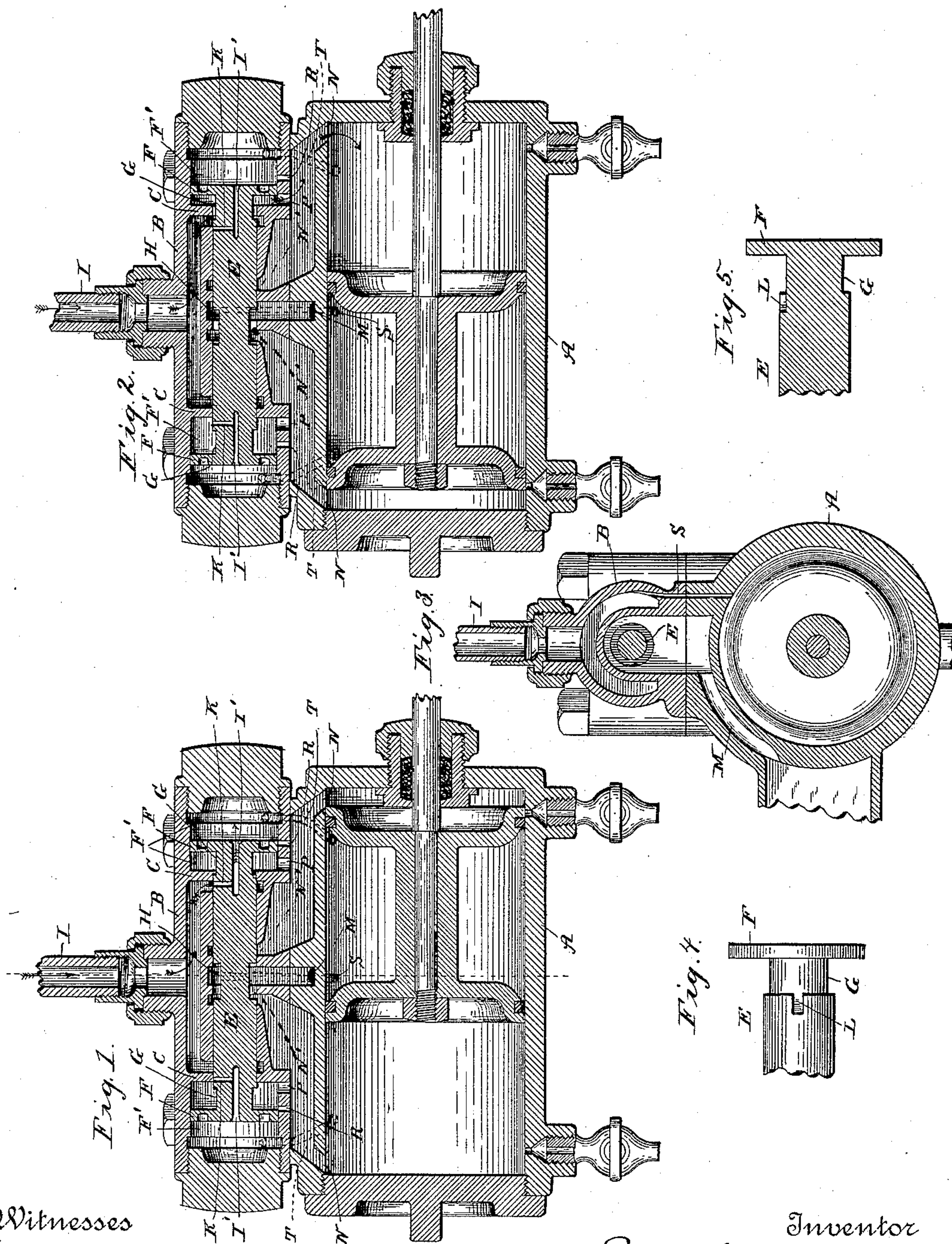


(No Model.)

E. A. MARSH.
STEAM ACTUATED VALVE.

No. 409,851.

