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DEEP WELL PUMP

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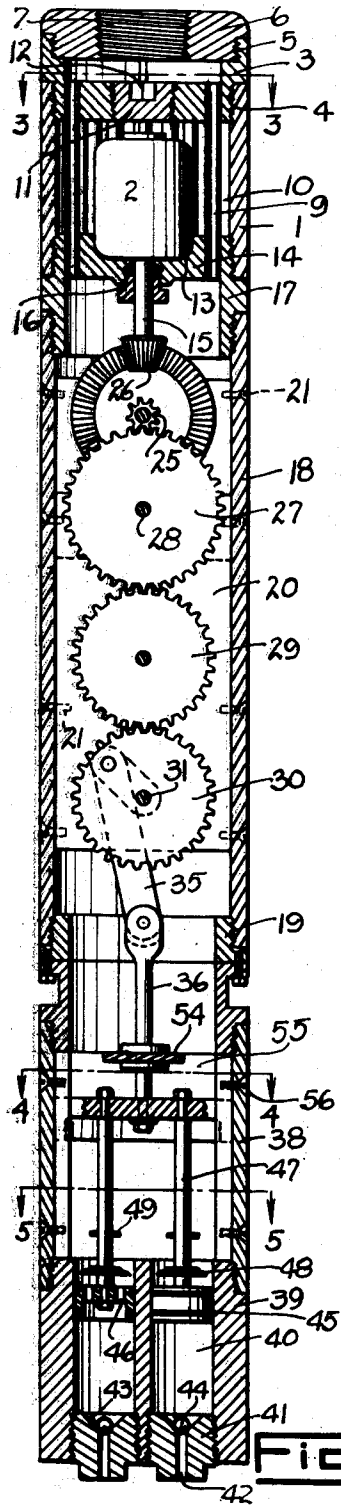


Fig. 1

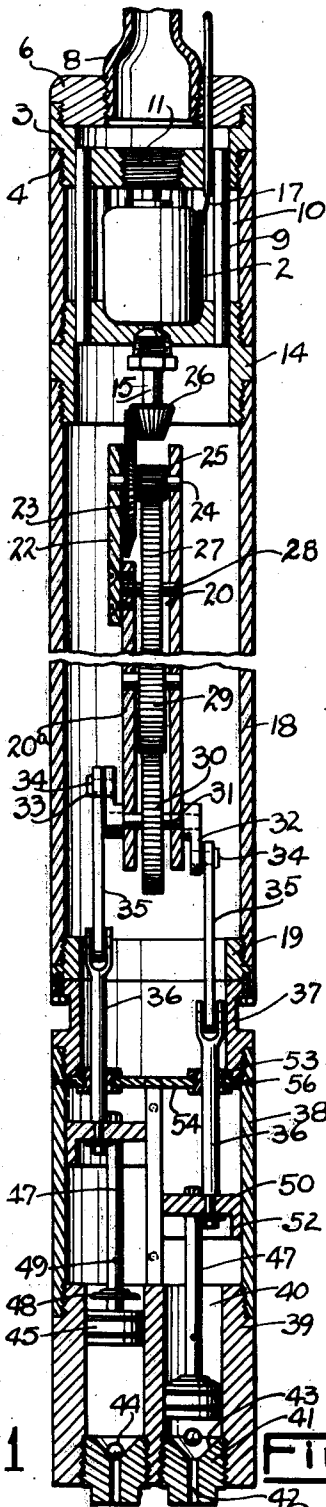


Fig. 2

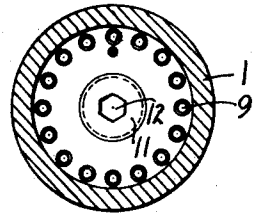


Fig. 3.

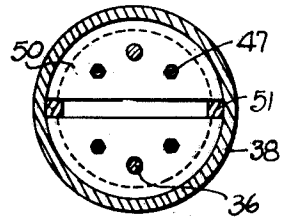


Fig. 4.

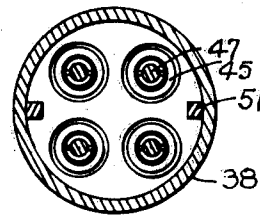


Fig. 5.

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DEEP WELL PUMP

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5 Claims. (Cl. 103—46)

The invention relates to pumps for operating in deep wells for the lifting of liquid therefrom. It pertains particularly to a pumping unit in which the prime mover is located adjacent the pump and below the liquid level in the well.

It is an object of my invention to provide a pump of the reciprocating type wherein the motor and the pump are housed for introduction into the well to the proper level therein.

It is a further object of the invention to provide a construction wherein the motor is housed within a closed chamber and sealed against the entrance of liquid thereto.

