A. N. BAADE.

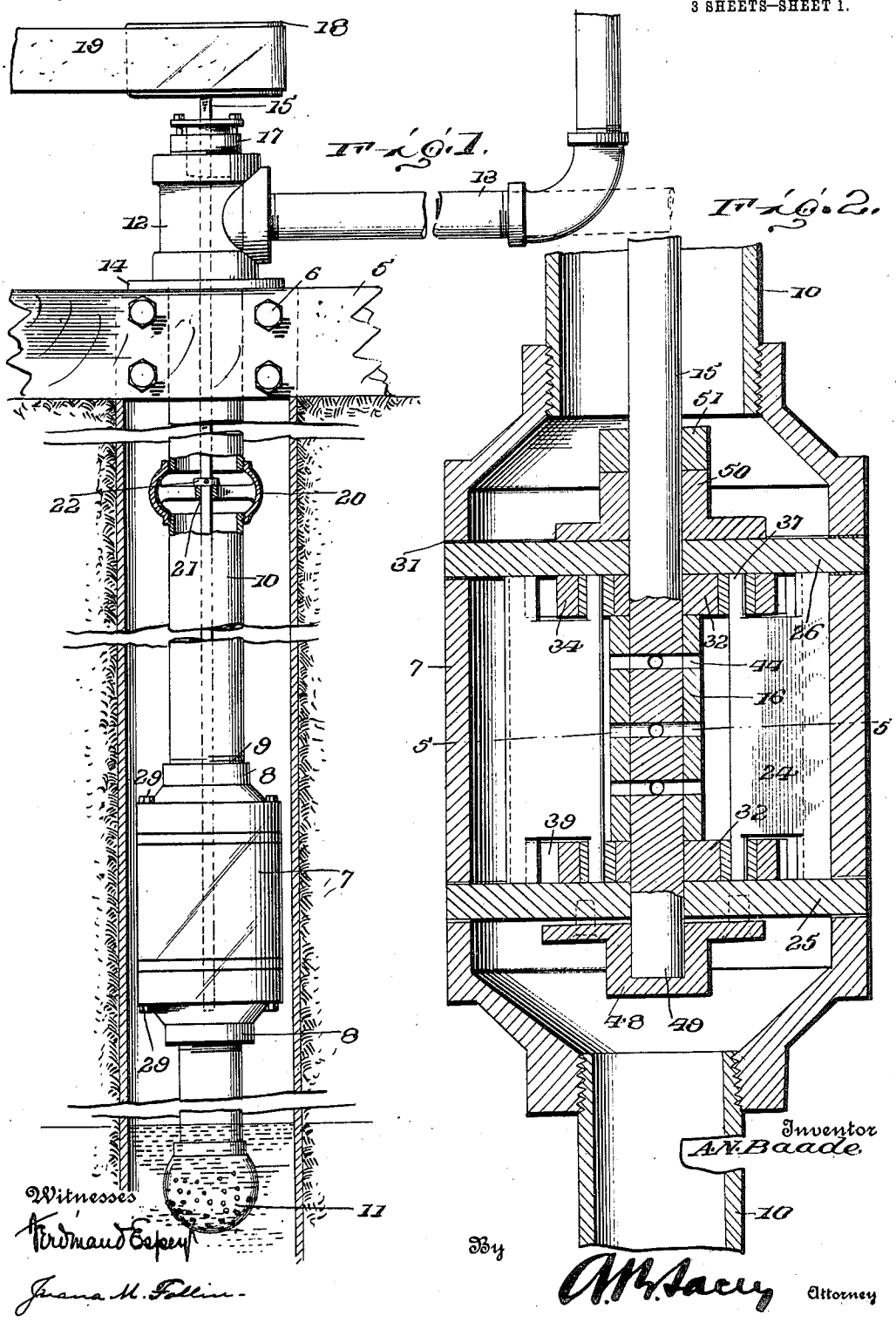
ROTARY PUMP.

APPLICATION FILED OCT. 7, 1911.

1,050,905.

