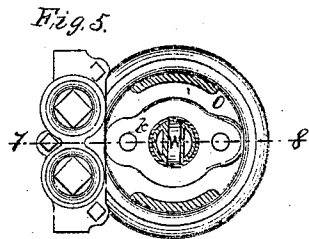
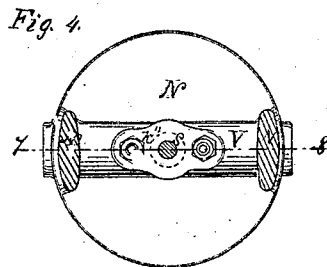
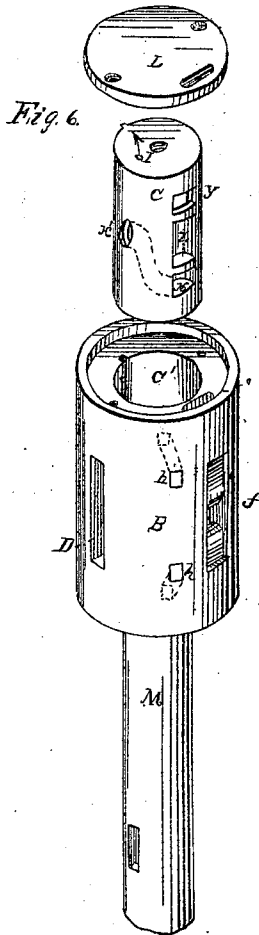
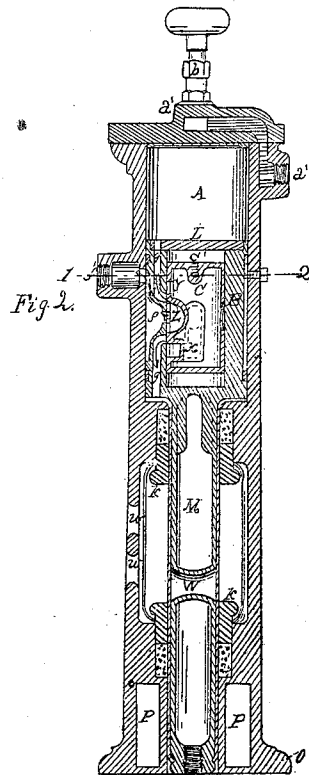
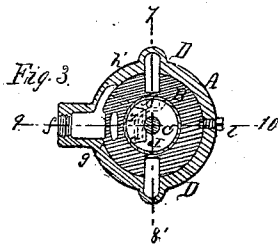
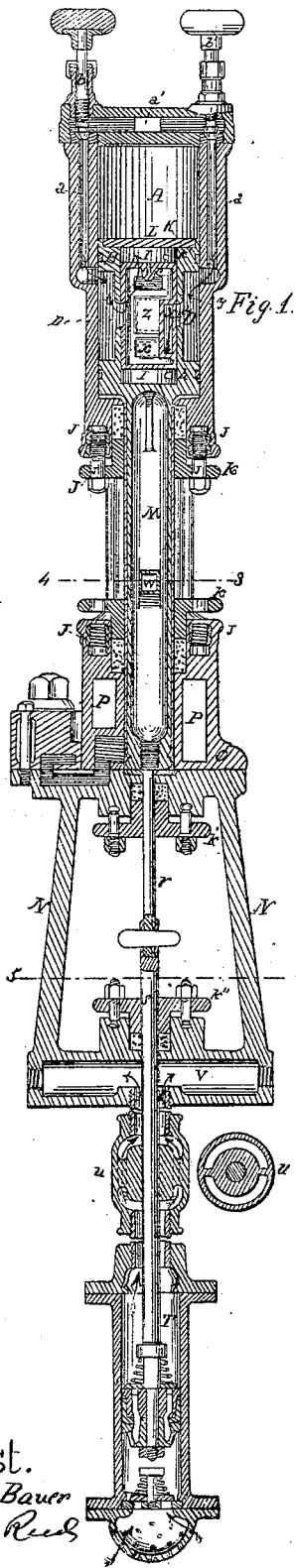


J.R. Maxwell & E. Cope.

