

May 20, 1924.

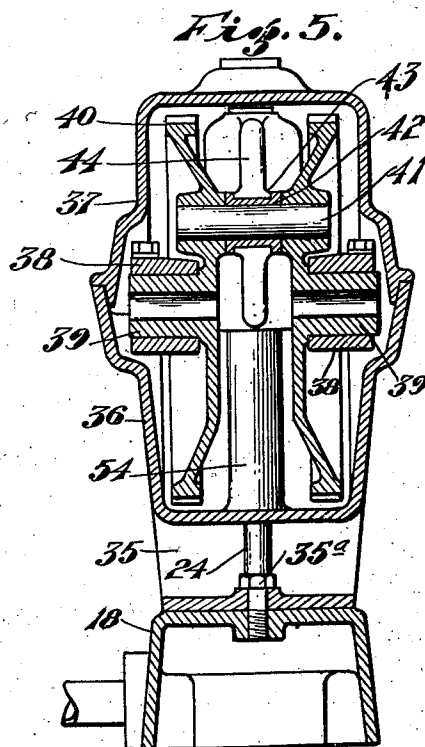
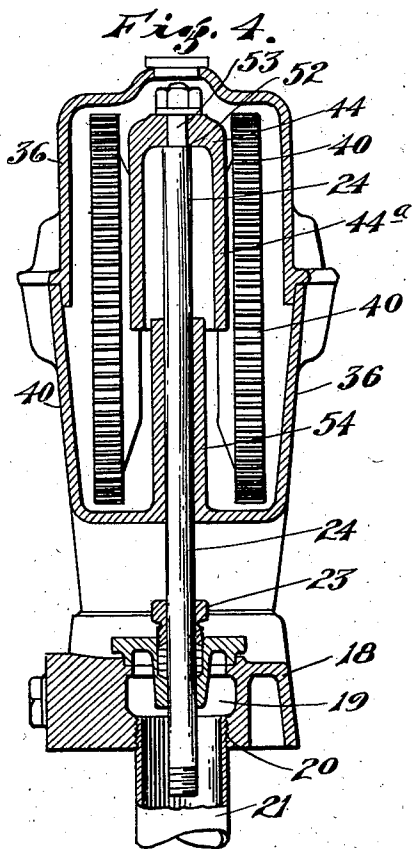
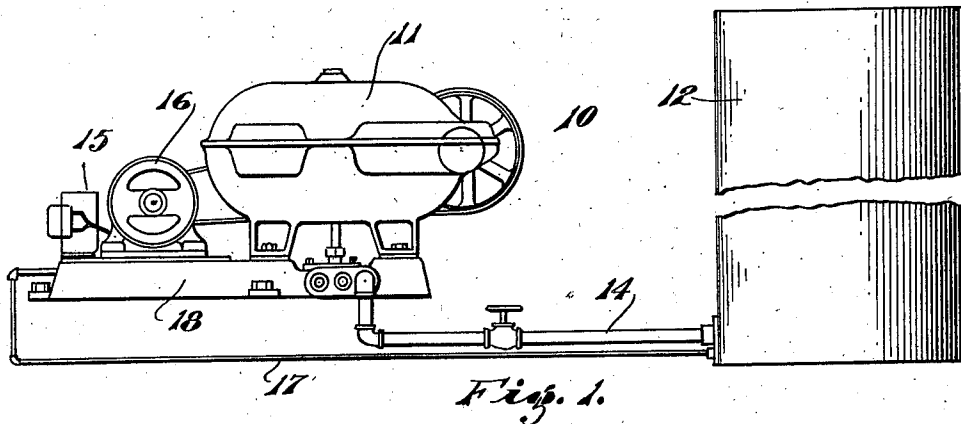
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W. E. HUBBARD

