

March 23, 1943.

W. F. WESLEY

2,314,745

PUMP

Filed Sept. 7, 1939

2 Sheets-Sheet 1

Fig. 1

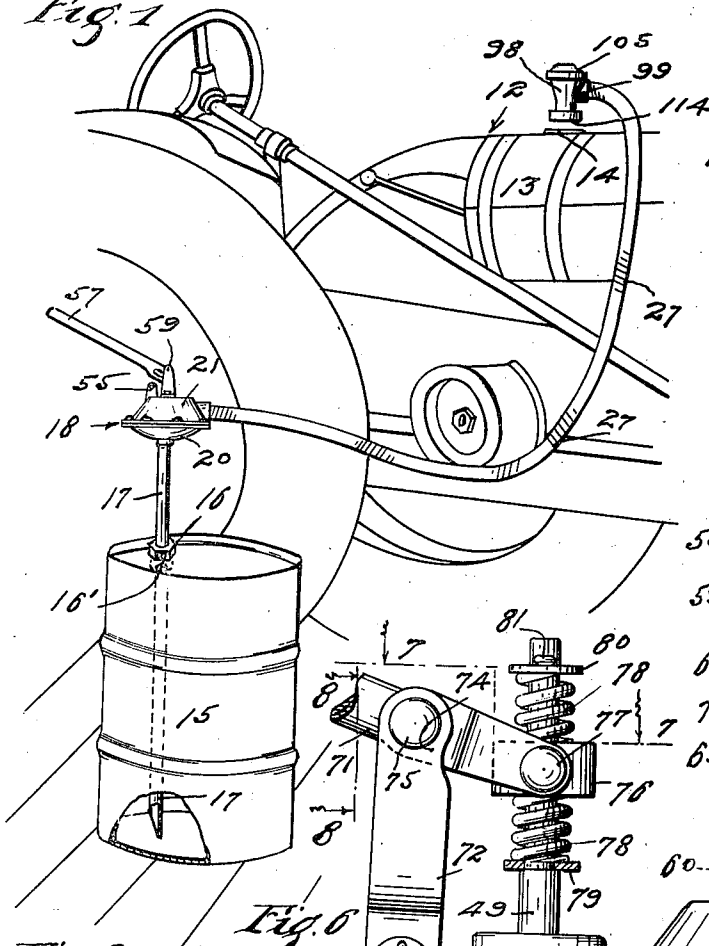


Fig. 7

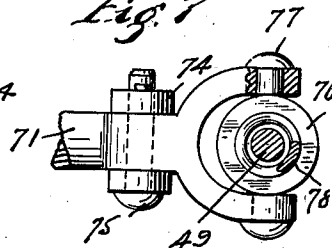


Fig. 3

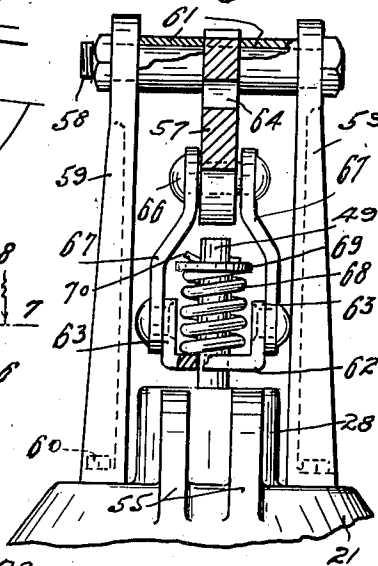


Fig. 6

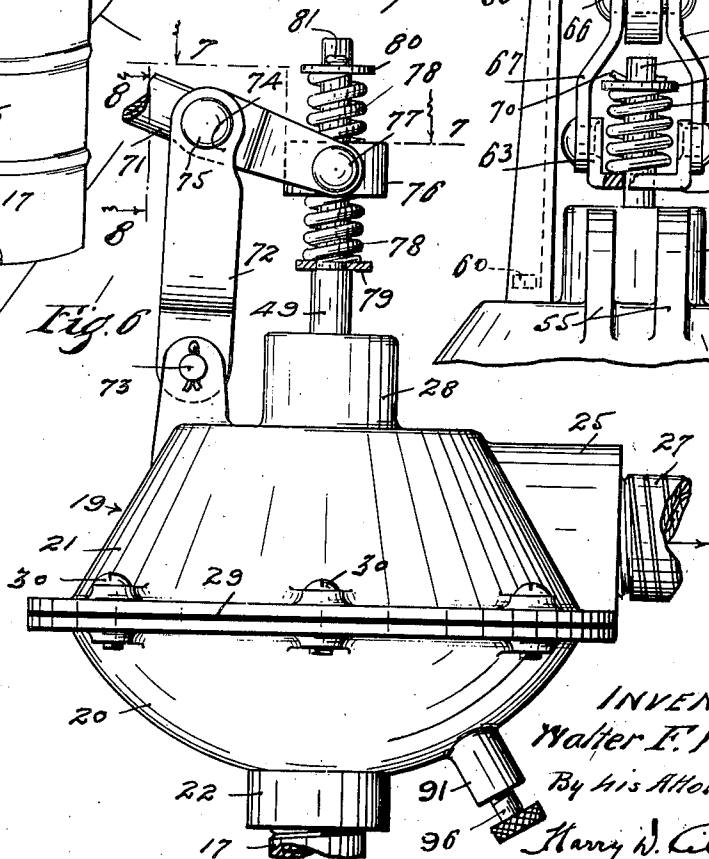
