W. Livingstone,

Steam Pump,

No. 103,756, Patented May 31, 1870.

Fig. 1.

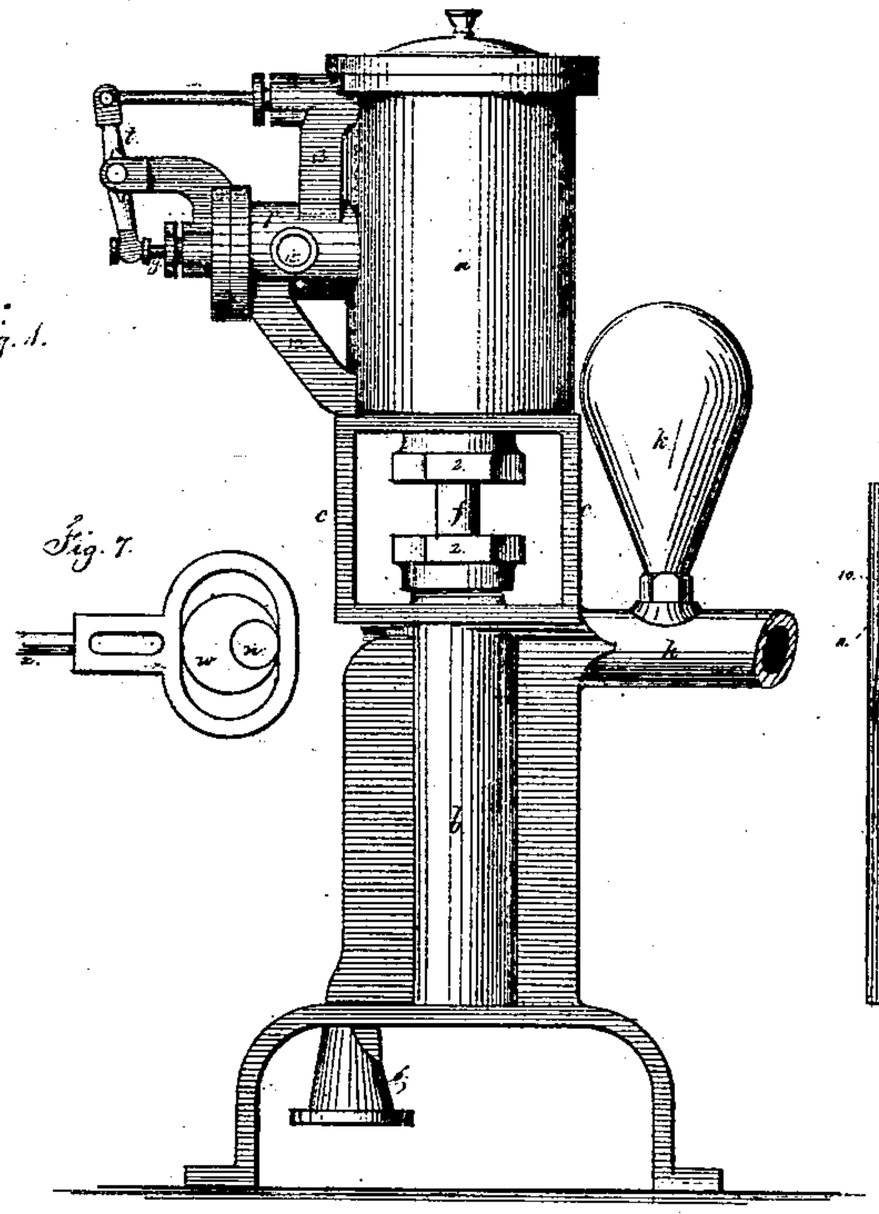


Fig. 7.

Fig. 2.

