April 12, 1927. 1,624,423

M. L. MILTON

SUBMERGED PUMPING UNIT

Filed May 14, 1926 2 Sheets-Sheet 1

Fig. 1.

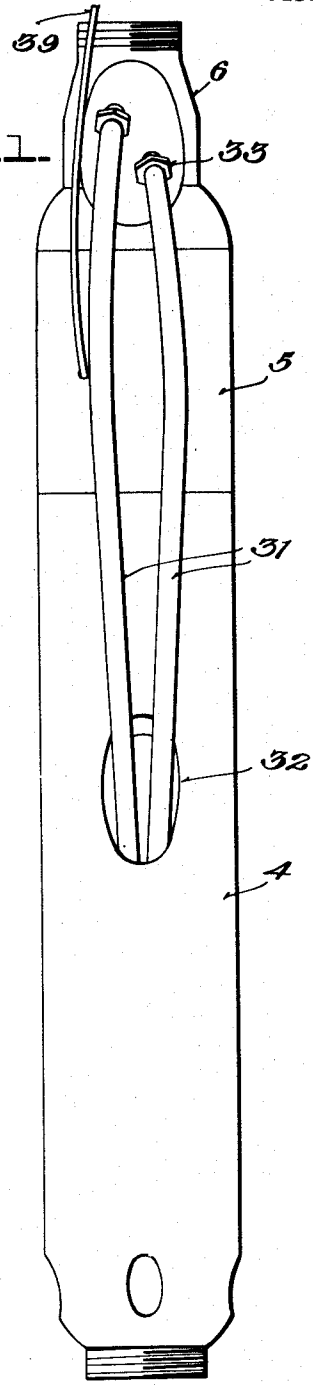
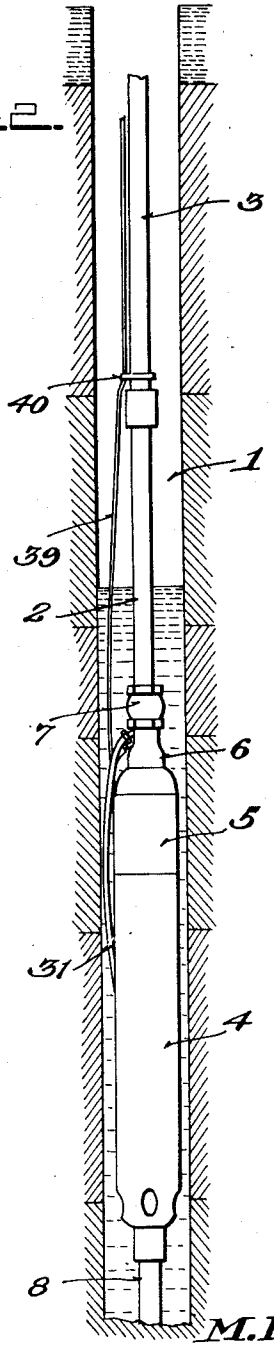


Fig. 2.



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Fig. 3.