HYDROPNEUMATIC PUMP

Filed Jan. 10, 1923

2 Sheets-Sheet 1



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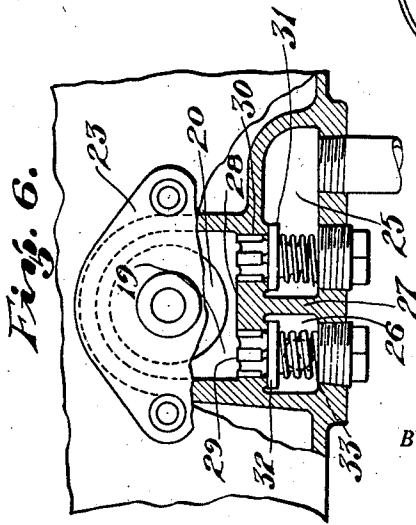
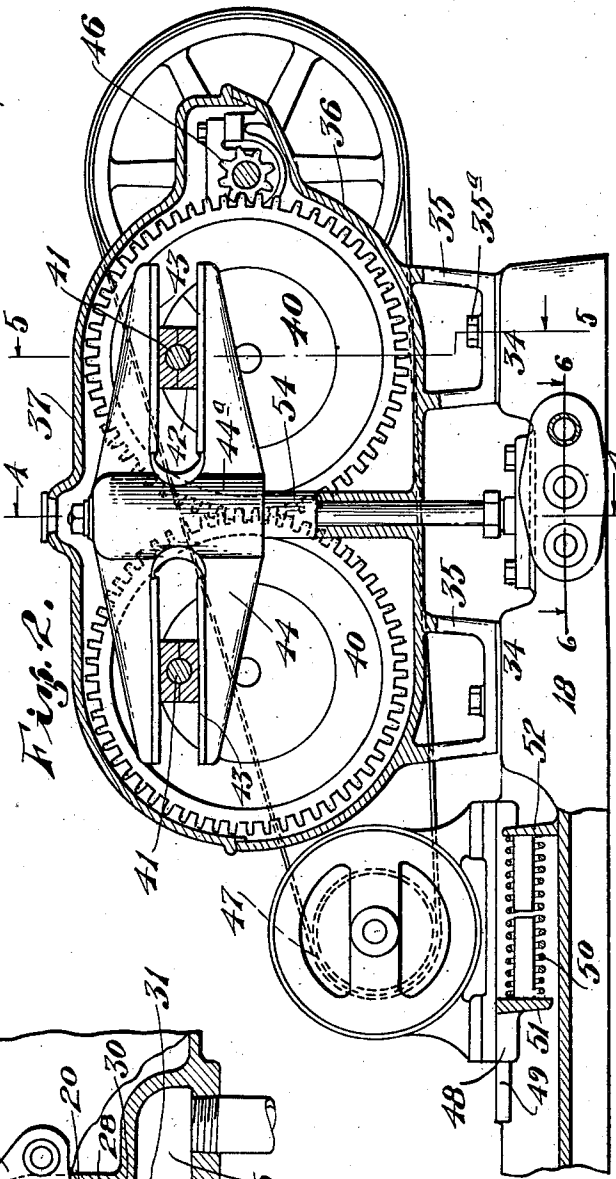
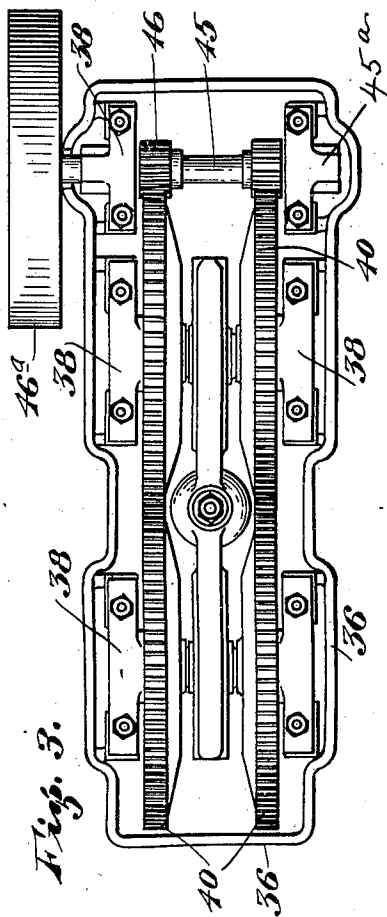
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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HYDROPNEUMATIC PUMP.

Application filed January 10, 1923. Serial No. 611,764.

To all whom it may concern:

Be it known that I, WILLIAM E. HUBBARD, a citizen of the United States, residing at Sausalito, county of Marin, and State of California, have invented new and useful Improvements in Hydropneumatic Pumps, of which the following is a specification.

This invention relates to deep well pumping equipment and particularly pertains to a power head adapted for use in connection with what is known as hydro-pneumatic pumping systems.

In general, such systems embody the use of a storage tank to which liquid is pumped from a well or reservoir by a power operated pump. The unit is automatically controlled so that when the pressure in the tank reaches a predetermined amount, the operation of the pump is discontinued. Also, when the pressure in the tank drops below a certain amount, the operation of the pump is automatically commenced to refill the tank.

