A. S. LYMAN.

PUMP.

No. 187,153. Patented Feb. 6, 1877.

Fig. 1.

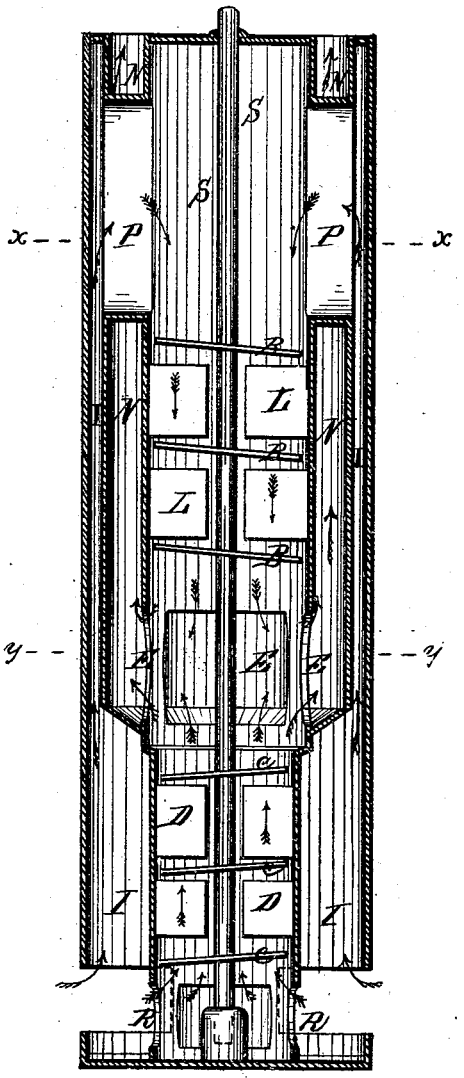


Fig. 2.

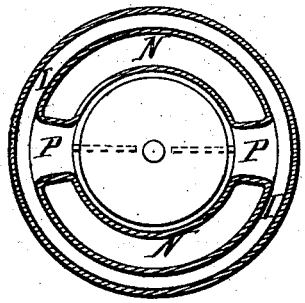
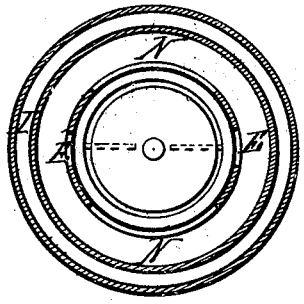


Fig. 3.



Witnesses.

W. L. Bennem.

Sa. S. Wightman

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UNITED STATES PATENT OFFICE.

AZEL S. LYMAN, OF NEW YORK, N. Y.

IMPROVEMENT IN PUMPS.

Specification forming part of Letters Patent No. **187,153**, dated February 6, 1877; application filed February 17, 1876.

To all whom it may concern:

Be it known that I, A. S. LYMAN, of the city, county, and State of New York, have invented certain Improvements in Balanced Screw-Pumps, of which the following is a specification:

The principal objections to the ordinary screw-pump, when driven by the ordinary engine, are, first, the reaction of the shaft carrying the screw is very great upon its base, being at all times equal to the whole amount lifted by the screws; second, the required velocity of revolution is so great, that much power is lost in gearing up from the common reciprocating engine, and in the attempt to economize in speed of revolutions, the screws are set at so great an angle as to use up a large per cent. of the power in forcing the water sidewise, which, if applied to screws of little pitch, would be spent in forcing the water directly forward.

The downward pressure of the revolving shaft and its rapid cutting out at the base has been prevented by attaching a piston-head to its upper end, surrounded by a cylinder strongly supported, and forcing water under this piston, so as to lift the shaft from its base, and cause it to ride on the water-bearing at the top.

My first and principal improvement consists in balancing the screw-pump by using right and left screws on the same shaft, so that as they force the water in opposite directions, they balance each other; second, in dispensing with the gearing ordinarily used for the high velocity by attaching it to the reacting vacuum rotary engine direct by a mere clutch or other suitable arrangement, thus also obtaining a much higher velocity, and setting the screws at a much lower pitch, by which much more of the power is utilized in forcing the water directly forward.

Figure 1 is a vertical central section. Fig. 2 is a horizontal section through *x x* of Fig. 1. Fig. 3 is a horizontal section through *y y* of Fig. 1.

B B B represent the upper set of screws, which are fixed upon the revolving shaft S S, so as to force the water downward. C C C represent the lower set of screws, which are attached to the same shaft, so as to force the water upward.

The upper set are made a little larger in area than the lower, the barrel of the pump being a little larger above than below. They are here also fixed at a slightly-greater pitch, so that the downward pressure shall be enough greater than the upward to balance the weight of the shaft and other revolving parts.

Either or both modes may be used in practice; but I prefer making them larger in area with the same pitch.

On the top of the shaft S S I attach a clutch, (not shown,) which couples it directly to the shaft of my vacuum rotary engine.

As that engine will make six thousand revolutions per minute, more or less, as its reacting surfaces describe a circle less or greater than about four feet in diameter, it will drive this pump with any required number of revolutions per minute without any gearing for increasing its speed.

The course of the water is shown by the arrows.

The water to supply the lower screws C C C enters by the lower openings R R, and is forced upward by these screws past the guides D D, which prevent it from attaining a rotary motion round the shaft, thence out the side openings E E, and up the passage N N.

The water to supply the upper screws B B B enters at the bottom, passes up the passage I I, and across the large ascending passage N N, by the long narrow passages P P, and is forced down by the screws past the guides L L, and out the large openings E E E, whence, together with the water from the lower screws, it is forced up the large passage N N.

I claim as my invention—

1. A screw-pump, having its shaft provided with right-and-left hand screws, in combination with the conduits, so arranged that the screws, revolving in the same direction, force the water toward each other, balancing the screws substantially as specified.

2. A screw-pump, having the screw that

forces the water downward, either larger in area, or of greater pitch than the screw that forces the water upward, thus supporting the moving parts on the water, substantially as specified.

3. A screw-pump, in which the water, or a large portion of it, is sent above the upper screw in a conduit outside that in which the screw revolves, substantially as specified.

AZEL S. LYMAN.

Witnesses:
W. L. BENNEM,
JAS. S. WIGHTMAN.