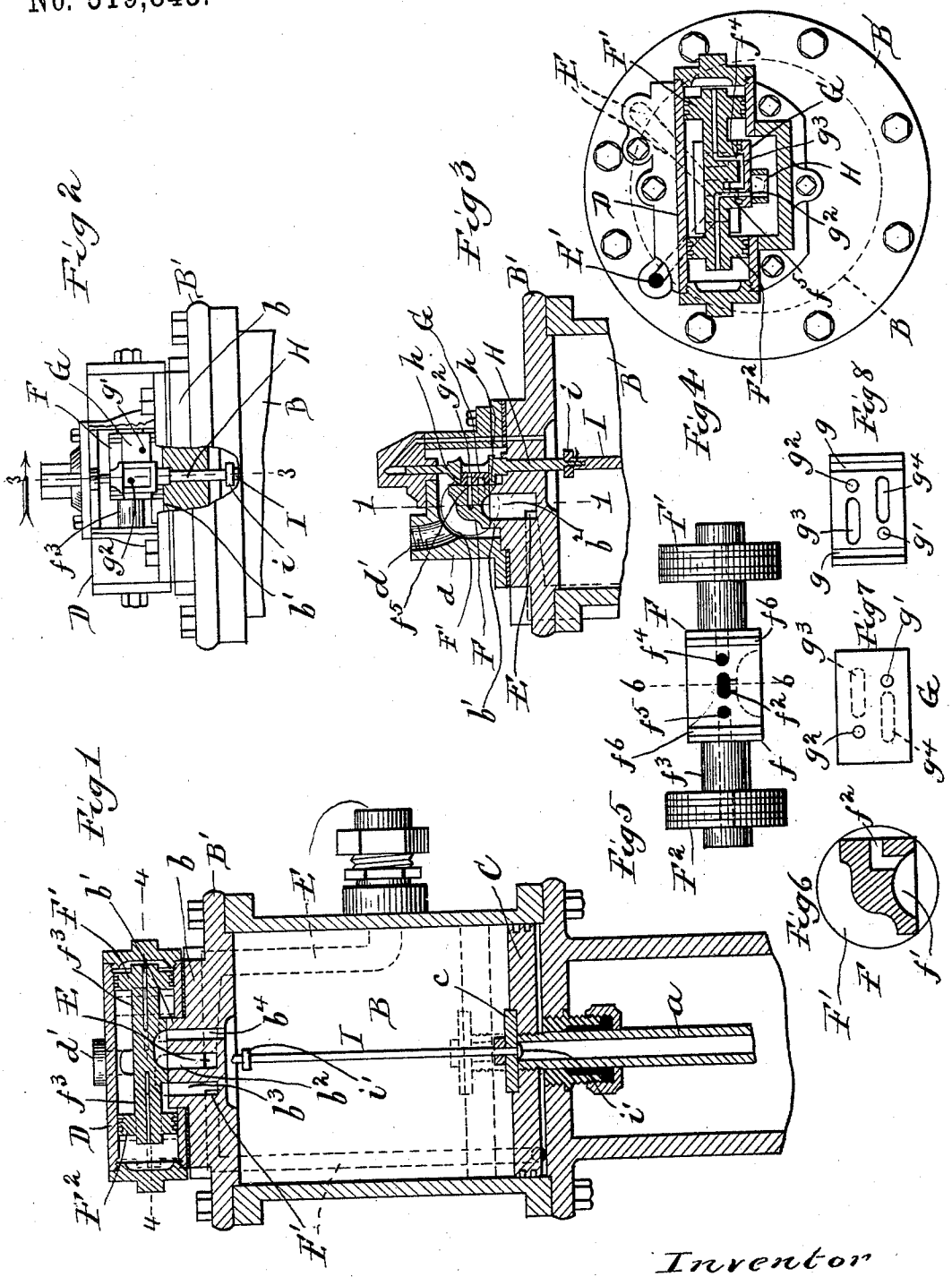
(No Model.)