In systems in general use prior to the present invention the power head was located at a point to one side of the well, sacrificing economical and balanced design so that the pump could be expeditiously removed from the well for adjustments and repaired without disassembling the power head. This arrangement has not proven entirely satisfactory, as it resulted in a considerable waste of power due to the unbalanced design, and required a great deal of attention due to the wearing of the parts, as it was impracticable to run them in lubricant.

Several attempts have been made to provide a satisfactory power head for deep well pumps which could be mounted directly over the mouth of the well with its operating parts running in lubricant. These experiments were finally abandoned as unsuccessful for several reasons, chief among which is the fact that it required practically complete disassembly of the power head before the pump could be removed from the well for adjustments or repairs.

With the object in view of overcoming the disadvantages of these prior structures the present invention embodies a generally improved and simplified power head which will be economical and efficient in operation and require but a minimum of attention and repairs.

One form which the invention may assume is exemplified in the following description

and illustrated by way of example in the accompanying drawings, in which—

Fig. 1 is a side elevation of a hydro-pneumatic pumping system embodying the invention.

Fig. 2 is a view in longitudinal section through the power head disclosing the preferred form of mechanism employed.

Fig. 3 is a plan view of the power head with the housing cover removed.

Fig. 4 is a transverse section through the power head taken on line 4—4 of Fig. 2.

Fig. 5 is a similar view taken on line 5—5 of Fig. 2.

Fig. 6 is a fragmentary view in plan section taken on line 6—6 of Fig. 2.

Referring more particularly to the accompanying drawings, 10 indicates a hydro-pneumatic pumping unit comprising a power head 11 and a storage tank 12. The power head connects with a pump and is driven by a motor 16, to operate the pump to raise liquid from a well or reservoir and deliver it to the tank 12 through a pipe line 14.

The power head 11 is equipped with a pressure actuated double pole electric switch 15 which controls the operation of the motor 16. This switch may be of any approved standard design and is connected with the storage tank by a pressure pipe line 17. It is intended that the pressure in the tank automatically control the switch and consequently the operation of the power head. That is, when the pressure in the tank 12 rises above a certain amount when the pump is being operated, the switch is opened and the operation of the power head is discontinued. Likewise, when the pressure in the tank drops below a predetermined amount, the switch is automatically closed to start the motor to operate the power head and consequently the pump.

The power head is fitted with a base member 18 which may be permanently mounted over the mouth of the well. This base is formed with an inlet chamber 19 having a threaded inlet port 20 for the reception of the threaded end of a pump casing 21. The upper end of the chamber 22 is closed by a flange having a packing gland and nut 23 through which the plunger rod 24 of the well pump may extend.

Formed in the base adjacent the receiving chamber is a discharge compartment 25 and a by-pass compartment 26. These compart-

ments are separated from each other by a wall 27 and from the receiving chamber by a wall 28. The latter wall is apertured as at 29 and 30 for the reception of check valves 31 and 32. The former of these valves controls the passage of liquid from the receiving chamber to the discharge compartment. The valve 32 controls the liquid flow from the chamber to the by-pass compartment 26. This compartment is in direct communication with the well through a passageway 33.

It is intended that the valve 31 be actuated by considerably less pressure than the valve 32, so that normally the passage of liquid from the well will be through the compartment 25, and thence through the pipe line 14 to the tank 12. However, for any reason should the control mechanism of the motor fail to operate when the pressure in the tank reaches the maximum amount, the liquid from the well will be by-passed through the compartment 26 back into the well. This protects the system from serious disablement due to excessive pressure.

The base 18 is formed with pads 34 for the reception of supports 35 of a power head housing 36. This housing is fitted with a cover 37 which co-operates therewith to entirely enclose the operating mechanism of the head. The housing is provided with bearings 38 which are adapted to receive trunnions 39 of spur gears 40. These gears are arranged in pairs meshing with each other and are identical in construction that they may be interchanged to prolong their usefulness.

The gears of each pair co-operate to revolve crank pins 41 which are fitted with crosshead boxes 42. These boxes are slidably disposed in guides 43 formed in opposite ends of a crosshead 44. Rotation of the gears will vertically reciprocate the crosshead through the medium of the crank pins 41.

To drive the gears, a drive shaft 45 is provided and is journaled in bearings 45^a. This shaft is fitted with pinions 46 which mesh with the gears 40 and serve to drive the same. The outboard end of the drive shaft is provided with a pulley 46^a which is connected by an endless belt to a pulley 47 on the driving motor.

