DE WITT E. YATES.

POWER DRIVEN PUMP.

APPLICATION FILED MAY 16, 1919.

1,391,036.

Patented Sept. 20, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

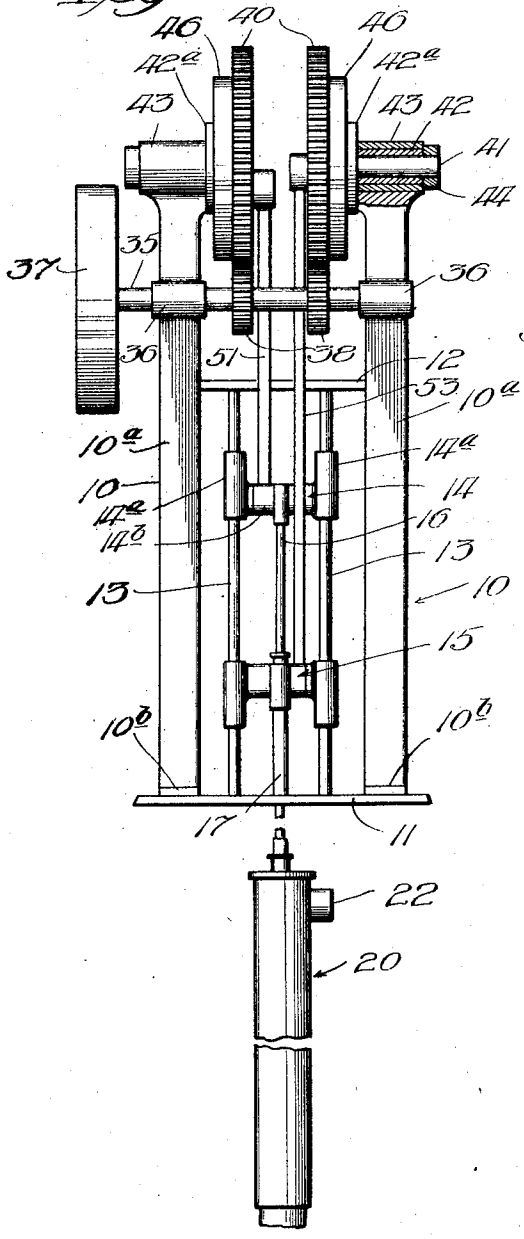
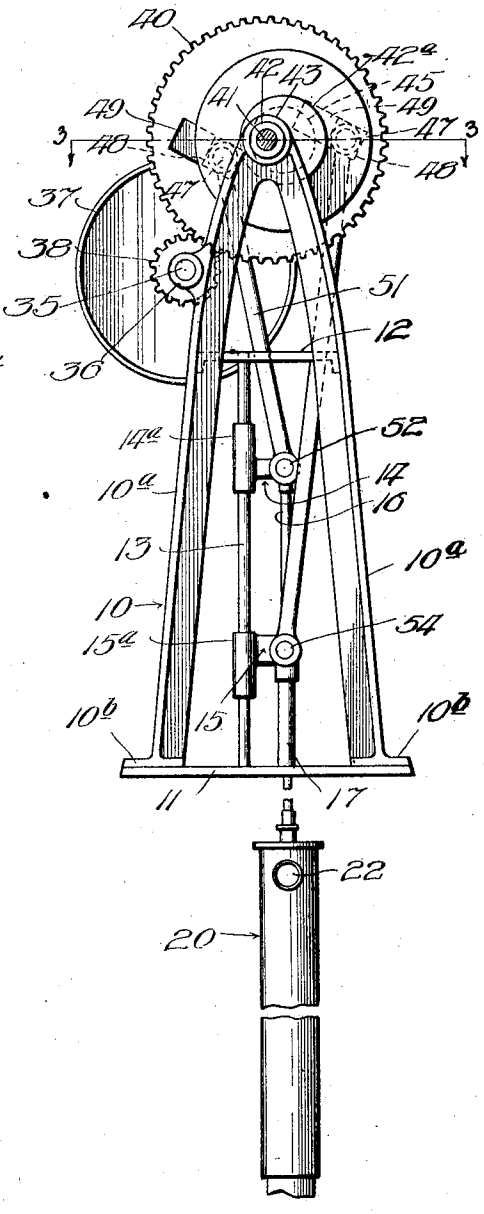


