

Nov. 29, 1927.

1,651,330

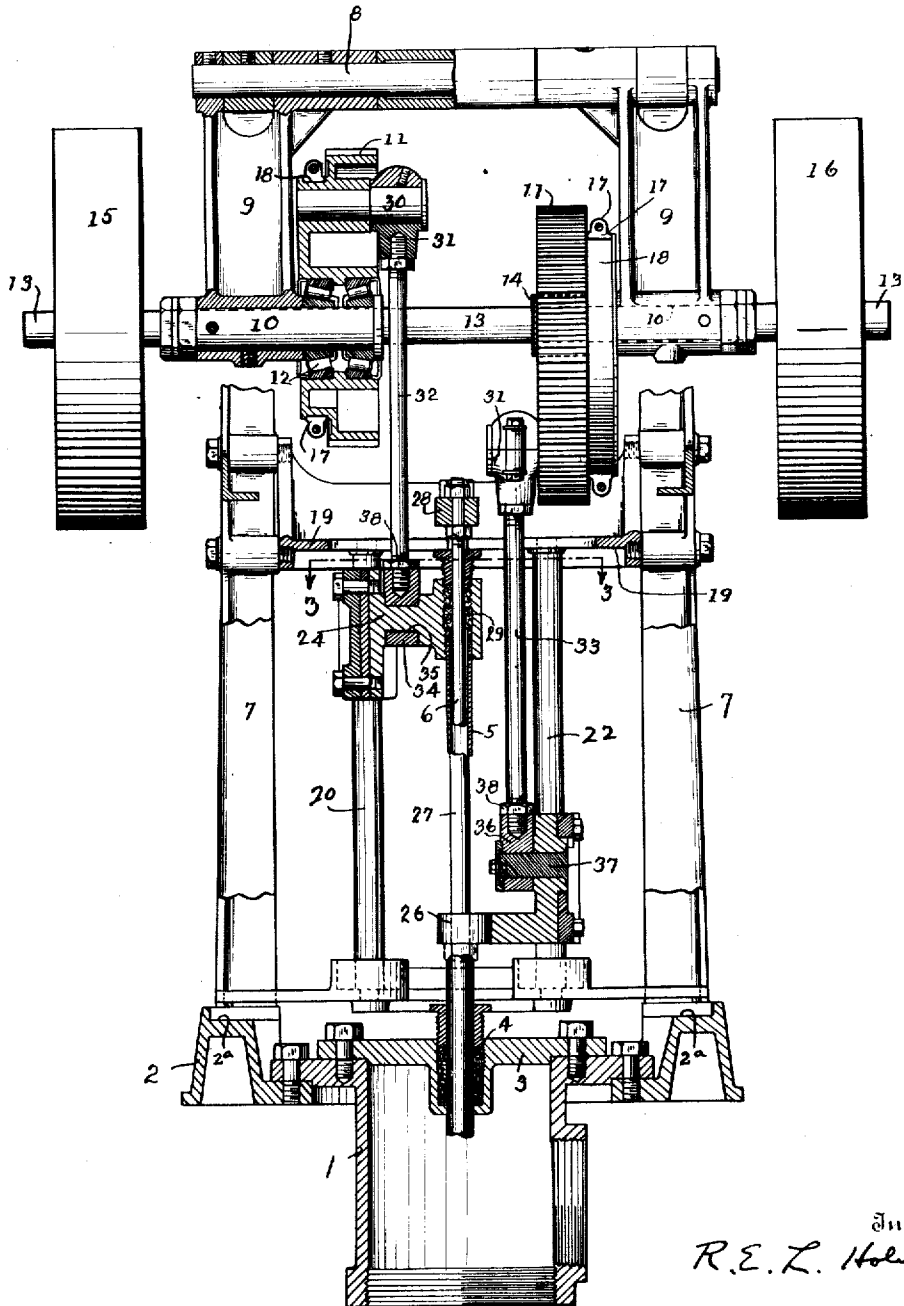
R. E. L. HOLMES

PUMP OPERATING MECHANISM

Filed Sept. 22, 1924

3 Sheets-Sheet 1

FIG. 1.