Patented Jan. 21, 1913.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

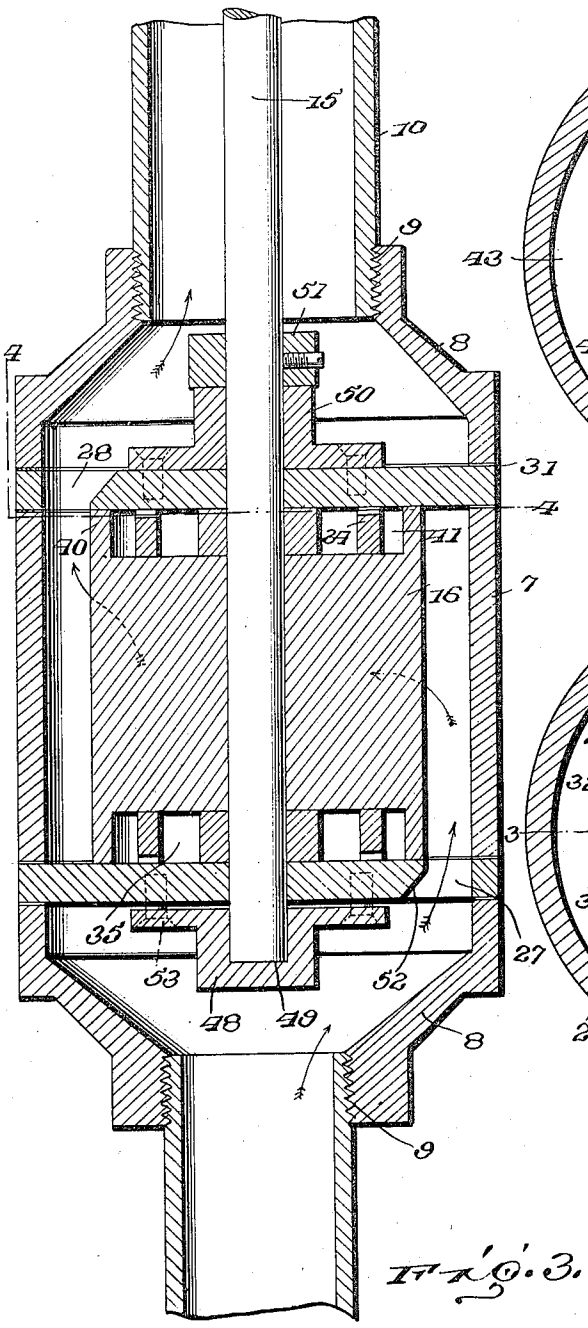

FIG. 3.

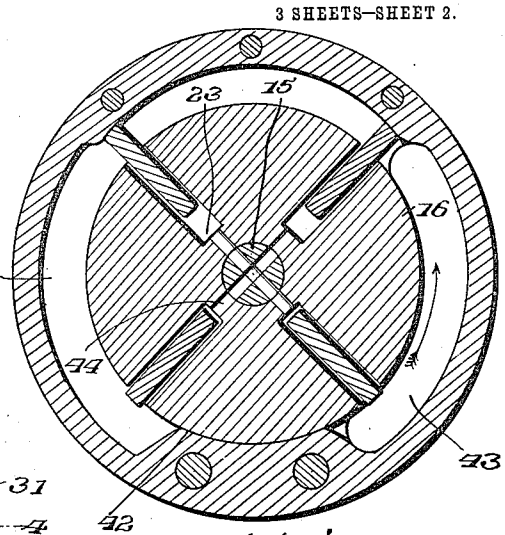

FIG. 5.

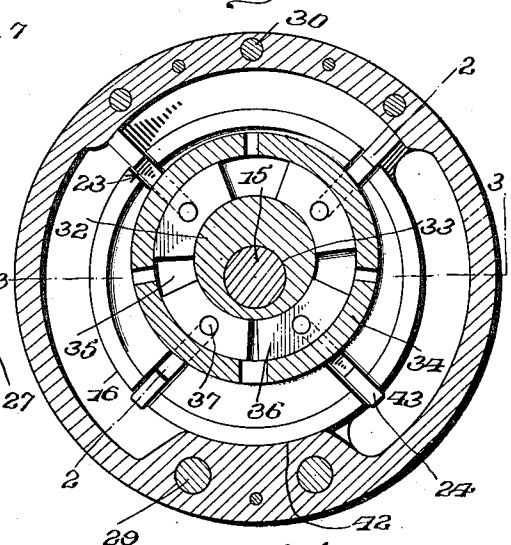

FIG. 4.

