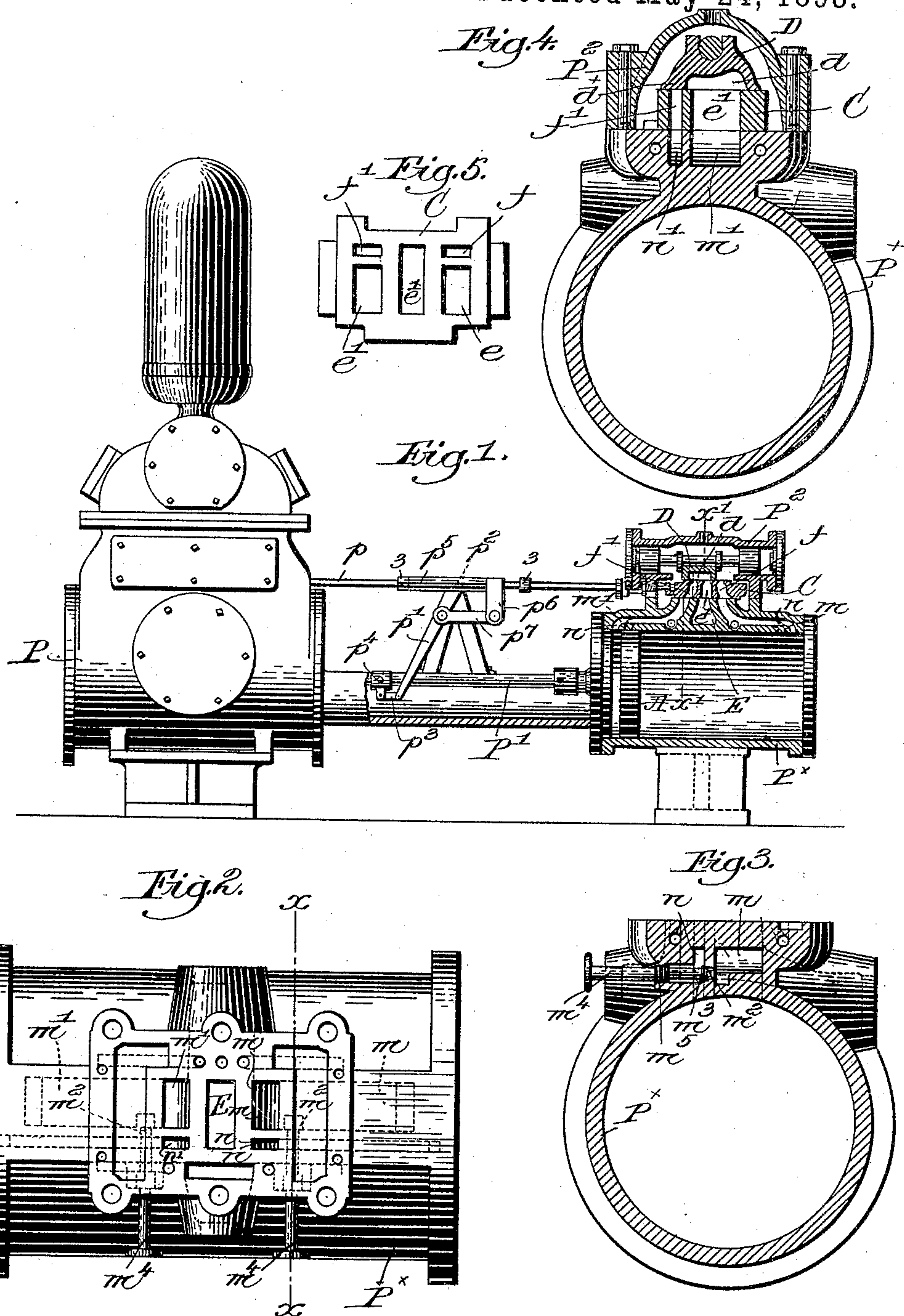


(No Model.)

A. F. HALL.
DIRECT ACTING STEAM PUMP.

No. 604,613.

Patented May 24, 1898.



