant is forced by the priming cylinder under a positive pressure to the high pressure cylinder 62.

After a drum of lubricant has been placed within the housing 10 and the pump lowered to the position shown in Fig. 1, the device operates in the following manner:

The motor 30, receiving compressed air from the hose 28, causes the piston rods 32 and 44 to reciprocate together. As piston 54 moves upwardly it creates a semivacuum in the priming cylinder 48, thus lifting the foot valve 52 and causing lubricant in the drum 49 to flow into the lower portion of the priming cylinder. The simultaneous upward movement of the piston 82 aids in conveying a quantity of the lubricant to the inlet of the priming cylinder. Upon the succeeding downward stroke, the foot valve 52 is closed and piston 54 rises against the shoulder 55 and permits lubricant in the lower portion of priming cylinder 48 to flow through the apertures 57 and into the upper portion of this cylinder. Simultaneously the piston 82 moves downwardly out of its recess 84, thus producing a substantial semivacuum at the inlet opening, inasmuch as this piston is solid and of comparatively large volume. Lubricant around the inlet opening therefore tends to flow into the recess 84 during the downward stroke as well as during the upward stroke. In compressors of this general nature the downward stroke is comparatively slow, since it is during this stroke that the high pressure cylinder 62 is being emptied against a heavy back pressure, and it will be seen, therefore, that the lubricant will have a comparatively long interval in which to flow into and fill the recess 84. Also the downward movement of piston 82 stirs the semifluid lubricant and aids in causing it more readily to flow into the recess 84. The result is that at the lower end of the pump stroke, the recess 84 is well filled and the piston 82 is well buried within the body of the lubricant mass.

Upon the next succeeding upward stroke of the pump, a quantity of the lubricant above the piston 82 is carried upwardly with this piston. It has very little tendency to flow to the side away from the inlet opening of the pump, inasmuch as the simultaneous upward movement of piston 54 creates a vacuum in the lower portion of the priming pump cylinder and at the inlet opening of this cylinder. In other words, a charge of lubricant is urged upwardly, both by the piston 82 beneath this charge and by the vacuum above the charge. The lubricant thus flowing into the inlet opening of the pump will substantially fill the portion of the priming cylinder below the piston 54. As the piston 82 enters the recess 84 the lubricant below the piston 54 will be placed under a positive pressure inasmuch as piston 82 displaces more lubricant upwardly than does the piston 54. After the priming cylinder has been packed, the excess lubricant flows downwardly around the edges of the piston 82.

Lubricant forced upwardly through the tube 46 by the priming piston passes through the chamber 58, passages 60 and 64, and port 66 into the high pressure cylinder 62. The quantity of

lubricant displaced upwardly by the piston 54 is considerably in excess of that which the high pressure cylinder 62 can receive, the excess being diverted through the passage 86 and relief pipe 88 to return to the lubricant drum. However, the tube 88 being of comparatively small diameter and of considerable length offers sufficient resistance to the flow of lubricant there-through, so that although excess lubricant can return through this pipe, yet lubricant is forced into the high pressure cylinder 62 under positive pressure, thus insuring the cylinder 62 receiving a full charge with each stroke of the pump.

The downward movement of the high pressure piston 32 closes the port 66 and forces the lubricant remaining in the high pressure cylinder 62 past the spring-pressed check valve 68 and into the chamber 70 from whence it flows through the passage 72, fitting 74, flexible hose 76, and to the coupler 78 through the control valve 80.

From the above description of a preferred embodiment of my invention, it will be seen that I have provided a barrel pump which may be manufactured at relatively low cost and which is well adapted to handle lubricant materials of high viscosity, as well as fibrous lubricants. It is apparent also that the pump of the present invention is much less likely to become air-bound than pumps now generally in use and that although the high pressure cylinder is charged under positive pressure by a priming cylinder, yet a simple means without moving parts has been provided to prevent the high pressure cylinder from being over-primed.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a lubricant compressor of the class described, a member having a cylinder therein, a piston rod extending through said cylinder and reciprocable therein, valved piston means located in said cylinder and carried by said rod, said member having a cylindrical extension at one end thereof, a piston secured to said rod beyond the end of said cylinder and adapted to take a position below the lower end of the cylindrical extension during a portion of the stroke of said rod and adapted to move into said cylindrical extension when the piston rod approaches one end of its stroke, a flow passage connecting said cylinder with said cylindrical extension, and a check valve situated in said flow passage.