Witnesses

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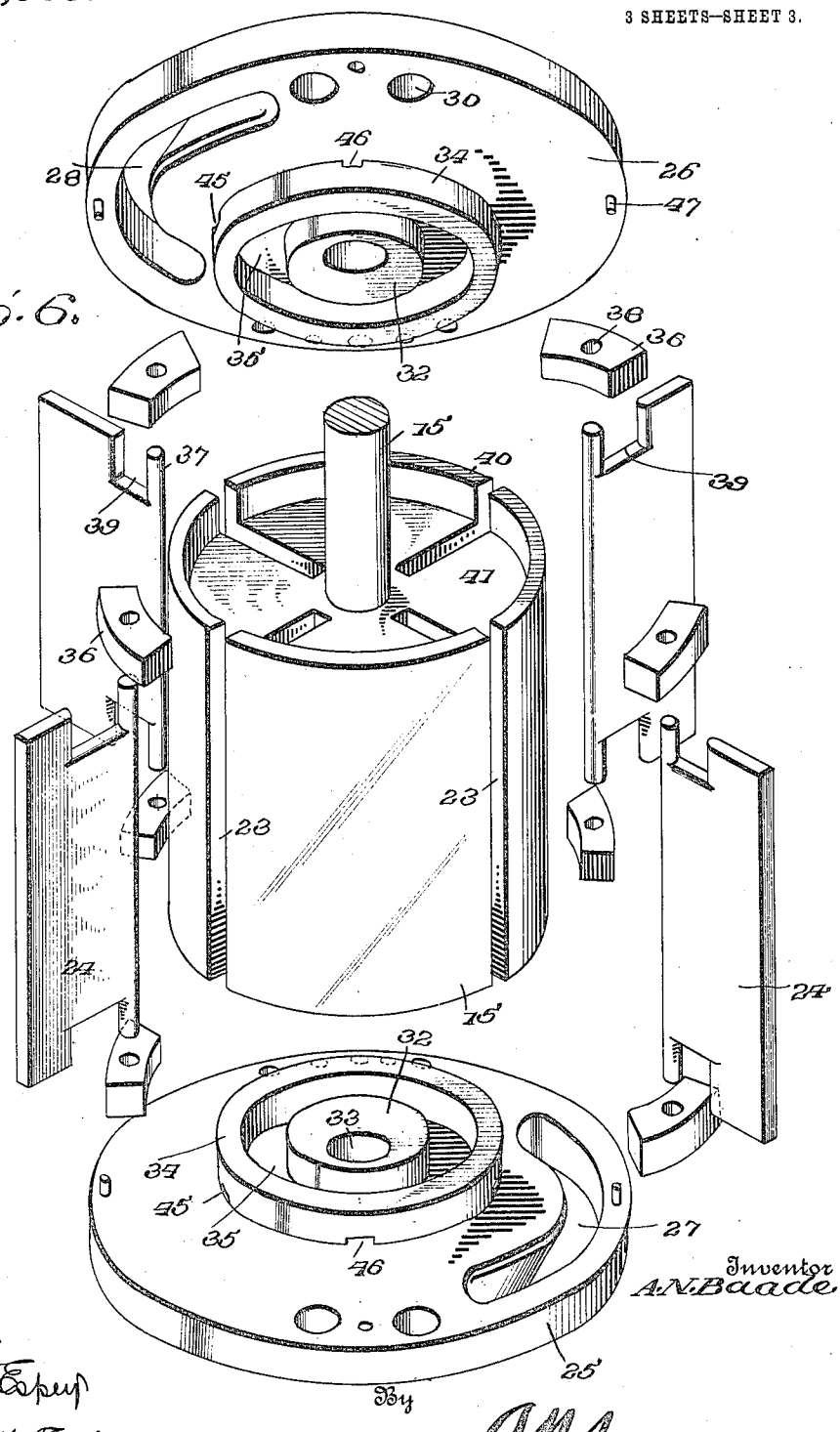
3 SHEETS—SHEET 3.

Fig. 6.



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ROTARY PUMP.

1,050,905. Specification of Letters Patent. Patented Jan. 21, 1913.

Application filed October 7, 1911. Serial No. 653,436.

To all whom it may concern:

Be it known that I, ANDREW N. BAADE, citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

This invention relates to pumps and more particularly to a rotary pump especially designed for elevating water for irrigation and other purposes.

