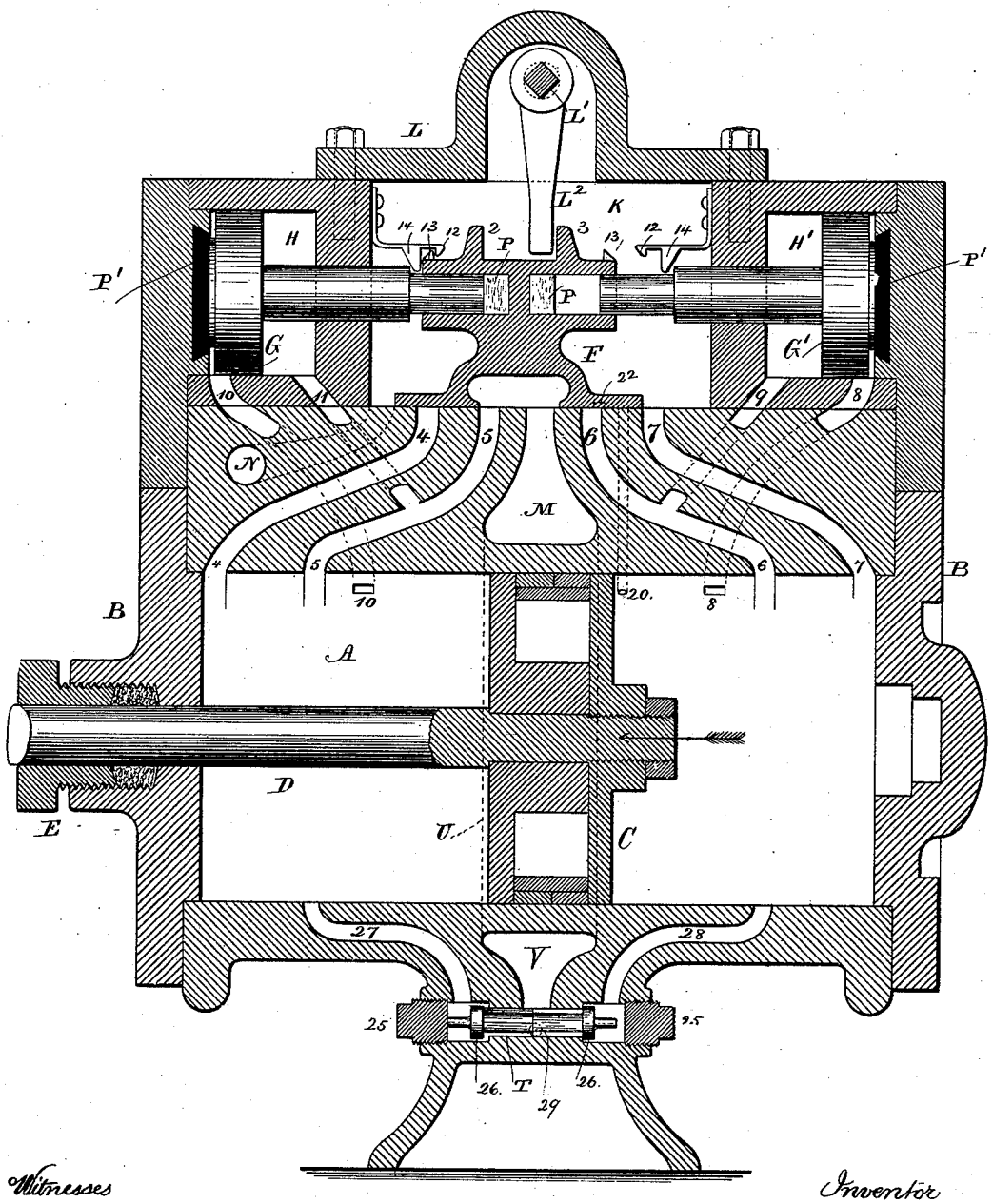
(No Model.) 3 Sheets—Sheet 1.

L. B. CARRICABURU.

STEAM ACTUATED VALVE.

No. 303,704. Patented Aug. 19, 1884.

Fig. 1.



Witnesses

Chas. H. Smith
Harold Serrell

Inventor

Leon B. Carricaburu

per Samuel W. Serrell atty.

(No Model.) 3 Sheets—Sheet 2.

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STEAM ACTUATED VALVE.

