April 8, 1952 J. R. LOWRY 2,591,951

RECIPROCATING PUMP

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Fig. 1

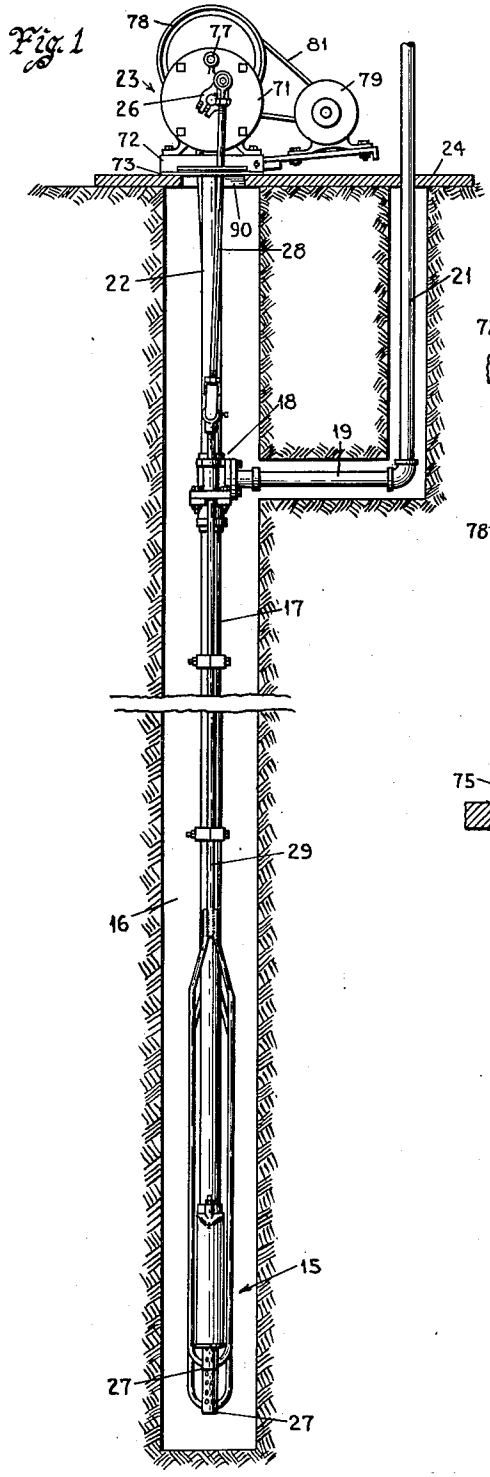


Fig. 3

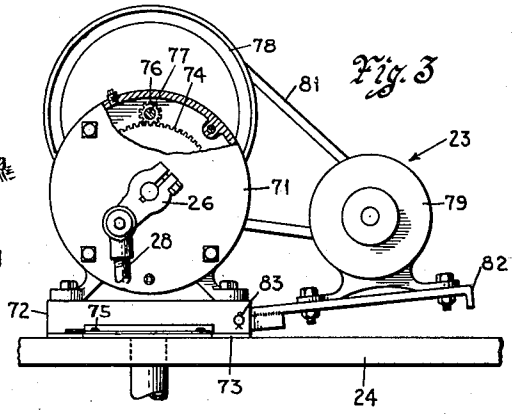
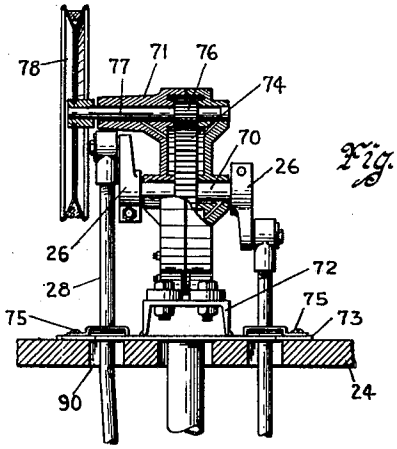
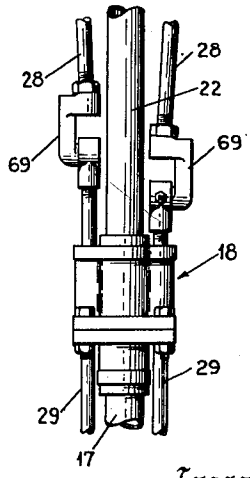


