



# UNITED STATES PATENT OFFICE.

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## STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 335,855, dated February 9, 1886.

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*To all whom it may concern:*

Be it known that I, JOHN T. TOOLE, of East Saginaw, in the county of Saginaw and State of Michigan, have invented a new and Improved Steam-Actuated Valve for Steam-Pumps, of which the following is a full, clear, and exact description.

The object of my invention is to provide a new and improved valve-gear for steam-pumps, which permits the starting or stopping of the pump without leaving it on the dead-center, and which allows the pump to work with regularity.

The invention consists in the construction and arrangement of parts, as will be herein-  
after fully described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate  
20 corresponding parts in all the figures.

Figure 1 is a longitudinal vertical section of my improvement attached to the steam-cylinder. Fig. 2 is an inverted plan view of the auxiliary steam-chest. Fig. 3 is a vertical  
25 cross-section on the lines *x x* of Fig. 1, and Fig. 4 represents a modification.

The steam-cylinder A, having the main ports *a* and *b* and the exhaust-port *c*, is provided with the piston B, to which is attached  
30 the piston-rod C. The steam-chest D is provided with the cylindrical valve-seat D', in which moves the main valve H. Between the steam-chest D and the cylinder A is placed the auxiliary steam-chest E, having the cylindrical valve-seat E', in which works the auxiliary valve or piston F, provided with the  
35 annular recesses F' and F<sup>2</sup>. The auxiliary valve F is provided on the outside of the auxiliary steam-chest E with the stem F<sup>3</sup>, on which are fastened, by means of set-screws, the collars F<sup>4</sup> F<sup>5</sup>, placed at suitable distances apart, and between which slides the upper end of the arm G, fastened to the piston-rod C. The auxiliary steam-chest E is also provided with the  
40 three ports *d*, *e*, and *f*, which correspond with the upper ends of the ports *a*, *b*, and *c* of the steam-cylinder A, and with the similar ports, *g*, *h*, and *i*, leading to the valve-seat E' of the steam-chest D. The auxiliary steam-chest E  
45 is also provided with the ports *k* and *l*, the upper ends of which connect with similar ports *m* and *n*, leading to the ends of the valve-seat

D' of the steam-chest D, and the lower ends of the said ports *k* and *l* connect with the exhaust-  
50 port *c* of the steam-cylinder A by means of the recesses *o* and *p*, cut in the under face of the auxiliary steam-chest E. The steam-chest D is provided on top with the steam-inlet D<sup>3</sup>, which connects with the steam-chamber D<sup>4</sup>, leading to the valve-seat D'. The main valve  
60 or piston H is provided with three annular grooves, H<sup>1</sup>, H<sup>2</sup>, and H<sup>3</sup>, of which the grooves H<sup>1</sup> and H<sup>3</sup> alternately connect the steam-chamber D<sup>4</sup> with the ports *g* and *i*, and the groove H<sup>2</sup> connects alternately the ports *g* and *i* with  
65 the exhaust-port *h*. The valve H is provided with longitudinal grooves H<sup>4</sup>, so as to admit steam behind its ends to form a steam-cushion in the valve-seat D'. The cylinder A is also provided on each end with a small groove, R,  
70 which extends from the ports *a* and *b* to the cylinder-heads, so as to form a steam-cushion for the piston B, and also to start the piston B on its return-stroke in the opposite direction by admitting live steam through the small  
75 groove R to the back of the main piston B.

The operation is as follows: The piston and valves, as shown in Figs. 1 and 3, are in the position they occupy when in the center of the  
80 stroke. The steam enters through the inlet D<sup>3</sup>, and passes from the chamber D<sup>4</sup> around the annular groove H<sup>3</sup> to the ports *i*, *f*, and *b*, and to the steam-cylinder A, thereby moving the piston B in the direction of the arrow *a'*. The steam on the other side of the piston B  
85 passes through the ports *a*, *d*, and *g* into the valve-seat D' around the annular groove H<sup>2</sup>, and down through the ports *h* and *e* into the exhaust-port *c*, from which it can escape by the outlets *c'* and *c''*, formed on each side of the  
90 steam-cylinder A. When the piston B comes near the end of its stroke, the arm G strikes the collar F<sup>4</sup> and moves the auxiliary valve F in the direction of the arrow *a'*, so that the ports F' and *k* are disconnected and the ports  
95 F<sup>2</sup> and *l* are put in communication with each other, so that the live steam exerting pressure against the valve H in the annular grooves H<sup>1</sup> and H<sup>3</sup> moves the valve H' in the inverse direction of the arrow *a'*, thereby connecting  
100 the steam-chamber D<sup>4</sup> with the port *g*, and placing the ports H<sup>2</sup>, *h*, and *i* in communication with each other, so as to reverse the motion of the piston B. The same movements in

reverse order take place, as stated, until the arm G strikes the other collar, F<sup>5</sup>, whereby the movement of the piston is again reversed. The steam in the valve-seat D' behind the ends of the main valve H exhausts alternately through the ports *n*, F<sup>2</sup>, and *l* into the groove *p* and through the ports *m*, *k*, and F' and the groove *o* into the exhaust-port *c*.

In the modification, as shown in Fig. 4, I attach to the main valve H a common slide-valve, T, which operates in precisely the same manner as the annular recess H<sup>2</sup> of the valve H, as before described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

The steam-valve gear herein described, the same consisting of the steam-cylinder A, having exhaust-port *c* and ports *a b* leading from the ends of the cylinder to the center of

the top, the piston B, the auxiliary steam-chest E, resting on the cylinder A and having central ports, *d e f*, registering with the ports *a b*, and end ports, *k l*, leading through passages *o p*, between the cylinder and chest, to the exhaust *c*, the auxiliary valve or piston F, having annular spaces F' F<sup>2</sup>, to register with ports *k l*, and intermittently operated from the piston B, the chest D on the chest E, having ports *g h i* in alignment with the ports *d e f a c b*, end ports, *m n*, in alignment with the ports *k l*, inlet-port D<sup>2</sup>, and a sliding valve in the chest D, adapted to close the ports *m g h* on one stroke and open the ports *i l*, and vice versa, substantially as set forth.

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Witnesses:

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