Witnesses:
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UNITED STATES PATENT OFFICE.

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DIRECT-ACTING STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 604,613, dated May 24, 1898.

Application filed July 26, 1897. Serial No. 645,885. (No model.)

To all whom it may concern:

Be it known that I, ALBERT F. HALL, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Direct-Acting Steam-Pumps, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

10 This invention relates to a certain form of direct-acting steam-pumps, and has for its object the production of improved means whereby the operation of such pumps may be improved.

15 Heretofore steam has been admitted to the cylinder through a large port, thus giving to the piston a jerking movement at the beginning of the stroke. Furthermore, the exhaust could not be cut off to provide a cushion for the piston at the end of the stroke.

20 By the construction to be hereinafter described I am enabled to provide a cushion for the piston at the end of the stroke and to effect a gradual and easy initial movement of the piston.

25 Figure 1, in side elevation and partial vertical longitudinal section, represents a direct-acting pump embodying my invention. Fig. 2 is an enlarged top or plan view of the steam-cylinder, the valve and steam-chest being omitted. Fig. 3 is a transverse sectional view of the steam-cylinder, taken on the line $x x$, Fig. 2. Fig. 4 is an enlarged transverse sectional view taken on the irregular line $x' x'$, Fig. 1; and Fig. 5 is an under side view of the movable seat.

35 Referring to Fig. 1, the pump-cylinder P, having suitable controlling valves and ports, the piston-rod P', connected directly to the main or steam piston A in the steam-cylinder P^x, the movable valve-seat C, and the main valve D are and may be substantially as in the well-known "Blake" pump, the movable seat C sliding upon a fixed seat on the steam-cylinder P^x and itself forming a seat for the main valve D.

40 As shown in the drawings, Fig. 1, the main valve D is at one end of its stroke and the movable seat C at the opposite end of its stroke, so that steam from the auxiliary cylinder P² will enter the right-hand end of the

cylinder P^x through the port e , Fig. 5, in movable seat C and the main steam-port m , (see dotted lines, Fig. 1,) and also through an independent auxiliary steam passage or port n , opening into the cylinder between the larger or full size main port and the end of the cylinder.

The movable seat C has a port f at the side of the port e to correspond with the upper end of the auxiliary passage n , the relative location of the ports m and n being clearly shown in Fig. 2, and also of the corresponding main and auxiliary ports m' n' for the other end of the cylinder.

It will be observed that both of the passages $e f$ in the movable seat C are uncovered by the main valve D, Fig. 1, to admit steam; but referring to Fig. 4 the main valve D is shown as so constructed that the recess therein is not sufficiently wide to include the auxiliary passage f' in the movable seat C, adjacent the main passage or port e' , the widened longitudinal portion d^x of main valve D closing such passage or port f' .

Obviously during exhaust, the piston A moving to the left, Fig. 1, the steam can escape through the main port m' and passages e' and e^x to exhaust-port E until the piston closes the cylinder end of the main port m' , such closure being shown in Fig. 1; but throughout the exhaust steam cannot escape through the small auxiliary port n' , as the main valve D closes its upper end, as shown in Fig. 4. As a result, a portion of the exhaust-steam is imprisoned between the piston and the cylinder-head after the piston-closure of the main port, the imprisoned steam being compressed to act as a cushion, so that the piston completes its stroke gradually and without shock. While this action takes place, the valve-rod p is moved, as will be described, moving the seat C to the left, Fig. 1, such action causing steam to be admitted at the left hand of the plunger-piston B, forcing it and the main valve D to the right, so that the movable seat C and main valve D will have positions just opposite to those shown in Fig. 1.

The plunger-piston and the movable seat C and main valve D are well known, and as they form no part of this present invention

need not be further described herein. In this connection, however, it is to be noted that in my present invention the single casting forming the movable valve-seat C also acts as an auxiliary valve to control the usual ports for the auxiliary cylinder P², said ports being shown in Fig. 2 in the part of the main casting forming a part of the steam-cylinder P^x.

