

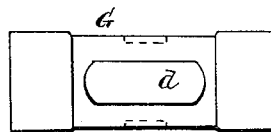
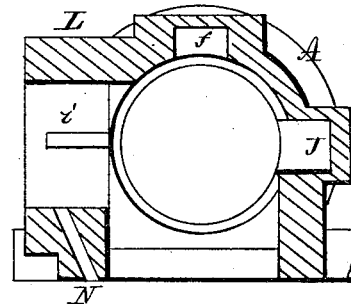
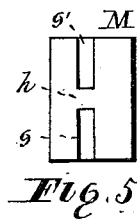
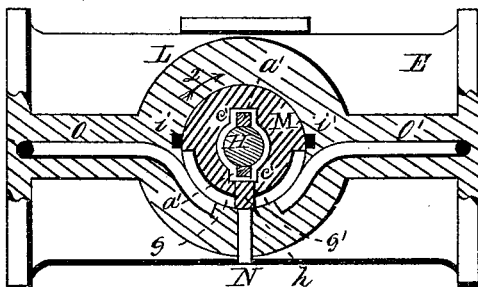
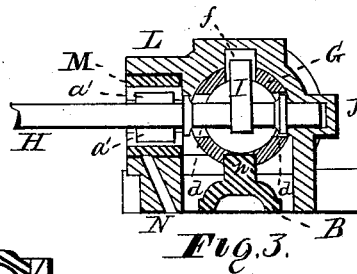
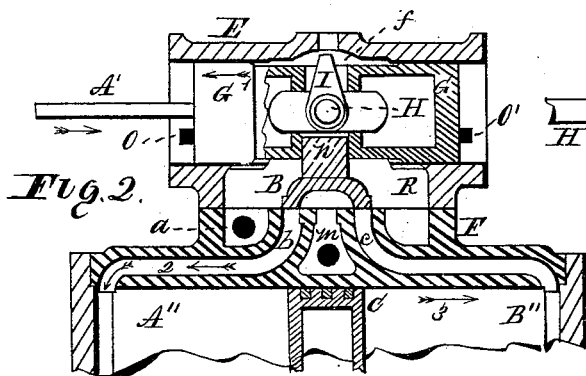
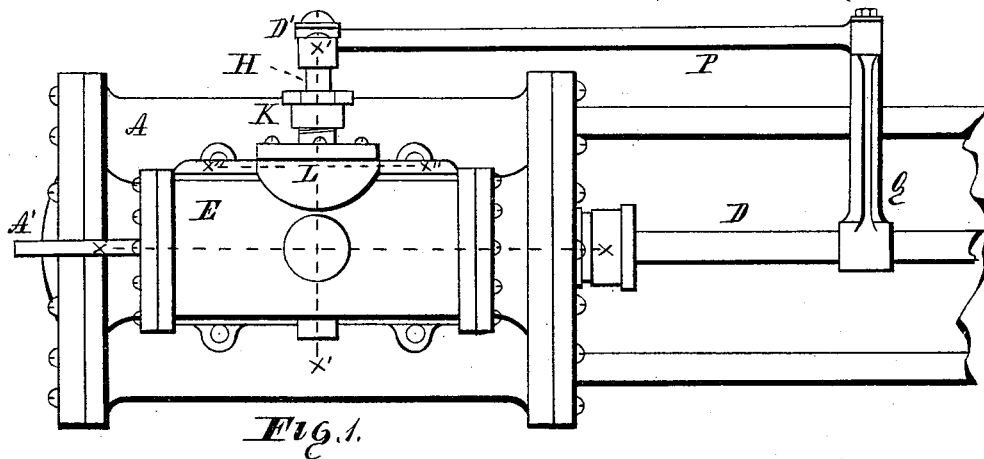
(No Model.)

W. H. & R. HUGHES.

STEAM ACTUATED VALVE.

No. 348,215.

Patented Aug. 31, 1886.



