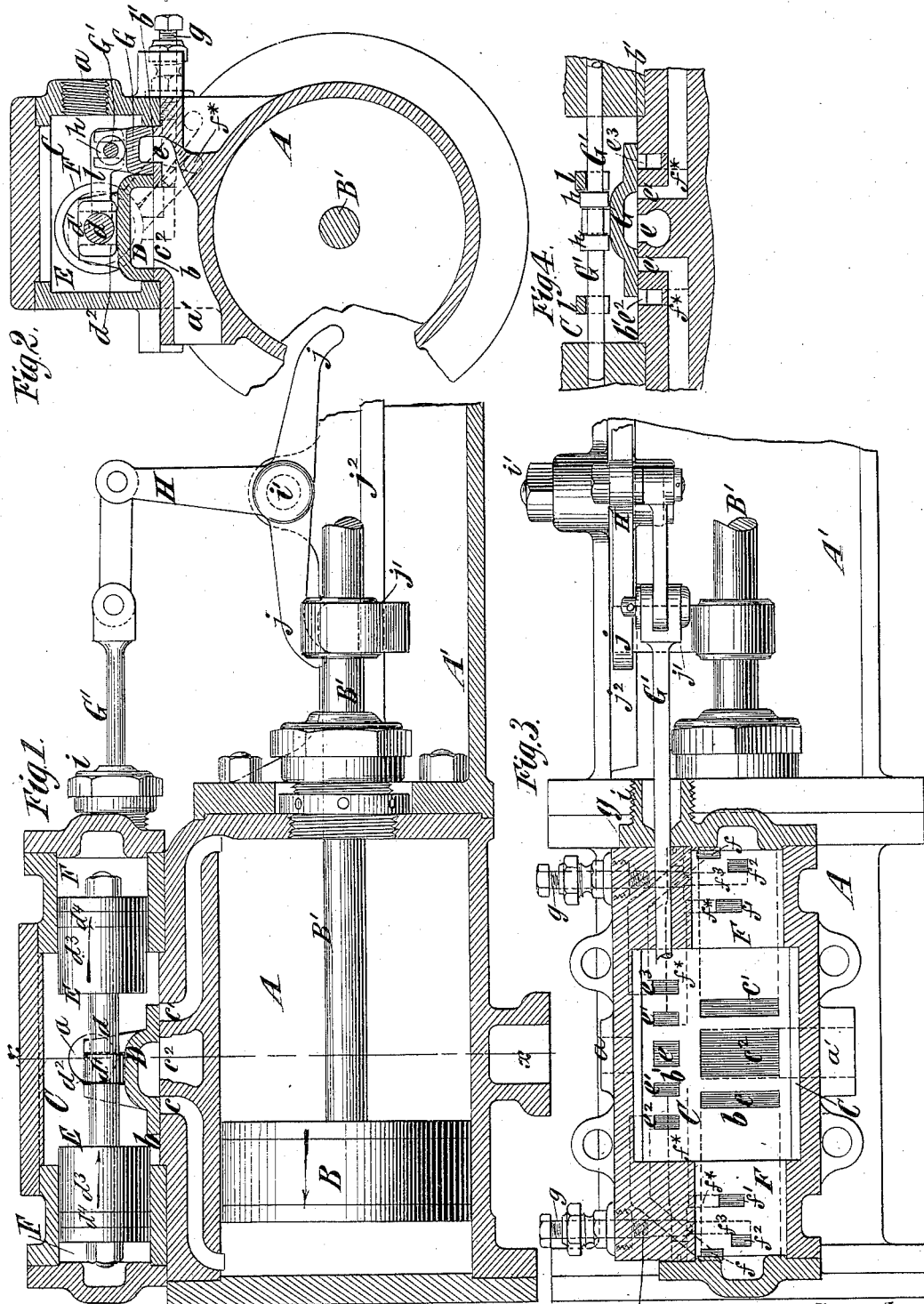


T. F. FLINN.
STEAM ACTUATED VALVE.

No. 306,475.

Patented Oct. 14, 1884.



Witnesses

Chandler Hall
Nat Pollock

Inventor
Thomas F. Flinn
By his Attys.
Brown & Hall

(No Model.)