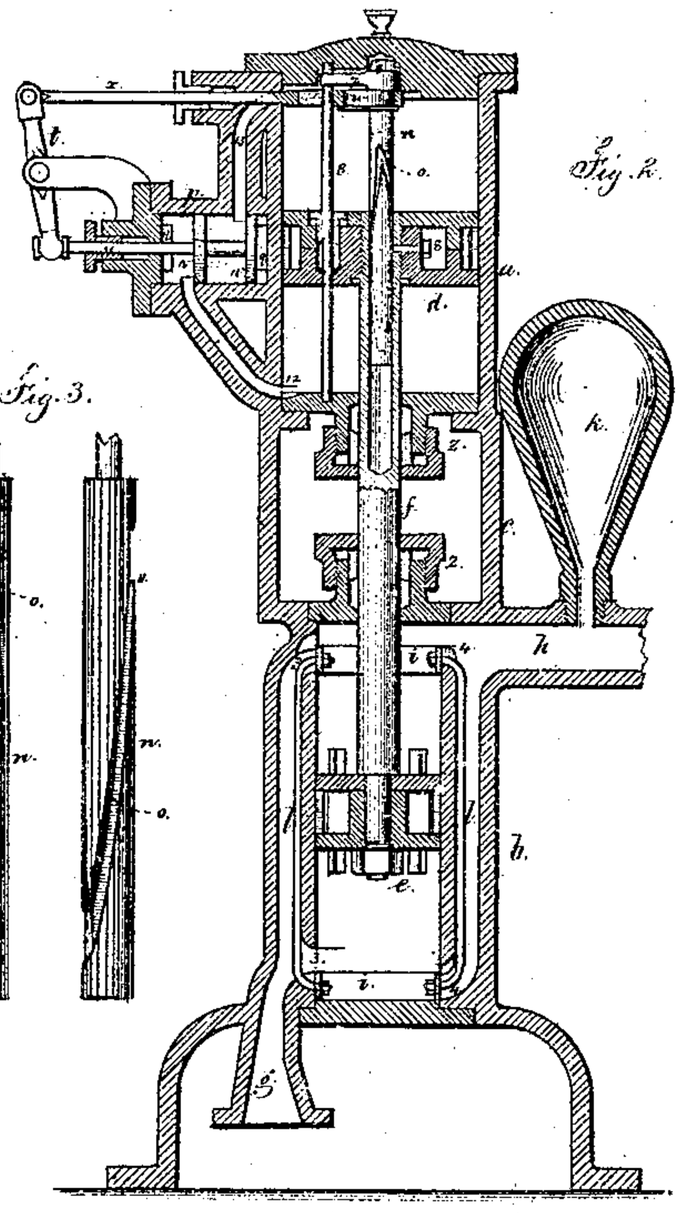


Fig. 3.

Fig. 6.

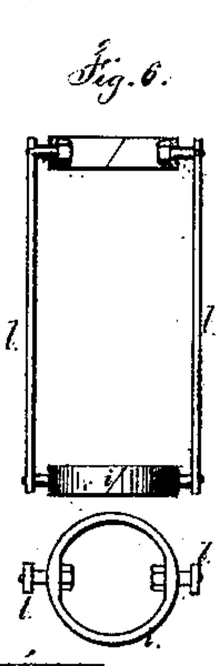


Fig. 4.

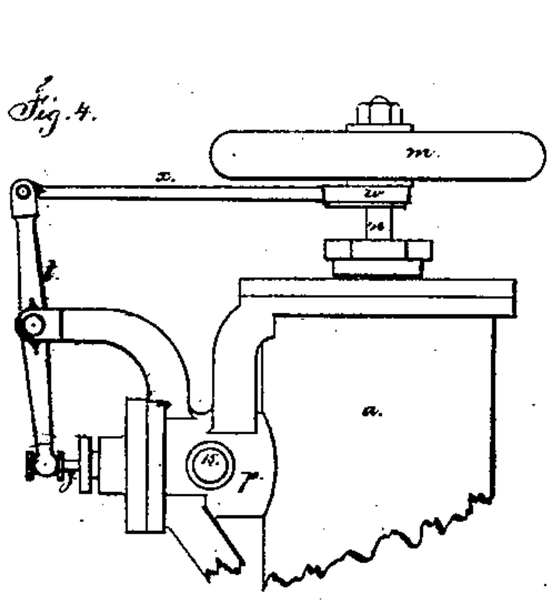


Fig. 5.

