(No Model.)

W. F. GARRISON.

STEAM ACTUATED VALVE.

No. 265,226. Patented Sept. 26, 1882.

Fig 1.

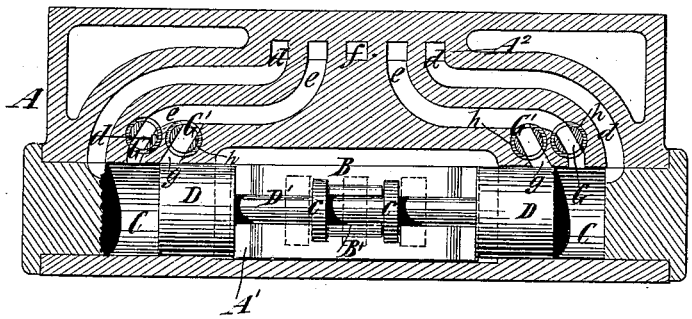


Fig 2.

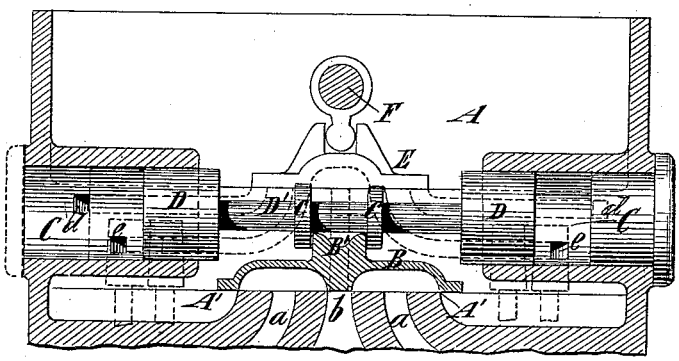


Fig 4.

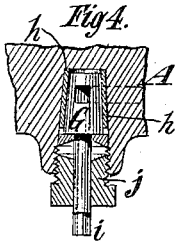
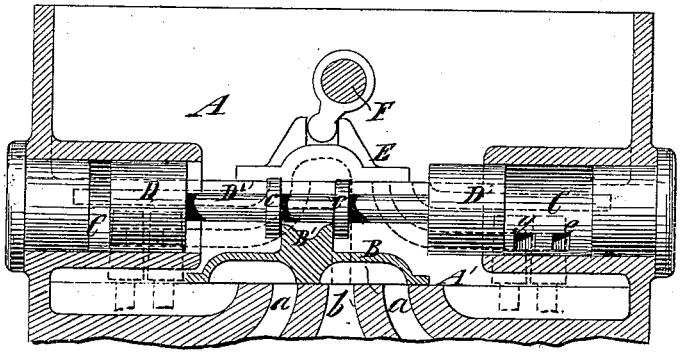


Fig 3.



Witnesses
Chas. Wayner
Ed. Moran

Inventor
William F. Garrison
by his Attorneys
Brown & Brown

UNITED STATES PATENT OFFICE.

WILLIAM F. GARRISON, OF BROOKLYN, NEW YORK, ASSIGNOR TO GUILD & GARRISON, OF SAME PLACE.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 265,226, dated September 26, 1882.

Application filed April 21, 1882. (No model.)

To all whom it may concern:

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

My invention relates to direct-acting engines which are frequently used to operate pumps, and in which the main slide-valve is operated by an auxiliary piston working within an auxiliary cylinder to which steam is admitted by an auxiliary valve operated from the moving piston-rod of the engine.

An important object of my invention is to prevent the main valve from being thrown suddenly from wide open in one direction to wide open in the other direction, but to move the valve as quickly as desirable throughout the first half of the stroke to cut off the steam from the end of the main cylinder, in which it has just done its work, and then move it slowly throughout the remainder of the stroke to admit steam to the opposite end of the main cylinder.