It is a further object of the invention to provide a pump of this character having a plurality of separate cylinders with pistons working therein for the more efficient lifting of large quantities of fluid when this becomes desirable.

I desire to provide a plurality of pistons connected with separate cross heads and operatively connected with the motor for simultaneous operation.

The device also contemplates the use and effective application of the power from the motor to the pump pistons so that a comparatively large volume of liquid may be handled.

My device is adapted for handling liquid such as oil, water, or mixtures of both in a deep well, but is adaptable for general use when desired.

In the drawing herewith

Fig. 1 is a central longitudinal section through the housing with the pumping apparatus therein.

Fig. 2 is a similar sectional view taken at right angles to the view shown in Fig. 1.

Figs. 3, 4 and 5 are transverse sections taken on the planes 3—3, 4—4 and 5—5, respectively, of Fig. 1.

My invention is housed within a tubular housing made up of connected sections of pipe. At the upper end of the housing I have a section 1, which forms a housing for an electric motor 2. This motor housing is connected at its upper end to a closure plate 3. Said plate is threaded on its outer periphery at 4 for connection with the housing member 1 and has its upper end threaded at 5 for connection with a bushing 6, which is in turn threaded at 7 to connect with the well tubing 8.

The plate 3 has a series of openings there-through for the reception of fluid conducting tubes 9. Said tubes extend longitudinally of a chamber 10 in which the motor is housed and act to conduct fluid through the motor chamber. The upper wall of the chamber through which the tubes extend has a central opening therein

which is normally closed by a threaded plug 11 formed with a wrench socket 12 therein through which it may be inserted or removed from the wall or plate 3.

The motor on its lower side is seated within the recess 13 within a lower wall or partition 14. Said wall closes the lower end of the chamber 10 and has a central opening therein to receive the motor shaft 15 which projects downwardly through the partition. A stuffing box is formed about the motor shaft 15, as shown at 16, so that a seal will be formed about the shaft to prevent leakage into the motor chamber.

It will also be noted from Fig. 2 that the wires 17 running to the motor are extended upwardly through the plug 3 and the bushing 6 through openings therein and it will be understood that the wires 17 are properly sheathed and protected from the liquid within the well.

The plug or partition 14 forms part of a coupling member 17, which connects at its lower end with the gear housing 18, said gear housing being in turn connected at its lower end with a nipple 19. Within the gear housing 18 are a plurality of gears which are mounted upon plates 20 and 20a, extending transversely of the housing and connected at their edges with the interior wall thereof. As will be seen from Fig. 1, these plates 20 and 20a are secured in spaced relation to each other by set screws shown in dotted lines at 21. The plate 20 is a single continuous plate but the plate 20a is offset at its upper end, as shown at 22, to accommodate a bevel gear 23.

The gear 23 is mounted upon a shaft 24 rotatable within bearings in the plates 20 and 20a. On the same shaft with the gear 23 is a small pinion 25. There is a drive pinion 26 upon the end of the motor shaft 15 which engages with the bevel gear 23 and communicates rotation to the shaft 24 and the small gear 25.

Said gear 25 has engagement with a large gear 27 mounted upon a shaft 28 journaled in the plates 20 and 20a for rotation. This gear has connection through an intermediate idle gear 29 with the gear 30, which drives a crank shaft 31, said crank shaft being journaled in the plates adjacent the lower ends thereof.

The crank shaft 31 has on opposite ends thereof the two crank arms 32 and 33. These arms have wrist pins 34 thereon which are connected by means of the two pitmans 35 with the upper ends of connecting rods 36.

The lower end of the gear housing 18 is connected through the nipple 19 with an interme-

diate connecting member 37, which is bolted to the nipple 19 as will be seen from the drawing. The lower end of the connecting member 37 is screwed within a pump housing 38. Said housing 38 is connected at its lower end with a shoe 39, which constitutes a closure for the lower end of the housing. Said shoe has therein four evenly spaced cylinders 40. Said cylinders are threaded at their lower ends to receive valve plugs 41, which have axial openings 42 therein for the passage of liquid into the said cylinders. Each of said plugs has a downwardly tapered recess 43 at its upper end to receive a ball valve 44 opening upwardly to allow the entrance of liquid to the cylinders.

Within each of the four cylinders operates a piston 45. Each piston has a plurality of openings 46 therethrough for the passage of liquid. A piston rod 47 connected with each piston has a valve plate 48 mounted thereon, said valve plate being slidable on the piston rod to and from closed position above the openings 46. I provide a cross pin 49 in each of the piston rods to limit the upward movement of the valve plate.

As shown in the drawing each of the piston rods is connected at its upper end to a cross head 50. Each cross head, as shown in Fig. 4, is approximately semicircular in shape, one side fitting against the cylindrical inner wall of the housing 38 and the inner edge engaging against a guide rib 51. The cross head has a downwardly extending flange 52 thereon which forms a sliding engagement with the housing. It will be obvious that the cross head may be movable to reciprocate the two piston rods 47 secured thereon.