Steam Pump

N^o 92,627

Patented Jul. 13. 1869.



Attest.
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UNITED STATES PATENT OFFICE.

JAMES R. MAXWELL AND EZRA COPE, OF CINCINNATI, OHIO.

IMPROVEMENT IN STEAM LIFT AND FORCE PUMPS.

Specification forming part of Letters Patent No. 92,627, dated July 13, 1869.

To all whom it may concern:

Be it known that we, JAMES R. MAXWELL and EZRA COPE, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Vertical Combined Steam Lift and Force Pump; and we do hereby declare the following to be an exact description of the construction and operation of the same, reference being had to the accompanying drawings, making part of this specification.

Figure 1 in the drawings is an exhibit of the manner of constructing, arranging, and combining the parts of our steam-pumps, as shown in the vertical section or elevation, bisected through the lines 7 and 8, Figs. 3, 4, and 5, showing the steam-cylinder A, piston B, cylindrical slide-valve C, pump O, ram M, pump support or base N, pipe-connection and rod-guide U, and lift-pump T, throttle or regulating valves $b b'$, main steam-passages $a a'$.

Fig. 2 is a vertical section through the line 9 and 10, Fig. 3, showing the steam-supply ports $a' a'$, exhaust from cylinder f' , exhaust-port in piston B at f , steam-ports for supply and exhaust in the piston at $g g$, steam-port for the lower end of steam-cylinder in the valve C at x , steam-port for the upper end of steam-cylinder in the valve C at y , and the exhaust-port in valve C at z .

Fig. 3 is a cross-section through the line 1 and 2, Fig. 2, showing the high-steam channels D D in cylinder A and piston B, exhaust-port f' from steam-cylinder, exhaust-port h from valve-chamber through the piston; port g' , leading steam to and from the upper end of steam-cylinder; guide-screw l , reaching into a slot formed in piston B; small steam-opening I, through the steam-valve C, at each end; high-steam channel x , leading to lower end of steam-valve C; and exhaust-chamber Z in valve C.

Fig. 4 is a cross-section through the line 5 and 6, Fig. 1, showing plan of stuffing box h'' , pipe-connection V, and base N.

Fig. 5 is a cross-section through the line 3 and 4, Fig. 1, showing plan of stuffing-box gland k , base of pump O, opening through plunger M, also plan of valve-caps.

Fig. 6 is a perspective view of steam-piston B, pump-ram M, steam-port D, exhaust-port

f , supply-port g , and small exhaust-ports $h h'$. The second figure is a view of the cylindrical slide-valve C, wherein is shown the high-steam passage $x x'$, leading to the lower end of steam-cylinder; port Y of high-steam passage, leading toward the upper end of steam-cylinder; exhaust-port Z, and the small steam-opening I at one end of the valve. A similar opening at the other end of the valve is not shown in this figure. The third figure L represents the cap or cover to open end of the piston B.

The steam-cylinder has a length equal to twice the stroke and lap of the piston, which has also added length in proportion, and incloses the valve in the manner described in Letters Patent of the United States, numbered 56,242, granted to us July 10, 1866, for steam-engine; but in the herein-described machine we make a permanent partition in the valve C, separating the steam-passages x and y , in which the flow of steam to the respective ends of the steam-cylinder is controlled by the adjustment of the valves $b b'$, to admit proper quantities or pressures of steam required to suit the character of the work being done. We form the channels and ports D D in the piston to serve as continuations of the main passages $a a'$, and to conduct the steam into the valve C; thence through the separate passages formed in the valve on its way to each end of the steam-cylinder. The exhaust-port f' , made in the shell of the steam-cylinder, is common to both ends, and is free to all escapements arising from the play of the valve by the provision of two ports, $h h$, through the wall of the piston, as they are alternately brought in communication with a cavity or branch extending from and being part of the port f .