The primary object of the invention is to provide a pump of simple, durable and compact construction, capable of being readily lowered within a drilled or other well to any desired depth and which may be conveniently operated from a point above the surface of the ground so as to cause a constant flow of liquid at the discharge pipe, regardless of any variation of the height of the water in said well.

A further object of the invention is to provide a pump including a stationary casing having a piston mounted for rotation therein and provided with a plurality of radiating blades movable alternately to extended and retracted positions as the piston is rotated so as to draw the water into the casing and force said water upwardly into a tank, ditch or other suitable receiver.

A further object is to provide the stationary casing with oppositely disposed heads having eccentrics secured thereto and fitting within depressions in the adjacent ends of the piston, there being retaining rings spaced from the eccentrics and defining intermediate guiding grooves for the reception of suitable ring segments, the latter being operatively connected with the sliding blades and serving to extend and retract the same.

A further object is to provide means for permitting the escape of water through the retaining ring as the segments are shifted, and means for allowing the free circulation of water between the radiating blades and through the operating shaft, thereby to prevent strains or compression on the parts and consequently increase the efficiency of the pump.

A still further object of the invention is generally to improve this class of devices so as to increase their utility, durability and efficiency.

Further objects and advantages will appear in the following description, it being understood that various changes in form, proportions and minor details of construction may be resorted to within the scope of the appended claims.

For a full understanding of the invention and the merits thereof, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a side elevation partly in section of a rotary pump constructed in accordance with my invention, showing the pump suspended within a small drilled well; Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 4; Fig. 3 is a similar view taken on the line 3—3 of Fig. 4; Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3 and looking in the direction of the arrow; Fig. 5 is a transverse sectional view taken on the line 5—5 of Fig. 2; Fig. 6 is a perspective view, showing the construction of the piston, casing heads, blades and ring segments, the parts being separated for the purpose of clearness.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The improved pump forming the subject matter of the present invention is principally designed for elevating water to be used for irrigating purposes, and by way of illustration is shown suspended within a drilled well by means of spaced sills or timbers 5 resting on the surface of the ground at the mouth of the well and connected by bolts or similar fastening devices 6.

The pump comprises a stationary cylindrical casing 7 having oppositely disposed reducing caps 8, the interior walls of which are threaded at 9 for connection with the correspondingly threaded ends of the adjacent pipe sections 10, the latter constituting a conductor, through which the water is discharged. The conductor 10 may be of any desired length and is preferably formed of a plurality of detachably connected pipe sections, the lower one of which is provided with a screen 11 adapted to be immersed or partially immersed within the water so as to prevent the entrance of sand and other foreign matter to the interior of the casing 7 and thus interfere with the proper operation of the pump.

Secured to the upper pipe section constituting the conductor 10, is a T-joint 12, to which is connected a discharge pipe 13, which pipe may be extended upwardly in a vertical plane so as to discharge into a tank or reservoir or extend in a horizontal plane and discharge into an irrigating ditch, as indicated by the dotted lines in Fig. 1 of the drawings. A washer 14 is preferably interposed between the T-joint 12 and sills 5 so as to form a firm support for the pump and also to prevent excessive wear on said sills.

Mounted for rotation within the conductor 10, is an operating shaft 15, to one end of which is keyed or otherwise rigidly secured a piston 16, while the other end thereof projects through a gland or bushing 17 and is provided with a terminal pulley 18 adapted to be connected through the medium of a belt 19 with a motor or other suitable source of power when the pump is in operation. Interposed between two of the pipe sections constituting the conductor 10, is a relatively short section 20 having a spider provided with a bearing 21 to permit the passage of the shaft 15, there being a collar 22 secured to the shaft and resting on the spider to assist in sustaining the weight of the piston and also to center the shaft with respect to the conductor.

The piston 16 is provided with spaced vertically disposed slots 23, in which are slidably mounted a plurality of radiating blades 24, the latter being movable alternately to extended and retracted positions when the piston is rotated, thereby to suck or draw the water into the casing and force said water upwardly through the discharge pipe 13.

Interposed between the casing 7 and caps 8, are stationary heads 25 and 26, one of which is provided with a segmental inlet port 27 and the other with a correspondingly shaped outlet port 28, the parts being detachably secured in assembled position by bolts or similar fastening devices 29 extending through registering openings 30 formed in the casing, heads and reducing caps, as shown. Suitable packing rings or gaskets 31 are also preferably arranged on opposite sides of the heads 25 and 26 in order to prevent leakage between the parts.