J. T. HAYDEN.

STEAM ACTUATED VALVE FOR PUMPS.

No. 519,843. Patented May 15, 1894.



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STEAM-ACTUATED VALVE FOR PUMPS.

SPECIFICATION forming part of Letters Patent No. 519,843, dated May 15, 1894.

Application filed October 2, 1893. Serial No. 486,997. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. HAYDEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Actuated Valves for Pumps, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a vertical section of a pump embodying my invention, the pump cylinder proper and its piston being mainly broken away, taken on the line 1. 1 of Fig. 3; Fig. 2, a front elevation of the valve chamber, partly broken away; Fig. 3, a detail vertical section, taken on the line 3. 3 of Fig. 2; Fig. 4, a plan section taken on the line 4. 4 of Fig. 1; Fig. 5, a front elevation of the valve detached; Fig. 6, a detail cross-section, taken on the line 6. 6 of Fig. 5; Fig. 7, a front elevation of the port-slide detached; and Fig. 8, a rear elevation of the same.

In the drawings, Figs. 1 to 4 inclusive are upon one and the same scale; and Figs. 5 to 8 inclusive are upon one and the same enlarged scale.

My invention relates to valve mechanism for steam and other vapor engines, especially engines intended for air-pumps and other like uses.

The invention consists in certain improvements in the valve and the devices for operating and controlling the same, which will more fully appear from the detailed description of the construction and operation of this mechanism, which I will now set forth, and will then point out more definitely in claims the special improvements which I believe to be new and desire to secure by Letters Patent.

In the drawings I have shown the invention applied to an air-pump, such as is used on locomotives for supplying air to the main reservoir of an air-brake apparatus; but this is for illustration only and I do not in any way limit my invention to this particular application. Only so much of the structure is shown as is necessary to an understanding of the present improvements, as the main parts of the pump are of any ordinary construction, and are not necessary to be shown and described here for an understanding of this invention.

In the drawings, A represents a portion of the chamber which is usually interposed between the air-pump cylinder and the steam cylinder, and *a*, the stem of the piston which works in the air-cylinder and extends up into the steam-cylinder, B, which is provided with the usual piston, C, attached to the upper end of the piston-rod, *a*. The cap or main head, B′, of the cylinder, B, is constructed with a slightly raised portion, *b*, extending partly over the cap, upon which is seated a valve chest, D, being secured thereto by screw-bolts, as seen in Figs. 3 and 4. On this raised portion, *b*, there is also a second raised section, *b′*, lifted a little above the level of *b*, and forming the seat for the controlling valve, as will presently appear. Ports are provided in this raised section as follows: About the center thereof is sunk a large port, b^2, on one side of which is a similar sunken port, b^3, and on the other side a through port, b^4, extending entirely through the cap and opening into the upper end of the cylinder. The port, b^2, is the exhaust port, and the exhaust pipe, E, connects directly with this port and extends thence outward radially to the edge of the cylinder and then is bent downward and carried on the side of the latter, as seen in Figs. 1 and 4. A conductor or delivery-pipe, E′, connects immediately with the sunken port, b^3, and extends thence outward radially and at an angle to the pipe, E, to the edge of the cylinder and then down the outside of the latter to the bottom thereof, where it again enters the extreme lower end of the cylinder, as seen in Figs. 1 and 3. The valve-chest, D, is of circular shape, but at the back has an outward extension, *d*, thus enlarging the chamber and extending it well back over the valve-seat, as seen in Fig. 3. A large aperture or port, *d′*, opens from the exterior into this rear portion of the chamber, as seen in Fig. 3, and the main feed-pipe is connected with this opening to supply steam to the chamber within the chest. A valve, F, is mounted within the chest, the central portion or body, *f*, of which is seated on the raised surface, *b′*. A recess, *f′*, is cut out in the un-

der side of this seat portion of the valve and about central thereof, as seen in Figs. 1 and 6, and at the front side of the valve there is a central port, f^2, extending inward horizontally a slight distance and then turning down at right angles and opening into the said recess, as seen in Figs. 5 and 6.