Witnesses.

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Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM H. HUGHES AND ROBERT HUGHES, OF CLEVELAND, OHIO.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 348,215, dated August 31, 1886.

Application filed December 24, 1885. Serial No. 186,613. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. HUGHES and ROBERT HUGHES, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and Improved Steam-Actuated Valve for Steam-Pumps; and we do hereby declare that the following is a full, clear, and complete description thereof.

The valve for steam-pumps, hereinafter described, relates to an oscillating auxiliary valve in connection with a plug-piston for operating the flat reciprocating valve of the steam-cylinder by which said pumps are worked. The construction of the auxiliary valve and piston and the operation of the same in its connection with said reciprocating valve are fully described in the following specification and shown in the accompanying drawings, in which—

Figure 1 represents a plan view of the cylinder containing the auxiliary valve and that of the steam-cylinder to which it is connected. Fig. 2 is a vertical longitudinal section of the two cylinders, taken through the line *x x*, showing the interior mechanism thereof. Fig. 3 is a vertical transverse section through the line *x' x'*. Fig. 4 is a longitudinal vertical section through the line *x'' x''* in Fig. 1, slightly enlarged. Fig. 5 is a detached view of the oscillating valve. Fig. 6 is a sectional view of the valve-chamber and the plug-piston cylinder, the valve and the piston being removed. Fig. 7 is a detached view of a plug-piston.

Like letters of reference refer to like parts in the several views.

In the drawings, A represents a steam-cylinder; B, the sliding valve.

C is the piston, and D the piston-rod by which the said piston C is connected to the piston of a pump. (Not shown in the drawings, as it forms no part of our invention and is not essential to a full understanding of the same.)

On the top of the cylinder A is secured a cylinder, E, in open communication with the steam-chest F of the cylinder A, as seen in Fig. 2, in which *a* is the induction steam-port, and *b c* the steam-ports leading from the steam-chest to the interior of the cylinder A.

In the cylinder E is fitted a hollow plug-piston, G, Figs. 2 and 3. A detached view of the plug-piston is shown in Fig. 7. The two

ends of the plug fit closely in the cylinder, whereas the central part is of smaller diameter, and in each side of which is a slotted opening, *d d*, through which to pass the rock-shaft H and the arm I, attached to said shaft, as seen in Figs. 2 and 3. Said shaft passes transversely through the cylinder E, and has its inner end supported in a bearing, J, Figs. 3 and 6, whereas the outer end of the shaft is secured in a stuffing-box, K, Fig. 1, and thereby made steam-tight in its passage through the side of the cylinder E.

The shaft, when in place in the cylinder, is shown in Fig. 3, in which it will be noticed that the arm I is within the hollow of the plug-piston and projecting upward therefrom through an opening in the plug into the top of the cylinder, in which a recess, *f*, Figs. 2 and 3, is made to receive it, and adapted to allow the end of the arm to vibrate for working the plug-piston, as and for the purpose presently shown.

From one side of the cylinder E projects an annular chamber, L, in which is fitted the auxiliary oscillating valve M, Figs. 3 and 4, above referred to. A detached view of the said valve is shown in Fig. 5. The rock-shaft H passes through the valve M, but is not rigidly connected therewith, but operates the valve by means of the feathers *a' a'*, Figs. 3 and 4, projecting from the shaft, respectively, into the notches *c' c'*, made in the sides of the eye of the valve, as shown in said Figs. 3 and 4, in which it will be noticed that the feathers alluded to are not closely fitted in the notches, there being some space between the feathers and the sides of the notches to allow a slight play of the feathers before they actuate the valve.