The piston B and ram M are cast in one single piece, with cavities to avoid excessive weight, then finished to cover the ram with brass when desired. This ram is designed for the single-acting pattern of pump, or rod and a piston; with side passages formed on pump O, may be substituted, to make it double-acting. The piston end of this casting is finished to serve as a chamber for valve C, a slot in the chamber and a feather inserted in the valve guide the latter in its movement. The lower end of the piston is

closed by the continuous casting. The upper end is closed by securely bolting thereon the cap L after the valve has been fitted in its chamber. The ports *g g* in the cap and bottom of piston are made to deliver the steam into the cylinder. The hole W in the ram, at a point between the stuffers *k k* is formed to receive a bar, introduced through the distance-piece at *w* and *w*, in order to move all working parts upward for thorough draining, and as may be desired.

The cylinder A, distance-piece, and pump O are cast together in one piece, with the wrought nuts for stuffing-box bolts accurately inserted in place, and with ports, passages, recesses, and cavities formed therein ready for dressing and fitting. One cavity on the discharge side of pump O is made to serve for air-chamber; another on the suction side is made to serve for vacuum-chamber.

The pump-valves are of ordinary construction. The stuffing-box glands are made separately, and secured in place by screwing bolts into the inserted nuts. The cylinder-head is made separately, fitted and bolted to place, with the valves *b b'* completed therein ready for use. The frame-support or base N is made separate, and fitted to support the pump, and to permit the extension of a pump-rod screwed to the bottom of the ram to pass downward to the lift-pump T through two stuffing-boxes, K' and K'', widely enough separated to afford space between them to couple or connect the proper length of rod. The bottom of the support forms a channel-plate, on the under side of which a pipe attachment is made in communication with the channel V, from whence a pipe reaches to, and connects with, the pump T. This pipe has the pump-rod to work within it, and when of such a length as to require it one or more of our combined pipe-couplings and rod-guides are employed. This combined pipe-coupling and rod-guide is cast of an enlarged globular form, with a webbed diaphragm, having water-ways around it, and bored out to fit and guide the rod, as shown by the letter U and U, Fig. 1.

The pump-rod is connected to the working parts of the lift-pump, which is of ordinary construction.

To operate this machine, steam is admitted through *a'*, Fig. 1, and passes through the regulating-valves *b b'*, which are adjusted to allow the quantity of steam to pass required to give the piston B a regular reciprocating motion suited to the required duty, the steam passes through the main passages *a a* in the direction of the arrows into the piston B and valve C, through the ports *x* and *y* and *g g*, into the cylinder.

The piston is shown as having just completed its downward stroke, and the valve C is in the middle of its motion upward, to give steam through the ports *x* and *g* to the lower end of the cylinder, while the steam in the upper end of the cylinder is finding its exit at *f*. The steam passes out of the valve C at each end, by the small holes I I, into the chamber C', and the pressure balances until the motion of the piston up or down brings the exhaust-ports *f'* in communication with *f*, which then lets the steam out of the valve-chamber faster than it can be supplied through the holes I, thus unbalancing the pressure on the ends of the valve, causing it to move in the opposite direction from the main piston, thus reversing the motion alternately as long as the steam is supplied. The reciprocating motion of the piston is communicated to the ram and to the working parts of the lift-pump below. The water is lifted and flows up through the pipe and passage V from well or reservoir by the upstroke, and is delivered into tank or heater, from which it is conducted to the pump O, the downstroke of which then forces the water into the boiler or other vessel.

Having thus fully described the construction and operation of our invention, what we claim, and desire to secure by Letters Patent, is—

1. The separate throttle or regulating valves *b b*, arranged to control the flow and quantity of steam admitted through separate passages to each end of the steam-cylinder, substantially as described.

2. The cylindrical slide-valve C, with passages X Y, to convey the steam to opposite ends of the steam-cylinder, substantially as described.

3. The valve C with the openings I I, constructed and arranged with reference to the chamber C' and the induction and eduction ports thereof, substantially as described.

4. The arrangement of the piston-head and pump-ram and the main steam-valve, moved direct by pressure of steam admitted through separate passages into each end of the steam-cylinder, and controlled by separate throttle or regulating valves, substantially as specified.

5. The arrangement of the pumping-engine A B, the pump and ram O M, the base N, and pump F, with reference to each other, substantially as described.

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EZRA COPE.

Attest:

CHARLES BAUER,
STEPHEN REED.