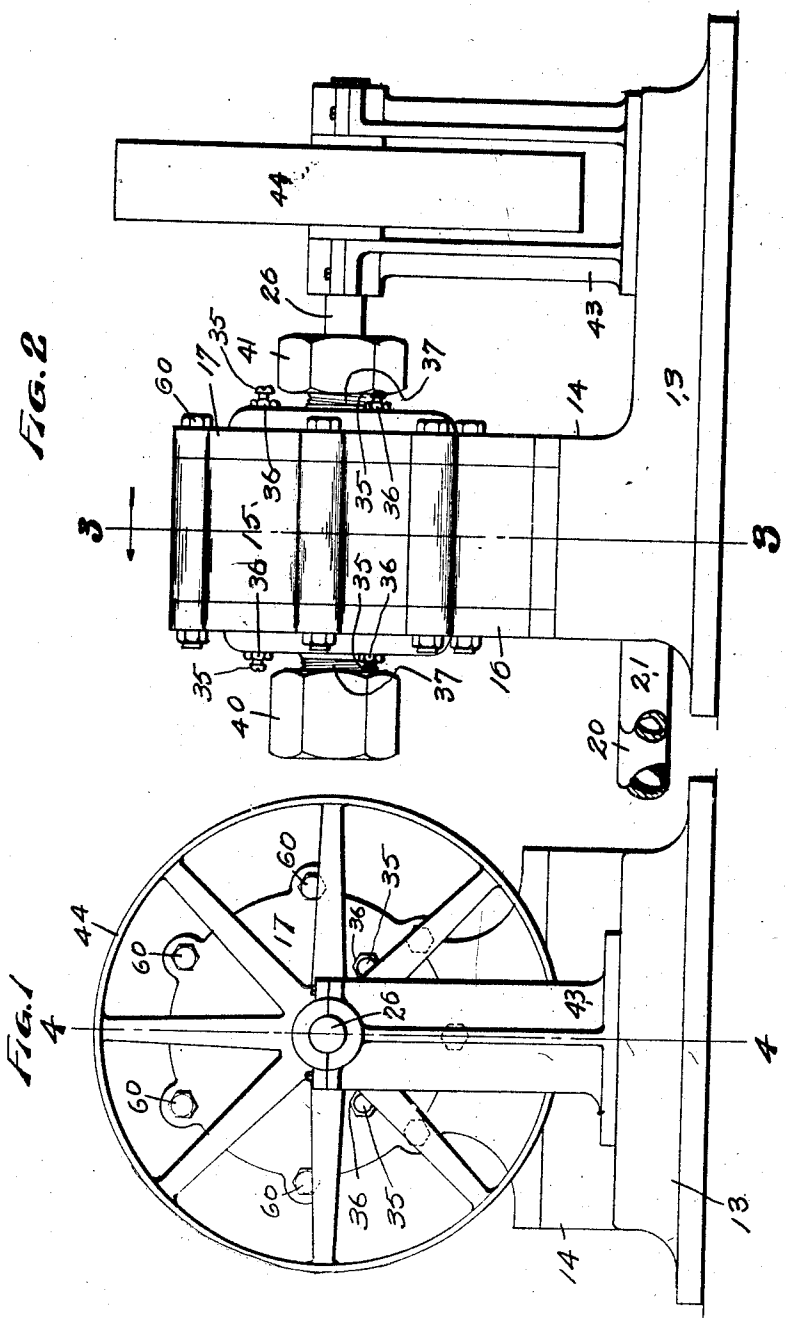
Feb. 2, 1926.

1,571,650

A. E. SIMPSON

ROTARY PUMP

Filed Nov. 21, 1923 3 Sheets-Sheet 1



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Feb. 2, 1926.

