(No Model.) 2 Sheets—Sheet 1.

J. A. MEURLING.

STEAM ACTUATED VALVE.

No. 304,344. Patented Sept. 2, 1884.

Fig. 1.

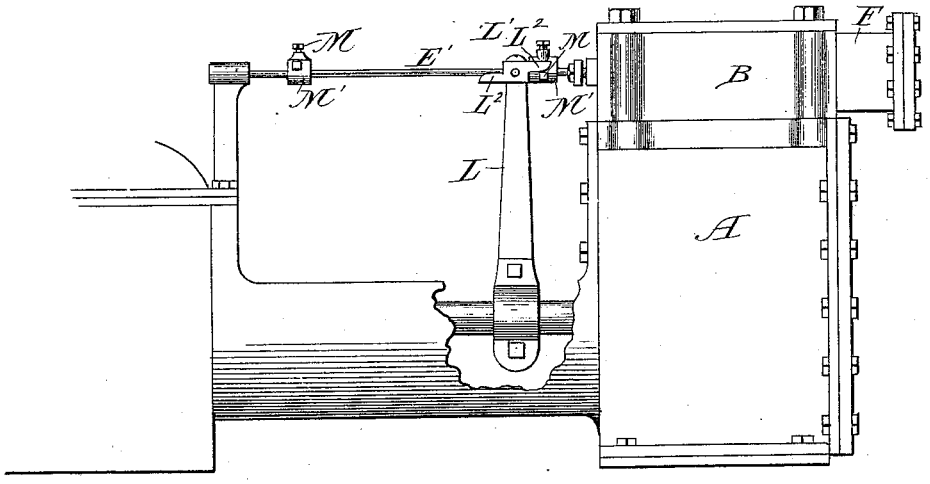
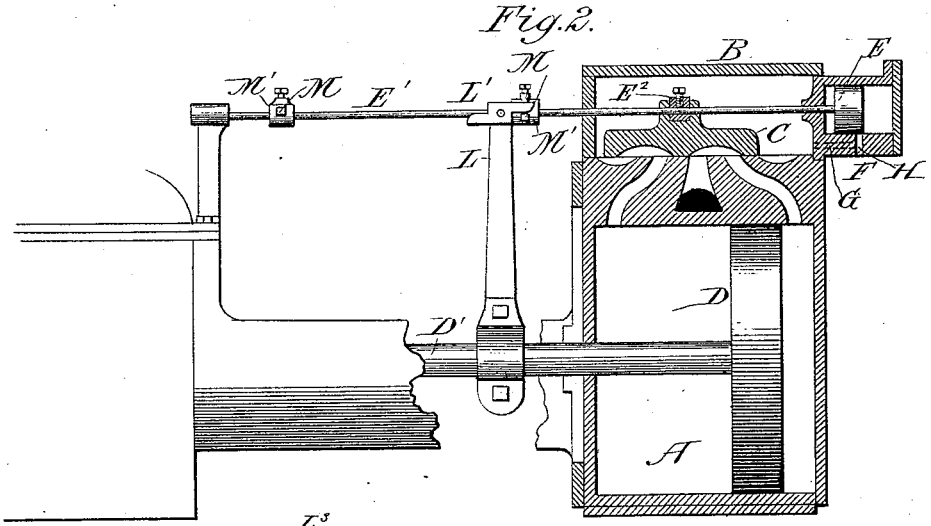


Fig. 2.



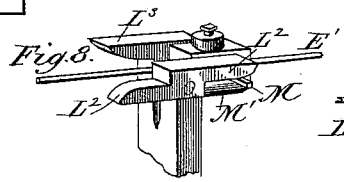


Fig. 3.