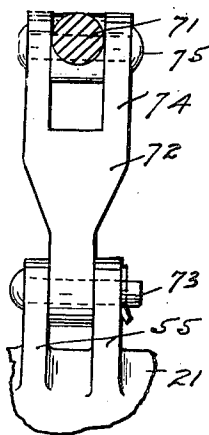


Fig. 8



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By his Attorney
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March 23, 1943.

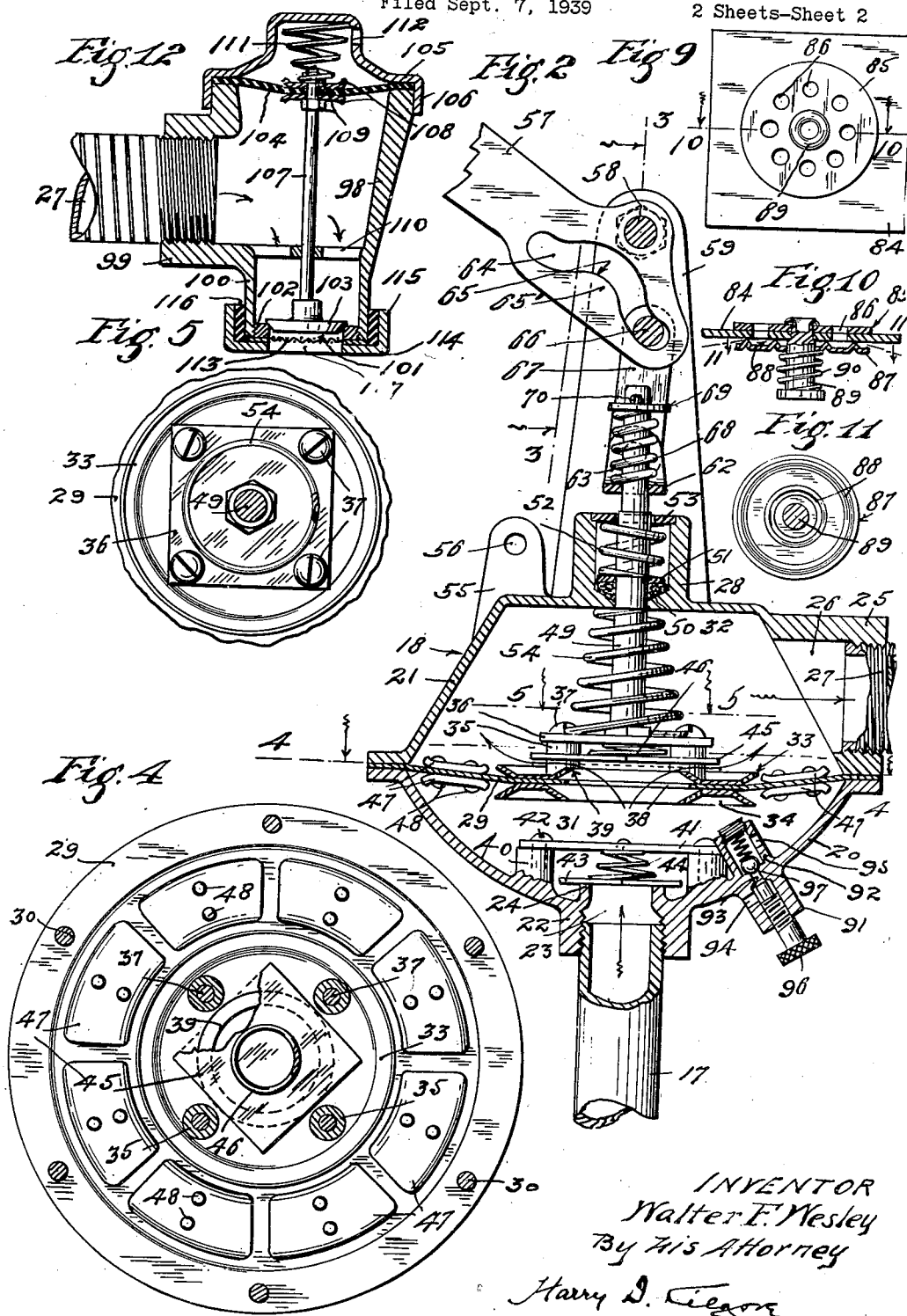
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Filed Sept. 7, 1939