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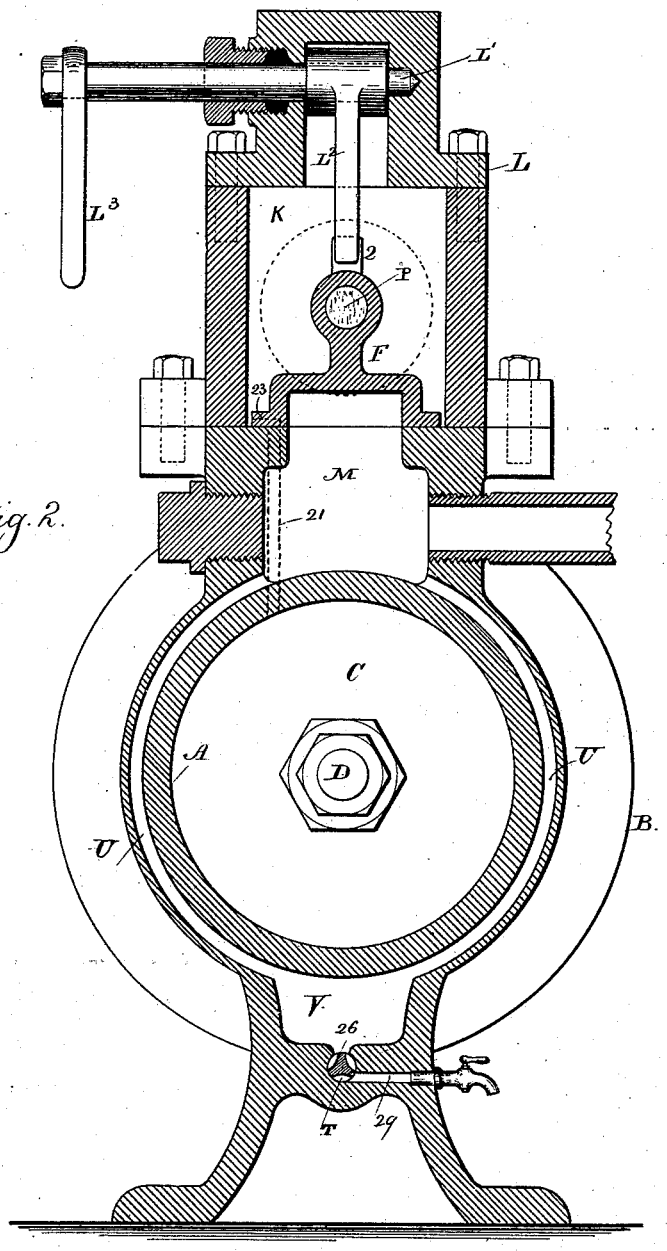
Fig. 2.



Witnesses
Chas. H. Smith
Harold Serrell

Inventor
Leon B. Carricaburu
per Lemuel W. Serrell
atty

(No Model.) 3 Sheets—Sheet 3.

L. B. CARRICABURU.

STEAM ACTUATED VALVE.

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Fig. 4.