Fig. 2





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Fig. 4

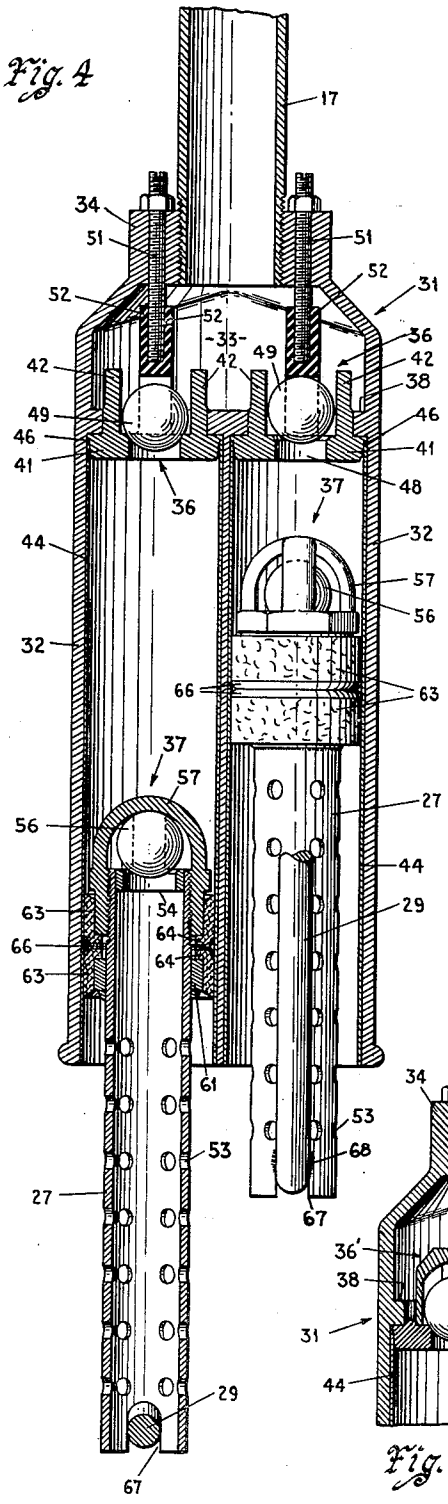


Fig. 5

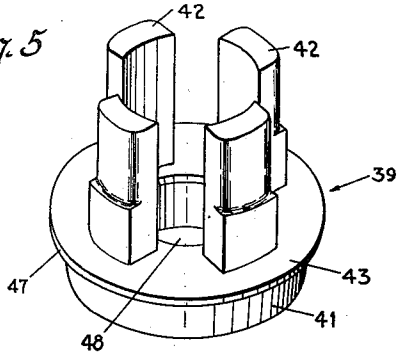


Fig. 9

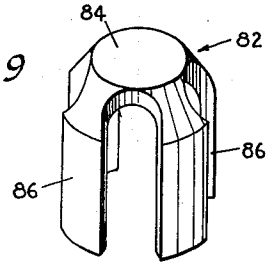


Fig. 6

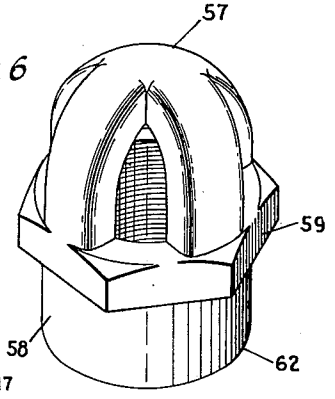


Fig. 7

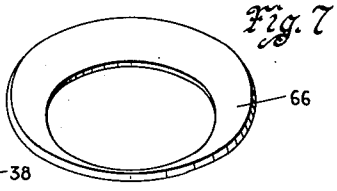


Fig. 8

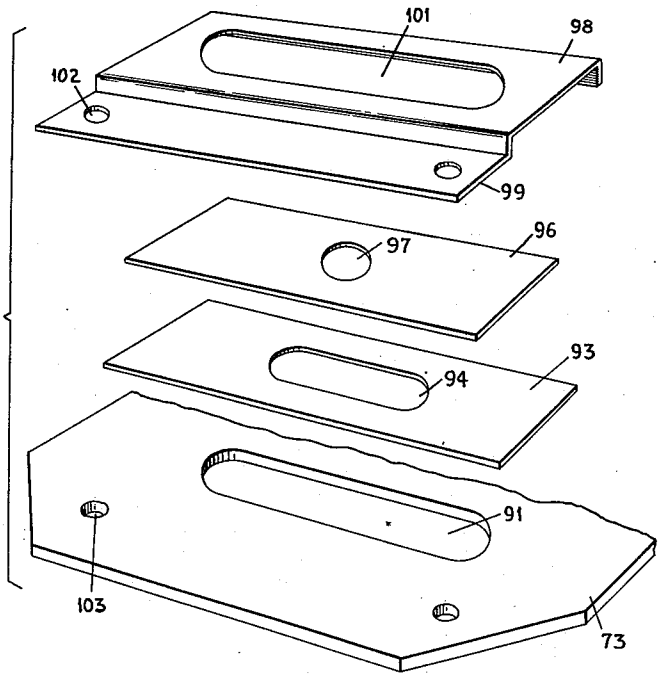
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Fig. 10



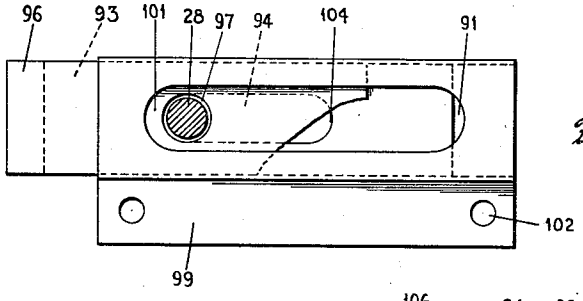
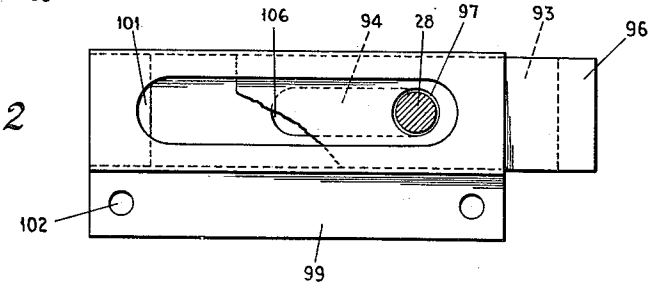


Fig. 11

Fig. 12



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RECIPROCATING PUMP

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Application January 11, 1946, Serial No. 640,556

3 Claims. (Cl. 103—229)

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This invention relates generally to reciprocating pumps and in particular to a multiple cylinder pump of double acting type.

An object of this invention is to provide an improved multiple cylinder pump of reciprocating type.

A further object of this invention is to provide a multiple cylinder reciprocating pump in which valve means, permanently assembled adjacent the outlet ends of the cylinders, are accessible for reseating purposes on removal of a well pipe common to the outlet ends of the cylinder.

A further object of this invention is to provide a multiple cylinder reciprocating pump having valve seats permanently assembled adjacent the outlet ends of the cylinders, in which valve members for the valve seats are assembled therewith through an outlet for a chamber common to the cylinders, and held in assembly position by adjustable means operable from the outside of the chamber.

