W. D. Andrews,

Rotary Pump.

No. 110,330. Patented Dec. 20. 1870.

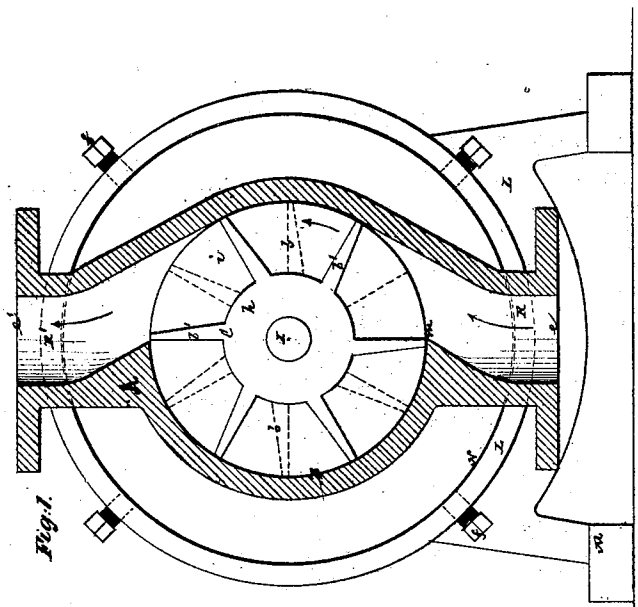

Fig. 1.

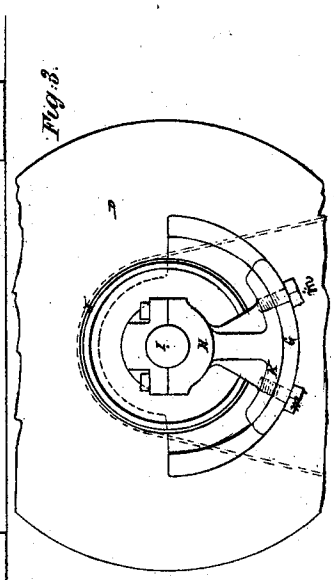

Fig. 3.

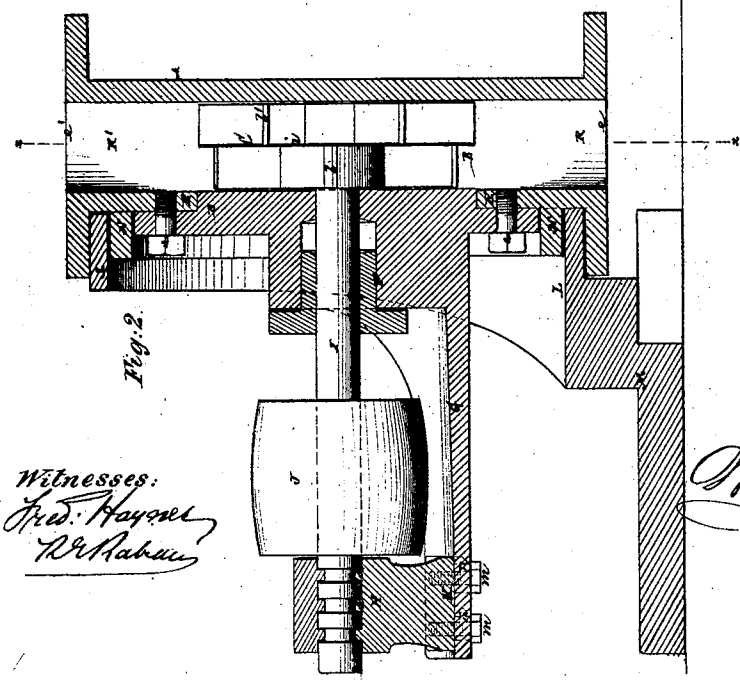

Fig. 2.

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Letters Patent No. 110,330, dated December 20, 1870.

IMPROVEMENT IN ROTARY PUMPS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, WILLIAM D. ANDREWS, of Brookhaven, in the county of Suffolk and State of New York, have invented certain new and useful Improvements in Pumps; of which the following is a full, clear, and exact description, reference being had to the accompanying drawing forming part of this specification, and in which—

Figure 1 represents a transverse sectional elevation, taken as indicated by the line *x x* in fig. 2, of a pump constructed in accordance with my invention;

Figure 2, a longitudinal sectional elevation of the same; and

Figure 3, an end view in part.

Similar letters of reference indicate corresponding parts.

This invention relates to a free-joint rotary or impetus pump, which carries and discharges water or other fluids through impetus given to it by rapid motion, as distinguished from pumps which act by pressure through means of tight-working pistons and joints.