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

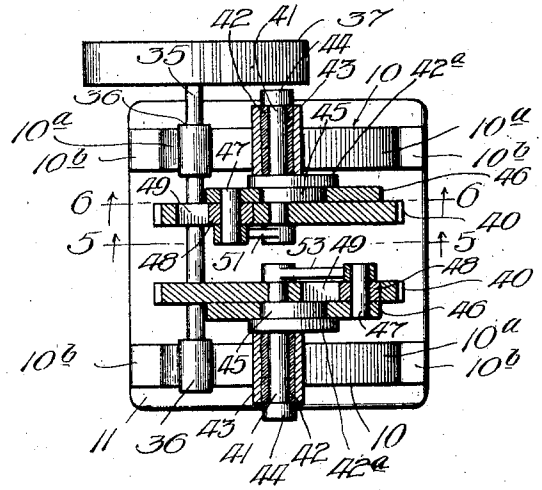


Fig. 4.

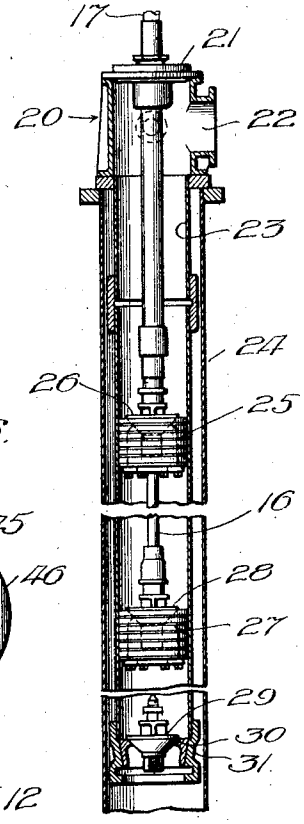


Fig. 5.

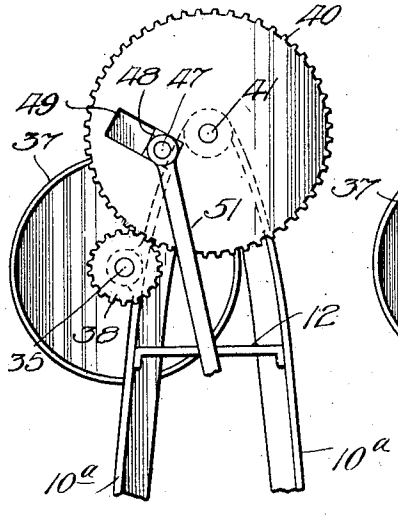
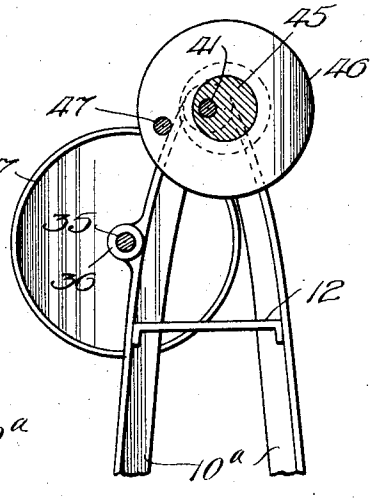


Fig. 6.



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UNITED STATES PATENT OFFICE.

DE WITT EDWARD YATES, OF CHIPPEWA FALLS, WISCONSIN.

POWER-DRIVEN PUMP.

1,391,036. Specification of Letters Patent. Patented Sept. 20, 1921.

Application filed May 16, 1919. Serial No. 297,612.