The body or seat portion of the valve is provided with cylindrical extensions, f^3, at its respective ends, on each of which is mounted a small piston, F′ and F², the former being seen at the right hand and the latter at the left hand of the valve in the section shown in Fig. 1, looking from what may be called the front of the structure. These pistons are fitted to the circular ends of the valve chest which form suitable cylinders therefor, as seen in Figs. 1 and 4, and the entire valve is somewhat shorter than the chest, so as to allow its reciprocation to a limited extent.

A port, f^4, leads into the body of the valve at the side thereof just at the right hand of the central exhaust port, as seen in Fig. 5, and then is bent at right angles outward and extends out entirely through the piston, F′, as seen in Fig. 1. A like port, f^5, is let into the valve at the left of the exhaust port and then is bent at right angles and extends straight outward through the valve and its piston, F², as also seen in Fig. 1. All three ports are in a plane face on one side of the valve.

A port controller or supplementary valve, G, is mounted on the front face of the valve, F, and adapted to slide vertically thereon. This valve is a plain rectangular plate provided on its inner face with vertical grooves, g, at its respective ends, which are adapted to receive similar splines or ribs, f^6, on the front of the valve, as seen in Figs. 4, 5 and 8, thereby providing guides for this supplementary valve on which it is free to slide up and down. This supplementary valve is provided with a port, g', located near the lower right hand corner, as seen in Fig. 7, and in a vertical line with the port, f^4, in the main valve, when the slide is mounted in place upon its guides. It is also provided with a similar port, g^2, located in the upper left hand corner thereof, and arranged in the same vertical line with the left hand port, f^5, when mounted in position. In the back of this supplementary valve there are also provided two recesses, g^3 and g^4, the former commencing near the upper right hand corner of the plate and extending lengthwise of the same nearly to the port, g^2, and the latter commencing near the lower left hand corner of the same and extending inward nearly to the right hand port, g', as seen in Figs. 7 and 8. If the supplementary valve is slid up and down when mounted on its guides at the front of the main valve, it is obvious that the ports therein will be brought alternately into register with the respective side ports in the front of the main valve, and the recesses at the back of this slide will at the same time alternately register with the exhaust port in the main valve. This reciprocation of the supplementary valve is effected by means already known and in use, consisting of a sliding carrier, H, on the cylinder cap, its lower end passing down through the latter loosely, as seen in Fig. 3. This vertically sliding carrier is provided with lips, h, upon its inside which receive and embrace the supplementary slide, as seen in Figs. 2 and 3, so that the latter will be moved up and down by the vertical movement of the carrier, and also slide laterally therein as carried by the main valve. The lower end of the carrier inside the cylinder is connected to the upper end of a rod, I, arranged within the cylinder and provided at this upper end with a button, i. The rod passes down within the cylinder and is fitted loosely through a cap, c, on the piston, C, closing the upper end of the piston rod, a, which is hollow, as seen in Fig. 1. The lower end of the rod, I, is provided with a head, i', by which it is prevented from passing up through the cap, c, but at the same time the latter is free to slip upon the rod, as the piston is moved upward, the hollow piston rod, a, accommodating this movement. But when the piston nearly reaches the end of its upward stroke, this cap strikes the button on the upper end of the rod, I, thereby lifting it, and with it the carrier, which will, of course, raise the sliding supplementary valve. Then, again, in the downward movement of the piston near the end of its stroke, it strikes the head on the lower end of the rod, I, thereby pulling it downward and so producing a corresponding downward movement of the carrier and supplementary-valve to which it is connected. These parts are relatively constructed and arranged so that the upward movement of the sliding carrier will bring the lower right hand port, g', into register with the right hand port, f^4, in the main valve, and at the same time the lower recess, g^4, will be brought into register with the exhaust port, f^2; and the downward slide of this valve will bring the upper left hand port, g^2, into register with the left hand port, f^5, of the valve, and the upper recess, g^3, will register with the exhaust port. Thus alternately connection is opened and closed between the steam chamber of the valve chest and the respective cylindrical ends thereof and with the exhaust passages for the respective ends of the steam cylinder.