Said invention comprises a case having an annular recess of equal diameter at each end, and a propelling wheel arranged to revolve free from contact therein, said case being provided with induction and eduction passages in communication with the annular recess, through openings in the periphery of the case, the centers of which passages are in the plane of motion of the center of the wheel.

The invention likewise comprises, in combination with said case, a propelling wheel, constructed to sweep the recess in the case by wings radiating from a central hub and supported by a central flange extending from the hub to their peripheries, said wings extending either entirely across the hub in a right line, or only from the central flange to one end of the hub, and alternately upon either side thereof, the wing upon one side being opposite the center of the space between two wings upon the other side of the flange.

The invention also includes a combination of a movable head to the case, and attached bearings for the propelling-wheel shaft, whereby said wheel with its shaft and bearings may be removed without disturbing the case or its attached pipes, the truth of the bearings is preserved, and increased facilities are afforded for adjustment or repair; likewise provision is secured, by the turning of the head with its attachments, for varying the direction of the driving-belt free from strain, operating to produce objectionable spring of the parts, and admitting of the removal of the belt without cutting it.

The invention likewise embraces an adjustable bearing-box, in combination with a grooved bearing for the propelling-wheel shaft, whereby increased facility is afforded for the removal of the shaft from its box, and withdrawal of the latter from the head of the pump or arm connected with said head.

Furthermore, the invention comprises a boss or ring for securing the pump in position, said boss or ring being concentric with the driving-shaft, and whereby provision is made for turning the pump entirely around upon the ring to suit different directions as regards attachment of the induction and eduction-pipes which connect with the pump.

In the accompanying drawing—

A represents the conducting case, formed with a circular recess, B, in its center, closed at one end, but open at the other, and of a diameter sufficient to allow of the propelling wheel C and its wings *b b'* revolving therein without touching. This recess B is left open at its one end for the insertion of the propelling wheel C, and is closed by an independent movable head, D, which is secured by bolts *c* to the flange E of the case, and has connected or cast in one piece with it a stuffing-box, F, and an arm, G.

An outside bearing-box, H, is attached to said arm by bolts *m* passing through slotted holes *n*, which permit of the adjustment of the propelling wheel within the case, and which box, in connection with the stuffing-box F, supports the propelling-wheel shaft I, that thus has no direct connection with the case A, so that said shaft and wheel may be removed together with the head D and boxes F and H, without disturbing the case or its attached pipes. By this connection of the propelling-wheel shaft and its bearings with the independent movable head D, that is attached only to the pump by the flange E, all danger of throwing the bearings out of line with each other by the springing of the pump, pipes, or foundation is avoided, and a ready means secured for taking the wheel from the case for alterations, adjustment, or repairs, to do which requires only the removal of the bolts *c* from the flange E.

This arrangement also permits of the turning of the head D, and with it the arm G and bearing-box H about the shaft I as a center, of motion, and independently of the pump-case, the screw-bolts *c* being withdrawn from one set of holes and inserted in another to suit, so that in whatever direction the driving-belt is carried around the pulley J it may be made to embrace the arm G, bringing the strain thereupon in the best direction to prevent its springing, and permitting removal of the belt from the pulley and pump without cutting it or displacement of the bearing-box H, as would be necessary if the belt were passed around the pulley J from the opposite direction to that shown, and between said pulley and the arm G.

The arm G is in the form of a segment of a circle, for purposes hereinafter specified.

The outer bearing-box H has one or more ridges or grooves *d*, which fit corresponding grooves or ridges in the surface of the driving-shaft, to prevent any end movement thereof. Said box H or standard which carries it, has a curved foot, or base, K, struck, as regards its outer surface, from the center of the shaft I, and made to fit the concave surface of the arm G, within or on which it is adjustably secured, as herein-

before described, by bolts *m* passing through slots *n*, and whereby the propelling wheel may be set out of contact with the end of the case and of the head D.

The object of making the arm and foot of the bearing-box circular is to allow of the removal of the shaft from said box and permit its withdrawal from the head, which is done by turning the box upside down, using the shaft as a center to revolve it upon, and removing the cap, when the box can be released, which, owing to the grooved clip of the box on the shaft, could not be done without this or a similar provision.

The distance between the stationary head and movable head D of the recess B is just sufficient to allow the propelling wheel to revolve between them without touching.