2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,314,745

PUMP

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Application September 7, 1939, Serial No. 293,765

7 Claims. (Cl. 103—151)

My present invention relates to improvements in pumps, and more particularly to a manually operated pump in which the suction producing member thereof is a diaphragm.

The object of this invention is to provide a pump that is relatively simple, easy to operate, and highly efficient in its action. A further object of the invention is to provide a pump that may be easily and quickly mounted on a barrel containing gasoline, fuel oil, lubricating oil, alcohol, or any other liquid to be pumped therefrom.

Other objects of the invention will hereinafter appear from the following description and appended claims had in connection with the accompanying drawings.

While the improved pump is intended for general use, it is especially designed and well adapted for use on a farm, in a garage, or on a construction job to pump gasoline from a barrel into the supply tank of a tractor, truck, automobile, and other vehicle for pumping oil or alcohol. It will be understood that the improved pump may be used for pumping fluid into an open tank or into a closed tank or receptacle under a predetermined pressure.

To the above end, generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views:

Fig. 1 is a fragmentary perspective view, principally in diagram, showing a tractor and a gasoline or other liquid fuel barrel on which the double acting pump is mounted, and having a hose leading therefrom to the liquid fuel tank of the tractor;

Fig. 2 is a view, partly in side elevation and partly in vertical section, taken centrally through the pump, shown in Fig. 1, on an enlarged scale;

Fig. 3 is a fragmentary detail view, partly in elevation and partly in section, taken substantially on the irregular line 3—3 of Fig. 2;

Fig. 4 is a view, partly in plan and partly in horizontal section, taken on the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary detail view, partly in plan and partly in horizontal section, taken on the line 5—5 of Fig. 2;

Fig. 6 is a view in side elevation, with some parts broken away, showing the single action pump;

Fig. 7 is a fragmentary detail view, partly in

plan and partly in section, taken on the irregular line 7—7 of Fig. 6;

Fig. 8 is a fragmentary detail view, partly in rear elevation and partly in section, taken on the line 8—8 of Fig. 6;

Fig. 9 is a plan view of modified form of an outlet valve in which is embodied a reducing valve;

Fig. 10 is a view, principally in vertical section, taken on the line 10—10 of Fig. 9;

Fig. 11 is a detail view, partly in plan and partly in section, taken on the line 11—11 of Fig. 9, and

Fig. 12 is a view of the automatic cut-off in central vertical section.