Yet another object of this invention is to provide a multiple cylinder pump which is of a simple and rugged construction, efficient in operation to supply a continuous flow of fluid against relatively large pressure heads, and having the valve members therein readily accessible for replacement and servicing purposes.

A feature of this invention is found in the provision of a pump apparatus for a well having a pump unit located in a well, driving means therefor at the top of the well, and a reciprocating rod connecting a working piston in the pump unit with a rotatable crank on the driving means, in which an opening in a cover means for the well adapted to receive the connecting rod is maintained closed for all moved positions of the rod.

Another feature of this invention is found in the provision of the multiple cylinder pump including a chamber common to all of the cylinders and having an outlet connectible with a well pump, in which valves for controlling the flow of fluid from the cylinders to the chamber include valve seats permanently assembled within the cylinders. Valve members for the seats are assembled therewith through the chamber outlet and movably maintained within upright guides on the valve seats by means adjustably supported in the wall of the chamber, and adjustable from the outside of the chamber. On removal of the valve members, the valve seats are accessible for resurfacing purposes through the chamber outlet.

Further objects, features and advantages of this invention will become apparent from the following description when taken in connection with the accompanying drawings in which:

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Fig. 1 is a foreshortened elevational view showing the pump of this invention arranged within a well hole;

Fig. 2 is a foreshortened elevational view, with certain parts shown in section, showing the upper portion of the pump and its relative assembly with driving means therefor;

Fig. 3 is a side elevational view of the pump driving means, with parts thereof shown in section to more clearly illustrate its construction;

Fig. 4 is an enlarged longitudinal sectional view of the pump showing the relative assembly and construction of the pump cylinders, pistons and valves for controlling the flow of fluid through the pump;

Fig. 5 is a perspective detail view of a valve seat forming part of the valve unit for controlling the flow of fluid from a cylinder;

Fig. 6 is a perspective detail view of a cage member forming part of the valve unit for controlling the flow of fluid through a piston;

Fig. 7 is a perspective detail view of a supporting member for the packing of a piston;

Fig. 8 is a fragmentary sectional view, illustrated similarly to Fig. 4, showing a modified form of valve structure for a cylinder;

Fig. 9 is a perspective detail view of a cage member forming part of the valve structure shown in Fig. 8;

Fig. 10 is an exploded perspective view of a plate assembly constituting part of the cover means at the top of the well for supporting the pump driving means;

Fig. 11 is a top elevational view of the plate assembly in Fig. 10 showing the plates in one moved position; and

Fig. 12 is illustrated similarly to Fig. 11 and shows the plate assembly in a second moved position.

With reference to the drawings the pump of this invention, indicated generally as 15, is illustrated in Fig. 1 in an installed position adjacent to the bottom of a well hole 16. Water is discharged by the pump through an upright well pipe 17, a T-joint 18, a transverse pipe 19 and then through an upright pipe 21 for delivery to a desired destination. That portion 22 of the pipe 17 above the T-joint 18 constitutes a stand pipe as will appear later. A driving unit 23 for the pump 15 is carried on a cover 24, for the top of the well 16, and includes a pair of rotatable cranks 26 connected in a driving relation with

the pump pistons 27 through pitman rods 28 and connecting rods 29.

The pump 15 (Fig. 4) comprises a unitary cylinder block, indicated generally as 31, which is formed with a pair of parallel cylinders 32, open at their lower ends, and having their upper ends in fluid communication with a common discharge header or chamber 33 formed at the top of the cylinder block 31. An outlet 34, for the chamber 33, is adapted for threaded connection with the lower end of the well pipe 17. The flow of fluid through the pump is controlled by valve units 36 for the cylinders 32, and valve units 37 for the pistons 27 which are operatively associated with the cylinders 32. Since the assembly of the valve units 36 and 37 with a corresponding cylinder 32 and piston 27, respectively, is the same for each cylinder, only one of such assemblies will be referred to in detail in the following description.