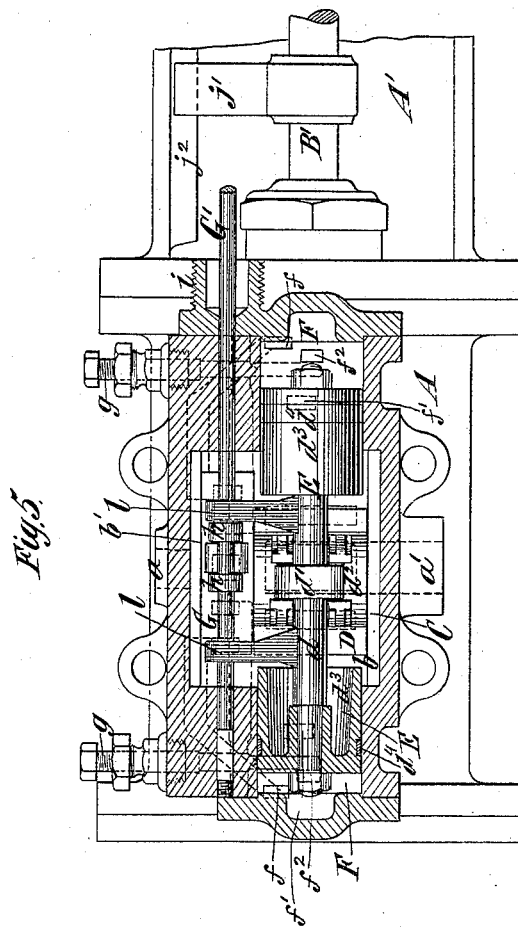
2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

THOMAS F. FLINN, OF BROOKLYN, NEW YORK.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 306,475, dated October 14, 1884.

Application filed January 26, 1884. (No model.)

To all whom it may concern:

Be it known that I, THOMAS F. FLINN, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Steam-Actuated Valves, of which the following is a specification.

My invention is particularly applicable to engines for direct-acting steam-pumps, and relates to that class of engines in which the main slide-valve is operated automatically by means of an auxiliary piston working in an auxiliary cylinder, the supply of steam to the auxiliary cylinder and the exhaust of steam therefrom being controlled by means of an auxiliary slide-valve operated from the moving piston-rod of the engine. In engines of this class as commonly constructed the supply of steam to and the exhaust of steam from the main cylinder are uninterrupted until the main piston nearly reaches the end of its stroke, and the main slide-valve is then thrown over suddenly by the action of the auxiliary piston from a closed to a full open position on that side toward which the main piston is moving. The effect of this action of the main slide-valve is to terminate the stroke of the main piston suddenly and to suddenly start it on its return-stroke, and this sudden stopping and reversing of the main piston while it is moving at nearly full speed cause the valves of the water-cylinder to seat violently and noisily, and is very destructive to all parts of the engine and pump, especially when working under a heavy water-pressure.

The essential objects of my invention are to provide for using in a direct-acting engine of the kind described a main slide-valve having inside and outside lap, and to produce such an action of the auxiliary piston and main valve as will close the exhaust from the main cylinder just before the main piston finishes its stroke, thus causing the piston to complete its stroke gradually and to come to a full stop before commencing its return-stroke, and will move the main slide-valve first quickly until it covers the exhaust-port, and while slowly moving to the extent of its lap allows the expanding steam to bring the main piston slowly to a state of rest on the cushion provided by the closing of the exhaust-port.

To these ends the invention consists in the combination, with the main cylinder and piston and a main valve having lap for controlling the supply and exhaust of steam to and from the main cylinder, of an auxiliary piston connected with the main slide-valve, an auxiliary cylinder having at each end a supply-port, a main exhaust-port, and a supplemental exhaust-port, and an auxiliary slide-valve for controlling said supply and exhaust ports of the auxiliary cylinder. These parts are so combined that when the auxiliary valve, operated by the moving piston-rod of the engine, admits steam to the auxiliary cylinder, the auxiliary piston and main valve will be moved quickly a distance sufficient to close the steam and exhaust ports of the main cylinder and bring the main piston gradually to a state of rest, and until the auxiliary piston covers the main exhaust-port at that end of the auxiliary cylinder toward which the auxiliary piston is moving; but as soon as this occurs the exhaust from the auxiliary cylinder can take place only through the smaller supplemental exhaust-port, and the auxiliary piston and main valve are caused to move slowly in traveling the extent of the lap and in uncovering the aforesaid main supply-port to admit steam to the main cylinder.