The tractor, fragmentarily and diagrammatically shown in Fig. 1, is indicated as an entirety, by the numeral 12, with the exception of its liquid fuel tank 13 in the top of which is an intake opening 14.

Also shown in Fig. 1 is a gasoline or other liquid fuel barrel 15 standing on end and having in its top a hole into which is screwed a collar or bushing 16 having a hexagon outer end. A pipe section 17 is inserted into the barrel 13 through the collar 16 and rests, at its lower end, on the bottom of said barrel. This pipe section 17 extends above the top of the barrel 15, its upper end being screw threaded, and it is important to note that the lower end portion of said pipe section is cut on an angle so as to form an intake opening therein. A set screw 16' in the collar 16 impinges against the pipe section 17 and holds the same from turning or endwise movements in the collar 16.

A double acting pump, indicated as an entirety by the numeral 18, is mounted on the pipe section 17. The single acting pump shown in Figs. 6, 7 and 8, is indicated as an entirety by the numeral 19.

Both pumps 18 and 19 are substantially identical, the one with the other, except the manually operated means for operating the diaphragm to produce pumping action, as will presently appear.

Each pump 18 or 19 includes a casing comprising a lower or base section 20, and an upper or top section 21. Formed with the casing section 20, on the under side thereof, is a boss 22 having a passageway that is axially aligned with the casing and affords an intake port 23. The boss 22 is internally screw threaded to receive the upper end portion of the pipe section 17 from which either pump 18 or 19 may be supported. Surrounding the port 23, within the casing section 20, is an upstanding annular valve seat 24. Formed with the upper casing section 21, at

the front thereof, is an outwardly projecting boss 25 having a passageway that affords a radially extended discharge port 26. A hose 27, having a flexible metal jacket or covering, is secured at its inner end to the boss 25 by screw threads. An upstanding stuffing box 28 is formed as an integral part of the top of the upper casing section 21 in axial alignment therewith.

A vibratory diaphragm 29, of rubber composition or any other suitable material, is held at its marginal edge portion, between the case sections 20 and 21, and said sections are clamped together and onto said diaphragm by a plurality of machine screws 30. Obviously the clamping of the diaphragm 29 between the casing sections 20 and 21 not only holds said diaphragm in place but forms a tight joint between said sections. This diaphragm 29 divides the casing into an intake compartment 31 and a discharge compartment 32 and extends between upper and lower sheet metal plates or disks 33 and 34, respectively. These disks 33 and 34 are axially aligned with the casing 20-21.

Four relatively short tubular posts 35 rest on the upper disk 33 and an anchor plate 36 rests on said posts 35. These posts 35 are circumferentially spaced equal distances apart for a purpose that will presently appear. Stove bolts 37 that extend through aligned holes in the disks 33 and 34 and the plate 36 and through the tubular posts 35 clamp said disks onto the diaphragm 29 and hold the posts 35 and the plate 36 in assembled relation on the upper disk 33.

The outer marginal portions of the disks 33 and 34 are outwardly inclined relatively to the diaphragm 29 so as to not cut or wear said diaphragm during vibration thereof. Aligned axial holes in the diaphragm 29 and the disks 33 and 34 afford a port 38 that connects the intake compartment 31 to the discharge compartment 32. The marginal portions of the disks 33 and 34, surrounding the axial holes therein, are also outwardly inclined from the diaphragm 29. The outwardly inclined marginal portion of the upper disk 33, surrounding the axial hole therein, affords an annular valve seat 39 that surrounds the port 38.