It will here be noted that the piston 16 turns to the left, while the pipe sections 10 are provided with right hand threads so that the turning of the operating shaft in the center of the conductor has a tendency to tighten rather than loosen the threaded connections between the pipe sections above the pump.

Detachably secured to the inner faces of the heads 25 and 26 by screws or similar fastening devices, are eccentrics 32 having openings 33 formed therein and also extending through the adjacent heads to permit the passage of the operating shaft 15. Surrounding each eccentric 32, is a retaining ring 34 also detachably secured to the adjacent head and spaced from the eccentric to form an intermediate groove 35 in which are slidably mounted a plurality of blocks or ring segments 36, four of said segments being preferably mounted in each guiding groove to conform to the number of radiating blades. It will of course be understood, however, that where additional blades are mounted on the pump, the number of segmental blocks or ring sections will be correspondingly increased.

The opposite ends of the blades 24 are provided with pins or trunnions 37 adapted to enter openings 38 formed in the adjacent ring sections, there being recesses 39 formed in the blades near the pins to accommodate the retaining rings 34.

Attention is here called to the fact that the piston 16 is provided with oppositely disposed flanges 40 defining seating recesses 41 which receive the eccentrics 32 and retaining rings 34 so that when the different parts of the pump are assembled, said retaining rings and eccentrics will be entirely housed within the recesses in the ends of the piston and thus provide a compact construction. It will also be noted that the members 32 and retaining rings 34 are arranged eccentric to the operating shaft, while the adjacent walls of the retaining rings and members 32 are disposed concentric with each other so as to permit free sliding movement of the segments 36 within the guiding grooves.

The interior wall of the casing 7 is provided with an enlargement 42 which constitutes an abutment, there being depressions 43 formed in the casing on opposite sides of the abutment 42 and registering with the adjacent inlet and discharge ports and constituting liquid receiving chambers.

The length of the blades 24 is such that they will preferably bear but lightly against the inner wall of the casing, so as to reduce friction between the parts to a minimum.

As a means for permitting free circulation of the water between the inner ends of the radiating blades and thus prevent binding action thereof, the piston, as well as the operating shaft 15, are provided with a series of intersecting passages 44 opening into the rear ends of the slots 23 in the piston, as best shown in Fig. 5 of the drawings. In order to permit the escape of water and sand from the guiding grooves 35 when the ring segments 36 are adjusted therein, the retaining rings 34 are each preferably provided with a series of spaced openings 45, there being a relatively large opening 46 formed in each retaining ring opposite the small portion of the eccentric, as best shown in Fig. 6 of the

drawings. By such a construction, the water is permitted to flow from one blade to the other through the operating shaft as the blades are alternately moved to extended and retracted positions, while the water between the ring segments is permitted to escape from the guiding grooves when said segments are actuated to operate the blades, thereby permitting free movement of the parts and consequently increasing the efficiency of the pump.

The inner faces of the heads 25 and 26 are preferably formed with pins 47 adapted to enter corresponding recesses formed in the adjacent end of the casing 7 to assist in centering the heads on said casing and prevent accidental displacement thereof when introducing the bolts or fastening devices 29. Secured to the lower face of the head 25, is a casting 48 having a step bearing 49 therein for the reception of the lower end of the operating shaft 15, there being a corresponding bearing 50 secured to the upper face of the head 26 for engagement with a stop collar 51 fastened on the shaft 15 so as to assist in sustaining the weight of the piston and its associated parts.

The inner wall of the inlet port 27 is preferably beveled at 52 to assist in directing the water into the adjacent chamber 43, while the wall of the discharge port 28 is correspondingly beveled to assist in directing the water into the conductor 10 as the piston is rotated.

The upper face of the casting 48 is preferably spaced from the lower face of the head 26 and secured thereto by bolts or similar fastening devices 53 so that by rotating said bolts, the casting may be adjusted vertically of the pump casing and thus allow for excessive wear on either the bearing 49 or lower end of the operating shaft.