R is the induction, and R′ the eduction passages for the admission and delivery of water to and from the case and wheel. These passages are in line with each other, at right angles to the driving shaft I, and are similar, the one to the other, so that their uses may be transposed by reversing the motion of the wheel. Said passages are circular in their cross-sections, at their openings *e e′*, but are gradually changed in form as they approach the wheel, maintaining, as nearly as may be, the same area of cross-section throughout, until where they enter and connect with the recess B they become oblong squares, having a breadth equal to that of the propelling wings, and a depth sufficient to maintain a proper area of cross-section. These passages may be made round, a continuation of and the same size as the openings *e e′*, but are changed in shape for the reason that the tendency of the water, when in contact with the wings in motion, is to move at right angles to their faces, and the first motion of the water, when met by each successive wing at the point of entrance to the recess, is partially across the incoming column, and the farther the inside of the passage is removed from the center of the wheel's motion the nearer will such motion coincide with that of the body of the moving column.

The same result in the opposite direction is effected in the eduction, and the necessary deflection of the water from a straight line in consequence of the changing of the position of the faces of the wings, by reason of their rotary motion, is thereby reduced.

A similar result ensues from an enlargement of the diameter of the wheel, but at an increased cost of construction.

The passages R R′ may be made to open into the recess B at points either nearer together or farther separated from each other than is here shown, the result being, if placed farther apart, a greater deflection of the water from a straight line in passing through the pump, causing increased friction, which is to some extent compensated for by the greater quantity of water acted upon at one time, which reduces the speed necessary to be given to the wheel to produce a given result. If placed nearer together less water is acted upon, a straighter course is maintained, decreasing the friction, but requiring a more rapid motion of the wheel to produce a given result.

L is a supporting standard, with a foot M for securing the pump to a post, floor, or other foundation. This standard is of an annular or recessed construction, to receive within it a boss or ring, N, of the pump-case A, concentric with the shaft I, and by which said case, through means of set-screws *f*, is secured to the standard. This arrangement permits of the pump being turned entirely around upon the boss N, as a center, and of being secured at any point of the circle by the set-screws *f*, to accommodate the direction of the attached induction and eduction-pipes as may be required. The boss and recessed portion into which it fits may be secured, the one to the other, by keys, wedges, or other devices accomplishing the same result as the set-screws *f*.

The propelling wheel C is of a form to sweep the recess B, having wings, *b b′*, which radiate from a central hub, *h*, and which are supported by a central flange, *i*, extending from the hub to the peripheries or outer extremities of the wings. These wings may extend entirely across the hub in right lines, or only from the central flange *i* to the end of the hub, and alternately upon either side, as shown in the drawing, wherein the wings upon one side of the flange are arranged to lie opposite the centers of the spaces between the wings on the other side thereof. This secures a more continuous or steady discharge from the pump.

Operation.

The pump being first filled with water, rapid motion is communicated to the propelling wheel C in the direction of the arrows, and the tendency of the water, when in motion, being to leave the wheel in lines at right angles to the faces of the wings, and the only opening from the recess by which it can escape on such line being by the eduction passage R′, the contents of the wheel are forced into said passage, creating a vacuum within the recess. Water then rises through the induction passage R to fill the vacuum, but being met at point *m* by the revolving wings, is prevented from passing behind the wheel, and is carried forward to the eduction passage R′, into and through which it escapes.

The motion communicated to the water being sufficient to create a partial or entire vacuum within the wheel, according to the speed at which it moves, no water can remain within it when in motion, except in the part occupying that portion of the recess forming the connecting passage between the induction and eduction openings, and the distance between these openings being small compared with the entire circumference of the circle, and the stream being but slightly deflected from a straight course in its passage through the pump, a saving of power results, which, in other free-joint pumps, is consumed either in carrying water around an entire circle or through passages having various deflections, angles, and curves, which are avoided in this invention.

Having described my invention,

I claim—

1. A free-joint rotary pump for conveying water or other fluid, by impetus communicated by rapid motion, when said pump is constructed with a case having an annular recess of like diameter at both ends, within which the propelling-wheel revolves or makes an entire sweep, free from contact, and said case having induction and eduction passages communicating with said recess through openings in its periphery, the centers of which openings are in the plane of motion of the center of the propelling-wheel, substantially as specified.

2. In combination with the case A, its annular recess B, and induction and eduction passages, as described, the propelling wheel C, made up of radial wings, arranged to project from a central hub, and supported by a central flange, for operation within the recess, essentially as specified.

3. The combination of the movable or adjustable head D and bearing-boxes F and H, substantially as and for the purpose herein set forth.

4. The bearing-box H having a curved base, K, and made adjustable in relation to the curved arm G, in combination with the shaft I having a grooved or ridged fit within said box, essentially as described.

5. The combination of the boss or ring N on the case A, and concentric with the shaft I of the pump, with the annular or recessed standard L, for varying the position of the pump, substantially as specified.

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Witnesses:

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