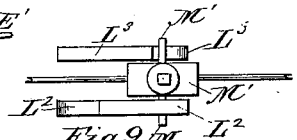


Fig. 9.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

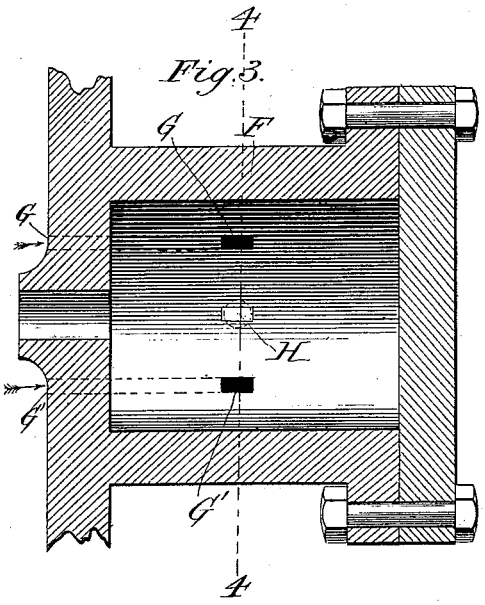


Fig. 6.

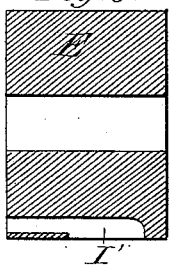


Fig. 4.

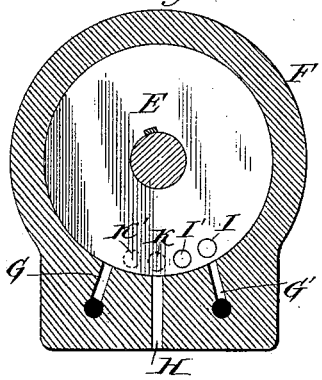


Fig. 5.

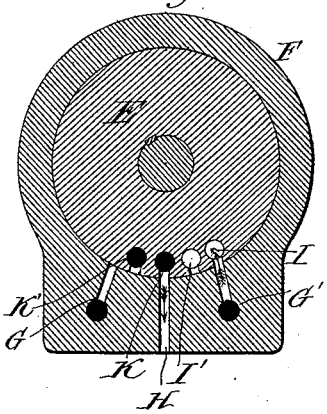
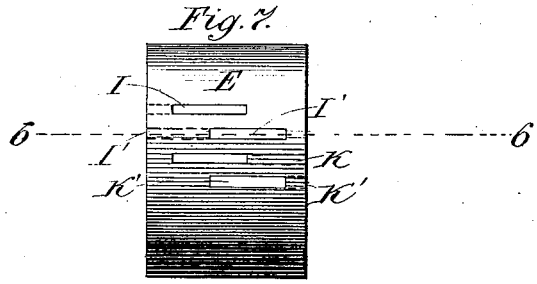


Fig. 7.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN A. MEURLING, OF CHICAGO, ILLINOIS.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 304,344, dated September 2, 1884.

Application filed March 31, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. MEURLING, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Steam-Actuated Valves, of which the following is a specification.

This invention relates to improvements in means for operating valves for piston-cylinders, and is especially applicable to that class of steam-pumps or engines in which a slide-valve arranged to work over the ports connecting the piston-cylinder with the steam-chest has heretofore been operated either by a double piston, for which latter two separate supplemental cylinders have been employed, or by a long oscillatory and longitudinally-reciprocating piston provided at each end portion with a passage leading from its end to a point not far back of the same, and working in a cylinder in which, near each end thereof, is arranged a pair of ports—one for the exhaust and the other for the live steam—so that while the cylinder is taking steam through the passage at one end of the piston it is exhausting through the passages at the opposite end thereof. In said latter instance a pair of supplemental passages has been situated alongside each of said main end passages, the said supplemental passages serving as a means for the admission of steam to the ends of the cylinder for cushioning purposes in case of a too long stroke on the part of the piston; but in either of the above cases the result is substantially that of a double piston and two cylinders, the only material difference between the two being that in one case two cylinders and a single rod provided with two pistons are employed, and in the other a long heavy piston equal in length to the combined length of the two pistons or ends of a double piston, and a long cylinder equal to the combined length of the pair of cylinders provided for the double piston.