Integral with the casing section 20, on the inside thereof, are four short posts 40 on which a plate 41 rests and is secured thereto by screws 42. A floating intake valve 43, in the form of a thin flat plate, which is square and made of fibre or any other suitable material, normally rests on the valve seat 24 and closes the intake port 23. This valve 43 is yieldingly held on the seat 24 by a spiral spring 44 that has a relatively light tension. Said spring 44 is held compressed between the valve 43 and the overlying plate 41 to which it is anchored and loosely rests on said valve. It will be noted that the valve 43, at its corners, extends between the posts 40 with freedom for limited edgewise shifting movement. However, the shifting movement of the valve 43 is not sufficient at any time to uncover the port 23.

A floating outlet valve 45, substantially identical with the inlet valve 43, normally rests on the valve seat 39 and closes the port 38. The valve 43 is yieldingly held on its seat 39 by a spiral spring 46 that has a relatively tight tension. This spring 46 is held compressed between the valve 45 and the anchor plate 36 to which it is anchored and loosely rests on said valve. The valve 45, at its corners, extends between the posts 35 with freedom for limited shifting edgewise

movement. This shifting movement of the valve 45, however, is not sufficient at any time to uncover the port 38.

Two washer-like reinforcing members 47 are applied, the one to the upper surface of the diaphragm 29 and the other to the lower surface thereof. These reinforcing members 47 extend substantially the full distance between the inner walls of the casing sections 20 and 21 and the disks 33 and 34, and each thereof is made up of a plurality of segments. The upper and lower segments of each pair are secured to each other, with the diaphragm clamped therebetween, by a pair of rivets 48.

Obviously, the diaphragm 29 hingedly connects the segments of the reinforcing members 47 and these segments permit free vibratory movement of the diaphragm 29. The purpose of the reinforcing members 47 is to stiffen the diaphragm 29 and prevent the same from cupping during pumping action. These reinforcing members 47 give the diaphragm 29 substantially the same effect as though it was a relatively rigid structure. Without the reinforcing members 47, the diaphragm 29 would cup during the pumping action and thereby reduce the capacity of the pump and it would also naturally interfere with the suction of the pump.

An upright stem 49 is rigidly secured, at its lower end, to the anchor plate 36 and works through the stuffing box 20. In the bottom of the stuffing box 28 is a packing 50 which surrounds the stem 49 and prevents leakage therearound. This packing 50 is held tightly pressed around the stem 49 by a washer 51 which rests thereon, and a coiled spring 52, compressed between said washer and a washer 53 secured in the stuffing box by a pressed fit.

A spiral spring 54, encircling the stem 49 and compressed between the anchor plate 36 and the top of the casing section 21, is provided to impart the return stroke to the diaphragm 29. Normally, the spring 54 holds the diaphragm 29 in a depressed or intake position, as shown in Fig. 2.

Integral with the top and back of the casing section 20 is a pair of laterally spaced upstanding bearing lugs 55 having a pair of aligned holes 56 therein.

The parts thus far described are common to both the single and double acting pumps 12 and 19, except that the spring 54 is dispensed with.

Referring now in detail to the manually operated means for imparting the suction stroke to the diaphragm 29 of the double acting pump 18, shown in Figs. 1 to 3, inclusive, and which means includes a handle 57. This handle 57 is pivoted on a nut equipped bolt 58 secured to a pair of bearings 59, detachably secured by screws 60 to the top of the casing section 20 with the stem 49 extending therebetween. A pair of spacing sleeves 61, on the bolt 58, hold the handle 57 centered between the bearings 59.

A horizontal bar 62, having a central hole through which the stem 49 loosely extends at a point between the stuffing box 28 and the handle 57, is provided at each end with an upstanding ear 63.

Formed in the handle 57 directly below its pivotal support 58 is a longitudinally extended slot 64 the bottom of which affords a cam surface 65, having an intermediate hump 65'. A cam pin 66 extends endwise through the slot 64 and a pair of links 67 connect the cam pin 66, at its ends, to the ears 63.

A coiled spring 68, encircling the stem 49 between the bar 62 and a washer 69 on the upper end portion of said stem affords a yielding connection between said stem and the handle 57. Said washer 69 is held on the stem 49 by a cotter pin 70 and normally the spring 68 is expanded to its full length and is not under compression.