Referring to the drawings, in illustration of the operation of the device, Fig. 1 shows the piston at the end of its downward stroke, and the downward pull on the rod, effected as described above, has brought the supplementary slide into the position seen in Fig. 2 with the upper left hand port brought into register with the left hand port, f^5, of the valve. This admits steam at once to the cylindrical end of the valve chest at the left thereof and opens the exhaust to the cylinder at the opposite end, as seen in Fig. 4, and the valve will immediately be thrown over to the right

into the position seen in Fig. 1, carrying the supplementary valve with it. This movement of the valve opens the port, b^3, thereby providing for passage of steam through the pipe, E′, to the under side of the piston. At the same time the through port, b^4, is connected with the exhaust port, b^2, by means of the recess, f', at the under side of the valve, as seen in the same view, Fig. 1. The piston will, of course, at once be lifted, and near the end of its upper stroke strikes the button and lifts the slide, as already described, closing the port, f^5, and raising the lower right hand port, g', into register with the port, f^4, when the valve will at once be shifted again and a reverse operation will take place.

In the special details of construction there may be modifications without destroying the main features of the invention, so that I do not wish to be understood as limiting the invention to the precise details herein described and shown.

Having thus described my invention, what I believe to be new, and desire to secure by Letters Patent, is—

1. In a steam pump, the cylinder provided with delivery and exhaust ports, in combination with a valve chest mounted thereon and having a cylinder chamber at each end, a sliding valve within said chest adapted to control said ports and having a piston at each end, fitting the respective end cylinders of the chest, a port leading to the exhaust and two ports separate from the said exhaust port leading to and through the respective end pistons, a supplementary slide mounted on and movable with the valve over the said ports and provided with ports adapted to be brought into register therewith, and mechanism for reciprocating said slide transversely of the main valve, and adapted to be operated by the movements of the main valve, substantially as described.

2. The valve chest, D, constructed with cylinders at each end, in combination with a valve, F, provided with recess, f', in its under side, and a port f^2, leading to the exhaust and separate ports, f^4 and f^5, leading to the respective cylinders, and arranged at one side of the valve, pistons, F′ and F², mounted on the respective ends of the valve and fitted to the end cylinders in the chest, sliding supplementary valve, G, mounted on and carried with the valve to cover and slide over the ports therein and provided with ports, g'—g^2, adapted to register with the ports leading to the respective cylinders and back recesses, g^3—g^4, adapted to register with the exhaust port, and mechanism for reciprocating this supplementary valve by the movement of the main valve, substantially as described.

3. The cylinder, B, provided with cap, B′, having exhaust port, b^2, sunken port, b^3, and through port, b^4, all opening into the valve-chamber, a delivery pipe, E′, connecting the sunken port, b^3, with the lower or opposite end of the cylinder, exhaust pipe, E, connecting directly with the exhaust port, b^2, valve chest, D, mounted on said cylinder head and provided with a cylinder at each end, valve, F, provided with recess, f', and ports, f^2, f^4, and f^5, pistons, F′ and F², fixed on the respective ends of the valve and fitted to the end cylinders of the valve chest, sliding supplementary valve, G, mounted on ways on the side of the main valve immediately over the ports therein and provided with ports, g'—g^2, and back recesses, g^3—g^4, sliding carrier, H, connected to said supplementary valve, rod, I, connected to said carrier, and piston, C, adapted to operate said rod at the end of its respective strokes, substantially as described.

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Witnesses:
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