In the periphery of the valve are two steam-ports, *g* and *g'*, Figs. 4 and 5, between which is a bridge or blank, *h*. Said bridge is adapted to cover or close the exhaust-port N, and the blank portion of the valve above the ends of said ports *g* and *g'* cover the steam-induction ports *i i*, made in the walls of the valve-chamber, as seen in Figs. 4 and 6. Said ports *i* and *i'* open into the cylinder E, as seen in Fig. 6, in which one of the ports, *i*, is shown. The ports *g* and *g'* are arranged in open relation to the steam-passages O and O', respectively, as

shown in Fig. 4. Said passages lead from the valve to each end of the cylinder E, respectively, as shown in said Fig. 4, and in which they terminate at each end of the plug-piston, as seen in Fig. 2 at O and O'.

The sliding valve B of the cylinder A, above alluded to, is attached to the plug-piston G by a stem, *n*, projecting upward therefrom into the plug-piston G, through an opening therein for that purpose, as seen in Figs. 2 and 3, and by which plug the said valve B is operated. The rock-shaft H, by which the valve M is actuated, is attached to the piston-rod D of the cylinder A by a connecting-rod, P, one end of which is connected to an arm, Q, Fig. 1, projecting from said rod D, and the opposite end of said rod P is connected to a crank-arm, D', depending from the rock-shaft, and by which the shaft is rocked for operating the valve M.

The operation of the above-described mechanism is substantially as follows: As shown in the drawings, all the steam-ports are closed—for illustration, the ports *i i'*, by the blank portion of the valve M, and the exhaust-port N by the bridge *h*, and the ports *b* and *c* by the valve B. In this condition of the steam-ports the plug-piston is centrally in the cylinder E, and the slide-valve B covers the ports *b c* of the cylinder A. In this condition of the several valves and ports the machine is at rest. In order to start the pump, (not shown in the drawings, but which is worked by the piston-rod D,) steam is admitted into the steam-chest F of the cylinder A through the steam-inlet *a*, Fig. 2, which fills the said chest, and also the steam-chest R of the cylinder E, and also the space in the cylinder around the central part of the plug-piston, and also the hollow in said plug-piston. To first start the machine when in the condition shown in the drawings, with all the steam-ports closed, which seldom happens, the plug-piston is pushed at first forward by the rod A' in the direction of the arrow. This movement of the plug opens the valve B and admits steam into the end A'' of the cylinder A through the induction-port *b*, thereby driving the piston C to the end B''. During this movement of the piston C the arm Q on the piston-rod D, by means of the con-

necting-rod P, operates the rock-shaft H, and the arm I thereof starts the plug-piston in the opposite direction, as indicated by the arrow 1. At the same time the feathers *a' a'* of the shaft H move the valve M in the direction of the arrow 2, bringing the port *g'* to the port *i'*, thus allowing steam to be admitted to the port O', thereby carrying the plug-piston, which had been previously started by the arm I, a full stroke, and at the same time moving the valve B and opening port *c*, allowing steam to enter the end B'' of the cylinder A and drive the piston to the end A''. The steam escapes from the end A'' of the cylinder, through valve B, to the exhaust *m*, as in an ordinary steam-engine. During this time steam escapes from the cylinder E through the port O and port *g*, thence to the exhaust-port N, which may be in connection with the exhaust-port *m*, or an independent exhaust.

The above open relation of the ports O and *g* and exhaust N is effected by the movement of the valve M in the direction of the arrow 2, above described, which at the same time opens the ports *i'* and *g'*, as above mentioned, and so on alternately during the operation of the machine.

Steam is taken at one end of the cylinder, and by the co-operation of the several valves and steam-ports, motion is given in one direction to the piston C for actuating the pump, and by a similar movement of the corresponding valves and ports a reverse action is effected for the reverse stroke of the pump.

What we claim as our invention, and desire to secure by Letters Patent, is—

In combination with the oscillating valve and plug-piston, the rock-shaft H, provided with a feather or feathers, and arm I, for operating said valve and piston, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM H. HUGHES.
ROBERT HUGHES.

Witnesses:

J. H. BURRIDGE,
M. L. DEERING.