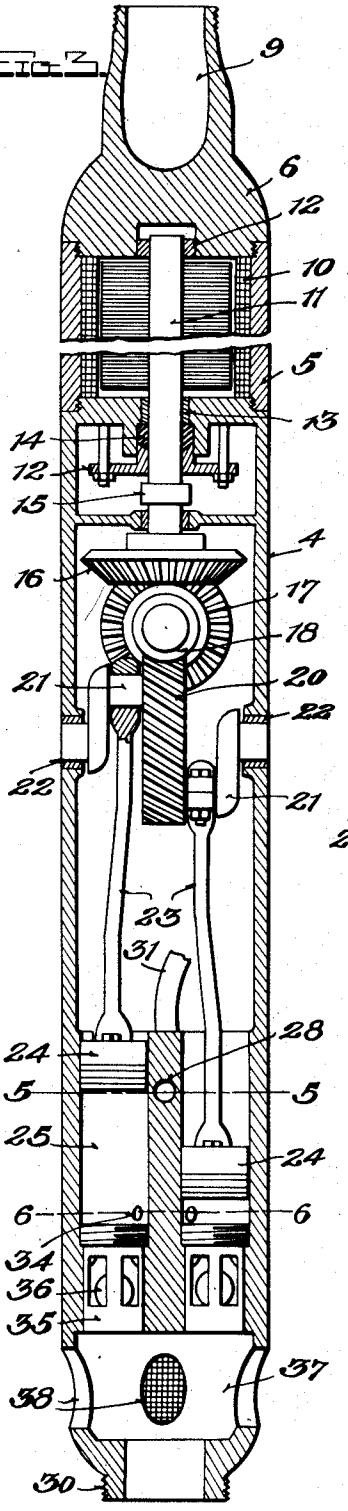


Fig. 4.

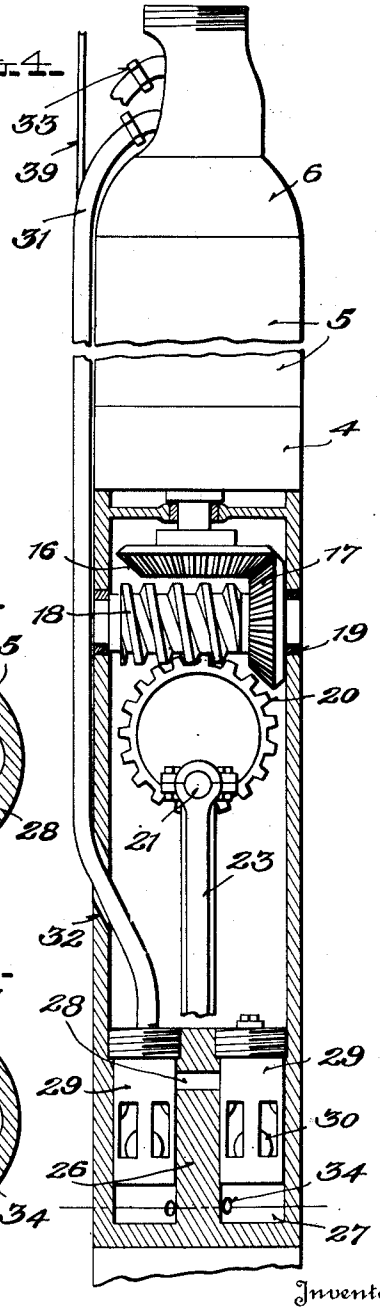


Fig. 5.

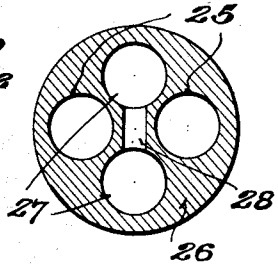
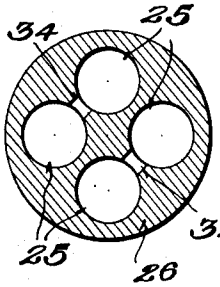


Fig. 6.



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UNITED STATES PATENT OFFICE.

MELVIN L. MILTON, OF DENVER, COLORADO.

SUBMERGED PUMPING UNIT.

Application filed May 14, 1926. Serial No. 109,111.

This invention relates to new and useful improvements in well pumping apparatus and more particularly to a submerged pumping unit for use in such apparatus, the primary object of the invention being to provide an improved unit of this character capable of being suspended within the well on the usual well tubing and which is adapted to be removed together with said well tubing, thus simplifying the operation and method of repair of said unit.

A further object of the invention resides in providing a pumping unit which is so constructed as to eliminate the usual heavy pumping machinery at the head of the well, thereby providing a simpler and much less complicated device than at present in use.

Another object of the invention resides in the provision of a device which will eliminate the use of sucker and pull rods, which are usually required in apparatus of this character and which are known to be a source of considerable trouble and expense.

Still another object of this invention resides in providing a pump unit which is adapted to elevate the fluid from the depths of the well in a continuous stream by the use of two positive-acting cylinders and a further object resides in constructing the device in a manner enabling the use of electricity as a source of power.

A still further object resides in providing a device of this character which is comparatively simple and durable in construction, inexpensive to manufacture and one which will be very efficient and useful in operation.