To this end the invention consists in the combination, with the auxiliary piston and an auxiliary cylinder having separate induction and eduction ports at opposite ends, of means for throttling or partially closing the eduction-ports, so as to control the movement of the auxiliary piston, so that it may move as rapidly as desirable during the first part of its stroke and may complete its movement very gradually and come to rest without shock or jar. This throttling of the eduction-ports may be accomplished by having a single eduction-port at each end of the cylinder provided with a controlling cock or valve, or by providing an additional or branch eduction-port at each end, and which is farther from the end of the cylinder than the principal eduction-port, so that it will be closed by the auxiliary piston by the time the latter reaches the center of its movement; and both the main eduction-ports of the auxiliary cylinder and the additional eduction-ports may be throttled by similar controlling cocks or valves, as hereinafter fully described.

The invention also consists in the combination, in a direct-acting engine, with a main-valve chest containing a main valve and an auxiliary cylinder, and provided with an auxiliary-valve seat containing separate induction and eduction ports leading to each end of said cylinder, and a single exhaust-port, of an auxiliary valve operated from the piston-rod of the engine and controlling the admission of steam to and its exhaust from the said auxiliary cylinder, as hereinafter more fully described.

In the accompanying drawings, Figure 1 represents a horizontal section of a steam-chest and auxiliary cylinder of an engine embodying my invention. Fig. 2 represents a vertical section thereof with the valve in its central position. Fig. 3 represents a section similar to Fig. 2, showing the valve wide open in one direction; and Fig. 4 represents a detail sectional view of a portion of the chest, showing a cock or valve for throttling the exhaust.

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

A designates the main steam-chest of the engine, and A′ designates the main-valve seat on which the main slide-valve B works. In the valve-seat A′ are two main induction-ports, *a*, leading to the opposite ends of the main cylinder, and a main eduction-port, *b*, leading to the atmosphere; and the valve B is provided with two coves or cavities, which place the induction-ports *a* alternately in communication with the steam-space in the chest and with the eduction-port *b*.

C designates the auxiliary cylinder, a part of which is formed in each end of the chest A; and D designates the auxiliary piston, which is composed of two heads connected by a rod, D′, on which are two collars, *c*, which receive between them a projection, B′, on the back of the main valve B, and which impart the movements of the said piston to said valve.

In the chest A is formed an auxiliary-valve seat, A^2, upon which works an auxiliary valve, E, which may be operated in the usual way by a rock-shaft, F, to which motion is transmitted from the moving piston-rod of the engine.

In the valve-seat A^2 are five ports, *d*, *d*, *e*, *e*, and *f*. (Shown clearly in Fig. 1 and in dotted lines in Figs. 2 and 3.) The outermost or end ports, *d d*, lead to the auxiliary cylinder C, near opposite ends thereof, and constitute induction-ports to admit steam to the said auxiliary cylinder. The ports *e e* lead to the aux-

iliary cylinder, near each end thereof, but farther from the ends than the ports *d d*, and constitute principal eduction-ports through which steam is exhausted from said cylinder; and the single port *f* is a common eduction-port leading to the eduction-port *b* of the main cylinder.

In the chest A are branch eduction-ports *g*, which are clearly shown in Fig. 1, and which form communication between the principal eduction-ports *e* and the auxiliary cylinder C, at a greater distance from the ends thereof than the points at which the ports *e* themselves enter said cylinder. The eduction-ports *e* are provided with cocks or valves G, by which the passage of steam through them may be regulated; and the branch eduction-ports *g* are provided with similar cocks or valves, G′, for a like purpose. These cocks or valves may be of any suitable construction; but as here represented they consist simply of cock-plugs which are fitted to bushings or sleeves *h*, which are driven into the chest A, and which form seats therefor. The said cocks or valves are provided with stems *i*, which project through stuffing-boxes *j* to the exterior of the chest A, and they may be turned by a wrench or key applied to the stems to more or less throttle or contract the ports *e g*, and thus control or regulate the passage of steam through them.