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ROTARY PUMP

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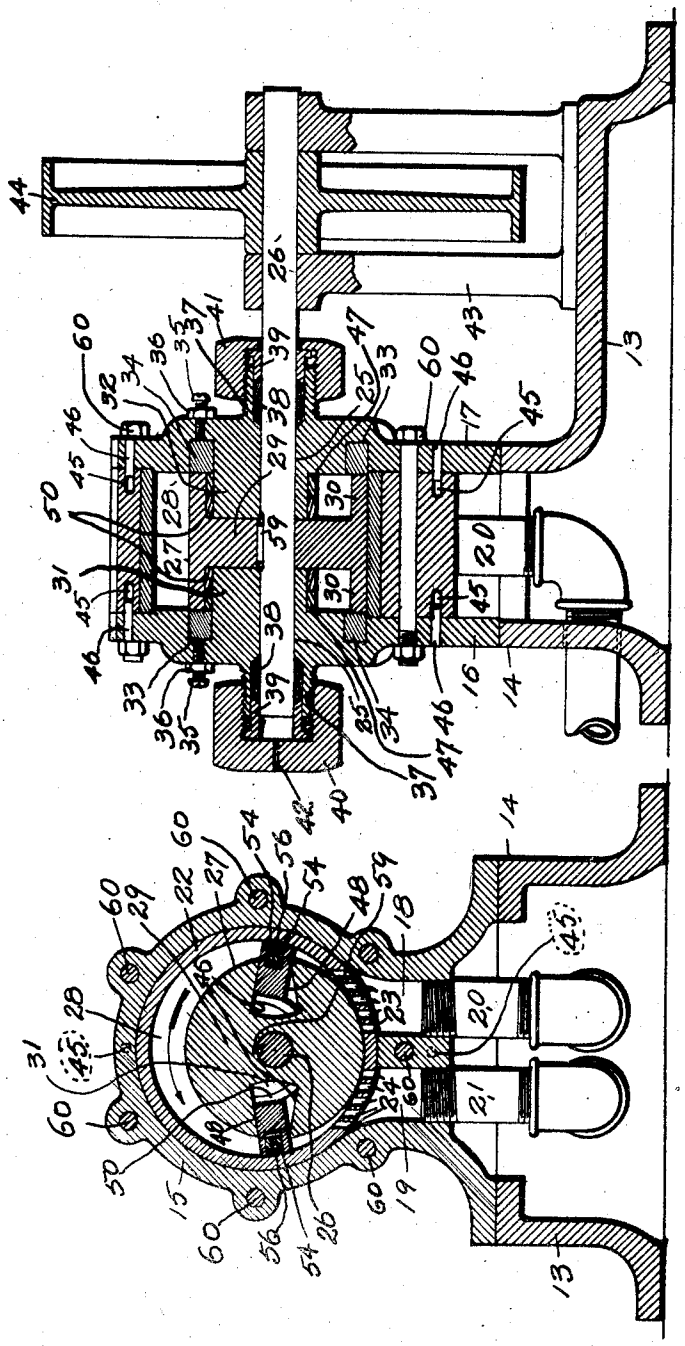