Patented Aug. 27, 1889.



Witnesses
Edwin L. Bradford
Wm. M. Stockbridge.

Inventor
E. A. Marsh.
By his Attorneys,
V. D. Stockbridge & Son.

UNITED STATES PATENT OFFICE.

ELON A. MARSH, OF BATTLE CREEK, MICHIGAN.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 409,851, dated August 27, 1889.

Application filed March 30, 1889. Serial No. 306,369. (No model.)

To all whom it may concern:

Be it known that I, ELON A. MARSH, a citizen of the United States, residing at Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Steam-Actuated Valves for Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in steam-engines of that class in which the valve which controls the induction and education of the steam to and from the cylinder is operated directly by the action of steam; and it has for its object to provide for actuating or starting the valve when the engine is at rest in whatever position its parts may have assumed when stopped, so as to insure the prompt and certain action of the engine under all circumstances.

The invention further has for its object to provide for a prompt reversal of the valve and piston of the engine at each end of the stroke, and at the same time cushion the valve and piston with live steam to avoid pounding and secure uniformity and smoothness in the action of the engine.

The invention further has for its object to provide for the admission of a large volume of live steam at either end of the valve at the moment of reversing the stroke, and to relieve the pressure of steam when the valve has been initially moved, and provide for cushioning and starting with an initial pressure at either side of the piston as it reaches the end of the stroke, as more fully hereinafter explained.

To this end the invention consists, generally, in the combination, with the valve-chest of an engine, of a reciprocating valve having annular grooves or recesses near each end and at the center preadmission-ports and relief-ports, and the cylinder of the engine having a double-headed recessed piston operating in connection with the ordinary parts of the engine, and with ports leading from the live-steam space of the valve-chest and to the spaces at each end of the valve, as more fully hereinafter described.

The above-mentioned objects I attain by the means illustrated in the accompanying drawings, in which—

Figure 1 represents a central longitudinal vertical sectional view looking toward the exhaust side of an engine which is constructed according to my invention, showing the relative positions of the piston and valve when the piston of the engine is near the right-hand end of its stroke. Fig. 2 represents a similar view looking from the same point as in Fig. 1, showing the positions of the piston and valve when the piston is near the left-hand end of its stroke and just as the valve is about to be moved to reverse the movement of the piston. Fig. 3 represents a transverse central section of the engine. Fig. 4 represents an elevation showing a modification of the valve, and Fig. 5 represents a longitudinal sectional view thereof.

A is the cylinder of the engine, which is of the ordinary construction; and B, the valve-chest thereof, which may be made separate from the cylinder and bolted thereto, as at present shown. The valve-chest is divided into three compartments by the diaphragms C, which have central openings, through which the valve reciprocates when the engine is in operation.

E is the valve. The said valve is fitted closely in the longitudinal central bore of the steam-chest, so as to slide freely therein, but prevent the passage of steam between the outside of the valve and the inside of the bore. At each end the valve is provided with an enlarged head F. These heads work in the chambers F' at each end of the valve-chest, and between the said heads and that portion of the bore in which the valve works the said valve is annularly grooved and recessed, as indicated by the letter G, and midway between the ends of the valve it is similarly annularly recessed or grooved, as indicated by the letter H. The central space between the two diaphragms is connected with the boiler by means of the pipe I, and during the operation of the engine always contains live steam. The valve at each end is provided with longitudinal central passages I', opening at the ends of the valve and connecting with lateral pas-

sages K, the said passages constituting the preadmission steam-ports to the end chambers of the valve-chest for operating the valve when the main ports are closed. Instead of these passages, however, the valve at or near the shoulders, just outside of that portion thereof which works within the central longitudinal bore of the valve-chest, may be formed with longitudinal grooves or channels L, as plainly shown in Figs. 4 and 5 of the drawings, these channels constituting the preadmission-ports to the main cylinder for starting the engine-piston.