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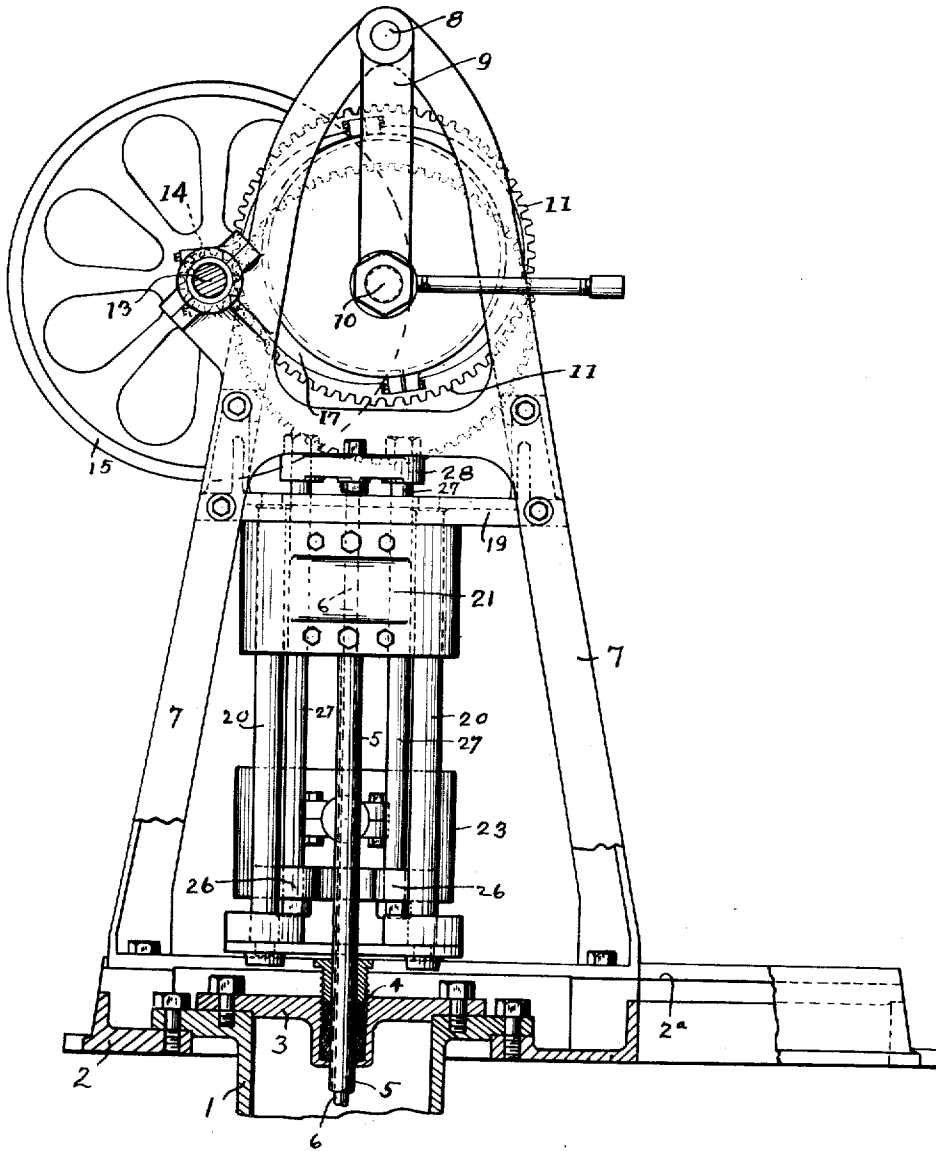
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FIG. 2.



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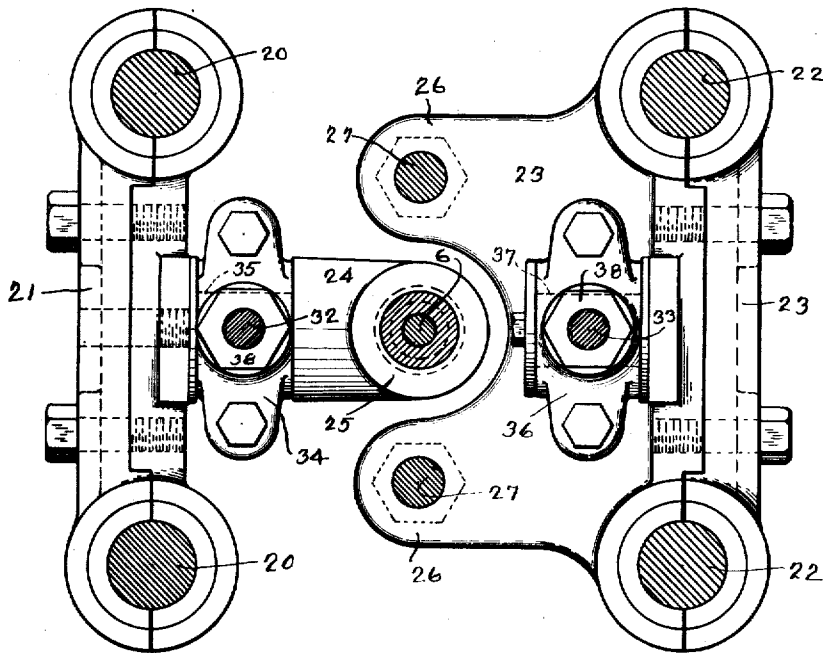
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3 Sheets-Sheet 3

FIG. 3.