With these and numerous other objects in view, my invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter referred to and more particularly pointed out in the specification and claims.

In the accompanying drawings, forming a part of this application—

Figure 1 is a front elevation of my improved pumping unit removed,

Figure 2 is a side elevation thereof connected with the well tubing and shown in place within a well, the ground surrounding said well being shown in section,

Figure 3 is an enlarged vertical section through the pump unit, parts being broken away,

Figure 4 is a side elevation, partly in section, of the unit, observed in a plane at right angles to the plane upon which the Figure 3 is observed, parts being broken away,

Figure 5 is a section as seen on the line 5—5 of Figure 3, parts being eliminated, and

Figure 6 is a horizontal section as seen on the line 6—6 of Figure 3.

In describing the invention, I shall refer to the drawings in which similar reference characters designate corresponding parts throughout the several views and in which the numeral 1 designates a well within the depths of which there is a liquid 2, which is adapted to be removed through a pumping apparatus. Projected into this well is a tubing 3 of the usual character to which is adapted to be connected my improved pumping unit, the latter being described in detail herebelow.

This pumping unit comprises a substantially tubular casing or housing 4 which is closed at its upper end and has threaded to the latter end a section 5 which is also tubular in design and in turn threaded into engagement with a head piece 6. The elements 4, 5 and 6 together comprise the unit which forms the basis of this application and when secured together as described and shown constitute a unitary device.

The upper and lower ends respectively of the head piece 6 and the casing 4 are reduced in diameter and externally threaded so as to be readily connected with the well tubing. As shown in Figure 2, a union 7 is provided between the tubing 3 and the head member 6 within which is disposed a check valve (not shown). The lower threaded end of the member 4 is engaged with a pipe section 8 which is adapted to retain the unit at the proper height above the bottom of the well, as shown in Figure 2 of the drawings.

The head member 6 is preferably formed solid for the greater portion of its area but is provided at its upper end portion with an enlarged cavity 9 which forms what may be termed a collector basin for the reception of the liquid pumped from the well, said basin continuing through the upper end of said head member, as clearly shown in Figure 3 of the drawings.

Mounted within the intermediate section 5 is an electric motor 10, the shaft of which is designated by the numeral 11, the latter having a bearing 12 supported in the lower end of the head member 6. This shaft 11

projects through an opening in the upper end of the casing 4, being supported in an additional bearing 13, and a packing box 14 is arranged in connection with said shaft and last mentioned bearing to prevent any possibility of the fluid from the well entering the housing of the motor.

Through the medium of a coupling 15, the shaft 11 is connected with a beveled gear 16, the latter in turn meshing with a second beveled gear 17 carried on a worm shaft 18. The ends of this shaft are rotatably supported in bearings 19 in the walls of the casing 4, as clearly shown in Figure 4 of the drawings and the worm portion of said shaft engages the teeth of a worm gear 20. Cranks 21 project from opposite faces of the gear 20 at points diametrically opposite one another and the outer ends of said cranks are rotatably supported in bearings 22 mounted in the walls of the casing 4, as clearly shown in Figure 3 of the drawings.

Connected to the crank arms 21 and bearinged in the usual or any preferred manner are the connecting rods 23 which operate at their lower ends the pistons 24, the latter being received in diametrically opposed cylinders 25. These cylinders are formed in a block 26 which is provided adjacent the lower end of the casing 4 and disposed in a plane at right angles to the vertical plane of the cylinders 25 and in the upper portion of the block 26 are the diametrically opposite valve wells 27. These valve wells have connection with one another through the medium of a port 28 formed in the center of the block, as clearly shown in Figures 3, 4 and 5, permitting the fluid to flow from one of the wells to the other and making it possible to remove the fluid through one side of the unit in a manner to be hereinafter and more particularly described. Mounted within the wells or chambers 27 are the valve cages 29 which support the gravity ball valves 30. Connected with the upper ends of the cages 29, which together with the ball valves 30 form discharge valves for the device, are the discharge tubes or pipes 31 which project through an opening 32 in the front of the casing 4 and extend upwardly. These discharge tubes or pipes connect through unions 33 with the head member 6 so that the fluid passing through said tubes may be deposited into the collector basin 9, as appears obvious from the showing in the drawings.