As best appears in Fig. 4 a cylinder 32 is formed at its upper end with an inwardly extended annular shoulder 38. A valve unit 36 includes a valve seat member 39 (Fig. 5) having a flat annular ring 41 formed with a valve opening 48, and angularly spaced upright guides 42 defining a circle concentric with the opening 48. That section 43 of the ring portion 41 between the guides 42 and the periphery of the ring portion constitutes a shoulder adapted for abutting engagement with the underside of the cylinder shoulder 38. At this engaged position the guides 42 extend upwardly through the opening defined by the cylinder shoulder 38, and into the chamber 33.

The valve seat 39 is positively held in abutting engagement against the shoulder 38 by a cylinder liner 44, the upper end of which is tapered inwardly and downwardly as indicated at 46 in Fig. 4. The outer periphery of the ring member 41 of the valve seat (Figs. 4 and 5) is formed adjacent its top edge with a shoulder 47 which has an outer diameter substantially equal to the bore of the cylinder 32. The peripheral surface of the ring below the shoulder 47 is tapered downwardly and inwardly. This relative construction of the peripheral surface of the ring member 41 and the upper edge 46 of the liner 44 provides for the edge 46 being inserted between the inner peripheral surface of the cylinder 32 and the ring member 41 to act as a wedge for positively holding the valve seat 39 in its assembly position against the cylinder shoulder 38.

Located within the upright guides 42 and adapted for movement relative to the valve opening 48 is a ball valve member 49. The movement of the ball 49 away from a seated position is limited by its engagement with the lower end of an adjustable screw 51, threadably supported in the outlet 34 at a position in coaxial alignment with the cylinder 32, and having its lower end extended within the chamber 33 to a position within the upright guides 42. The lower end of the adjustable screw 51 thus functions as a stop to always maintain the ball within the uprights 42.

In practice it was found that the direct engagement of the ball 49 with the lower end of the screw 51, on each opening of the valve unit 36, resulted in an undesirable clicking noise. To reduce this noise to a minimum a rubber stop 52 is secured to the lower end of the screw 51 for contact engagement with the ball 49.

In the assembly of the valve unit 36 the valve seat 39 is inserted through the lower end of a

cylinder 32 until the ring 41 is in abutting engagement with the under side of the cylinder shoulder 38. The cylinder liner 44 is then inserted within the cylinder 32 until its upper end is wedged between the outer peripheral surface of the ring 41 and the inner peripheral surface of the cylinder 32. The valve seat 39 is thus permanently assembled with the cylinder 32. The ball 49 is dropped through the outlet 34 between the guides 42, after which the screw 51 is adjusted for contact engagement with the ball. Should the valve seat require grinding the ball valve 49 is removed by first retracting the screw 51, and then inverting the cylinder block 31 whereby the ball valve 49 drops outwardly through the outlet 34. Grinding of the valve seat then takes place by the insertion of the grinding tool through the outlet 34.

A piston 27 (Fig. 4) comprises an elongated tube formed with perforations 53 for admitting fluid within the piston from the well, with the flow of the fluid through the piston and into a cylinder 32 being controlled by a valve unit 37. A valve unit 37 includes a seat member 54 which is press fitted within the inner end of the piston 27. A ball valve 56 for the valve seat 54 is maintained in assembly position by a cage member 57 (Figs. 4 and 6) having its upper end of an open dome construction, and its lower end 58 of a tubular construction adapted for threadable connection about the upper end of the piston 27. The threadable connection of the cage member 57 with the piston 27 is facilitated by the provision of a nut portion 59 which defines the junction between the dome and tubular portions of the cage member 57.