The purpose of the spring connection 68 is to automatically compensate for stretch, as the same is produced in the diaphragm 29 by use, and thereby permits full strokes to be imparted to the diaphragm 29 at all times by the spring 54 and the handle 57.

Primarily the length of the spring 68 is such that it must be compressed during each stroke of the handle 57 to increase the operative length of the connections between the diaphragm 29 and the cam pin 66 and thereby permit said pin to move over the hump 65'. As the diaphragm 29 stretches, less compression of the spring 68 is required to permit the cam pin 66 to move over the hump 65'.

When the handle 57 is in either of its extreme positions, the cam surface 55 is in an oblique position, and the spring 54 holds the diaphragm 29 in its lowermost position with the cam pin 66 on the lower portion of the cam surface 55. During each stroke of the handle 57, it will lift the diaphragm 29, produce the suction stroke thereof, and place the spring under tension. During the final movement of the handle 57 in either direction, the spring 54, acting on the diaphragm 29, will draw the cam pin 66 over the hump 65' which has been tilted in the direction of the movement of the cam pin 66 on the cam surface 55, and impart the return stroke to the diaphragm 29. It will thus be seen that for each stroke of the handle 57, the diaphragm 29 will be given a suction stroke and a return stroke, thus producing a fast pumping action.

Referring now in detail to the manually operated means for operating the diaphragm 29 in the single action pump, shown in Figs. 6, 7 and 8, and which operating means includes a handle 71. This handle 71 is fulcrumed on the casing section 21 by a link 72, the lower end of which extends between the bearing lugs 55 and is pivoted on a pin 73 which extends through the holes 56 in said lugs. The upper end portion of link 72 is bifurcated to receive the handle 71 between the prongs 74 thereof, and which handle is pivoted thereto by a pin 75 that extends through aligned holes in said prongs. The handle 71, at its inner end portion, is bifurcated to receive a collar 76 through which the stem 49 loosely extends. Said collar 76 is provided with a pair of diametrically opposite trunnions 77 turnably mounted on the prongs 74 and thereby connects said collar to the handle 71.

A pair of opposing buffer coiled springs 78, encircling the stem 49, hold the collar 76 centered therebetween. One of these springs 78 is compressed between the bottom of the collar 76 and a washer 79, that rests on a shoulder on the stem 49, and the other of said springs is compressed between the top of the collar 76 and a washer 80 on the upper end portion of the stem 49 and held in place by a cotter pin 81.

The tension of the springs 78 is such as to normally hold the collar 76 against longitudinal movement on the stem 49, but in case the handle 71 is given a longer stroke than that required to operate the diaphragm 29, the spring 78 receiving the force of the stroke of the handle 71,

will yield and thus prevent undue strain from being placed on the diaphragm 29.

When the pump casing is used for the single acting pump 19, the bearings 59, used in connection with the double acting pump are of course removed.

To adapt either the single or double acting pump to deliver air or liquid therefrom at a predetermined pressure, a modified form of discharge valve 45 is shown in Figs. 9, 10 and 11. The discharge valve 84 is reinforced by a disk 85 on the top thereof, and in which valve and disk is a plurality of air intake holes 86 circumferentially spaced about the axis of said valve and disk. On the under side of valve 84 is a reducing valve 87, in the form of a disk, and having on its upper face a pair of concentric annular V-shaped beads 88 that normally engage the under side of said valve 84 with the holes 86 therebetween and thereby close said holes.

The valve 87 is slidably mounted on a stud 89, the upper end position of which is reduced to form a shoulder on which the valve 45 rests. Said reduced end portion of the stud 89 extends through axially aligned holes in the valve 84 and the disk 85, and is upset onto said disk and thereby rigidly secures the stud 89 to the valve 84 and also holds the disk 85 clamped onto said valve. A coiled spring 90, encircling the stud 89, is compressed between a head on the lower end of said stud and the bottom of the valve 87, and yieldingly holds said valve closed.