In operation, the pump is suspended within a well and actuated through the medium of the belt 19. As the piston rotates, a partial vacuum will be formed in the casing 7, thus drawing or sucking the water through the inlet port into the adjacent chamber 43. As the outer edges of the blades successively register with the inner face of the abutment 42, a suction will be produced on one side thereof and the water on the other side of the blade forced upwardly through the discharge port 28, conductor 10 and pipe 13 into the tank or ditch. The eccentric 32 is so disposed that as the outer edges of the blades 24 register with the abutment 42, said blades will be retracted and consequently draw the adjacent ring segments together, the water between said segments being permitted to escape through the opening 46 and the water between the blades being permitted to circulate through the shaft during the operation of the pump, in the manner before described.

It will of course be understood that the pipe sections comprising the conductor 10 may be connected to each other and to the cap reducers by means of flanges instead of threads, and that gearing may be attached to the top of the shaft so as to render it possible to operate the pump by hand instead of by power, without departing from the spirit of the invention.

Thus it will be seen that there is provided a thoroughly efficient pump of compact construction, which may be lowered to a great depth in a small drilled well, thereby saving the expense incident to digging a large well, to admit more bulky machinery, such as the ordinary rotary or centrifugal pump. While the pump is principally designed for elevating water for the purpose of irrigating land, it will of course be understood that the pump may be used with good results for circulating water through gas engines, for fire protection or wherever a pump of this character is found desirable or applicable.

Having thus described the invention, what is claimed as new is:

1. A rotary pump including a casing having inlet and discharge ports, arranged out of alinement, the discharge port being above the inlet port, a piston mounted for rotation within the casing, radiating blades slidably mounted on the piston, an eccentric arranged at each end of the piston, retaining rings spaced from and encircling the eccentrics, ring segments slidably mounted between the eccentrics and the retaining rings and operatively connected with the blades, means for permitting the circulation of water between the blades, and means for permitting the escape of water through the retaining rings as the position of the ring segments is changed.

2. A rotary pump including a casing, heads forming closures for the lower and upper ends of the casing and provided with inlet and discharge ports, a shaft journaled in the heads, a piston secured upon the shaft and interposed between said heads, radiating blades slidably mounted on the piston, eccentrics secured to the inner faces of the heads, retaining rings surrounding the eccentrics and spaced concentrically from the latter, ring segments slidably mounted between the eccentrics and the rotating rings and operatively connected with the blades for moving the blades to extended and retracted positions when the piston is rotated, and means for permitting the escape of water through the retaining rings as the ring segments are shifted.

3. A rotary pump including a stationary casing, upper and lower heads rigidly secured to and closing the ends of the casing and provided with inlet and discharge ports arranged out of alinement, a shaft journaled in said heads, a piston interposed between

the heads and mounted for rotation with the shaft, said piston being provided with oppositely disposed seating recesses, eccentrics secured to the inner faces of the heads and fitted in the recesses in the piston, retaining rings surrounding the eccentrics and spaced concentrically therefrom and also fitted in the recesses in the piston, radiating blades slidably mounted on the piston, ring segments slidably mounted between the eccentrics and the retaining rings and operatively connected with the adjacent blades, and means for rotating the shaft.

4. A rotary pump including a stationary casing, upper and lower heads rigidly secured to and closing the ends of the casing and provided with inlet and discharge ports, arranged out of alinement, an operating shaft, mounted centrally in said heads, a piston secured to the shaft and interposed between the heads, radiating blades slidably mounted on the piston, eccentrics secured to the inner faces of the heads, retaining rings on the inner faces of the heads surrounding the eccentrics and spaced concentrically from the latter, and ring segments slidably mounted between said eccentrics and retaining rings and operatively connected with the blades, there being seating recesses formed in the opposite ends of the piston to accommodate the eccentrics and retaining rings.

5. A rotary pump including a stationary casing, heads secured to the lower and upper ends of the casing and provided respectively with inlet and discharge ports, a shaft, a piston secured to the shaft for rotation between said heads concentric with the casing, eccentrics secured to the inner faces of the heads, retaining rings surrounding the eccentrics and spaced concentrically from the latter, ring segments slidably mounted between the eccentrics and retaining rings and held thereto by the heads and the ends of the piston and radiating blades slidably mounted on the piston and provided with pins for pivotal connection with the adjacent ring segments, each blade having its opposite ends cut-away to accommodate the adjacent retaining rings.