To maintain the belt taut, the base of the motor is secured on a slide 48 mounted on guides 49 formed on the base. An expansion spring 50 is interposed between a lug 51 on the slide and a lug 52 on the base. This spring constantly tends to force the motor away from the drive shaft and thereby maintains the belt taut. This mounting of the motor is a considerable improvement over prior devices which employ an idler pulley as a belt tightener, for the reason that pumping plants of this character are given but slight attention and the problem of main-

taining the idler properly lubricated has always been difficult.

The central portion of the crosshead 44 is hollow and cylindrical with an open bottom. The pump plunger rod 24 is shouldered, as at 52, and extends upwardly through the cylindrical portion and detachably connects to the top thereof, as at 53.

The bottom of the housing is formed with an upwardly extending sleeve 54 through which the plunger rod extends. This sleeve is considerably less in diameter than the interior dimension of the cylindrical portion 44^a of the crosshead and is positioned concentric thereto. The cylindrical portion 44^a telescopes over the sleeve 54 when the crosshead reciprocates for the purpose of preventing leakage of oil through the sleeve along the plunger rod. By this construction there is no necessity of fitting the housing with a packing gland, the latter being expensive and requiring considerable attention.

It is seen that oil may be introduced into the casing in sufficient quantity so that the gears will dip therein and splash the same about to lubricate the bearings and other working parts.

By referring to Fig. 2, it will be seen that the supports 35 of the housing are each secured to the pads 34 of the base by one cap screw 35^a. Therefore, when it is desired to remove the pump from the well, one of these cap screws is removed, and by slightly loosening the other screw and utilizing it as a pivot pin, the housing may be swung to a position unobstructing the mouth of the well. To do this, the plunger rod 24 is disconnected from the crosshead and allowed to lower and disengage from the housing, which may then be swung around. To remove the pump it is only necessary to disconnect the flange so as to gain access to the open end of the pump casing.

In operation, assuming that the tank 12 is empty, the motor will operate to actuate the pump to refill the tank. When this is accomplished and the pressure therein reaches a predetermined amount, the switch 15 will automatically open and discontinue the operation of the motor. However, should the switch fail to operate, when the pressure reaches the maximum point the liquid lifted by the pump will be by-passed through the valve 32 back to the well.

Should it be desired to remove the pump, the pump rod 24 is disconnected from the housing and one of the screws 35^a is removed. The housing may then be swung to an unobstructing position that the pump may be withdrawn from its casing.

It is obvious that the removal of the pump may be easily accomplished by an unskilled person as it does not necessitate the disturbing of any of the parts of the mechanism of the power head.

As the parts of the power head are constantly and positively lubricated by the splash of the gears the mechanism will need but a minimum of attention and will serve a long period of usefulness.

While I have described the preferred form of the invention as now known to me, it is to be understood that various changes in its construction may be made without departing from the spirit of the invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A power head comprising a pair of rotors having cranks, a crosshead operatively connected to said cranks, a casing enclosing said rotors and said crosshead, a sleeve projecting upwardly within the casing from the bottom thereof through which a pump rod may project, and means on the crosshead adapted to connect with said rod and telescope over said sleeve when said crosshead is reciprocated.

2. A power head comprising a pair of rotors having cranks, a crosshead having horizontally disposed guides slidably engaging said cranks whereby rotation of the rotors will vertically reciprocate the crosshead, a casing enclosing said mechanism, a sleeve formed integral with the bottom of said casing through which a plunger rod of

a pump may project, means formed centrally in the crosshead for detachably connecting with said rod and telescoping over said sleeve when said crosshead is reciprocated.

3. In a power head, a casing, bearings mounted therewithin, rotors having trunnions journaled in said bearings, cranks carried by said rotors, a crosshead operatively connected to said cranks whereby rotation of the rotors will reciprocate the crosshead, a sleeve formed integral with the bottom of the casing and extending upwardly therein through which a plunger rod may extend, and means on the crosshead detachably connecting with said rod and constituting a cap for said sleeve to prevent liquid leakage therethrough.

4. In a power head, a casing enclosing a drive mechanism for vertically reciprocating a pump rod extending into the casing and operatively connecting with said mechanism, a sleeve projecting from the bottom of the casing and through which said pump rod extends, and means fixed on the pump rod constituting a cap for said sleeve and adapted to telescope over said sleeve when said pump rod is reciprocated to prevent liquid leakage through the sleeve.

WILLIAM E. HUBBARD.