It may be assumed that the reducing valve 87 is set to maintain, for instance, a pressure of 35 pounds in the compartment 32, and in case the pump is being operated, and forces liquid into said compartment above this pressure, the valve 87 will automatically open and release the excess pressure.

Formed with the casing section 20 are inner and outer bosses 91 and 92, respectively, connected by a port 93. An air intake port 94 in the boss 91 leads from the exterior of said boss to the port 93 and a port 95 leads from the port 93 to the interior of the intake compartment 31.

A needle valve 96 having screw threaded engagement with the boss 91 normally closes the port 93 at its outer end and a check valve 97 normally closes the port 93 at its inner end. Said check valve 97, as shown, is a spring pressed ball in the boss 92.

After the desired amount of liquid has been pumped from the barrel 15, the hose 27 may be emptied by opening the needle valve 96 while the pump is being slowly operated, to draw air through the ports 93, 94 and 95, the compartment 31, the port 38, the compartment 32 and into the hose 27.

The check valve 97 permits the escape of air or fluid from the compartment 31 during the down or return stroke of the diaphragm 29.

Obviously, the valve 43 will be held closed during the return stroke of the diaphragm 29, and at the same time the valve 45 will be opened by the liquid pressure in the compartment 31. During the suction stroke of the diaphragm 29, the valve 43 will be opened and the valve 45 will be closed.

The floating valves 43 and 45, by their freedom for limited shifting movements in the planes thereof, will prevent grooves from being worn in said valves. This movement of the valves 43 and 45 will also keep said valves and their seats 24 and 39 clean, so that said valves, when seared, will completely close the ports 23 and 38.

Obviously, for each stroke of the handle 57, the diaphragm 29 is the double acting pump will be given a suction stroke and a return stroke and thereby produce a very fast pumping action.

Referring again to the hose 27, which, as shown in Figs. 1 and 12, has an automatic cut-off attached to its outer or discharge end. This automatic cut-off includes a casing 93 having a boss 99 into which the respective end of the hose 27 is secured by screw threads. Formed with the casing 98 is a short depending neck 100 having a discharge opening 101 in which is secured a valve seat 102. The discharge opening 101 is normally closed by a valve 103 that is automatically opened by fluid pressure in the casing 98 on a diaphragm 104. This diaphragm 104 closes the open upper end of the casing 98 and is clamped, at its marginal edge portion, between the upper end of said casing and a cover or gland 105 having a capping flange 106 secured to said casing by a pressed fit. Secured to the valve 103 is an upstanding stem 107, the upper end portion of which extends through a hole in the diaphragm 104, at the axis thereof, and is secured to said diaphragm by a pair of cup-washers 108 and a pair of opposing nuts 109. The valve stem 107 is guided for straight line endwise movement by a spider 110 anchored to the casing 98. A coiled spring 111, compressed between the top of the gland 105 and the diaphragm 104, yieldingly holds the valve 103 closed on its seat 102. Formed in the gland 105 between the top thereof and the diaphragm 104 is an air vent 112.

A screen 113 covers the discharge opening 101 and is clamped between the lower end of the neck 100 and a gland 114 and held in place thereby. The gland 114 has a capping flange 115 frictionally secured to the neck 100 by a rubber ring 116 interposed between said flange and said neck. Formed in the gland 114 is a hole 117 that is coincident with the passageway in the valve seat 102.

During each suction stroke of the diaphragm 29, fluid forced thereby from the hose 27 into the casing 98 will lift the diaphragm 104 against the tension of the spring 111 and open the valve 103. At the completion of each suction stroke of the diaphragm 29 the spring 111 together with the weight of the fluid on the valve 103 will close said valve.

The automatic cut-off prevents a flow of fluid from the casing 98 after the completion of the suction stroke of the diaphragm 29 and also prevents fluid from dripping from the casing 98.

The purpose of the screen 112 is to prevent fluid from spattering during its discharge from the automatic cut-off.