The object of my invention is to simplify the construction, decrease the length, weight, cost, and amount of material employed in the construction of a steam-actuated oscillatory and longitudinally-reciprocating supplemental piston or cylindrical valve for operating a slide-valve of the character described, and to provide the supplemental piston and its cylinder with an arrangement of steam-ports or passages whereby the length of both the piston and its cylinder can be decreased at least one-half the length of the supplemental pistons heretofore employed for operating a slide-valve. These objects I attain by the means hereinafter described and claimed, and illustrated in the annexed drawings, in which—

Figure 1 represents a side elevation of my invention embodied in a steam-engine for operating a pump, of which latter a portion of the casing is shown. Fig. 2 shows a longitudinal section taken on a vertical plane through that portion of the engine to which my improvements are applied. Fig. 3 represents on a larger scale a section taken on a horizontal plane through the supplemental cylinder, and shows the arrangement of exhaust and induction ports. Fig. 4 show a section taken transversely through Fig. 3 on the line 4 4, and also represents in elevation one end of the supplemental piston, the ports or passages opening at this end of the latter being shown in full lines and the ports opening at the opposite end thereof being illustrated in dotted lines. Fig. 5 is a like section, and also shows a section taken transversely through the supplemental piston at the middle thereof. Fig. 6 is a longitudinal section taken on line 6 6, Fig. 7. Fig. 7 is a side view of the piston, and shows in full and dotted lines the longitudinal ports or passages formed therein. Fig. 8 is a detail view illustrating in perspective the tappet provided for giving a partial rotation to the supplemental piston at the end of each stroke of the latter. Fig. 9 is a top view of the same.

The steam-piston cylinder A is of any ordinary or suitable construction, and is provided with a steam-chest, B, in which a slide-valve, C, is placed to work over the steam-ports, by which live steam is admitted to the cylinder and exhaust-steam from the latter allowed to pass, as usual, to a condenser or the atmosphere, as the case may be.

The piston D is constructed in any desirable way, and can be employed for operating a pump mechanism or any desired construction of engine.

As a means for operating the slide-valve, I provide a small supplemental piston, E, working within a supplemental piston-cylinder at one end of the steam-chest, and having its rod

E′ connected with the slide-valve, so that a reciprocation of the said supplemental piston shall effect a like reciprocation on the part of the slide-valve.

The cylinder F, provided for the supplemental valve-operating piston, can be secured to or cast in one piece with the steam-chest, and is arranged at one end of the latter, so that the rod of the supplemental piston, working through the ends of the steam-chest, can be extended back and over the rod of the main piston.

The supplemental piston-cylinder F is provided with a pair of induction steam-ports, through which live steam is admitted from the steam-chest for the purpose of driving the supplemental piston, and it is also provided with a single exhaust-port, through which the exhaust-steam is allowed to pass out from the supplemental cylinder.

The two induction-ports G and G′ for the supplemental piston-cylinder open into the latter at points intermediate of the ends thereof, and are conveniently adapted to communicate with the steam-chest by forming two parallel passages through the shell of the supplemental cylinder, (indicated by dotted lines in Figs. 2 and 3,) which said passages run back to and open into the steam-chest.

The exhaust-port H is formed through the shell of the supplemental cylinder at a point intermediate of the steam-induction ports G and G′, whereby said three ports communicate with the supplemental cylinder at points on a line taken transversely through the same.

