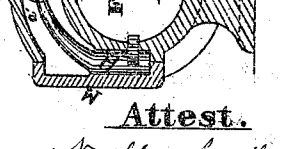
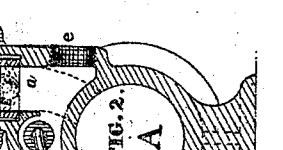
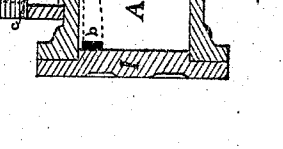
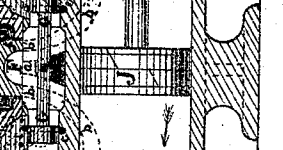
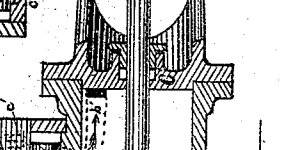
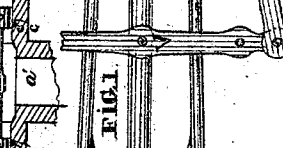
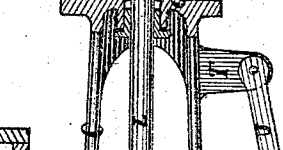
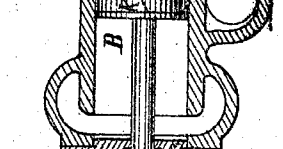
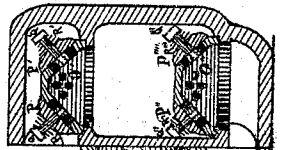
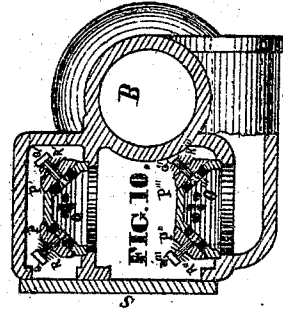
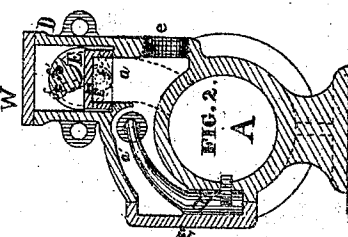
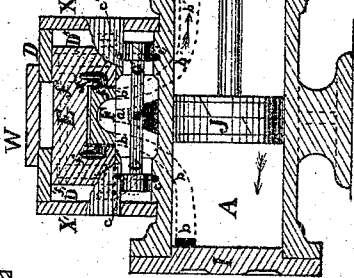
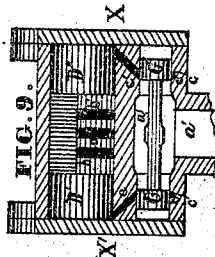
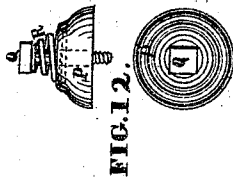
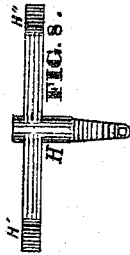
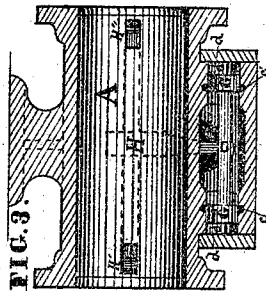
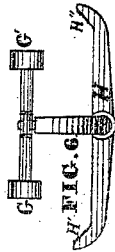
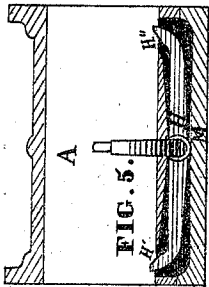
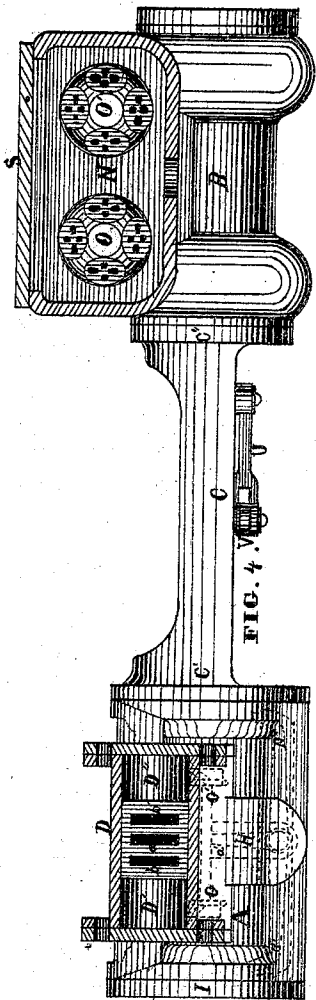


J. R. MAXWELL & EZRA COPE.

Steam Pumps.

No. 123,185.

Patented Jan. 30, 1872.



Inventors,
James R. Maxwell
Ezra Cope

Attest.
A. Clark
J. S. Lloyd

UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. 123,185, dated January 30, 1872.

To all whom it may concern:

Be it known that we, JAMES R. MAXWELL, of Cincinnati, in the county of Hamilton and State of Ohio, and EZRA COPE, of Covington, in the county of Kenton and State of Kentucky, have invented a new and useful Improvement in Direct-Acting Steam-Pumps; and do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawing and to the letters of reference marked thereon, like figures referring to like parts.

