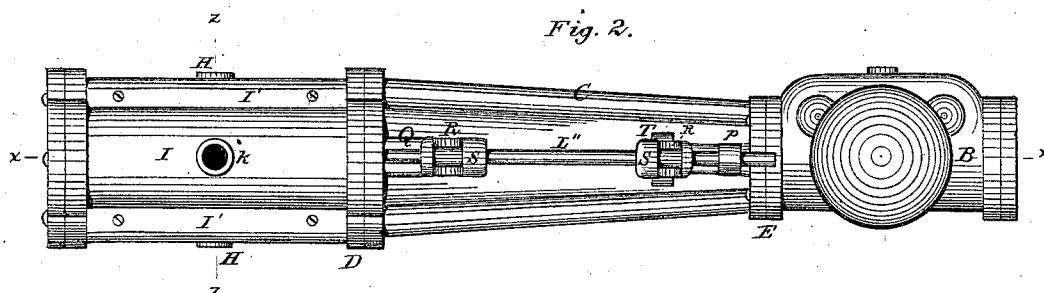
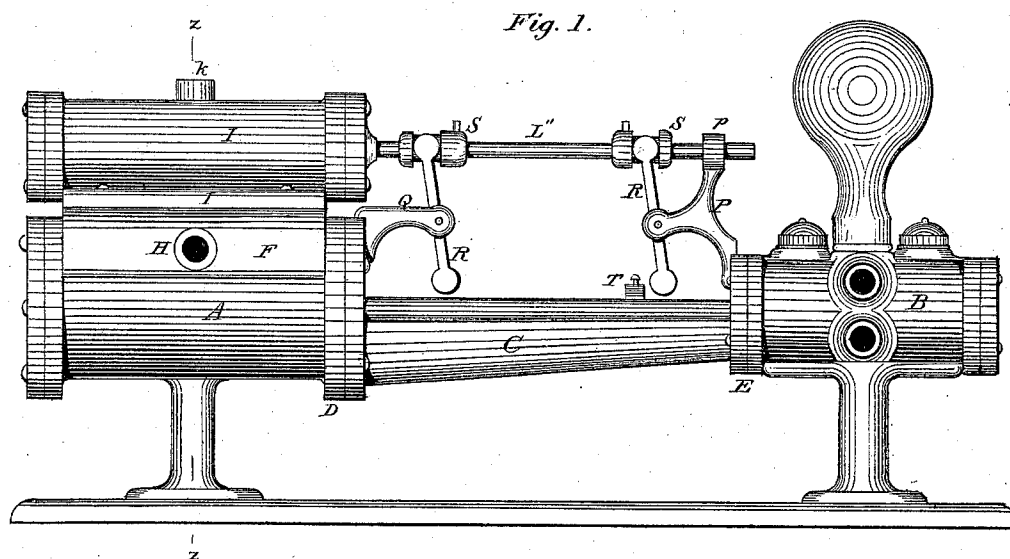


GEORGE J. ROBERTS.

Improvement in Steam-Pumps.

No. 126,834.

Patented May 14, 1872.



Witnesses.

C. H. Poole
John R. Young

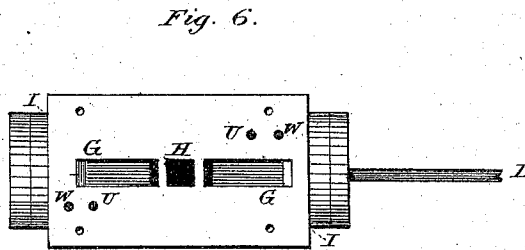
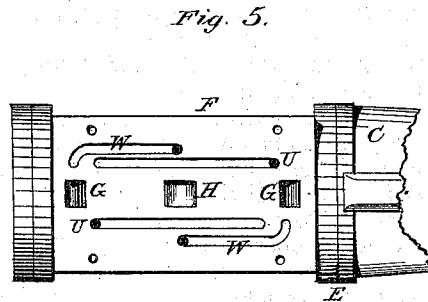
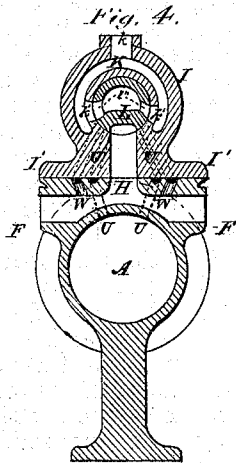
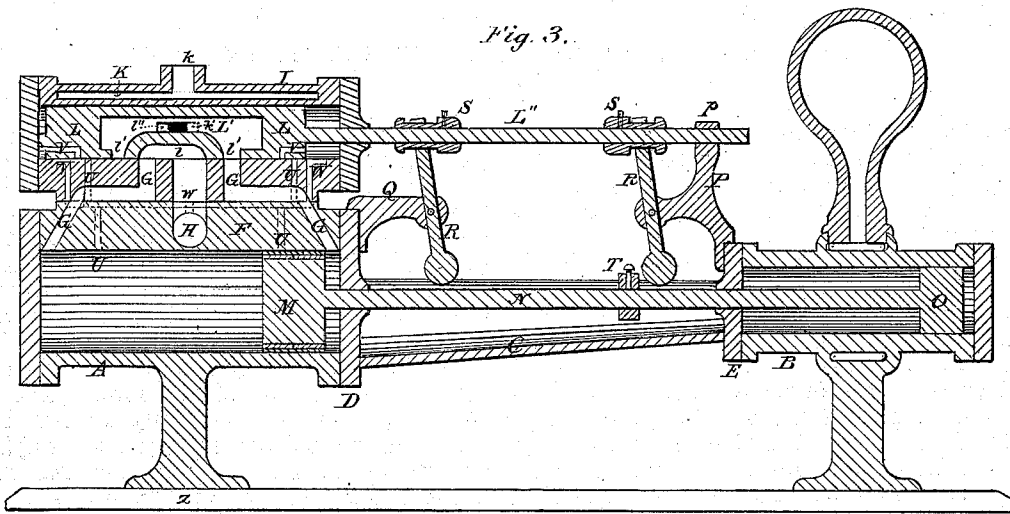
Geo. J. Roberts, by
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Witnesses.