The supplemental piston E is adapted to act as a valve for the ports of the supplemental cylinder, and to such end it is provided with four passages, so arranged that at any one time but two of these passages can be in register with two of the ports in the supplemental cylinder, whereby while live steam from the steam-chest is allowed to enter the supplemental cylinder at one end of the piston the exhaust shall take place at the opposite end thereof. To such end I provide the supplemental piston E with four longitudinal passages, (indicated by the letters I I′ K K′,) which said passages run in parallel lines, and are arranged to open at opposite ends of the piston, and also at points in the face or perimeter of said piston between the ends of the latter in the following manner, to wit: The passages I and I′ commence at one end of the piston and run back through the same to points where they open at the side or periphery of the piston, while the passages K and K′ commence at the opposite end of the piston and likewise terminate at the periphery of the piston at points between the ends thereof. These passages are each conveniently formed by channeling the side or perimeter of the piston between the ends thereof for a portion of its length, and then extending the passage to the end of the piston by forming a longitudinal bore running from an end of the piston to one end of the said channel, as best illustrated in Fig. 6. These passages are disposed so that when one of them is in register with one of the live-steam ports for the purpose of admitting steam to the supplemental cylinder at one end of the supplemental piston, another one of said passages shall be in register with the exhaust-port, in order to exhaust from said cylinder at the opposite end of its piston. Thus, when the supplemental piston is in position to bring its passage I in register with the induction-port G′ in the cylinder, so as to admit live steam back of the piston, the third passage, K, in the series of passages formed in the piston will be in register with the exhaust-port H in the cylinder, as in Figs. 4 and 5, and hence allow the exhaust to take place in front of the piston, it being seen that passage I opens at one end and passage K at the opposite end of the piston, as indicated by dotted lines in Fig. 7. Assuming the piston to be at the end of its stroke in one direction and its said passages I and K to be respectively in register with one of the live-steam ports and the exhaust-port, the piston will, under the steam-pressure, be driven forward to the completion of its stroke in an opposite direction. Arriving at the terminus of this stroke, it becomes necessary to give a part turn to the piston, so as to change the position of the passage in the piston relatively to the induction and exhaust ports, in order to bring passage K′ in the piston into register with live-steam port G in the cylinder and passage I′ in the said piston into register with the exhaust-port, whereby the order of the admission and exhaust of steam into and from the supplemental cylinder shall be reversed, and hence a reverse stroke be given to the supplemental piston.

As a means for giving a partial rotation to the supplemental piston at the end of each stroke thereof, I provide the rod D′ of the main piston with an arm, L, carrying a tappet, L′, and at points upon the supplemental piston-rod I arrange two pairs of teats or projections, M, lying in the path of said tappet, and so situated upon the supplemental piston-rod that when the main piston is completing its stroke either way the tappet shall engage one of said pairs of projections on the supplemental piston-rod, and thereby cause a partial rotation on the part of the supplemental piston. In order to adjust these projections upon the supplemental piston-rod, I provide upon the latter a pair of sleeves, M′, adjustably secured in any convenient way upon the rod, and each carrying two projections extending laterally from opposite sides of the sleeve. The tappet is provided with two pairs of fingers, L^2 and L^3, one pair of fingers, L^2, being adapted to engage the projections at one side of the supplemental piston-rod, and the remaining pair of fingers, L^3, being adapted to engage the projections at the opposite side of the said supplemental piston-rod. The fingers L^2 are arranged in different horizontal planes, so that when the main piston is completing its stroke one way one of said fingers

L^2 shall engage under a projection at one side of the supplemental piston-rod, and when the main piston is completing its stroke in a reverse direction the remaining one of said fingers L^2 shall engage over a projection at the same side of the supplemental piston-rod as in Fig. 1, whereby the latter, together with its piston, shall be alternately turned in reverse directions. The pair of fingers L^3 is in one respect a duplication of the pair L^2, the only difference being that the fingers L^3 are set reversely to the fingers L^2—that is to say, they are arranged so that when one finger, L^3, is acting under and against a projection at one side of the supplemental piston-rod an opposite finger, L^2, will be acting over and upon the projection diametrically opposite to the said projection against which the said finger L^2 is acting, as in Fig. 9, in which way there will be no liability of twisting the rod, and a more efficient action on the part of the tappet will be attained than if the piston-rod were provided with projections at one side only, and the tappet provided with but one set of fingers.

The sleeves carrying the teats or projections M are adjusted upon the supplemental piston-rod, so that the tappet shall act upon one pair of said projections at a moment when the main piston is completing its stroke either way, whereby at the finish of each stroke of the main piston the supplemental piston shall be in position to admit steam into the supplemental-piston cylinder through the required port, and also to allow the exhaust to take place from the required end of the supplemental-piston cylinder. Should the supplemental piston, after being turned by the tappet, fail, by reason of rust or other cause, to start at the proper moment, the projection just engaged by the tappet will be struck by the body portion of the tappet, advancing with the main piston to the completion of the stroke of the latter, and hence a forward impulse or start will be given to the supplemental piston.