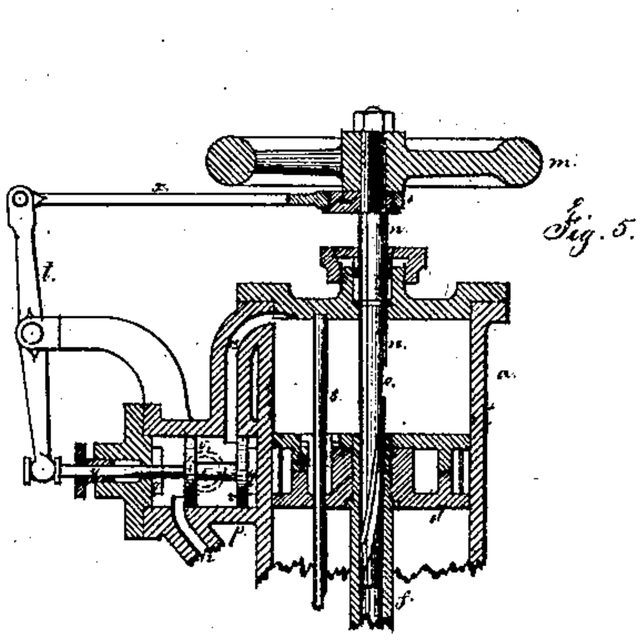


Fig. 8.

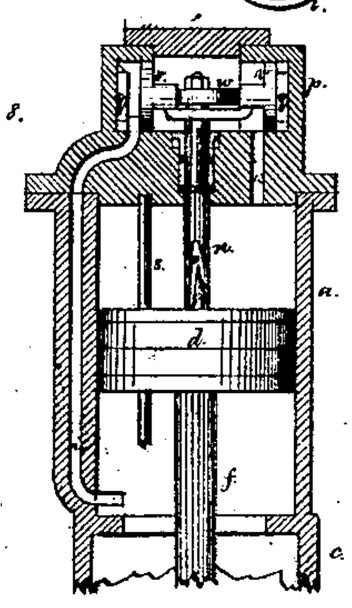
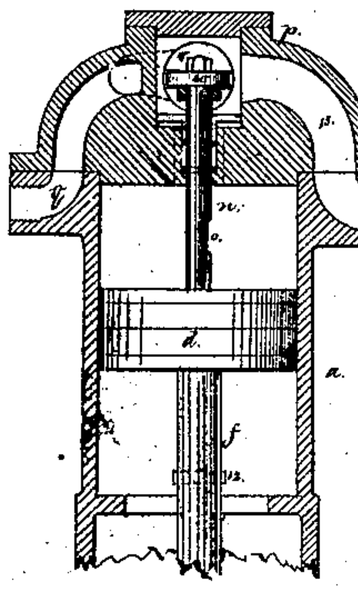


Fig. 9.



Witnesses.

Chas. H. Smith

Geo. H. Walker.

William Livingstone

UNITED STATES PATENT OFFICE.

WILLIAM LIVINGSTONE, OF NEW YORK, N. Y., ASSIGNOR TO JOHN ROACH, OF SAME PLACE.

STEAM-PUMP.

Specification forming part of Letters Patent No. **103,756**, dated May 31, 1870.

To all whom it may concern:

Be it known that I, WILLIAM LIVINGSTONE, of the city and State of New York, have invented an Improvement in Steam Pumps or Engines; and the following is declared to be a correct description thereof.

This invention is for a direct-acting steam pump or engine, whereby the movements are made more reliable than heretofore.

The valves of the pump are made by expansive rings within the cylinder, actuated by the piston, to cover or uncover the respective ports at the ends of the stroke.

The steam-cylinder is made with a hollow piston-rod that slides over a grooved spindle, and a pin working in said groove gives rotation to the spindle to actuate the valves.

By this construction and arrangement the parts are very compact and not liable to get out of order, the motions are direct, and a fly-wheel is not required, although the same might be used if preferred, and the rotary motion that actuates the valve is obtained without the use of a crank and shaft.