In Figs. 1 and 2 the main valve B and the auxiliary piston D are shown in their central position, and in Fig. 3 they are shown in the position they will occupy when moved fully to the left, and in which position they remain stationary, thus leaving the left-hand main induction-port *a* open to the steam to admit steam to the left-hand end of the main cylinder. The engine-piston has at this time completed its full movement toward the right and has moved the auxiliary valve E far enough to the right to uncover the left-hand induction-port *d*. It will be observed that when the auxiliary piston D is in this position it leaves both the right-hand ports *e* and *g* uncovered in the cylinder C. The steam now enters the cylinder C through the induction-port *d* and forces the auxiliary piston D toward the right, and the main valve B, by its connection therewith, is also moved in the same direction. This movement is very rapid until the piston and valve approach their central position, because the eduction-ports *e g* on the right-hand end of the piston D are uncovered, and the main valve B will therefore be moved very quickly toward the right to cut off steam from the left-hand main eduction-port *a;* but as soon as the piston covers the left-hand branch port *g*, in which position it is shown in Figs. 1 and 2, the exhaust is throttled by only having the one port *e* for the steam to escape, and remaining portion of the movement toward the right is much slower, thereby uncovering the right-hand main induction-port much more slowly than it would otherwise be uncovered. By turning the valve G the escape of steam may be retarded as much as desirable, and consequently it will be seen that by regulating said valve the steam may be exhausted as fast or as slow as is desirable, and the last half or portion of the movement of the auxiliary piston and main valve may be made as fast or slow as is desired. The covering of the branch eduction-port *g* by the auxiliary piston constitutes one means whereby the throttling of the exhaust may be accomplished, and the adjustment of the controlling-valves G G′ constitutes a further means whereby the same result may be obtained. After the auxiliary piston and main valve complete their movement toward the right they remain stationary until the engine-piston and auxiliary valve E complete or nearly complete their movement toward the left, when steam will be admitted on the right-hand side of the auxiliary piston, and the said piston and main valve will be moved toward the left, first quickly and then more slowly, as previously described.

In some cases the branch ports *g* and their valves G′ may be dispensed with and the gradual throttling of the exhaust be effected by the valves G in the ports *e*, and in such case the said ports *e* should be so arranged that the pistons may pass and close them, and so complete the throttling of the exhaust. The valves G G′ might be entirely dispensed with and the passages *e g* only be employed; but in the latter case no means of varying the degree of throttling the exhaust would be afforded.

By giving the main valve a proper lap the steam may be cut off from the main cylinder at any point within certain limits—say anywhere beyond three-quarter stroke of the main piston.

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

1. In a direct-acting engine, the combination, with an auxiliary piston and an auxiliary cylinder having separate induction and eduction ports at opposite ends, of means, substantially as described, for throttling or partly closing the eduction-ports, so that the auxiliary piston will be moved as rapidly as desirable during the first part of its movement and more slowly during the remaining portion of its movement, substantially as and for the purpose specified.

2. In a direct-acting engine, the combination, with an auxiliary piston, of an auxiliary cylinder provided at opposite ends with separate induction and principal eduction ports, and also provided with branch eduction-ports, leading from said principal eduction-ports, and terminating at a greater distance from the ends of the cylinder than said principal ports, substantially as and for the purpose specified.

3. In a direct-acting engine, the combination, with an auxiliary piston and an auxiliary cylinder provided with separate induction and eduction ports at each end, of cocks or valves for throttling or contracting said eduction-ports, substantially as and for the purpose specified.

4. The combination of the main valve B, the

auxiliary cylinder C, provided with the induction-ports *d*, the principal eduction-ports *e*, and the branch eduction-ports *g*, the controlling-valves G G′, and the auxiliary piston D, all substantially as and for the purpose specified.

5. The combination of the valve-chest A, containing the auxiliary-valve seat A^2, provided with ports *d d e e f*, the auxiliary cylinder C, the main valve B, and the auxiliary valve E, all substantially as and for the purpose specified.

W. F. GARRISON.

Witnesses:
FREDK. HAYNES,
ED MORAN.