The cross heads are each connected to a connecting rod 36 previously noted. Said connecting rods are slidable through bushings 53 secured within a transverse guide plate 54. It will be seen that the guide plate 54 extends diametrically across the housing but provides a space 55 on each side thereof through which the fluid being pumped may pass. The guide plate is secured at its ends to the wall of the housing by screws 56, as seen in Fig. 2.

In the operation of my device the motor may be connected in a circuit including the wires 17 from the surface, and when the device has been lowered to the proper position in the well the motor may be actuated to rotate the train of gears connected with the drive pinion 26 on the motor shaft. This train of gears constitutes a reduction train of gears so that the speed of the motor is materially reduced when communicated to the crank shaft 31. The rotation of the crank shaft will transmit a reciprocating motion through each of the pitmans 35, connecting rods 36, cross heads 50, and piston rods 47, so that the pistons may be operated.

As each of the crank arms 32 extend in opposite directions from the crank shaft one of the cross heads with the pistons attached thereto will be moved downwardly as the opposite cross head is moved upwardly. The action of the pump will therefore be to cause a continuous movement upwardly of fluid pumped there-through. The liquid from the well will pass upwardly through the inlets 42 and the cylinders 40 and through the space between the two cross heads 50 into the housing. From there the liquid has a free passage upwardly through the tubes 9 into the pump tubing 8 and from thence up to the surface where it will be discharged in the normal manner.

It will be obvious that this type of pump will

be exceedingly easy to install and operate. The use of sucker rods for reciprocating the pistons in the well will be entirely eliminated. The installation of the customary jack or walking beam at the surface for operating the usual pump rod can also be dispensed with.

Further, by the use of a plurality of pistons operating in the manner described an effective volume of liquid may be handled by the pump so that where necessary large volumes of liquid can be pumped during each day. It will be seen therefore that the device is easy to install and operate and will be able to produce a satisfactory volume of liquid from the well when the device is in operation.

I claim:

1. In a deep well pumping unit, a housing, a shoe at the lower end thereof, a plurality of cylinders formed in said shoe, an inlet to each of said cylinders, a valve in each inlet, a pair of cross heads of approximately semicircular shape reciprocable in said housing above said shoe, piston rods on said cross heads, pistons on said rods fitting within said cylinders, cross head guide members on the walls of said housing separating said cross heads, a motor in said housing, a crank shaft rotatable by said motor, crank arms on said shaft, and means reciprocable by said crank arms to move said pistons.

2. In a deep well pumping unit, a housing, a shoe at the lower end thereof, a plurality of cylinders formed in said shoe, an inlet to each of said cylinders, a valve in each inlet, a pair of cross heads of approximately semicircular shape reciprocable in said housing above said shoe, piston rods on said cross heads, pistons on said rods fitting within said cylinders, means to guide said cross heads, a motor in said housing, a set of reduction gears driven by said motor, a crank shaft rotatable by one of said gears, crank arms thereon, a connecting rod on each of said cross heads, and a pitman connected with each crank arm and operatively connected with one of said rods.

3. A deep well pump including a housing, a plurality of cylinders at the lower end of said housing, valve controlled inlets to said cylinders, pistons adapted to reciprocate in said cylinders, piston rods thereon, a pair of cross heads slidable in said housing and connected with said piston rods, a transverse guide plate above said cross heads, connecting rods slidable in said guide plate and connected with said cross heads, a closed chamber at the upper end of said housing, an electric motor housed therein, tubes extending longitudinally through said housing for the fluid being pumped, and means driven by said motor to reciprocate said connecting rods.

4. In a deep well pumping unit, a housing, a closed chamber at the upper end thereof, a motor in said chamber, a shaft on said motor projecting downwardly through the bottom of said chamber, fluid conducting tubes extending longitudinally through said chamber about said motor, a gear train driven by said motor, a crank shaft rotatable through said gear train crank arms thereon, a pair of cross heads below said crank shaft and connected for reciprocation therewith, a plurality of pistons connected with each cross head, cylinders in which said pistons reciprocate, fluid inlets to said cylinders, valves therein, and valve controlled passages through said piston.

5. A deep well pump for oil including a housing, a plurality of cylinders at the lower end of

said housing, pistons in said cylinders, inlets to said cylinders from the well, valves in said inlets, opposed vertically arranged guide members on opposite sides of said housing above said cylinders, approximately semicircular cross heads separated by said guide members, piston rods connecting said cross heads and said pistons, a

crank shaft in said housing, means to rotate said crank shaft, and operative connections between said crank shaft and said cross heads, the oil from said cylinders having a passage upwardly between said cross heads and through said housing.

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