W. H. Poole.
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UNITED STATES PATENT OFFICE.

GEORGE J. ROBERTS, OF DAYTON, OHIO.

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. 126,834, dated May 14, 1872.

To all whom it may concern:

Be it known that I, GEORGE J. ROBERTS, of Dayton, in the county of Montgomery and in the State of Ohio, have invented certain new and useful Improvements in Steam-Pumps; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, in which—

Figure 1 is a side elevation of my improved device. Fig. 2 is a plan view of the upper side of the same. Fig. 3 is a vertical longitudinal section on line *x x* of Fig. 2. Fig. 4 is a vertical cross-section on line *z z* of Figs. 1, 2, and 3. Fig. 5 is a plan view of the upper side of the steam-cylinder with the steam-chest removed, and Fig. 6 is a like view of the lower side of said steam-chest.

Letters of like name and kind refer to like parts in each of the figures.

My invention belongs to a class of direct-action steam-pumps in which a reciprocating movement of the piston in opposite directions is caused and controlled by the working of the valve, and without the employment of a fly-wheel; and it consists, principally, in the arrangement of the ports by means of which exhaust steam is admitted to and permitted to escape from the steam-chest for the purpose of throwing the valve, substantially as and for the purpose hereinafter specified. It consists, further, in the means employed for communicating motion from the piston-rod at the end of each stroke to the valve-rod, substantially as and for the purpose hereinafter shown. It consists, finally, in the construction and relative arrangement of the main ports within the valve, substantially as and for the purpose hereinafter set forth.

In the annexed drawing, A represents the steam-cylinder, and B the pump-cylinder, connected together by means of a frame, C, upon the ends of which are formed two heads, D and E, which, respectively, inclose the inner ends of said cylinders A and B. The steam-cylinder A is provided upon its upper side with a horizontal and vertical enlargement, F, which contains the induction and eduction pipes G and H, respectively, and furnishes a bearing for the steam-chest or valve-cylinder I, which latter part is provided with a bottom flange, I', that extends horizontally outward

and corresponds to and is bolted upon said enlargement. As seen in Fig. 3, the induction-pipes G extend vertically downward from the interior of the valve-cylinder and upon either side of its longitudinal center to the flange I', within the lower side of which they extend longitudinally outward, in either direction, to or near the ends of the steam-cylinder, and from thence downward with the lower end of each opening into the interior of said cylinder, in the usual manner. The eduction-pipes H extend vertically downward from the longitudinal center of the valve-cylinder to and within the enlargement F, and thence pass horizontally outward in opposite directions. The steam-chest or valve-cylinder I has a straight cylindrical central bore, between which and the outer side of said cylinder is a space or chamber, K, which extends longitudinally nearly to its ends and concentrically to the bore, about two-thirds around said part. An opening, *k*, at the upper side of the cylinder, receives the supply-pipe and admits steam to the space K, from whence it passes into the interior of said cylinder through two ports, *k'*, situated at the longitudinal center, upon opposite sides, and below the vertical center of the same. The valve L conforms to and closely fills the cylinder I transversely, while its length equals the interior of said cylinder, less the amount of travel required. Upon or within the lower side of the valve is a D-shaped cavity, *l*, for connecting the exhaust and steam ports, while at or near each side of said cavity is a steam-port, *l'*, which corresponds in size and shape to the ports G, and opens upward into a space, L', formed within the interior of said valve. Two openings, *l''*, corresponding in size, shape, and radial position to the ports *k'*, extend outward through the walls of the valve and permit steam from the space K to pass into the space L'.