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UNITED STATES PATENT OFFICE.

ROBERT E. L. HOLMES, OF DAVENPORT, IOWA, ASSIGNOR TO WESTCO-CHIPPEWA PUMP COMPANY, OF DAVENPORT, IOWA, A CORPORATION OF DELAWARE.

PUMP-OPERATING MECHANISM.

Application filed September 23, 1924. Serial No. 739,036.

This invention relates to improvements in power driven deep well pump operating mechanisms and more specifically to plunger pumps of the overlapping stroke type in which the pistons are actuated by pivotally suspended crank gears in such a manner as to provide a slow up stroke and a relatively quick down stroke, the present invention being an improvement upon the pump disclosed in the patent to Johnson 1,364,995, January 11, 1921.

The main objects of the present invention are to provide more direct connections from the actuating members to the pistons, to provide a compact piston actuating mechanism having all parts readily accessible for replacement, adjustment or repair, and to provide a mechanism in which all of the operating parts are above the supporting base so that it is not necessary to provide the pit below the base of the frame heretofore necessary to permit access to the parts connecting the actuating members to the piston rods.

With the above and other objects in view the invention may be said to comprise the mechanism as illustrated in the accompanying drawings hereinafter described and particularly set forth in the appended claims together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention appertains.

Reference should be had to the accompanying drawings forming a part of this specification in which:

Figure 1 is a sectional elevation showing part of the pump operating mechanism in front elevation and part in central vertical section.

Fig. 2 is a side elevation of the pump operating mechanism showing the supporting base and a portion of the pump cylinder in section.

Fig. 3 is a horizontal section taken on line 3-3, Fig. 1, above the piston operating crossheads and showing a top plan view of the crossheads.

Referring to the accompanying drawing the pump cylinder or casing 1 is attached at its upper end to the base 2 upon which the operating mechanism is supported, the cylinder or casing 1 having a cover plate 3 detachably secured to its upper flanged end

which is provided with a central opening 55 provided with a gland 4 through which the tubular piston rod 5 extends, a second piston rod 6 being mounted for longitudinal movement within the outer tubular rod. As is well understood in the art the two piston rods carry pistons at their lower ends which operate in the pump cylinder to elevate the water.

Supported upon the base 2 is the supporting frame 7 which at its top carries a horizontal shaft 8 from opposite ends of which are suspended links 9 which carry at their lower ends horizontal stub shafts 10 upon each of which is eccentrically mounted a large spur gear 11. Roller bearings 12 are preferably interposed between the eccentric gears 11 and the stub shafts 10 upon which they are mounted to rigidly hold the gears against movement at an angle to their axes. Parallel with the stub shafts 10 and at substantially the same height from the base 2 a drive shaft 13 is journaled in the frame at one side thereof, the drive shaft 13 having small spur pinions 14 fixed thereto which mesh with the eccentric gears 11. The shaft 13 is driven by a belt pulley 15 secured to the end of the shaft and at its opposite end is mounted a fly wheel 16. The eccentric gears 11 are maintained at all times in mesh with the driving gears 14 by means of restraining links 17 which have collars fitting over cylindrical hub portions 18 formed upon the sides of the gears and collars fitting over the shaft 13. The links 17 being thus pivotally connected to the driving shaft 13 and to the gears 11, restrain the centers of the gears to movement in arcs the centers of which are at the axis of the drive shaft. The rotation of the gears is permitted by the simultaneous pivotal movements of the suspension links 9 and restraining links 17.