Fig. 4

Fig. 3

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FIG. 10

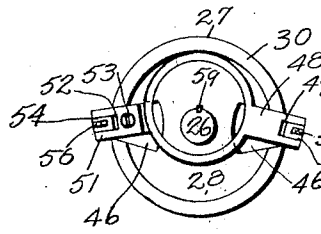


FIG. 11

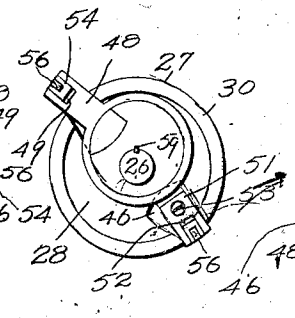


FIG. 12

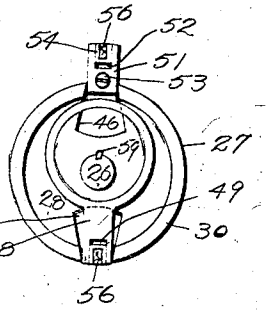


FIG. 9

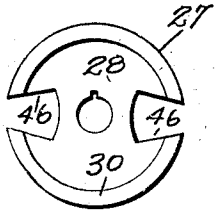


FIG. 7

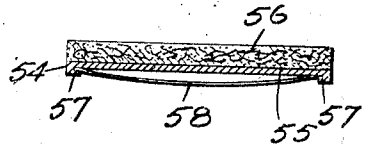


FIG. 8

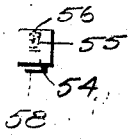


FIG. 6

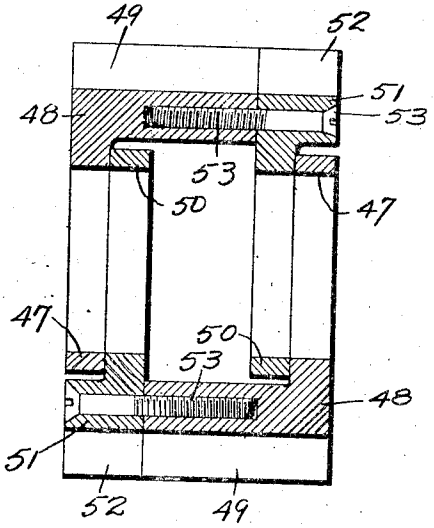
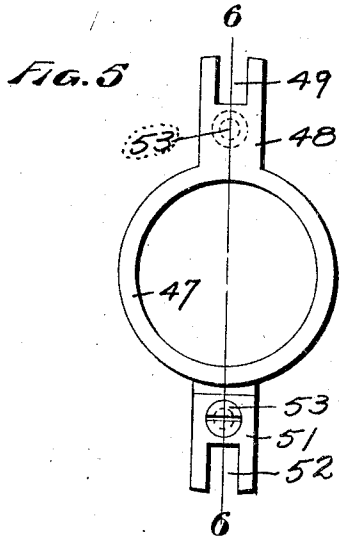


FIG. 5



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Patented Feb. 2, 1926. 1,571,650

UNITED STATES PATENT OFFICE.

ARTHUR E. SIMPSON, OF WEST FRANKFORT, ILLINOIS, ASSIGNOR TO H. L. WEBB, J. M. HARRIS, B. H. WEBB, T. M. SILKWOOD, R. P. BLAKE, AND C. E. PITCHFORD, ALL OF WEST FRANKFORT, ILLINOIS.

ROTARY PUMP.

Application filed November 21, 1923. Serial No. 676,022.

To all whom it may concern:

Be it known that I, ARTHUR E. SIMPSON, a citizen of the United States, and resident of the city of West Frankfort, county of Franklin, and State of Illinois, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification, containing a full, clear, and exact description, reference being had to accompanying drawings, forming a part thereof.

My invention relates to improvements in rotary pumps and has for its primary object a pump provided with a rotor and pistons, the rotor being mounted eccentrically of the cylinder while the pistons are concentric so that during the rotation of the rotor and pistons, the pistons will move in and out of the rotor.

A further object is to construct a rotary pump which is so arranged as to be practically self-cleaning so that sand or grit drawn into the pump can be readily discharged and not retained within the pump and cause damage by grinding and cutting.

A still further object is to construct a rotary pump provided with a rotor and pistons, the axis of rotation of which are in different planes and in which the pistons are driven by the rotation of the rotor.

In the drawings:—

Fig. 1 is an end elevation of my device;

Fig. 2 is a side elevation of the same;

Fig. 3 is a section taken on the line 3—3 of Fig. 2 viewing the same in the direction of the arrow;

Fig. 4 is a cross section taken on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged end view of the piston assembly;

Fig. 6 is a vertical section taken on the line 6—6 of Fig. 5;

Fig. 7 is a longitudinal vertical section of one of the packing bars employed;

Fig. 8 is an end elevation of the same;

Fig. 9 is an end view of the rotor; and

Figs. 10, 11 and 12 are diagrammatic views of the rotor and pistons showing the position occupied by the pistons during various periods of rotation.