Referring to Fig. 5, the valve-seat C is shown as having a lateral projection 50 at one side and a recess 60 in the opposite side to govern the ports for the auxiliary cylinder, thus simplifying the construction and reducing the number of parts.

Now the movement of the main valve and the movable seat described will simultaneously open both the large main and small auxiliary ports *m' n'*; but the cylinder end of port *m'* is still closed by the piston, so that steam can enter only through the smaller auxiliary port *n'*, and the smaller quantity of steam thus supplied will serve to effect initial movement of the piston gradually and slowly without any jerk or jump. After the piston has been thus started it will uncover the main port *m'*, and the full supply of steam will then enter through both main and auxiliary ports till cut off, the exhaust escaping through port *m* until stopped by the piston, as described, when cushioning takes place, as hereinbefore set forth. Both the main and auxiliary ports thus operate during the admission period, while under ordinary circumstances the auxiliary ports are closed during the exhaust period. It is desirable, however, to sometimes vary or regulate the amount of imprisoned steam at the end of the stroke to thus vary the cushioning for the piston according to the work to be done. This I have herein effected by connecting the main and auxiliary ports by a passage *m*², Fig. 3, forming a seat for a valve *m*³ on a stem *m*⁴, mounted in a suitable bearing *m*⁵, (see Fig. 3,) so that by opening the valve more or less there will be a certain exhaust from the auxiliary port into the adjacent main port, the quantity of imprisoned steam at the end of the stroke being varied according to the amount the valve is opened. A lever *p'* is fulcrumed on a fixed bracket at *p*² and pivotally connected at its lower end by a short link *p*³ with a collar *p*⁴, fast on the piston-rod P', the lever being thereby oscillated as the piston-rod reciprocates. The valve-rod *p* has adjustable collars 3 3 thereon, between which slides a sleeve *p*⁵ on the valve-rod, said sleeve having a depending lug *p*⁶, pivotally connected by a link *p*⁷ with the actuating-lever *p'*, so that the valve-rod will be reciprocated, the stroke of the sleeve *p*⁵ being longer than the distance between the collars 3 3. A very simple and direct connection is thus effected between the piston and valve rods.

My invention is not restricted to the precise construction and arrangement of valve mechanism herein shown, nor to the shape

and exact location of the steam-ports for the cylinder, as variations may be made in various particulars without departing from the spirit and scope of my invention.

The device still preserves the features of the Blake pump, in which, should the plunger-piston fail to reverse at once, steam of boiler-pressure will enter the main cylinder to arrest the main steam-piston in addition to the inclosed steam.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an apparatus of the class described, a steam-cylinder having large main steam-ports, a piston reciprocable in the cylinder, a movable valve-seat, a main valve, and small auxiliary steam-ports opening into the cylinder near the end thereof, adapted and arranged to admit a small quantity of steam at the beginning of the stroke to impart a gradual initial movement to the piston, substantially as described.

2. In an apparatus of the class described, a steam-cylinder, a reciprocating piston therein, and means including a movable valve-seat and a main valve, to admit a small quantity of steam to the cylinder at the beginning of the stroke and thereafter an independent larger quantity, and to cushion the piston at the end of the stroke, substantially as described.

3. In an apparatus of the class described, a steam-cylinder having main and auxiliary steam-ports, a reciprocating piston in the cylinder, a movable valve-seat and a cooperating main valve for said ports, whereby steam is admitted through both, and exhausted through the main port, and manually-controlled means to at times effect communication between said ports to permit a limited exhaust from the auxiliary into the main port, to regulate the amount of cushion, substantially as described.

4. In an apparatus of the class described, a steam-cylinder having main and auxiliary steam-ports, a reciprocating piston in the cylinder, a combined movable valve-seat and auxiliary valve, said seat having ports corresponding to the said main and auxiliary steam-ports, a main valve, whereby steam is admitted through both of said main and auxiliary steam-ports but exhausted through the main port only, an auxiliary steam-cylinder having steam and exhaust ports, and a plunger-piston therein to move the main valve, said ports being controlled by said auxiliary valve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALBERT F. HALL.

Witnesses:

JOHN C. EDWARDS,
AUGUSTA E. DEAN.