Spaced from the inner end of the piston 27 is an annular external shoulder 61, which cooperates with the lower edge 62 of the cage member 57 as a clamp for the piston packing comprised of two members 63 having adjacent portions 64 located between the shoulder 61 and the cage member 57. Located between the packings 63 and positioned about the piston 27 are a pair of packing supporting collars 66 (Figs. 4 and 7). The collars 66 provide a bearing support for the packing portions 64 so that on threadable movement of the cage member 57 towards the shoulder 61 the portions 64 are retained against spreading movement radially of the cylinder 32. A more positive clamping and holding action on the portions 64 is thus accomplished.

The outer or lower end of a piston 27 is formed with a pair of oppositely arranged recesses 67. A connecting rod 29, has its lower end of a loop shape, as best appears in Fig. 1. The sides of the loop are arranged at opposite sides of the cylinder block 31, and the lower end of the loop is received within the recesses 67 so as to extend across the lower end of the piston 27. The loop is rigidly secured to the piston 27 by welding at the recesses 67 as indicated at 68. The connecting rod 29 is guidably supported in its reciprocating movement at the T-joint 18 (Figs. 1 and 2) and its upper end is pivotally connected with the lower end of a pitman rod 28 through a clamp member 69.

The cranks 26 for the pitman rods 28 are mounted at the opposite ends of a common shaft 70 which is rotatably supported in a housing member 71 (Figs. 2 and 3). The housing 71 is mounted on a channel member 72 which is secured, as by welding, to a base member 73. The base 73 in turn is secured to the well cover 24 by bolts 75. Also mounted on the shaft 70, inter-

mediate the cranks 26, is a gear 74 which is in meshing engagement with a pinion 76 carried on a shaft 77 rotatably supported in the housing 71 in a parallel relation with the shaft 70. A pulley 78 carried on the shaft 77, is connected with an electric motor 79 through a belt 81. The motor 79 is mounted on a base member 82 which is pivoted on the channel member 72, at 83, for up and down pivotal movement. The downward pivotal movement of the motor 79 is limited by the length of the belt 81, so that the weight of the motor 79 automatically retains a proper tension in the belt 81 for driving the pulley 78.

In the operation of the pump rotation of the crank members 26 reciprocates the connecting rods 28 and 29 and in turn the pistons 27. The crank members are set 180° apart on the shaft 70 so that the pistons 27 move in opposite directions. Control of the fluid flow through the pump is accomplished by the valve units 36 and 37 which are operated in response to the fluid pressures in the cylinders 32 and in the chamber 33.

In Figs. 8 and 9 there is shown a modified form of valve unit 36' for the cylinders 32. The unit 36' is substantially similar to the valve unit 36 illustrated in Fig. 4 except for the substitution of a cage member 82 for the upright guides 42.

A valve unit 36' includes a valve seat member 39' which is assembled with the cylinder shoulder 38 and with the cylinder liner 44 in all respects similar to the valve seat member 39. The top surface of the member 39' has an upright annular rim 85 receivable within the opening defined by the cylinder shoulder 38. The cage member 82 (Fig. 9) is formed with a top body portion 84 having angularly spaced downwardly extended legs or guides 86 adapted to fit within the rim 85 with their lower ends supported on the top face of the valve seat member 39'. With the ball valve 49, located within the cage member 82 its movement away from a seated position with the seat member 39' is limited by the cage top portion 84, and such movement is guided by the legs 86. The cage member 82 is clamped against the valve seat member 39' by the screw 51 threadable within the chamber outlet 34 and accessible from the outside of the pump casing 31.

In the assembly of the vave unit 36' the member 39' is assembled with the cylinder shoulder 38 and the liner 44 in all respects similar to the seat member 39 in Fig. 5. The ball member 49 is then dropped through the outlet 34 to its position on the seat member 39' after which the cage member 82 is inserted through the outlet 34 to its position about the ball 49 and with the guides 86 thereof within the annular upright rim 85. The screw 51 is then adjusted to clamp the cage member 82 against the seat member 39'.