As thus constructed it will be seen that as the valve is moved longitudinally in opposite directions steam from the supply-pipe will pass through the opening *k*, chamber K, ports *k'* and *l''*, chamber L', and ports *l'*, into the side pipes G, and through the same into the steam-cylinder A, from whence, after having performed its work, said steam escapes through said side pipes, the cavity *l* within said valve, and the exhaust-port H, by which means a re-

ciprocating motion is given to the piston M, and through it and the rod N to the pump-piston or plunger O.

From the arrangement of the ports it is necessary that the motion of the valve should be in an opposite direction to the motion of the piston, to accomplish which result the following described means are employed: A valve-rod, L'', is attached to and extends from the inner end of the valve inward through the corresponding head of the valve-cylinder, and has its opposite end contained within a suitable guide or bearing, p, attached to and forming part of an arm, P, which extends upward and forward from the inner end of the pump-cylinder B. A second arm, Q, is secured upon and extends forward from the inner end of the steam-cylinder A, and has pivoted within its end a lever, R, the upper forked end of which embraces a grooved collar, S, that is secured upon the valve-rod L'', while the lower end of said lever extends downward in a line with and nearly to the piston-rod N. A second lever, R, is pivoted within the arm P and engages with a collar, S, upon the valve-rod, as in the preceding case, while a collar, T, secured upon or around the piston-rod N at its longitudinal center, strikes against and alternately moves said levers R as said piston-rod moves to and fro and through said levers actuates said valve-rod and the valve.

When running at different velocities it has been found that the travel of the piston was not always uniform, the valve being sometimes moved too little, while at other times it was forced to the extreme end of its cylinder, and the latter, or some of the intermediate parts between said valve and the piston-rod, broken or otherwise injured.

To obviate this difficulty and render the operation of the valve independent of the movement of the piston after the first slight impulse is given to the former, the following described means are employed: A small steam-passage, U, extends from the interior of the steam-cylinder, near each end, upward into the enlargement F, from thence horizontally toward the opposite end of said cylinder, and again upward, and opens into the valve-cylinder at a point just within and beneath the end of the valve, when the same is thrown to its furthest limit toward the opposite end of its cylinder. Within each end of the valve is formed a passage, V, which corresponds in transverse size and shape to the passage U, and extends upward from the lower side of said valve, and thence outward to its end; the lower end of said passage V being arranged so as to coincide with the upper end of said passage U when said valve has been moved slightly toward the opposite end of its cylinder. Another passage, W, has its upper end within the lower side and interior of the valve-cylinder at each end, and just outside of the valve when moved to its furthest limit in an opposite direction from whence said opening extends downward and toward

the exhaust-pipe H, into which its lower end opens.

As thus arranged, the operation of these passages is as follows: Just before reaching the end of its stroke in either direction the piston, through its intermediate connections, moves the valve so as to cause the passages U and V, within the corresponding end of the valve and its seat, to coincide, upon which the nearly-expanded steam within the steam-cylinder, and upon the opposite side of said piston, rushes through said passages U and V and filling the space between the end of the steam-chest or valve-cylinder, and said valve forces the latter quickly forward to the limit of its stroke; such motion being so much more rapid than that communicated by the piston as to cause said valve to draw the lower end of the lever being operated upon forward from contact with the collar and beyond the stroke of the latter, which, by the action of steam upon the opposite side of the piston, has its motion promptly arrested and is instantly moved in the reverse direction. As soon as the end of the valve uncovers the passage W the steam within the end of the steam-chest is exhausted through said passage; but, while confined and operating upon said valve, the impulse given to the latter by said steam is sufficient to carry it to the limit of its stroke.

For convenience of construction the passages U and W are placed upon each side of the regular side pipes instead of at the lower vertical center of the steam-chest.

The advantage of this method of operating the valve will be readily seen, as by it the piston gives only the first slight impulse, after which said valve and its operating mechanism move forward out of contact with said piston, so as to render the length of the stroke of the latter (within reasonable limits) a matter of no consequence.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. The combination of the ports U and W in the valve-seat with relation to the bent ports V in the valve L, substantially as and for the purpose specified.

2. In combination with the piston-rod N and valve-rod L'', the adjustable collars S and T and the pivoted levers R, arranged substantially as and for the purpose shown.

3. The valve L provided with the central space L' and the ports V' and V'', in combination with the steam-chest or cylinder I provided with the steam-space K and with the ports k and G, when said parts are constructed substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 26th day of March, 1872.

GEO. J. ROBERTS.

Witnesses:

LEWIS R. PFOUTZ,
JACOB SNYDER.