Below the eccentric gears the frame 7 has a rigid cross member 19 and between these cross members and the base 2 are mounted a pair of vertical guide rods 20 upon which a crosshead 21 is slidably mounted and a second pair of vertical guide rods 22 upon which a second crosshead 23 is slidably mounted. The crosshead 21 has an inwardly extending centrally disposed arm 24 which has a vertically disposed collar 25 at the end thereof within which the upper end of

the tubular piston rod 5 is secured. The crosshead 23 has spaced inwardly projecting arms 26 which straddle the tubular piston rod 5 and which are spaced a sufficient distance apart to permit passage of the collar 25 between them so that the crossheads may pass each other when moving in opposite directions. The arms 26 of the crosshead 23 have vertical connecting rods 27 rigidly attached thereto which extend upwardly upon opposite sides of the piston rod 5 through the cross member 19 and have a cross bar 28 rigidly secured thereto. The inner piston rod 6 extends beyond the upper end of the tubular piston and through the cross member 19 of the frame and is rigidly connected to the center of the cross bar 28, a suitable gland 29 being secured in the upper end of the collar 25 to prevent leakage of water.

The two crossheads 21 and 23 are thus mounted for independent movement between the base 2 and cross member 19 of the frame and the two piston rods 5 and 6 are rigidly connected to said crossheads 21 and 23 for simultaneous movement therewith, all of the connections between the crossheads and piston rods being within the frame 7 and above the base 2 and therefore being conveniently accessible. Also it will be noted that since the piston rods are actuated beneath the gears 11 and the base of the frame, and the crossheads are designed to have an overlapping stroke, the frame 7 may be relatively short and the rigidity of the frame may be increased with considerably less material used.

Each of the eccentrically mounted gears 11 is provided on its inner side with a crank pin 30 which projects inwardly from the gear. Rotatably mounted on the pins 30 are collars 31 to which the connecting rods 32 and 33 are attached at their upper ends. The two gears are so mounted upon their shafts that the crank pins are disposed angularly, one with respect to the other, 180°. The lower end of the connecting rod 32 is connected to a collar 34 which is rotatably mounted upon a cylindrical portion 35 of the inwardly extending arm 24 of the crosshead 21 and the connecting rod 33 is connected to a collar 36 rotatably mounted on a pin 37 projecting inwardly from the crosshead 23. To provide a convenient adjustable and detachable connection between the connecting rods 32 and 33 and the collars on the eccentric gears and crossheads, the opposite ends of the rods 32, 33 are threaded and engage threaded sockets in the collars on the gears and crossheads, the rods being secured in adjusted position with respect to the collars by lock nuts 38.

It will be noted that the frame 7 may be disconnected from the base 2 moved along the tracks 2^a of the base to one side of the

pump casing so that the piston rods and pump cylinder or casing can be removed without interference by the frame.

Upon rotation of the drive shaft 13 the eccentrically mounted gears 11 are simultaneously driven in the same direction to reciprocate the crossheads 21 and 23 and the piston rods 5 and 6 connected thereto through the connecting rods 32 and 33. The movements of the eccentric gears 11 during their rotation caused by the suspension links 9 and restraining links 17 cause variations in the speed of movement of the crossheads such that the pistons which move with the crossheads are given a relatively slow upward or working stroke and a relatively fast downward or return stroke. The angular spacing of the crank pins causes the working strokes of the pistons to be balanced one with respect to the other and the variations in the speed of movement due to the mounting of the eccentric gears cause an overlapping of the working strokes so that the water is pumped in a continuous stream and fluctuations in the load upon the driving mechanism are reduced to a minimum.

In addition the movements of the eccentric gears are such that the connecting rods 32 and 33 are at all times within a small angle from vertical position so that the thrust of the cranks is effectively transmitted to the piston actuating crossheads. During the operation of the pump the crossheads 21 and 23 reciprocate between the base 2 and the rigid cross member 19 of the frame. Also the cross bar 28 which moves with the crosshead 23 and is connected to the inner piston rod 6 reciprocates between the eccentric gears 11 between the cross member 19 and the top of the frame 7.

The disposition of the piston rod actuating connections, as above described, permits the entire pump operating mechanism to be mounted as a compact unit in the frame above the head of the pump cylinders, thus doing away with a pit frequently used in present constructions and disposed beneath the frame for containing the means connecting the crossheads with the piston rods. It will thus be seen that the piston rods, crossheads and practically the entire pump operating mechanism is readily accessible and conveniently and easily assembled and disassembled.

Furthermore, it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from my invention as defined in the appended claims.

What I claim is:

1. In a pump operating mechanism, the combination of a pump cylinder, outer and

inner piston rods in said cylinder, said rods projecting above the top of the cylinder and connected to a pair of reciprocating crossheads, said outer rod being connected to one crosshead, and said inner rod being connected to the other crosshead, by means of a pair of supports and a crossarm arranged in the same vertical plane as said outer rod but having a range of movement entirely above the upper end of the stroke of said outer rod.