Each cylinder 25 has connection with a valve well 27 through the medium of a port 34, as clearly shown in Figure 6 of the drawings, whereby the liquid drawn within the cylinders may enter the discharge wells. At the lower end of each cylinder there is removably mounted a valve cage 35, similar in construction to the valve cages 29 previously described, and supported in each valve cage is a ball valve 36, as clearly shown in Figure 3 of the drawings. These cages 35 are constructed to fit into receiver ports which extend from the bottom of the cylinders to a chamber 37 formed in the lower end of the unit immediately adjacent the lower mouth portion thereof. A plurality of entrance openings 38 are provided in the wall of the casing 4 so that the fluid within the well may be readily admitted to the chamber 37, but it will be understood that other means may be provided for the admission of the fluid to said chamber.

As previously stated, an electric motor 10 is mounted within the detachable unit section 5 and this motor may be as long as necessary in order to obtain the power required, it being of course understood that a different length section may be used where longer motors are provided. The section 5 being detachable makes it possible to use any size motor or motors removed for purposes of repair when necessary. The motor is preferably of the induction type, thus eliminating the necessity of sparking commutators which ordinarily cause trouble when operated in an entirely enclosed motor. The power cable which conducts the electric power to the motor is designated in the drawings by the numeral 39, said cable being supported along the length of the well tubing 3 by means of clamps or the like 40.

In operation, fluid in the well will enter the chamber 37 at the lower end of the unit through the medium of the openings 38, or otherwise as desired, and from the chamber, said fluid will be drawn into the cylinders 25 through the valves 36, which are gravity valves and will close at the end of the upstroke of the pistons. At the down-stroke of the pistons, the fluid will be forced through the ports 34 into the valve wells and through the discharge valves 30 into the discharge tubes 31. Thus the fluid is carried upwardly through said tubes 31 and deposited into the collector basin 9 at the top of the unit from whence said fluid enters the well tubing and is conducted to the top of the well.

From the foregoing description of the construction of my improved device, the operation thereof will be readily understood and it will be seen that I have provided a simple, inexpensive and efficient means for carrying out the objects of the invention.

While I have particularly described the elements best adapted to perform the functions set forth, it is obvious that various changes in form, proportion and in the minor details of construction may be resorted to, without departing from the spirit or sacrificing any of the principles of the invention.

Having thus described my invention what I claim is:

1. A pumping unit comprising a casing

having a closed upper end and provided at its lower end with a piston block having an inlet opening, the upper end of said casing being provided with a liquid receiving chamber, a motor housed in the upper portion of the casing, a pump housed in the casing and connected with the motor and having a piston slidably mounted in the block, and a pipe connected at one end with the piston block and at its other end with the liquid receiving chamber, the intermediate portion of said pipe passing through the side wall of the casing and disposed exteriorly of the casing along the motor housing portion thereof.

2. A pumping unit comprising a casing having a closed upper end and provided at its lower end with a piston block having an inlet opening and a well cavity, the upper end of said casing being provided with a liquid receiving chamber, a motor housed in the upper portion of the casing, a pump housed in the casing and connected with the motor and having a piston slidably mounted in the block and a pipe connected at one end with the block and communicating with the well cavity thereof and connected at its other end with the liquid receiving chamber, the intermediate portion of said pipe passing through the side of the casing and disposed exteriorly of the casing along the motor housing portion thereof.

3. A pumping unit comprising a casing having a closed upper end and provided at its lower end with a piston block having an inlet opening, said block having a piston chamber and a well chamber spaced from each other by a partition and connected with each other by a port passing through the partition, the upper end of said casing being provided with a liquid receiving chamber, a motor housed in the upper portion of the casing, a pump housed in the casing and connected with the motor and having a piston slidably mounted in the piston chamber of the block, and a pipe connected at one end with the well chamber of the block and at its other end with the liquid receiving chamber, the intermediate portion of the pipe passing through the side of the casing and disposed exteriorly along the motor housing portion thereof.

In testimony whereof I affix my signature.

MELVIN L. MILTON.