To all whom it may concern:

Be it known that I, DE WITT EDWARD YATES, a citizen of the United States, residing at Chippewa Falls, in the county of Chippewa and State of Wisconsin, have invented certain new and useful Improvements in Power-Driven Pumps, of which the following is a specification.

This invention relates to improvements in pumps, and its purpose is to provide an improved form of pump adapted to discharge a continuous stream of water or other liquid.

The principal object of the present invention is to provide an improved piston pump in which the pistons are mechanically actuated to discharge a continuous stream of water from the pump cylinder while maintaining the maximum economy and efficiency in the operation of the pump mechanism. An important feature is the provision of actuating mechanism for one or more pistons adapted to produce a relatively slow and substantially uniform travel of the piston during the pumping stroke and to effect a relatively rapid movement of the piston during the return stroke. For this purpose a mechanism is provided in which a rotary element is adapted to supply its power to the piston through a varying radius, so that the force supplied to the piston and the speed of movement thereof are capable of being properly adapted for the pumping strokes and return strokes of the piston. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which one embodiment is illustrated.

In the drawings—

Figure 1 shows a side elevation of the invention;

Fig. 2 shows an end elevation looking toward the left, as viewed in Fig. 1;

Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a vertical sectional view taken through the pump cylinder;

Fig. 5 is a detailed sectional view through the upper part of the pump mechanism taken on the line 5—5 of Fig. 3; and

Fig. 6 is a detailed sectional view through the upper part of the pump mechanism taken on the line 6—6 of Fig. 3.

The invention comprises two supporting frames 10 which are spaced apart and provided with upwardly converging arms 10^a, the lower ends of which are provided with transverse flanges 10^b secured to a common base plate 11, which is adapted to be mounted on a concrete foundation or other support. Frame members 12 extend transversely of the machine between the legs 10^a of the frame and are secured to the flanges thereof, these members 12 serving with the base plate 11 as supports for the vertical guide rods 13. Two cross heads 14 and 15 are provided with tubular parts 14^a and 15^a, respectively, which are slidably mounted on the guide rods 13. The transverse arm 14^b of the upper cross head is secured to a piston rod 16, and the transverse arm 15^b of the lower cross head is secured to another piston rod 17 which is hollow and adapted to receive the smaller piston rod 16.

A housing 20 is mounted beneath the base plate 11, and the upper end of this housing is closed by a cover plate 21 which serves as a bearing for the outer piston rod 17. This housing is provided at one side thereof with an outlet 22 through which the water is discharged, and the lower end thereof communicates with the upper end of the pumping cylinder 23, which is mounted within the vertical tube or conduit 24 which forms the well. The lower end of the outer piston rod 17 is connected to a piston 25 having an upwardly opening valve 26 mounted therein, and the smaller piston rod 16 which extends through the piston rod 17 and through the piston 25 is connected at its lower end to another piston 27 having mounted therein an outwardly opening valve 28. The lower end of the pumping cylinder 23 is normally closed by a valve 29 which rests on a valve seat 30 mounted in the casing 31. The piston rods are actuated, as hereinafter described, to move the pistons 25 and 27 simultaneously in opposite directions, so that when the upper piston moves downwardly, the water between the pistons passes through the valve 26 into the space above the upper piston and is discharged through the opening

22, while during the downward movement of the piston 27, the piston 25 moves upwardly and discharges the water which is above that piston. During the downward movement of the piston 27, the water beneath that piston and the valve 29 passes through the valve 28 into the space between the two pistons. Upon the upward movement of the piston 27, a new charge of water is drawn through the valve 29. One of the pistons is therefore adapted to be moving continuously in a vertical direction, so that a continuous stream of water is discharged through the outlet 22.