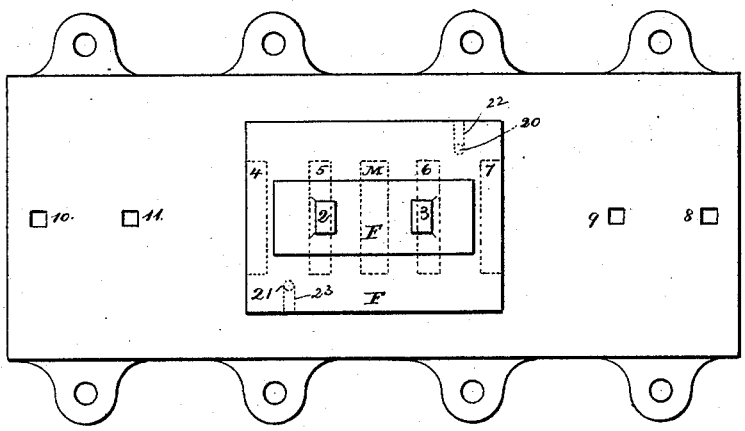
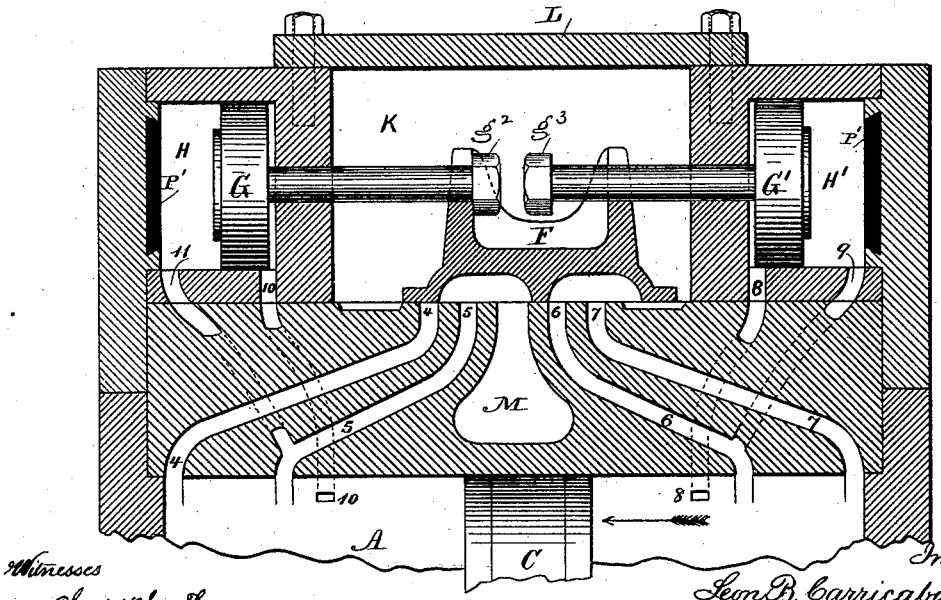


Fig. 3.



Witnesses
Chas. H. Smith
Harold Serrell

Inventor
Leon B. Carricaburu
per Lemuel W. Serrell
atty

UNITED STATES PATENT OFFICE.

LEON B. CARRICABURU, OF NEW YORK, N. Y.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 303,704, dated August 19, 1884.

Application filed January 21, 1884. (No model.)

To all whom it may concern:

Be it known that I, LEON B. CARRICABURU, of the city and State of New York, have invented an Improvement in Steam-Actuated Valves for Engines, of which the following is a specification.

This engine is intended especially for pumps where the full force of the steam is required during the entire stroke, and in this engine the steam that acts to move the valve is admitted by the piston of the engine.

My invention relates to the combination, with the valve, of valve-moving pistons and ports arranged in such a manner that when the piston of the engine has nearly completed its movement it uncovers a port that admits steam to the valve-moving piston to give motion to the same and to the valve. I also provide an auxiliary steam-port that serves to prevent the possibility of the valve remaining over the steam-ports and closing the same where the complete movement may have been arrested.

In the drawings, Figure 1 is a section longitudinally of the cylinder and valve-chest. Fig. 2 is a cross-section. Fig. 3 is a section showing the improvement as applied to a B-valve; and Fig. 4 is a plan of the valve and valve-seat, Figs. 1 and 2.

The cylinder A, heads B, piston C, piston-rod D, and packing-gland E are of ordinary character.

F is the valve; G G′, the valve-moving pistons within the cylinders H H′, and K is the steam-chest, and L the cap or cover for the same, in which may be placed the rock-shaft L′, with a toe, L^2, within the steam-chest, acting against the horns 2 and 3 upon the top of the valve; and L^3 is a lever by which the rock-shaft, toe, and valve may be moved by hand, if necessary, in starting the engine, and until the parts become sufficiently warm by the action of the steam to prevent detention by the condensation of steam.

In Figs. 1, 2, and 4, I have shown my improvement as applied to a D slide-valve, and in Fig. 3 as applied to a B slide-valve.

I will first describe the improvement with reference to Fig. 1.

M is the exhaust-port, and 4, 5, 6, and 7 are ports opening from the steam-chest into the steam-cylinder, and 10 is a port from the steam-cylinder A into the cylinder H, and 8 is a similar port to the cylinder H′, and 11 and 9 are ports between the exhaust-ports 5 and 6 and the cylinders H H′, respectively.