The invention consists in the method of constructing and operating the steam and pump valves, and the manner of arranging and combining the respective parts of the machine.

To enable others skilled in the art to make and use our invention, we now proceed to fully describe the construction and operation of the same.

A represents a steam-cylinder, with the ordinary steam-passages leading from their respective ports from the valve-seat in the steam-chest to each end of the steam-cylinder, as shown by the dotted lines $b\ b\ b$ and $b'\ b'\ b'$, Figure 1. The steam-chest D, main exhaust-chamber a , and the chamber in which the rocker-arm H plays, are cast in one piece with the steam-cylinder and closed with caps M, W, X, and X', fitted and bolted thereon. The separation of the exhaust-chamber from the chamber of the rocker-arm and the prevention of communication between the ends of the steam-cylinder are effected by jointed surfaces and the enlarged or plug-like axis of the rocker-arm fitted in bearings, as shown in Fig. 2. G, Figs. 3 and 9, represents an auxiliary valve properly chambered for end play in the main exhaust-chamber to be actuated by a finger extending from the axis of the rocker-arm, and is designed to open and close communication between the ends of the steam-chest or auxiliary cylinder D D and the main exhaust-chamber when in its movement the passages c and c' leading from either end of the auxiliary cylinder are covered or uncovered by it. H, in Figs. 5, 6, and 8, represents a rocker-arm, pivoted on an axis and with inclined faces on bent ends, so adjusted in length as to reach into the interior of the steam-cylinder at or near each end, and derive a motion, from contact with the piston-head,

in a plane at right angles to an axial section of the steam-cylinder. In Fig. 3 E represents an auxiliary piston recessed to receive the usual D-form of valve F, and allow it slight space for end motion, and having return steam-passages $f\ f$ and $f'\ f'\ f'$ leading from either end of the recess to terminate, respectively, at the opposite ends of the auxiliary piston, for the purpose of delivering steam from the auxiliary cylinder—where the steam is admitted in the usual manner—to impel the auxiliary piston and valve in alternate directions, as communication of the passages with the interior of the auxiliary cylinder may be made by the position of the co-operating parts. B, in Figs. 4 and 10, represents a pump-cylinder, with the usual passages, chambers, and openings, connected in line with the steam-cylinder by a distance piece of usual form. The valve-chamber of the pumps is provided with disk-valves P P' P'' P''', as shown in Figs. 12, 11, 1 and 4, so formed as to be guided on central stems when clustered to operate on a number of planes, which afford a group of planes for valve-seats formed in a single casting for the advantages of economy, compactness, directness, and increase of water-way. The valves are formed with a raised ledge or guard on the verge of the top or back to serve as a seat for a spiral or volute spring. The base of the spring is made by soldering the first coil in the form of a ring, from which the volute form is generated. In Figs. 1 and 4 V represents a lever, pivoted to the piston-rod and the swinging link, for the purpose of operating the machine by manual power when used as a test-pump for boilers, or at other times in the absence of steam. Additional rods, properly connected to the lever, may be made to afford another mode of imparting the required motion to the auxiliary valve.

To operate the machine steam is admitted into the auxiliary cylinder, a movement of the auxiliary valve is effected to open communication between the auxiliary cylinder and the exhaust-chamber through the passage c , and thus exhaust all pressure from the relating end of the auxiliary piston, which piston freely moves and brings one end of the recess in contact with the D-valve, which slight movement completely closes the passage $f'\ f'\ f'$ and opens

space at the opposite end of the recess to admit steam to the passage *fff* and deliver the steam at the end of the auxiliary piston, where that passage terminates. The auxiliary piston with the **D**-valve is impelled, after contact, in the same direction. The **D**-valve permits free flow of steam in the direction of the arrow shown, through the passage *b' b' b'*, into the steam-cylinder, to move the main piston until the auxiliary piston passes over the port to the passage *c* and is arrested for the reverse movement by the steam trapped in the end of the auxiliary cylinder, effected by the main piston having completed its stroke and imparted, through contact with the rocker-arm, motion to the auxiliary valve, to close the passage *c* and exhaust from the other end of the auxiliary piston to permit the reverse and alternate reciprocating motion throughout the relating parts and entire machinery.

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

1. The auxiliary piston, formed with a recess to receive a **D**-valve, and provided with high steam-passages *fff* and *f' f' f'*, leading from each end of the recess to the opposite end of the auxiliary piston, when the auxiliary piston and the **D**-valve are arranged to co-operate in order to open and close the passages *f*

ff and *f' f' f'*, substantially as shown and described.

2. The arrangement of the auxiliary valve within the main exhaust-chamber, in combination with a direct-acting steam-pump, substantially as shown and described.

3. The rock-shaft **H**, with its axis at right angles to that of the main cylinder, formed in one piece, with inclined faces or ends to project into the main cylinder near its ends, substantially as shown and described.

4. A disk-valve, having a raised ledge or rim, for the purpose described, when constructed so as to be guided in the operation of opening and closing by central stems, substantially as shown and described.

5. A cluster of valve-seats, each seat being formed on a different facet or part of a surface, having convexity, for the purpose described, in combination with disk-valves guided in the operation of opening and closing by central stems, when constructed and arranged substantially as shown and described.

JAMES R. MAXWELL.
EZRA COPE.

Witnesses:

N. MARCHANT,
THOS. S. ROYSE.