In connection with the supplemental exhaust-ports from the auxiliary cylinder, I employ valves whereby the exhaust of steam through said supplemental ports may be regulated or controlled, and by opening or closing such valves more or less the rapidity with which the main valve is allowed to move in admitting steam to the main cylinder may be varied to suit the head under which the pump is working, and other circumstances. I also provide engaging devices between the auxiliary-valve stem and the auxiliary piston and main valve, whereby the movement of the said auxiliary piston and main valve will be effected directly in case of the failure of said piston and valve to move automatically.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through the main and auxiliary cylinders of an engine embodying my invention. Fig. 2 is a transverse vertical section thereof on the dotted line *x x*, Fig. 1. Fig. 3 is a horizontal section through

the auxiliary cylinder and steam-chest, the auxiliary piston and main and auxiliary valves being removed in order to clearly show the ports. Fig. 4 is a longitudinal section through the auxiliary valve; and Fig. 5 is a horizontal section through the auxiliary cylinder and piston and a plan of the main and auxiliary valves, the position of parts corresponding to that shown in Fig. 1.

Similar letters of reference designate corresponding parts in all the figures.

I have not illustrated the water-cylinder of the pump, as it forms no part of my invention; and may be of any well-known or suitable construction.

A designates the main steam-cylinder, which is connected with the water-cylinder by the trunk or brace A', and in which is the usual main piston, B, attached to the piston-rod B'.

Above the cylinder A is the steam-chest C, to which steam is admitted from a supply-pipe, *a*; and D designates the main slide-valve, which moves on a seat, *b*, in which are the ports *c* *c'*, leading to opposite ends of the main cylinder, and the intermediate exhaust-port, *e'*, from which leads the exhaust-pipe *a'*. The main slide-valve D is constructed to have inside and outside lap, as shown in Fig. 1, and with it the auxiliary piston E is connected. This piston may be of any suitable construction; but, as here shown, it consists of a body-piece, *d*, having upon it a collar, *d'*, which drops into a socket, *d''*, on the back of the main valve D, and so connects the said piston and valve that they are caused to move together. The body-piece *d* may be forged, and to its ends are secured the piston-heads *d''*, which may be provided with ring-packing *d'*. F designates the auxiliary cylinder, wherein the piston-heads of the auxiliary piston E work. It is formed integral with the steam-chest C, or bolted or otherwise secured thereon, as desired.

In the steam-chest C is formed a second valve-seat, *b'*, on which works the auxiliary valve G. (Best shown in Fig. 4, but also in Fig. 5.) The auxiliary valve G controls five ports—namely, a central exhaust-port, *e*, which communicates with the main exhaust *a'*, as shown in Fig. 2, two side exhaust-ports, *e'* *e'*, which communicate by passages with the ends of the auxiliary cylinder F, and two supply-ports, *e''* *e''*.

In each end of the auxiliary cylinder F are three ports—namely, a supply-port, *f*, which is connected by a passage (shown dotted in Fig. 3) with the supply-port *e''* or *e''* in the valve-seat *b'*, and arranged close to the head of the auxiliary cylinder F; a main exhaust-port, *f'*, communicating by a passage, *f''*, (shown dotted in Fig. 3,) with one of the ports *e'* in the valve-seat *b'*, and a supplemental exhaust-port, *f''*, communicating by a short passage, *f''*, with the passage *f''*. The exhaust of steam from the supplemental port *f''* at each end of the auxiliary cylinder is regulated by means of a

valve, shown as consisting of a fine-threaded screw, *g*, which may be turned to more or less choke the passage *f''*, and which is inserted from the side of the cylinder.

G' designates the auxiliary-valve rod, having collars *h*, which receive between them a U-shaped lug or ear projecting upward from the auxiliary valve G, and which is guided in the chest C. This valve-rod works through a suitable stuffing-box, *i*, and is connected to the upper end of a rocker-arm, H, fulcrumed at *j'* to the trunk or cylinder-brace A', and having toes or arms *j* projecting in opposite directions, as shown in Fig. 1.

From the piston-rod B' an arm, *j'*, extends horizontally to and is guided upon a rib or flange, *j''*, on the cylinder-brace A', and as the piston-rod B' reciprocates, the arm *j'* acts alternately on the arms or toes *j* of the rocker H, and so tilts or swings it first one way and then the other to reciprocate the valve-rod and auxiliary valve G' G.