6. A rotary pump including a stationary casing, reducing caps forming ends for the casing, heads interposed between the casing and reducing caps and provided with inlet and discharge ports, arranged out of alinement, a step bearing secured to the under side of the lower head, an operating shaft journaled in said bearing, and extending through the heads, a piston interposed between the heads and mounted for rotation with the shaft, said piston being provided with radiating slots, a bearing secured to the upper side of the upper head, a stop collar carried by the shaft and engaging the last mentioned bearing, and means carried by the opposed faces of the heads and engaging the blades for moving the latter to extended and retracted positions.

7. A rotary pump including a stationary casing, heads forming closures for the opposite ends of the casing and provided with inlet and discharge ports, an operating shaft, a piston interposed between the heads and mounted for rotation with the shaft, said piston being provided with radiating slots and having its opposite ends formed with seating recesses, eccentrics secured to the inner faces of the heads and extending within the seating recesses in the ends of the piston, retaining rings surrounding the eccentrics and also extending within the seating recesses in the piston, said retaining rings being spaced from the adjacent eccentrics, radiating blades slidably mounted in said slots and provided with oppositely disposed pins and recesses to accommodate the adjacent retaining rings, and ring segments slidably mounted between the eccentrics and the retaining rings and having apertures formed therein for the reception of the pins of the adjacent blades.

8. A rotary pump including a stationary casing, heads secured to the opposite ends of the casing, a shaft journaled in said heads, a piston secured to the shaft and mounted for rotation between the heads, eccentrics secured to the inner faces of the heads and fitting into the adjacent ends of the piston around said shaft, retaining rings surrounding the eccentrics and spaced from the latter to form guiding grooves, radiating blades slidably mounted on the piston, ring segments slidably mounted in the grooves and operatively connected with the adjacent blades, there being a series of spaced openings formed in the retaining rings to permit the escape of water from the guiding grooves as the position of the segments is changed, one of the openings in each retaining ring opposite the small part of the adjacent eccentric being larger than the remaining openings.

9. A rotary pump including a stationary casing having its inner wall provided with a longitudinal enlargement constituting an abutment, there being depressions formed in the wall on opposite sides of the abutment and constituting liquid chambers, heads rigidly secured to the ends of the casing and provided with inlet and discharge ports registering with the adjacent liquid chambers, said ports being disposed at diametrically opposite points of the casing, a shaft journaled in the heads, concentric with the casing, a piston mounted for rotation with the shaft and provided with radiating slots, blades slidably mounted in said slots and movable successively to extended position into engagement with the abutment, means carried by the inner faces of the heads and

engaging the blades for moving the latter to extended and retracted positions, and means for permitting the free circulation of water between the blades when the piston is rotated.

10. A rotary pump including a fluid conductor, means for suspending the conductor within a well, a stationary casing inserted in the conductor and provided with inlet and discharge ports in its opposite ends arranged at diametrically opposite sides of the casing, the inner wall of said casing being provided with a longitudinal enlargement constituting an abutment adjacent one end of the inlet port, a shaft mounted for rotation within the conductor, a piston secured to the shaft and mounted for rotation within the casing, means for centering the shaft within the conductor, a plurality of radiating blades slidably mounted on the piston and movable successively into engagement with the abutment, means housed within the casing at the ends thereof and operatively connected with the ends of the blades for moving the latter to extended and retracted positions, and means operatively connected with the upper end of the shaft for rotating the same.

11. A rotary pump comprising a vertically disposed cylinder, heads secured rigidly to the ends of the cylinder to close the same and provided with segmental openings arranged out of alinement and constituting inlet and outlet ports, a rotary shaft extending centrally through the heads, a piston secured to the shaft between the heads and provided with radial slots opening through its ends and with annular axially extending flanges at its ends, circular blocks on the inner faces of the heads eccentrically around the shaft, retaining rings on the inner faces of the heads spaced from and concentric with said circular blocks, ring segments slidably mounted between the circular blocks and the retaining rings and provided with central vertical openings, and blades slidably mounted in the slots in the piston and provided at their ends at their inner corners with longitudinally disposed pins to engage the openings in the ring segments, the ends of the blades adjacent the pins being recessed to clear the ring segments and the retaining rings and fit against the inner faces of the heads.

In testimony whereof I affix my signature in presence of two witnesses.

ANDREW N. BAADE. [L. S.]

Witnesses:
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T. N. ACKER.