In carrying out my invention I employ a base 13 which is provided with an elevated portion 14. Secured to the elevated portion 14 is a pump cylinder 15, the cylinder 15 is provided with heads 16 and 17. The cylinder 15 is provided with an inlet opening 18 and an outlet opening 19 which are screw threaded so as to receive the suction pipe 20 and discharge pipe 21, respectively. Within the cylinder 15 is located a sleeve 22 which acts as a lining for the cylinder and which is provided with a plurality of openings 23 which register with the opening 18, and a plurality of openings 24 which register with the opening 19. The purpose of these openings will be explained in detail later.

Formed through the heads 16 and 17 is a bore 25 through which the shaft 26 extends. This opening is made eccentric to the inner circumference of the cylinder. In other words, it is placed below the center so that when the rotor 27 is secured on the shaft it will contact with the lower portion of the sleeve or lining 22 and leave a crescent shaped chamber 28 in the upper portion of the cylinder. In other words, the rotor 27 by contacting with the sleeve 22 at its lower portion tends effectually to separate the intake and outlet ports 18 and 19.

The rotor 27 is cylindrical and has its opposing faces recessed so as to leave a central web 29 and projecting flanges 30, these flanges projecting from either side of the central web. Formed integral with the heads 16 and 17 are bosses 31 and 32, these bosses are cylindrical in form and concentric to the sleeve 22 although eccentric to the opening 25. The heads 16 and 17 are also provided with recesses 33 which are concentric to the bore or opening 25 and in which are located packing rings 34. These packing rings are adapted to bear against the flanges 30 of the rotor and are adjusted to the rotor by means of screws 35. When this adjustment has been completed, it is maintained by means of lock-nuts 36.

The heads 16 and 17 are also provided with screw threaded glands 37 for the reception of packing 38, this packing is compressed by means of a sleeve 39, which sleeve is forced into the gland by means of nuts 40 and 41. The nut 40 is closed with the exception of an air vent 42 which is for the purpose of permitting the nut to be screwed on without compressing any air since the shaft 26 does not extend through the nut. The shaft 26 extends through the nut 41 and is supported in a bracket 43, which bracket

is secured to the base 13. The bracket 43 is bifurcated and between the bifurcation is located a pulley 44. My purpose of locating the pulley 44 between the bifurcation of the bracket 43 is to relieve any pull on the shaft 26 within the stuffing box so that a leak tight point can be at all times maintained.

While I have shown a pulley as the driving means it is obvious that various other mechanisms can be employed ranging all the way from direct motor connections down to sprocket wheels, gear wheels, silent chain drive or other power transmission other than belting as shown.

The cylinder 15 is provided with openings 45 into which dowel pins 46 carried by the heads 16 and 17 are adapted to fit. The purpose of these dowel pins is to insure absolute alinement of the projections 31 and 32. This is essential because if either one were twisted ever so slightly the pistons would not function properly.

The rotor 27 is provided with diametrically opposed dovetailed grooves or slots 46 for the reception of the pistons. The pistons each consist of a ring-shaped member 47 which have projecting therefrom a rectangular member 48. This rectangular member is provided with a recess or slot 49 for the reception of a packing bar and in order to complete the piston I employ a ring-shaped member 50 which is provided with a rectangular projection 51 which is also slotted as at 52, which forms a continuation of the slot 49. The two members which form a complete piston are secured together by means of a screw 53. This division of the piston into two sections is essential so that the piston can be fitted into the slots 46, while the ring-shaped portions 47 and 50 pass over the cylindrical projections 31 and 32 which are formed integral with the cylinder heads 16 and 17. Located in the slots 49 and 52 are packing bars 54 which are provided with a central slot 55 into which a packing 56 is placed. This packing may be either leather or other resilient material and is intended primarily to make a tight fit between the pistons and the sleeve 22. The lower portion of the packing bars 54 is hooked as at 57, which hooks are adapted to receive the ends of a spring 58. The purpose of this spring being to hold the packing bars against the interior of the sleeve 22.

It will be noted from the drawings that the rotor 27 is secured to the shaft 26 by means of a key 59 so that the rotor and shaft will rotate simultaneously. The heads 16 and 17 are secured to the cylinder 15 by means of bolts or screws 60.