2. Pump operating mechanism comprising a pump cylinder, piston rods for reciprocation therein, a pair of spaced cranks independently mounted, means for rotating said cranks, a pair of crossheads mounted for reciprocating movement beneath said cranks, connecting rods connecting said cranks and crossheads, one of said piston rods connected into one crosshead, the other crosshead having a part extending upwardly therefrom to the space between the cranks, and the other piston rod connected to said upwardly extending part for reciprocating therewith.

3. Pump operating mechanism comprising a pair of gears independently and eccentrically mounted, a drive shaft having gears meshing with said eccentric gears, means for maintaining said eccentric gears in mesh with the gears of the drive shaft, crank pins projecting from the inner sides of said gears, crossheads beneath said gears having overlapping range of movement, connecting rods connecting said crank pins and crossheads, a tubular piston rod connected with one of

the crossheads, and a piston rod within said tubular piston rod and projecting upwardly into the space between said gears, and means beyond the range of movement of said crossheads for connecting the upper end of said inner piston rod to the other crosshead for movement therewith.

4. Pump operating mechanism comprising a cylinder, a frame above the upper end of the cylinder, a tubular piston rod projecting into the lower portion of said frame, a pair of crossheads mounted for vertical reciprocating overlapping movements in the lower portion of the frame, a pair of gears journaled eccentrically in the upper portion of the frame, a drive shaft having gears meshing with said eccentric gears, means for holding the eccentric gears in mesh with said driving gears, crank pins carried by said gears and positioned oppositely with respect to the axes of the gears, connecting rods extending from the crank pins to the crossheads, one of said crossheads being directly connected to the tubular piston rod, a second piston rod within the tubular rod and projecting beyond the upper end thereof into the upper portion of the frame above the zone of movement of the crossheads, and a cross bar rigidly connected to the other crosshead and secured to the upper end of the second piston rod.

In testimony whereof, I hereunto affix my signature.

ROBERT E. L. HOLMES.

inner piston rods in said cylinder, said rods projecting above the top of the cylinder and connected to a pair of reciprocating crossheads, said outer rod being connected to one crosshead, and said inner rod being connected to the other crosshead by means of a pair of supports and a crossarm arranged in the same vertical plane as said outer rod but having a range of movement entirely above the upper end of the stroke of said outer rod.

2. Pump operating mechanism comprising a pump cylinder, piston rods for reciprocation therein, a pair of spaced cranks independently mounted, means for rotating said cranks, a pair of crossheads mounted for reciprocating movement beneath said cranks, connecting rods connecting said cranks and crossheads, one of said piston rods connected into one crosshead, the other crosshead having a part extending upwardly therefrom to the space between the cranks, and the other piston rod connected to said upwardly extending part for reciprocating therewith.

3. Pump operating mechanism comprising a pair of gears independently and eccentrically mounted, a drive shaft having gears meshing with said eccentric gears, means for maintaining said eccentric gears in mesh with the gears of the drive shaft, crank pins projecting from the inner sides of said gears, crossheads beneath said gears having overlapping range of movement, connecting rods connecting said crank pins and crossheads, a tubular piston rod connected with one of

the crossheads, and a piston rod within said tubular piston rod and projecting upwardly into the space between said gears, and means beyond the range of movement of said crossheads for connecting the upper end of said inner piston rod to the other crosshead for movement therewith.

4. Pump operating mechanism comprising a cylinder, a frame above the upper end of the cylinder, a tubular piston rod projecting into the lower portion of said frame, a pair of crossheads mounted for vertical reciprocating overlapping movements in the lower portion of the frame, a pair of gears journaled eccentrically in the upper portion of the frame, a drive shaft having gears meshing with said eccentric gears, means for holding the eccentric gears in mesh with said driving gears, crank pins carried by said gears and positioned oppositely with respect to the axes of the gears, connecting rods extending from the crank pins to the crossheads, one of said crossheads being directly connected to the tubular piston rod, a second piston rod within the tubular rod and projecting beyond the upper end thereof into the upper portion of the frame above the zone of movement of the crossheads, and a cross bar rigidly connected to the other crosshead and secured to the upper end of the second piston rod.

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CERTIFICATE OF CORRECTION.

Patent No. 1,651,330.

Granted November 29, 1927, to

ROBERT E. L. HOLMES.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 20, claim 2, for the word "into" read "to", and line 22 for the word "to" read "into"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of December, A. D. 1927.

Seal.

M. J. Moore,
Acting Commissioner of Patents.

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