2. In a lubricant compressor of the class described, a member having a vertical cylinder therein, a piston rod extending axially through said cylinder and reciprocable therein, means above said cylinder to reciprocate said piston rod, valved piston means located in said cylinder and carried by said rod, said member having a cylindrical extension at the lower end thereof, a piston secured to the lower end of said rod beyond the end of said cylinder and adapted to take a position below the lower end of the cylindrical extension during a portion of the stroke of said rod and adapted to move upwardly into said cylindrical extension when the piston rod approaches the upper end of its stroke, a flow passage connecting said cylinder with said cylindrical extension and a check valve situated in said flow passage.

3. In a lubricant compressor of the class described, a member having a cylinder therein, a piston rod extending through said cylinder and reciprocable therein, valved piston means located in said cylinder and carried by said rod, a pis-

ton secured to said rod in a position that is beyond the end of said member during at least a portion of the stroke of the piston rod and a check valve situated in said member between the cylinder and the last said piston.

4. In a lubricant compressor of the class described, a member having a cylinder therein, a piston rod extending through said cylinder and reciprocable therein, valved piston means located in said cylinder and carried by said rod, said member having a cylindrical extension at one end thereof, a piston secured to said rod beyond the end of said cylinder and adapted to take a position below the lower end of the cylindrical extension during a portion of the stroke of said rod and adapted to move into said cylindrical extension when the piston rod approaches one end of its stroke, a flow passage connecting said cylinder with said cylindrical extension, a check valve situated in said flow passage, and the diameter of said cylindrical extension being greater than the diameter of said cylinder.

5. In a lubricant compressor of the class described, a member having a cylinder therein, a piston rod extending through said cylinder and reciprocable therein, valved piston means located in said cylinder and carried by said rod, said member having a cylindrical extension at the lower end thereof, a piston secured to the lower end of said rod beyond the end of said cylinder and adapted to take a position below the lower end of the cylindrical extension during a portion of the stroke of said rod and adapted to move into said cylindrical extension when the piston rod approaches one end of its stroke, a flow passage connecting said cylinder with said cylindrical extension, a check valve situated in said flow passage, and the diameter of said cylindrical extension being approximately one-tenth of an inch greater than the diameter of the last said piston.

6. In a lubricant compressor, a member having a first cylinder therein and a second cylinder therein below said first cylinder and passage means connecting said cylinders, said cylinders being in alignment and the second of said cylinders being of greater diameter than the first of said cylinders, a reciprocable piston rod extending axially through the first of said cylinders and into the second of said cylinders, a first piston on said rod located in said first cylinder, check valve mechanism associated with said first piston adapted to permit upward flow but to prevent downward flow of fluid relative to said piston, a second piston on said rod located in said second cylinder, second check valve means in said passage means adapted to permit fluid to pass from said second cylinder to said first cylinder but to prevent flow in the reverse direction, said second cylinder having an inlet adapted to communicate with a mass of fluid to be pumped, said inlet being located below said second piston during a portion of the stroke of said second piston so that said second piston operating in said second cylinder will, in conjunction with said second check valve, produce a partial vacuum within the second cylinder upon initial downward movement of the piston rod and until the second piston passes said inlet, thus tending to cause fluid in the mass to surge into said inlet when said second piston passes said inlet, and said second piston being adapted to permit the escape of fluid in excess of the capacity of said first cylinder downwardly relative to said second piston during upward movement of said piston rod.

7. In a lubricant compressor, a member having a first cylinder therein and a second cylinder therein, and passage means connecting said cylinders and the second of said cylinders being of greater diameter than the first of said cylinders, 5 a first piston in said first cylinder, a second piston in said second cylinder, a piston rod connecting said pistons so that said pistons reciprocate together, check valve mechanism associated with said first piston adapted to permit 10 flow of fluid relative to said piston in one direction but to prevent flow in the opposite direction, second check valve means in said passage means adapted to permit flow in the same direction as the first said check valve means, said direction 15 being from said second cylinder to said first cylinder, said second cylinder having an inlet adapted to communicate with a mass of fluid to be pumped, said inlet being adapted to be uncovered by said second piston after said second piston has moved a predetermined distance away from said second check valve means so that a partial vacuum is produced within said second cylinder upon initial outward movement of said second piston before said second piston reaches said inlet, thus, tending to cause fluid in said mass to surge into said inlet when said second piston passes said inlet, and said second piston being adapted to permit the escape of fluid in excess of the capacity of said first cylinder during inward movement of said pistons.

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