It will of course be understood that the automatic cut-off may be directly attached to the pump casing by a pipe or otherwise.

It will be understood that the invention described is capable of various modifications within the scope of the invention herein disclosed and claimed.

What I claim is:

1. A pump of the kind described comprising a casing, a diaphragm dividing the casing into an intake compartment and a discharge compartment, an intake port and a discharge port in the casing, the former leading into the intake compartment and the latter leading from the discharge compartment, a port in the diaphragm connecting the two compartments, valves for opening and closing the intake port and the port in the diaphragm, and means for operating the

diaphragm to produce pumping action, said operating means including a spring under strain to move the diaphragm in one direction, and connections including a lever for moving the diaphragm in the opposite direction to that imparted thereto by the spring, and against the tension of said spring, said connections being constructed and arranged to impart two strokes to the diaphragm during each stroke of the lever.

2. The structure defined in claim 1 further including automatic means in the diaphragm operating means, to compensate for stretch as the same takes place in the diaphragm.

3. A pump of the kind described comprising a casing, a diaphragm dividing the casing into an intake compartment and a discharge compartment, an intake port and a discharge port in the casing, the former leading into the intake compartment and the latter leading from the discharge compartment, a port in the diaphragm connecting the two compartments, valves for opening and closing the intake port and the port in the diaphragm, a stem on the diaphragm working through a stuffing box on the casing, a spring for moving the diaphragm in one direction, a lever having a cam surface, a cam pin riding on said surface, and connections including a spring connecting the cam pin to the stem.

4. A mechanical movement including a reciprocating member, and operating connections for reciprocating said member including a spring under strain to move said member in one direction, a pivoted lever for moving said member in the other direction, said lever having a longitudinally extended cam surface directly below its pivot, said cam surface having a hump intermediate of its ends, and a cam member yieldingly held on said cam surface by said spring.

5. A pump of the kind described comprising a casing, a diaphragm dividing the casing into an intake compartment and a discharge compartment, an intake port and a discharge port in the casing, the former leading into the intake compartment and the latter leading from the discharge compartment, a port in the diaphragm connecting the two compartments, valves for opening and closing the intake port and the port in the diaphragm, and means for operating the diaphragm to produce pumping action, said operating means including a lever and a cam for imparting two strokes to the diaphragm during each stroke of the lever.

6. A pump of the kind described comprising a casing, a diaphragm dividing the casing into an intake compartment and a discharge compartment, an intake port and a discharge port in the casing, the former leading into the intake compartment and the latter leading from the discharge compartment, a port in the diaphragm connecting the two compartments, valves for opening and closing the intake port and the port in the diaphragm, a stem on the diaphragm, a spring for imparting the intake stroke to the diaphragm, a member slidably mounted on the stem, means for reciprocating said member, an upper coiled spring and a lower coiled spring encircling the stem with said member therebetween, the outer ends of the springs relative to said member being anchored to the stem, said upper spring affording a yielding buffer for said member during movement thereof by its reciprocating means to impart the suction stroke to the diaphragm and also to compress the spring that imparts the intake stroke to the diaphragm, said lower spring affording a yielding buffer for said member dur-

ing movement thereof by its reciprocating means while the intake stroke of the diaphragm is taking place.

7. A pump of the kind described comprising a casing, a diaphragm dividing the casing into an intake compartment and a discharge compartment, an intake port and a discharge port in the casing, the former leading into the intake compartment and the latter leading from the discharge compartment, a port in the diaphragm 10 connecting the two compartments, valves for opening and closing the intake port and the port in the diaphragm, a stem on the diaphragm, a member slidably mounted on the stem, means for

reciprocating said member, an upper coiled spring and a lower coiled spring encircling the stem with said member therebetween, the outer ends of the springs relative to said member being anchored to the stem, said upper spring affording a yielding buffer for said member during movement thereof by its reciprocating means to impart the suction stroke to the diaphragm, said lower spring affording a yielding buffer for said member during movement thereof by its reciprocating means to impart the intake or discharge stroke to the diaphragm.

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