The movement of the pistons in the manner above described is effected by means of operating mechanism comprising a driving shaft 35 which is journaled in bearings 36 carried by the frames 10. This shaft is connected with a suitable source of power through a driven pulley 37, and the shaft has keyed thereon two driving pinions 38. Each of the pinions 38 meshes with a gear 40, and each gear 40 is secured to one of the shafts 41 which are journaled in the bushings 42 carried by the bearing 43 at the upper ends of the frames 10. A collar 42^a is formed integrally with each bushing 42 and engages the inner end of the bearing 43. Another collar 44 is secured to the outer end of each shaft 41 and engages the outer end of the bearing 43. Each collar 42^a carries on the inner side thereof a hub or bearing 45 which is eccentrically located with respect to the shaft 41, as shown for example in Figs. 2 and 6. A disk 46 is journaled on each of the hubs 45 and each disk carries a crank pin 47 adapted to have a rotative engagement with a block 48 slidably mounted in a slot 49 formed in the adjacent gear 40 outwardly from the center thereof. The projecting end of one crank pin is pivotally attached to a connecting rod 51 which extends downwardly and is pivotally connected at 52 to the upper end of the piston rod 16. The crank pin 47, carried by the other disk 46, is pivotally attached to another connecting rod 53 which extends downwardly and is pivotally connected at 54 to the upper end of the other piston rod 17.

As the shaft 35 rotate, the pinions 38 drive the gears 40, and these gears in turn rotate the disks 46 by which the crank pins 47 are carried. As the gears 40 rotate, the crank pins 47 and the blocks 48 in which they are mounted travel in the slots 49 due to the action of the eccentrically mounted disks 46 which are caused to travel in paths eccentrically located with respect to the circular paths of the gears 40 because of the eccentric location of the hubs 45. The relative positions of the slots 49 and the pins 47 on the disks 46 are adapted to cause the pins 47 to move in toward the inner ends of the slots 49 during the upward or pumping strokes of the piston rods, thus securing a relatively slow movement of each piston and the application of power thereto through a relative short radius on the driving gears. During the downward strokes of the pistons, the corresponding pins 47 are located at or adjacent the outer ends of the slots 49, so that the piston rods have relatively rapid movements during their return strokes. The shape and inclination of the slots 49 may be altered as desired in order to bring about the most suitable relation between the movements of the pistons during the pumping strokes and during the return strokes thereof. For example, by properly designing the slots, each piston may have a relatively slow and substantially uniform movement during its pumping stroke and a relatively rapid motion of varying velocity during its return stroke. The parts of the driving mechanism are preferably designed so that each piston is returned to its lower position and starts on its upward stroke before the other piston has reached the upper limit of its travel, so that one piston is constantly moving in an upward direction. This invention makes it possible to discharge a continuous stream of water from the outlet 22 and to secure the maximum efficiency in the operation of the pumping apparatus by reason of the fact that the mechanism is of simple design and is adapted to return the pistons to their lower positions with the minimum loss of time and expenditure of power.

Although I have shown and described one embodiment of the invention for purposes of illustration, it will be understood that it may be constructed in various other forms without departing from the scope of the appended claims.

What I claim is:

1. The combination in a pump, of a rotary driving element, a controlling element mounted adjacent said driving element and adapted to rotate about an axis eccentric to said driving element, and a driven element having a sliding connection with said driving element and adapted to have its position varied with respect to the axis of said driving element by the operation of said controlling element.

2. The combination in a pump, of a rotary driving element, a controlling element adapted to rotate on a bearing eccentrically located with respect to the axis of said driving element, a crank pin adapted to rotate with said controlling element and having a sliding connection with said driving element, and a driven element connected to said crank pin.

3. The combination in a pump, of a rotary driving element, a reciprocating driven element, said driving element being provided with a slot extending in a general

radial direction, connecting means engaging said slot and connected to said driven element, and means adapted to rotate on an axis eccentric to the axis of said driving element for causing said connecting means to travel in said slot during the operation of said pump.

4. The combination in a pump, of a rotary driving element, a reciprocating driven element, a rotatable controlling element mounted adjacent said driving element to rotate on an axis eccentric to the axis of said driving element, said driving element being provided with a slot, a pin carried by said controlling element and engaging said slot, and means connecting said pin with said driven element.