The operation of the engine is as follows, the parts being in the position shown, and the main piston B supposed to be moving in the direction of the arrow thereon: By the movement of the piston B and rod B' in the direction of the arrow, Fig. 1, the arm *j'* has been brought against the rocker H, and has shifted or tilted it sufficiently to move the valve-rod G' and auxiliary valve G and slightly uncover the port *e'*, as shown in Fig. 4. Steam is thus admitted through the port *e'* and the supply-port *f* to the left-hand end of the auxiliary cylinder F, and by the time the piston B reaches the position shown in Fig. 1 the main valve D has been moved toward the right, as indicated by the arrows in Fig. 1, sufficiently to close the ports *c* *c'*, leading to the cylinder A, and the main piston is therefore cushioned on the exhaust-steam remaining in the cylinder, and its stroke is completed by the expansion of steam behind it. The piston is thus made to complete its stroke gradually and come to a stop for a limited time before being reversed. The ports in the auxiliary-valve seat *b'* and the passages leading therefrom are very large, and consequently the movement of the auxiliary piston and main valve in the direction of the arrow, Fig. 1, will be rapid until the auxiliary piston has covered the main exhaust-port *f'*, leading from the right-hand end of the auxiliary cylinder. When the main valve D reaches the position shown in Fig. 1, the exhaust-port *f'* at the right of the auxiliary piston has been covered by the piston. The main exhaust-port *f'* from the right-hand end of the auxiliary piston being now closed by the piston itself, the exhaust from that end of the auxiliary cylinder must take place through the supplemental exhaust-port *f''* and passages *f''* *f''*, through the ports *e'* *e'*, under control of the auxiliary valve G; and as the passage *f''* may be choked as much as desired by turning up the screw *g*, it will be seen that the movement of the auxil-

iliary piston and main valve necessary to open the port *c* to the steam may be made as gradual as desired. Consequently the piston B will be reversed and started in its movement toward the right very gradually. When the main piston B nearly reaches the end of its movement toward the right, the port *c'* will be closed and the piston will be slowed down gradually and reversed easily, as above described.

In order to start the main valve and auxiliary piston forward positively in case they should fail to work automatically, I provide engaging devices between the auxiliary-valve stem *G'* and the auxiliary piston E, which will thus effect the movement of the auxiliary piston and main valve positively, but which will not interfere with the free automatic movement of said piston and valve, whatever may be the position of the auxiliary valve. In this example of my invention the body-piece *d* of the auxiliary piston E is provided with two arms, *l*, which project over the auxiliary-valve stem *G'*, and in the path of the collars *h*. In case the auxiliary piston and main valve fail to move automatically, one or other of the collars *h* will act on one or other of the arms *l*, and will thus move or start the said piston and valve.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a direct-acting engine, the combination, with a main cylinder and piston and a main slide-valve having lap for controlling the supply and exhaust of steam, of an auxiliary piston connected with said main valve, an aux-

iliary cylinder having at each end a supply-port, a main exhaust-port, and a supplemental exhaust-port, and an auxiliary slide-valve for controlling said supply and exhaust ports of the auxiliary cylinder, substantially as and for the purpose herein described.

2. In a direct-acting engine, the combination, with a main cylinder and piston and a main slide-valve having lap for controlling the supply and exhaust of steam, of an auxiliary piston connected with said main valve, an auxiliary cylinder having at each end a supply-port, a main exhaust-port, and a supplemental exhaust-port, an auxiliary valve for controlling said supply and exhaust ports of the auxiliary cylinder, and means for regulating the exhaust through said supplemental exhaust-ports, substantially as and for the purpose herein described.

3. In a direct-acting engine, the combination, with a main cylinder and piston and a main slide-valve therefor having lap, of an auxiliary cylinder and an auxiliary piston connected with said main valve, an auxiliary valve for controlling the supply and exhaust of steam to and from the auxiliary cylinder, and engaging devices between the auxiliary piston and the auxiliary-valve rod, whereby said rod is enabled to move the auxiliary piston and main valve, substantially as and for the purpose herein described.

T. F. FLINN.

Witnesses:

CHANDLER HALL,
HARRY BOGERT.