M is the exhaust-port of the engine, which extends annularly around the annularly-grooved portion of the central bore of the valve-chest and leads downwardly therefrom and laterally out through the side wall of the cylinder, as usual. The ports N N, leading, respectively, to each end of the cylinder, also connect with annular passages N' in the said central bore at each side of the central annular passage of the exhaust-port, before mentioned. The induction-openings of the preadmission-ports are so located relatively with respect to each other and to the partitions C C of the valve-chest, before mentioned, that one of said openings will always be in communication with one of the chambers and the valve-chest in case the main ports are closed, so as to admit live steam at one end of the valve, in order to shift the valve and start the engine.

From the chambers F' F' at the ends of the valve-chest extend the ports P into the ports N N, leading to each end of the cylinder at opposite sides of the piston thereof, through which live steam is alternately admitted to the cylinder at opposite ends of the piston when the engine is in operation. The chambers F' F' also connect with the ports N N by means of short relief-ports R R for the purpose hereinafter explained.

S is a port leading from the live-steam chamber in the valve-chest down into the cylinder between the heads of the piston into the annular live-steam chamber of said piston, so as to keep said chamber constantly supplied with steam during the operation of the engine.

T T are ports leading from near each end of the cylinder A into the chambers F' of the valve-casing to convey steam from the annular space around the piston alternately to the said chambers, as more fully hereinafter described.

The operation of my invention is as follows: The parts being in the position shown in Fig. 1 of the drawings, with the engine-piston at one end of the stroke and the valve at half-way between the opposite ends of its stroke, it will be seen that the preadmission-port through the valve is open from the live-steam chamber of the steam-chest to the

chamber F' at the right of the valve-chest. In this position of the valve on the admission of steam from the boiler to the steam-chest it will take the direction indicated by the arrows, through the preadmission-port at the right of the valve, starting the valve toward the left and opening the annular induction-port at the right of the valve-chest and cylinder, so as to admit live steam behind the right end of the piston and drive it toward the opposite end. When the piston reaches the left end of the cylinder, as shown in Fig. 2 of the drawings, the space or chamber between the heads of the piston will connect with the port T, leading to the chamber at the left of the valve-chest, and live steam will be supplied to said chamber through said port and quickly move the valve to the right and reverse the engine. After the head on the left end of the valve passes the relief-port R, and at the same moment that the valve is shifted so as to open the annular induction-port at the left end of the valve-chest, the steam will pass through the said relief-port and furnish a volume to the left end of the engine-cylinder, so as to cushion the piston and initially start it on its reverse movement, which is continued by the steam then furnished through the annular induction-port just established, at the same time balancing the pressure of the steam at the actuating end of the valve-chest, so as to prevent the pounding of the valve against the diaphragm, and insuring a smooth and uniform motion to the parts of the engine. The relief-ports also permit larger ports to be employed between the cylinder and chambers F', so as to permit a sufficient volume of live steam to be admitted thereto to instantaneously actuate the valve.

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

1. In a steam-actuated valve, the combination of a steam-chest provided with induction-ports and a valve provided with passages, and preadmission-ports leading to end chambers beyond the ends of the valve, whereby said valve and the engine may be started, notwithstanding the valve may have come to rest with the main induction-ports closed, substantially as described.

2. The combination, with the cylinder of an engine, of a valve-chest having chambers at each end and relief-ports leading through the main steam-passages to the cylinder, substantially as described.

3. The combination of a cylinder of an engine, a valve-chest having ports or passages connecting the central and end chambers thereof with the middle and the ends of the cylinder, respectively, and an annularly-chambered piston, whereby live steam is admitted alternately in volume to the outer

ends of the end chambers of the valve-chest to promptly move the valve to reverse the engine, substantially as described.

4. In an engine, the combination of a steam-
5 actuated valve, a cylinder, a central live-steam port communicating with the same, ports leading from said cylinder to chambers in the valve-chest, and an elongated chambered piston, substantially as described.

In testimony whereof I affix my signature to in the presence of two witnesses.

ELON A. MARSH.

Witnesses:

GEO. W. MECHEM,
MARK H. BURNHAM.