By virtue of the driven connection of the pitman rod 28 with the crank 26 it is apparent that the rods are moved laterally concurrently with their up and down reciprocal movement. To accommodate this lateral movement of the rods 28 the cover 24 and the base 73 for the pump driving means 23 are provided with openings 90 and 91, respectively (Figs. 1, 2 and 10). As a result the elongated opening 91 in the base 73 is of an appreciable size so that dirt and the like can readily fall into the well. In order to eliminate this condition plate assemblies are provided for maintaining the openings 91 closed at all moved positions of the rods 28. Since duplicate plate assemblies are used for closing the openings 91 only one thereof will be described in detail.

A plate assembly includes a first or lower plate member 93 which is slidably supported on the base 73 for movement longitudinally of the base opening 91 (Figs. 10, 11 and 12). The plate 93 is formed with an elongated opening 94 which is of a smaller length than the base opening 91 so that the plate 93 partially covers the base opening 91.

A second or upper plate member 96 is slidably supported on the lower plate member 93 and is formed with a circular opening 97 of a size to slidably receive the pitman rod 28. The upper plate 96 thus completely covers the elongated opening 94 in the lower plate 93, while the circular opening 97 in the upper plate is closed by the extension therethrough of the pitman rod 28.

It is seen, therefore, that the plates 93 and 96 are superposed upon the base 73 for relative slidable movement longitudinally of the elongated opening 91 in the base, with this longitudinal movement taking place in response to the lateral movement of the pitman rod 28. The slidable movement of the plates 93 and 96 longitudinally of each other is guided by a guiding member integrally formed with a substantially inverted U portion 98 and a flat portion 99 extended laterally from the free edge of one of the legs of the U portion 98. The base or upper side of the portion 98 is formed with an elongated opening 101 of a size substantially equal to the opening 91 in the base member 73. The U portion 98 is adapted to fit over the superposed plates 93 and 96 so that its legs are in contact engagement with the sides of the plates 93 and 96. The guide member is secured against the base 73 by the bolts 75 which are extended through openings 102 and 103 in the base 73 and guide member, respectively, for attachment with the well cover 24.

In the operation of the pump assume a pitman rod 28 to be at one limit of its lateral movement as illustrated in Fig. 11. At this moved position the opening 91 in the base 73 is closed in part by the plate 93, while the opening 94 in the plate 93 is completely covered by the plate 96. On lateral movement of the pitman rod 28 to its extreme position in an opposite direction, as illustrated in Fig. 12, the plate 96 is initially moved toward the right, as viewed in Fig. 11, in response to the movement of the pitman rod 28, while the plate 93 remains stationary until the pitman rod engages the end 104 of the opening 94. Prior to this engagement it is seen that the plate 93 is moved into a covering position relative to the opening 94, and that the plates 93 and 96, after engagement of the rod with the slot end 104, are moved to the right together until the pitman rod reaches its position illustrated in Fig. 12.

It is apparent, of course, that on movement of the pitman rod 28 from its position shown in Fig. 12 to its position shown in Fig. 11 the plate 93 will remain stationary until the pitman rod engages the end 106 of the opening 94 and after the opening 94 has been closed by the initial movement of the plate 96 relative to the plate 93. The plates 93 and 96 are thus relatively moved in response to the lateral movement of the pitman rod 28 so as to completely close the opening 91 in the base 73 for all moved positions of the pitman rod.

As previously mentioned the upper portion 22 of the upright pipe 17 constitutes a standpipe for the pump. In order to brace the well pipe 17

the upper end of the pipe 22 is welded to the under side of the base member 73. The base 73, the channel member 72, and the upper portion 22 of the pipe 17 are thus an integral preassembled unit.