In assembling my device the rotor and shaft are first secured to each other. The piston assembly is then secured in the following manner:—The rings or sections 50 are first placed in position within the flanges of the rotor so that they rest against the web 29, the rings 47 are next inserted, the projections 48 being passed through the opening 46, the bolts or screws 53 are then inserted thus binding the piston and rotor assembly together. The head 17 is then placed in position, the packing ring 34 having been previously inserted, and then the rotor together with the piston assembly and shaft 26 mounted therein. During this assembly the rings or circular portions 47 and 50 are placed over the cylindrical projection 32. The head 16 which has had the packing ring 34 previously inserted is then placed over the shaft 26 in such a manner that the cylindrical projection 31 will enter the ring portions 47 and 50 of the pistons which are located on the opposite side of the rotor and by means of the dowel pins 46 the two cylindrical projections 31 and 32 are brought into absolute alinement. When this much of the assembling has been completed the heads are fastened in position by means of the screws or bolts 60. When these have been tightened up sufficiently, the packing rings 34 are adjusted by means of the screws 35 until the proper pressure against the rotor has been obtained, after which the lock-nuts 36 are seated. The glands are now packed and the packing nuts 40 and 41 are drawn up sufficiently tight, the bifurcated bracket 43 and drive pulley 44 are next placed in position and then the suction and discharge pipes 20 and 21 secured to the pump and to their respective terminals, after which the device is ready to be connected up to the source of power and be operated.

After the device has been assembled as previously described and the proper suction and discharge outlets made, the pump is ready for operation. In operating the pump the rotation is in the direction of the arrow, as illustrated in Fig. 3 and the pumping is accomplished in the following manner:—

The pulley 44 is rotated which rotates the shaft 26, the rotor 27 being keyed to the shaft is also rotated and since the shaft 26 is below the center of the cylinder lining 22, the periphery of the rotor 27 will always remain in contact with the lower portion of the cylinder so that the chamber 28 will always remain in its same position and never vary. The rotation of the rotor causes the pistons 48 to rotate, this is due to the fact that the pistons are located in the dovetailed slots 46. The pistons are held in constant contact with the inner surface of the sleeve or lining 22 due to the fact that they are mounted concentric therewith but eccentric to the axis of rotation of the rotor 27. This eccentric mounting of the

pistons relative to the rotor causes the pistons to work in and out of the rotor. This is plainly shown in Figs. 10, 11 and 12. During the rotation of the pistons and rotor, the pistons also have a rocking movement relative to the rotor due to the fact that the pistons extend radially from the axis of the cylindrical projections 32, while the slots 46 extend radially from the axis of the shaft 26 and it is for this purpose that the slots 46 are dovetailed so as to permit this relative rocking movement of the pistons.

As the rotor is rotated carrying with it the pistons a suction is created in the pipe 20 raising liquid therein and permitting it to discharge through the openings 23 into the chamber 28. The liquid thus raised in the chamber 28 is caught by the next piston and pushed ahead of the piston, carried around over the top surface of the rotor and then discharged through the opening 24 into the delivery pipe 21.

By my construction each piston serves a two-fold purpose, the one side pushing the liquid ahead of it while the other side creates a suction, so each piston may be virtually said to have a forcing and sucking action simultaneously. Of course when the piston reaches the point between the openings 23 and 24 it is wholly within the rotor and therefore does not possess either of these actions.

An important feature of my device is that by having the inlet and outlet located at the bottom of the pump casing the pump is made virtually self-cleaning. In other words, if sand or any grit is drawn into the pump chamber it is carried around and has in addition to the force of water being discharged from the pump to carry it away, the assistance of gravity. This is not the case with pumps where the discharge is at any other point than the bottom, especially when the opening is above the horizontal center line, because in that instance, gravity acts against the force of water and has a tendency to retain the foreign matter and score and scratch the interior of the pump.

By my construction of pump a constant and continuous flow is produced and all pulsations of the liquid eliminated.