In the drawing, Figure 1 is an elevation of the pump and engine. Fig. 2 is a vertical section; and Figs. 3 are elevations, in larger size, of the spindle. Fig. 4 is an elevation; and Fig. 5, a section of part of the steam-cylinder, illustrating the manner in which a fly-wheel can be used. Figs. 6 show the water-valves attached. Fig. 7 is the eccentric and strap for the steam-valve detached and in enlarged size. Fig. 8 is a vertical section of the steam-cylinder, showing a modification of the valves and ports; and Fig. 9 is a similar view at right angles to Fig. 8.

The steam-cylinder *a* is connected to the water-cylinder *b* by the frame-work *c*.

The steam-piston *d* and water-piston *e* are united by the piston-rod *f*, that is partially or entirely tubular and passes through the stuffing-boxes 2 2. The cylinders *a* and *b* and frame-work *c* may be in one casting, as shown, to facilitate the boring and fitting of the parts.

The water is drawn in through the induction-pipe *g* and ports 3 3 and delivered through the ports 4 4 and eduction-pipe *h*; and *k* is the air-vessel.

The ring-valves *i i* are within the cylinder *b*, and are connected together by the rods *l l*, that pass either through the water-ways, as shown, or through holes in the piston *e*; and these rings are at such distance apart, and the ports 3 3 4 4 so located relatively to each other, that, as the piston completes its stroke in either direction, the rings are moved with it, uncovering the eduction-port at the opposite end of the cylinder and closing the induction-port at that end, and simultaneously uncovering the induction-port near the piston and closing the eduction-port, so that the parts are in position for the reverse movement of the piston *e*.

The spindle *n* is mounted centrally of the steam-cylinder, so that the piston-rod *f* slides over it, and this spindle is held in place by a nut or head, 6, above an arm, 7, so that the spindle is free to be rotated.

A rod, 8, secured at both ends by the cylinder-heads, serves as a guide to prevent the pistons revolving or partially turning upon or with the piston-rod.

In the spindle *n* is a compound twisted or inclined groove, *o*, that makes a half-turn in passing the length of the piston's stroke, and then another half-turn in coming back to the point of beginning, so that a pin or a stud and roller, *s*, upon the piston *d* communicates to the spindle *n* one revolution each complete stroke. The rotation of this spindle *n* gives motion to the steam-valves, and, if desired, this spindle *n* may be prolonged through the cylinder-head and receive a fly-wheel, *m*, to equalize the movement; but I find that if one side of the groove *o* is inclined to the extreme end, so that the pin *s* continues to act against the same and turn the spindle *n*, and if the other portion of the groove is nearly straight, as at 10, the pin *s* will be sure to pass upon the proper side of the point 11, between the grooves, and thereby insure the rotation of the spindle, even if the piston may vary slightly in the length of stroke.

The valves I employ are circular or piston-valves *v v*, connected together and contained in the cylindrical steam-chest *p*.

q q are the steam-inlet ports from the steam-pipe; 12 and 13, the ports to the cylinder, and 15 the exhaust-pipe.

These piston-valves operate in the well-known manner for giving the steam and al-

lowing the exhaust, and, being balanced by the pressure acting in opposite directions, move with very little friction.

The eccentric *w* is employed upon the spindle *n* for moving these valves.

In Figs. 1 and 2 the eccentric *w* is within the steam-cylinder, and the rod *x* passes out through a stuffing-box and connects to the lever *t* of the valve-rod *y*, so that the said valves are moved thereby. Said eccentric *w* and rod *x* may, however, be outside the cylinder, as in Figs. 4 and 5, or, if the steam-chest is at the end of cylinder *a*, as in Figs. 8 and 9, the eccentric *w* may be within the steam-chest and act between the piston-valves *v v*.

A cam may be substituted for the eccentric *w*, and shaped so as to give any desired movement, to open the ports more or less rapidly.

I claim as my invention—

1. The ring-valves *i i* within the pump-cylinder *b*, connected together and actuated by the piston, in combination with the induction and eduction ports, substantially as and for the purposes specified.

2. The spindle *n* and groove, receiving a rotary movement from a pin upon the piston *d*, in combination with mechanism, substantially as specified, for connecting the said spindle to the steam-valve, as set forth.

I witness whereof I have hereunto set my signature this 31st day of March, 1870.

WILLIAM LIVINGSTONE.

Witnesses:
CHAS. H. SMITH,
GEO. T. PINCKNEY.