The disposition of such portions of the passages in the supplemental piston as are designed to connect with the ports in the supplemental cylinder is illustrated in Fig. 7, in which it will be seen that these portions of the passages alternately run nearer at one end to one end of the piston, so as to allow the cut-off to take place at the proper moment during the reciprocation of the piston. The supplemental-piston rod is connected in any suitable manner with the slide-valve, so as to admit of the required rocking motion of the rod, and at the same time cause the slide-valve to reciprocate with the supplemental piston E′. This connection between said rod and the valve can be conveniently attained by one or more cross-pieces, E^2, transversely arranged upon the rod, and secured thereon by means of a set-screw, the said cross-piece being adapted to engage and oscillate in a seat or groove formed transversely in the top of the slide-valve, and the required oscillation on the part of said cross-piece about the axis of the rod when the latter is turned either way being permitted by bending up the ends of the cross-piece.

The supplemental piston is arranged so that during and at the end of its stroke either way it lies over the ports in the cylinder, in order that a partial turn of said piston shall bring one of its ports into register with an induction-port, and another one of its ports into register with the eduction or exhaust port in the said cylinder. The piston is also arranged so that there shall be a clearance space between one end of the piston and one of the cylinder heads or ends at the finish of each stroke, whereby the piston shall be steam-cushioned at the completion of its stroke in either direction, and also a clearance space left for the inducted live steam.

It will be seen that the arm L, carrying the tappet, can be properly adjusted upon the main piston-rod, and that the sleeves M′, provided with the projections which are alternately acted upon by the tappet-fingers, can be adjusted upon the supplemental-piston rod.

The main piston by which a pump mechanism or any desired construction of engine is driven is operated in the usual way, and the slide-valve and steam-ports over which the slide-valve works are constructed and arranged to operate in any well-known or convenient manner.

During the operation of the main driving-piston the supplemental piston is operated independently of the said main piston, so as to cause the slide-valve to work over the steam-ports, through which steam is supplied to and allowed to exhaust from the main piston-cylinder, and at the end of each stroke of the supplemental piston the latter is given a partial rotation from the main piston through the medium of the intermediate devices hereinbefore described, so as to shift the position of the ports or passages in the supplemental piston, in order to reverse the stroke thereof. It will also be seen under this arrangement that in addition to the main piston and its cylinder but one supplemental cylinder and one supplemental piston for operating the valve is required, and hence that I produce a simplified and efficient construction of valve-operating mechanism at less than one-half the usual cost. It will also be seen that I dispense with the double supplemental piston and double cylinder or two cylinders for a double piston in a valve-operating mechanism, and that in lieu thereof I provide a single steam-actuated piston connected directly through the medium of its rod with the valve, and while operating as an ordinary piston it also subserves the functions of a rotary or oscillatory valve for the ports of its own cylinder.

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

1. The combination, with a slide-valve, of an oscillatory and longitudinally-reciprocating steam-driven supplemental piston connected with the slide-valve, and provided with steam-passages opening at points both at and midway of its ends, and a cylinder for the supplemental piston, provided with induction and exhaust ports, connecting with the said cylinder at points midway of the ends thereof, substantially as and for the purpose set forth.

2. The combination, with a slide-valve, of an oscillatory and longitudinally-reciprocating steam-driven supplemental steam-actuated piston, connected with the slide-valve, and provided with steam-passages leading from the ends of the supplemental piston to points situated side by side on a line intermediate of the ends thereof, and a cylinder for the supplemental piston, provided with induction and exhaust ports connecting with the cylinders at points side by side on a line transversely to the length of the cylinder and intermediate of the ends thereof, substantially as described.

3. The combination, with a slide-valve, of the supplemental piston E, operating as and for the purpose set forth, and provided with four longitudinal steam-passages leading in pairs from opposite ends of the piston, and all opening at points side by side between the said ends, and a cylinder for the supplemental piston, provided with a single exhaust-port and a pair of induction-ports, all three of which are arranged side by side on a central line transversely to the length of the cylinder, substantially as described.

4. The combination, with a slide-valve, of the short oscillatory and longitudinally-reciprocating supplemental piston constructed to operate in a cylinder situated at one end of the steam-chest, substantially as described, and having its rod passing through the latter and connected with the slide-valve, said cylinder being provided with live-steam ports running from its middle portion back to the steam-chest, substantially as and for the purpose set forth.

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