Presuming the parts to be in the position shown in Fig. 1, the steam is passing through the port 7, and the piston is moving in the direction indicated by the arrow, and the exhaust 5 is open by the valve to M. As soon as the piston C passes or covers the ports 5 and 27, the steam or air in the cylinder A is confined, and cushions to prevent the piston C striking the cylinder-head. The distance between the port 10 and the cylinder-head is greater than the thickness of the piston C; hence the steam enters the port 10 as soon as the piston C uncovers such port; and while the piston is compressing the confined steam the live steam passes through such port 10 and acts upon the piston G, and moves it and the valve F, covering 7, and uncovering the port 4 for admitting steam, and opening the exhaust by 6 to M, and the piston C commences to move the other way. The exhaust of the steam lessens the pressure in the port 10 and cylinder H, and the steam in the chest acts upon the rod and drives the piston G back before the piston C uncovers the port 5, and then the steam coming through 5 and 11 holds G in place, and the steam coming through 10 causes the pressures to balance at opposite sides of the piston G, and it remains in its normal position.

I remark that the steam may be admitted in any desired manner to the steam-chest. I have shown the pipe N, Fig. 1, from which there is a port or ports into the steam-chest, as indicated by dotted lines. When the valve is in the opposite position to that shown in Fig. 1, and the piston C is moving toward the right, the parts act in the same manner as before described. The exhaust-steam remaining between the ports 6 and 28 and cylinder-head is compressed by the piston, the live steam acts through 8 to move G′ and the valve as soon as the piston passes beyond and uncovers said port 8, then, as the pressure is relieved by the exhaust through 5 to M and steam is admitted by 7, the pressure in 8 and H′ is lessened, and the steam in the chest K,

acting on the piston-rod of G′, returns the piston to its normal position, and when the movement of the piston C uncovers the port 6 the steam acts through 9 to fill the cylinder H′. The pressure at both sides of the piston G′ is equalized as soon as the piston C passes the port 8.

It will be understood upon reference to Fig. 3 that with a B slide-valve the movements are the reverse of those with the D slide-valve, Fig. 1, and that the piston-rods pull the valve along instead of pushing it, and to effect these movements the ports 10 and 8 open at the sides of the pistons G G′ next to the valve instead of at the back of such pistons. The operations are identical with those before described. The steam passing around below the end of the valve F and through 7 moves the piston C, and after 6 is uncovered, then the steam passes through both 6 and 7 to move the piston to the left, as indicated by the arrow. The port 4 being closed, the exhaust-steam will cushion after the piston covers the exhaust-port 5, and when the piston passes beyond the port 10 the live steam will be admitted by 10 to move G and the valve F, so that live steam passes through 4 to move the piston C. The exhaust being opened through 6 to M, the pressure will be relieved on the piston G, and the steam, passing into the port 5 at the same time that it passes into the port 4, goes by the port 11 into the cylinder H and returns the piston G to its normal position; and as the steam-piston C moves to the right the port 5 will be first uncovered, and then the pressure will be equalized at both sides of G when the port 10 is uncovered. Similar movements to those before described will take place in moving the piston G′ at the other end of the stroke of the piston C.

I provide notches between horns upon the valve F, Fig. 3, for the nuts g^2 g^3 of the valve-moving piston-rods to act against in moving the valve, and I sometimes introduce rubber or other yielding material at P′ to receive the blow from the valve-moving pistons G G′, respectively, and prevent any noise should there be a concussion, and I prefer to introduce rubber or similar material at P, Fig. 1, for the ends of the valve-moving piston-rods to press against and prevent concussion by the sudden movement of the valve.

If the valve and engine stand vertically or at an inclination, or if it becomes desirable to hold the valve at the ends of its stroke, I make use of spring-latches having hooks 12, that are run under by and catch the projections 13 upon the body of the valve. In order to unlatch these respective latches, I provide on each an incline, 14, adjacent to a shoulder upon the valve-moving piston-rod, so that when the said rod is moved forward by the piston the first thing the shoulder does is to underrun the incline 14 and lift the spring-latch, so as to liberate the projection 13 from the spring-latch and allow the valve to be moved freely.

If, from any obstruction, the valve should only be moved sufficiently to exactly cover both steam-ports 4 and 7, Figs. 1 and 4, or to just close the steam-inlets below the valve, Fig. 3, the parts might come to a standstill. To prevent the parts remaining in this condition, I provide the ports 20 21, passing down to the steam-cylinder A, and I drill holes through the valve, or make recesses in the under surface of the valve at 22 23, so that when the valve is in the position named, and as shown in Fig. 4, the recesses or holes correspond with these ports 20 and 21, and let steam pass into these small ports 20 and 21, and act through the port 10 or 8 upon whichever valve-moving piston is to be further moved to complete the movement of the valve. The openings 22 and 23 only correspond with 20 21 at the middle portion of the valve movement, and the ports 20 21 are closed at all other times.