5. The combination in a pump, of a rotary driving element, a reciprocating piston, a controlling element mounted to rotate on an axis eccentric to the axis of said driving element, a crank pin carried by said controlling element, said driving element having a guide engaged by said crank pin, and means connecting said crank pin with said piston, said guide and said controlling element being adapted to cause said pin to occupy a position inwardly toward the center of said driving element during the pumping stroke of said piston and an outward position away from the center of said driving element during the return stroke of said piston.

6. The combination in a pump, of a frame, a pair of shafts journaled in said frame, a pair of driving elements each mounted on one of said shafts, a pair of controlling members mounted to rotate on axes eccentric to the axes of said shafts, a pair of crank pins each carried by one of said controlling members, each of said driving members being provided with a slot engaged by one of said crank pins, a pair of pistons, and means for connecting each of said pistons with one of said crank pins, the eccentricity of one of said controlling members being opposite to that of the other, whereby said pins travel in said slots during the rotation of said driving elements and effect the application of power to said pistons through relatively small radii during the pumping strokes and through relatively large radii during the return strokes with the pumping strokes of one piston alternating with those of the other.

7. The combination in a pump, of a frame, a pair of shafts journaled in said frame, a pair of driving gears each mounted on one of said shafts, means for driving both of said gears, a pair of controlling members, each mounted to rotate about an axis eccentric to the axis of one of said shafts, a pair of crank pins each carried by one of said controlling members, each of said gears being provided with a slot extending in a general radial direction, a pair of piston rods each connected to one of said pistons, and a pair of connecting rods each extending between one of said piston rods and one of said crank pins.

8. The combination in a pump, of a frame, a pair of bearing members journaled in said frame, a pair of shafts each journaled in one of said bearing members, a pair of controlling members each mounted to rotate on one of said bearing members about an axis eccentric to the axis of the adjacent shaft, a pair of driving elements each secured to one of said shafts, each of said driving elements being provided with a slot extending in a general radial direction, a pair of crank pins each carried by one of said controlling members and engaging one of said slots, a pair of pistons, and means for connecting each of said pistons with one of said crank pins.

9. The combination in a pump, of a frame, a pair of bearing members journaled in said frame, a pair of shafts each journaled in one of said bearing members, a pair of controlling members each mounted to rotate on one of said bearing members about an axis eccentric to the axis of the adjacent shaft, a pair of driving elements each secured to one of said shafts, each of said driving elements being provided with a slot extending in a general radial direction, a pair of crank pins each carried by one of said controlling members and engaging one of said slots, a pair of pistons, means for connecting each of said pistons with one of said crank pins, a common driving shaft, and means carried by said driving shaft for actuating each of said driving elements.

10. The combiantion in a pump, of a frame, a pair of bearing members journaled in said frame, a pair of shafts each journaled in one of said bearing members, a pair of controlling members each mounted to rotate on one of said bearing members about an axis eccentric to the axis of the adjacent shaft, a pair of driving elements each secured to one of said shafts, each of said driving elements being provided with a slot extending in a general radial direction, a pair of crank pins each carried by one of said controlling members and engaging one of said slots, a pair of pistons, and means for connecting each of said pistons with one of said crank pins, the eccentricity of one of said controlling members being opposite to that of the other.

11. The combination in a pump, of a frame, a pair of bearing members journaled in said frame, a pair of shafts each journaled in one of said bearing members, said bearing members being provided with eccentric hubs, controlling disks rotatably mounted on said hubs, crank pins carried by said controlling disks, driving gears se-

cured to said shafts and having slots therein engaged by said crank pins, a pump cylinder, a pair of pistons mounted to reciprocate in said cylinder, a pair of piston rods each connected to one of said pistons, means for connecting each of said piston rods to one of said crank pins, a driving shaft journaled in said frame, and pinions carried by said driving shaft and meshing with said driving gears.

In testimony whereof, I have subscribed my name.

DE WITT EDWARD YATES.