From the above description it is seen that the invention provides a double acting pump of reciprocating type which is efficient in operation to maintain a substantially continuous flow of water through the upright pipe 17, and with such flow being capable of taking place against relatively large pressure heads. In one embodiment of the pump satisfactory results were obtained when the pump was operating against a pressure head of 250 feet, and in lieu of this pressure head operated to satisfactorily distribute water at ground level to a destination located substantially 1500 feet from the well. Further the valve structures 36 and 37 for controlling the flow of water from the cylinders 32, and through the piston 27, respectively, are of a simple construction and adapted to be readily assembled into the pump and accessible for servicing and maintenance purposes. Also the assembly of the sliding plates 93 and 96 with the pitman rods 28 provides for the top of the well being completely covered at all times so as to eliminate the possibility of the well becoming contaminated from dirt and the like falling therein.

Although the invention has been specifically described and illustrated with respect to a preferred embodiment thereof it is to be understood that it is not to be so limited since changes and modifications can be made therein which are within the full intended scope of this invention as defined by the appended claims.

I claim:

1. In a pump having a casing with an upright cylinder therein provided with an open lower end and an outlet portion at its upper end, a valve unit for controlling the flow of fluid through said outlet portion including a valve seat within said cylinder positioned inwardly of and against said outlet portion, a ball valve for said seat located in said outlet portion, an upright annular projection on said seat in a concentrically spaced relation with the fluid opening in said seat, a cage member for said ball valve projected upwardly through said outlet portion and having its lower end positioned within the confines of said annular projection, and means adjustably supported in a side wall of said casing and engageable with said cage member to hold the cage member against said valve seat.

2. In a pump having an upright cylinder therein with an inlet end and an outlet end, a valve unit for controlling the flow of fluid through said outlet end of the cylinder comprising an annular inwardly extended shoulder at said outlet end, a valve seat within said cylinder having an annular flange in abutting engagement with the underside of said shoulder, a guide means on said valve seat projected upwardly from said outlet end through the opening defined by said annular shoulder, a liner for said cylinder insertible through the inlet end of the cylinder to a position in engagement with said valve seat, a ball valve for said valve seat located within said guide means, and means for limiting the movement of said ball valve within said guide means, with said valve seat, guide means and ball valve all being removable through the inlet end of said cylinder.

3. A pump comprising a cylinder block having an upright cylinder and a chamber formed therein, with said cylinder being open at one end to said chamber, an outlet for said chamber, an annular inwardly extended shoulder on said cylinder adjacent the upper end thereof, a valve unit including a valve seat with a shoulder portion adapted for abutting engagement with the under side of said cylinder shoulder, and guide means projected upwardly through the opening defined by said cylinder shoulder and into said chamber, a liner for said cylinder having its inner end wedged between the outer periphery of said valve seat and the inner periphery of said cylinder to hold the valve seat in a fixed position against said cylinder shoulder, a valve member for said valve seat movable into and out of a seated position within said guide means, a screw threadably supported in a wall of said chamber and having the inner end thereof extended into said chamber, a resilient stop member on said inner end for contacting said valve member to limit the movement of the valve member away from a seated position, and a valved piston for said cylinder.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
93,810	Crouse	Aug. 17, 1869
135,905	Gill	Feb. 18, 1873
195,375	Judkins	Sept. 18, 1877
226,019	Beebe et al.	Mar. 30, 1880
780,993	Hall	Jan. 31, 1905
800,399	Richards	Sept. 26, 1905
940,347	McCarthy et al.	Nov. 16, 1909
1,025,977	Henderson	May 14, 1912
1,044,623	Bailey	Nov. 19, 1912
1,212,294	Walker	Jan. 16, 1917
1,265,313	Ewing	May 7, 1918
1,489,779	Mohr	Apr. 8, 1924
1,613,559	Caps	Jan. 4, 1927
1,896,237	Huff	Feb. 7, 1933
1,908,440	Milton	May 9, 1933
2,005,299	Penrod	June 18, 1935
2,074,787	Herbst	Mar. 23, 1937
2,240,780	Hunter	May 6, 1941
2,382,080	Lowry	Aug. 14, 1945