It often happens that water of condensation accumulates in the cylinder, especially of a pumping-engine, when first started, and also in the stand-pipe, through which the exhaust-steam escapes. I provide for removing this in the following manner:

Beneath the cylinder A is a small valve-chamber, T, which is tubular, and provided with caps 25 at the ends, and valves 26, with triangular guide-stems in the smaller inner portion of the tubular chamber T. The combined length of the two valve-stems is greater than the distance between the seats for the valves; and there are ports 27 28 from the ends of the chamber T to the steam-cylinder, and a lateral discharge-pipe, 29, between the valve-seats, which may be provided with a cock. When steam acts on one side of the piston C, the pressure closes the valve 26 upon which it acts, opening at the same time the other valve, so that water of condensation can run off at the exhaust side from the cylinder A. These operations are automatic, the valves 26 closing and opening in opposite directions each admission of steam to the cylinder; hence water of condensation will always be taken away. Furthermore, I make a chamber, V, under the steam-cylinder, and a circumferential channel around the steam-cylinder at U, to connect the exhaust-port M with the discharge-pipe 29, in order that any water of condensation in the rising exhaust-steam pipe may be at liberty to run down at once into the chamber V, and pass away by the pipe 29 and cock along with the water of condensation from the steam-cylinder.

When the valve F is on its center, Fig. 4, and the ports 20 and 21 are open into the steam-cylinder, if the steam-piston C is covering one of the ports 10 or 8, and thereby obstructing the operation of the valve-motion, the steam admitted by 20 and 21 will act upon the steam-piston, moving it until the port 10 or 8 that had been covered is uncovered, and the steam acting through such port upon the valve-moving piston will remove the valve from its central position.

The valves for allowing water of condensation to escape from the cylinder, being regarded as a separate invention, are not herein claimed, and the right is hereby reserved to make a separate application for the same.

I claim as my invention—

1. The combination, with the steam cylinder and piston, of the valve F, the valve-moving pistons G G′, the cylinders for the same, the ports 4, 5, 6, and 7, leading from the steam-chest to the cylinder A, and the ports 8 and 10, leading from the cylinder A to the cylinders H H′, respectively, and the ports 9 and 11 between the ports 5 and 6 and cylinders H H′, respectively, substantially as set forth.

2. The combination, with the steam-valve and two separate and independent valve-moving pistons, of two steam-ports and two exhaust-ports extending from the valve-seat to the main cylinder, and an exhaust-outlet, the parts being arranged substantially as set forth, so that the steam-piston is cushioned at the end of each stroke, and the steam-ports open into the cushioning-spaces of the steam-cylinder, and the live steam is admitted by the valve directly into the cushion to move the piston, substantially as specified.

3. The combination, with the valve and the valve-moving pistons and rods, of india-rubber or other yielding material between the valve and the piston-rods, substantially as set forth.

4. The combination, with the valve and the valve-moving pistons and rods, of the latches, constructed, substantially as set forth, to retain the valve when moved, and to be unlatched by the piston-rod as it commences to move the valve, substantially as set forth.

5. The combination, with the valve, of the valve-moving pistons, piston-rods, and cylinders, and the respective ports between the steam-chest, the engine-cylinder, and the cylinders for the valve-moving pistons, and the ports 20 and 21, substantially as and for the purposes set forth.

6. The combination, with the steam-engine cylinder, of a chamber, V, and the channel around the cylinder connecting with the exhaust-port for the discharge of the water of condensation, substantially as and for the purposes set forth.

7. The combination, with a steam-valve having one or more small passages, of a valve-seat with one or more openings into the steam-cylinder, and closed by said valve, except when the valve is in a central position, in order to communicate the pressure from the steam-chest to the steam inclosed in the cylinder when the valve is on its center, so the steam will act upon the valve-moving devices and complete the movement of the valve, substantially as set forth.

8. In a direct-acting steam engine, a valve and one or more openings controlled by the valve, and acting, when the valve is on its dead-center, to admit more steam to the valve-moving device for completing the movement, substantially as specified.

Signed by me this 10th day of January, A. D. 1884.

L. B. CARRICABURU.

Witnesses:
GEO. T. PINCKNEY,
WILLIAM G. MOTT.