My pump is also readily reversible so that by merely reversing the direction of rotation of the pulley 44 the suction and delivery pipes are converted respectively to delivery and suction pipes. This makes my pump especially useful in handling treating liquids where it is desired to pump liquid from one tank into another and then pump the liquid back again into the original tank. This can be readily accomplished by my device by merely reversing the direction of the pulley 44, as aforestated.

It is also to be noted that by the construction of my device, no check valves are required due to the absence of any pulsation action in the pump, and this absence of check valves permits my pump to be reversible.

My purpose of providing the sleeve 22 with the openings 23 and 24 in place of one large opening is to permit the packing bar to be supported at intervals across its entire face. This would not be possible were one larger opening used for the discharge and suction outlets and inlets. I consequently get a more even wear entirely across the face of the packing and less liability of the packing catching and jamming the pump than would be possible if a single large opening were used. In this connection it is to be noted that the inlet and discharge openings are flared and made larger as they approach the cylinder so that the combined areas of the openings 23 and 24 are equal to the area of the openings 18 and 19. In this way a ready intake and discharge is permitted without causing any congestion or compression in the liquid being pumped.

Having fully described my invention, what I claim is:—

1. In a rotary pump, a casing, a fixed sleeve located in said casing, heads secured to said casing, cylindrical projections formed integral with said heads and concentric to said sleeve, pistons rotatably mounted on said projections, a shaft extending through said projections and heads and eccentric thereto, a rotor concentrically mounted on said shaft in said casing and adapted to engage with and rotate said pistons, and means for placing the rotor in operation.

2. In a rotary pump, a casing having an outlet and an inlet port, heads secured to said casing, a sleeve having a plurality of perforations therein in alinement with each of said ports located in said casing, pistons carried by said heads and located in said casing and rotatable concentric therewith, a rotor eccentrically mounted in said casing and contacting with said sleeve between said ports, said rotor and pistons being interlocked whereby said pistons are rotated simultaneously with said rotor.

3. In a rotary pump, a casing having an inlet and an outlet port, a fixed sleeve located in said casing, heads secured to said casing, a cylindrical projection formed integral with each of said heads and concentric to said sleeve, pistons rotatably mounted on said projections, a rotor eccentrically mounted in said casing and adapted to engage with and rotate said pistons and to contact continuously with said sleeves at a point between said ports, a packing adjustably carried by said heads and adapted to contact with the ends of the rotor, and means for placing the rotor in operation.

4. In a rotary pump, a casing having an

outlet and an inlet port, a fixed sleeve having perforations in alinement with each of said ports located in said casing, pistons mounted in said casing and rotatable concentric therewith, a rotor eccentrically mounted in said casing and in constant contact therewith at a point between said ports, said rotor and pistons being interlocked whereby said pistons are rotated simultaneously with said rotor, a packing adjustably carried by said heads and adapted to contact with the ends of the rotor.

5. In a rotary pump having an outlet and inlet port located adjacent each other and at the bottom of the casing, a fixed sleeve located in said casing and having perforations in alinement with said ports, heads secured to said casing, a shaft extending through said heads eccentrically of the casing, a cylindrical projection formed integral with the inside of each of said heads and concentric with said casing, a rotor provided with diametrically opposite slots secured to said shaft and in constant contact with said sleeves between said ports and forming with said sleeve a crescent shaped chamber, pistons rotatably mounted on said projections and adapted to extend through said slots, whereby said pistons and rotor are rotated simultaneously.

6. In a rotary pump, a casing having inlet and outlet ports adjacent each other, and heads secured to said casing, a rotor eccentrically mounted in said casing and contacting therewith only between said ports, and pistons concentrically mounted in said casing, said pistons adapted to be driven by said rotor whereby said rotor acts as a division between the suction and outlet ports, and the pistons are adapted to move in and out of the periphery of the rotor, and packing adjustably carried by said heads and adapted to contact with the ends of the rotor at its periphery.

In testimony whereof, I have signed my name to this specification.

ARTHUR E. SIMPSON.