(No Model.)

W. J. ALLEN.

VALVE FOR STEAM ENGINES.

No. 383,935. Patented June 5, 1888.

Fig. 1

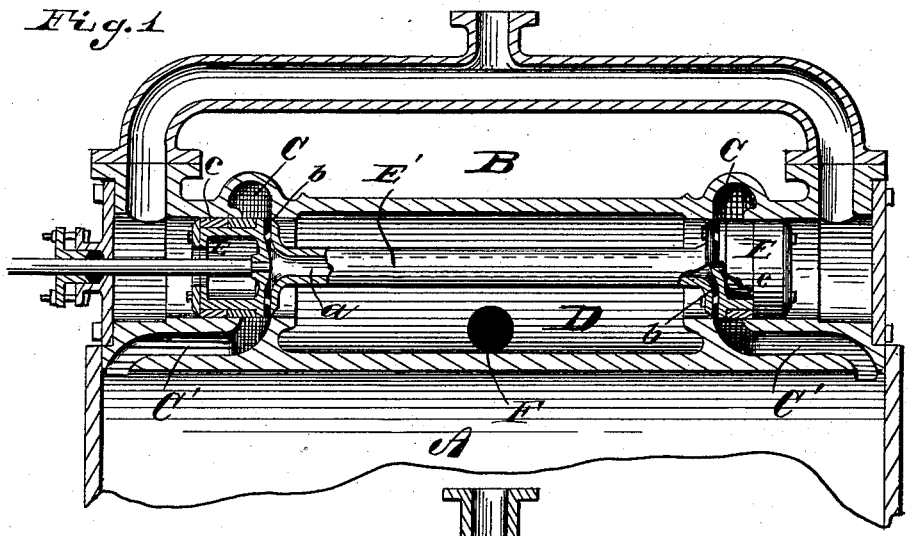


Fig. 4

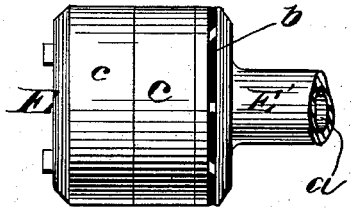


Fig. 2

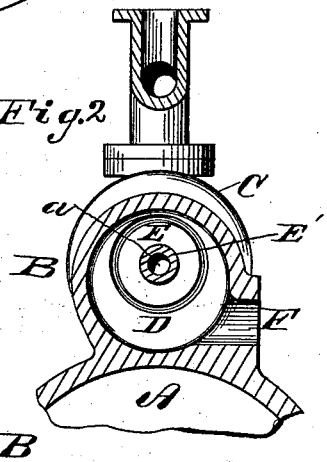


Fig. 5

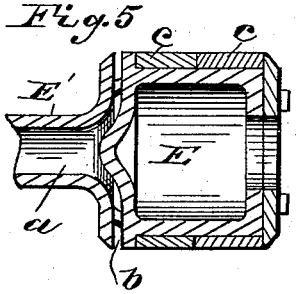
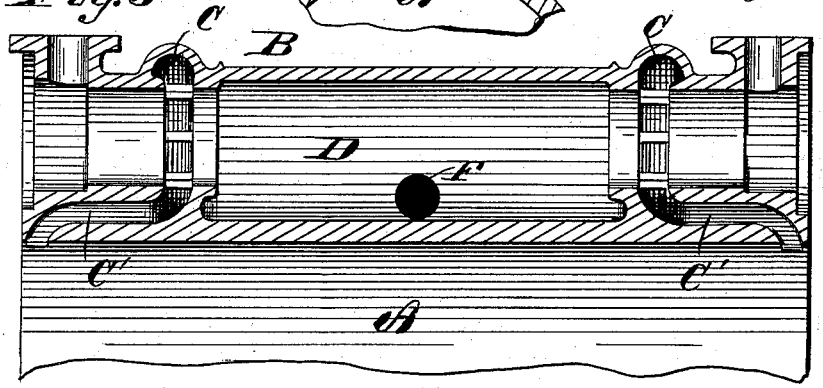


Fig. 3



Witnesses.

A. O. Huffman.

A Bradford.

Inventor.

Walter J. Allen.

By Paul A. Staley & Co.

UNITED STATES PATENT OFFICE.

WALTER J. ALLEN, OF SPRINGFIELD, OHIO, ASSIGNOR OF TWO-THIRDS TO PHILIP J. COLE AND LAWRENCE J. HICKEY, BOTH OF SAME PLACE.

VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 383,935, dated June 5, 1888.

Application filed September 8, 1887. Serial No. 249,081. (No model.)

To all whom it may concern:

Be it known that I, WALTER J. ALLEN, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Valves for Steam-Engines, of which the following is a specification.

My invention relates to improvements in valves for steam-engines; and it particularly relates in its nature to that class of valves known as "balanced valves."

The object of my invention is to provide a valve of novel construction, the operation of which produces an automatic cushion at each end of the engine stroke by establishing a direct communication through the valve between the back and front of the piston, thus creating a premature discharge or exhaust before the final exhaust takes place, this premature exhaust being adapted to transfer the terminal pressure from the back to the front of the piston producing the cushion.

My invention consists in a cylindrical or piston-shaped valve adapted to fit at either end in a cylindrical chamber which communicates with the engine-cylinder through one of the ports by which the steam is admitted or exhausted to or from the said cylinder, the said valve being reduced at the middle and provided with a longitudinal opening which connects at either end with a small circular port in the periphery of the valve, adapted near the end of each stroke to register with the main ports of the engine cylinder, and thus establish a communication through the exhaust-chamber from one end of the cylinder to the other.

My invention further consists in various constructions and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 is a partial sectional view of the valve-chamber and valve and so much of the engine-cylinder as is necessary to the understanding of my improved valve and its operation. Fig. 2 is a transverse sectional view of the same. Fig. 3 is a longitudinal sectional view of the same, showing the valve removed; and Figs. 4 and 5 are detail views of the ends of the valve, showing, respectively, an exterior and an interior or sectional view of the same, enlarged.

Like parts are indicated by similar letters of reference throughout the several views.

In the said drawings, A is the engine-cylinder, and B the steam-chest or valve-chamber. The valve-chamber is bored out at each end to form valve-seats, about which are circular cavities C, into which the cylinder-ports C′ open. The central portion of the valve-chamber B is preferably enlarged to form an exhaust-chamber, D, which extends from one valve seat to the other and completely surrounds the middle portion of the valve.

The valve I form with piston shaped end portions, E E, adapted to fit the seats in said chamber, and a reduced middle portion, E′, which passes through the exhaust-chamber D, and connects the said piston or bearing portions E E. The steam to supply the engine is preferably admitted through suitable pipe-connection to the respective ends of the valve-chamber, and presses with equal force, but in opposite directions on each end of the valve, thus forming a balanced valve. The valve is adapted to be reciprocated as the engine moves by any of the well-known valve-gear heretofore used for that purpose. As the valve travels back and forth, the end portions are adapted to uncover the cylinder-ports in such a manner that they shall alternately communicate with the exhaust-chamber D and the live steam in the ends of the valve-chamber B, and thus admit and exhaust the steam in the ordinary manner.

Extending through the middle portion, E′, of the valve is a longitudinal opening, *a*, which connects at either end to small circular ports *b*, which extend outward to the periphery of the piston-shaped ends E E. These small ports *b* *b* are so arranged with reference to the main cylinder-ports, that just prior to the final exhaust from either end of the cylinder, the said ports *b* *b* are adapted to register with the main ports, as shown in Fig. 1, and thus establish a direct communication from the back to the front of the engine-piston, through which the terminal pressure of the steam at the back of the piston is transferred to the front thereof, thus forming an automatic cushion for the said

piston at the end of each stroke or while passing centers. The cushion thus formed, it will be seen, is dependent upon the terminal pressure of the steam in the cylinder after each stroke. The terminal pressure is dependent upon the work taxed upon the engine. Consequently the cushion will be automatically regulated to the labor of the engine. In order that the automatic cushion may be effective, it should be used prior to the termination of the stroke and as soon as practicable after the exhaust from that side of the piston is closed. To accomplish this I make the exhaust side practically without lap—that is, the small premature exhaust-ports *b* are placed in the exhaust side of the valve, and that portion of the valve is cut away, so as to leave practically no intervening space on the valve between the premature exhaust-ports *b* and the exhaust-chamber of the valve. By this construction it will be seen that the premature exhaust which forms the automatic cushion is accomplished just before the main exhaust takes place, and the cushion produced in the opposite ends of the cylinder immediately after this end of the cylinder is closed. By this construction it will be seen that the exhaust becomes practically continuous, and the exchange is made just before the piston reaches the end of its stroke, thus permitting the piston to cushion on the terminal pressure.

I preferably provide the bearing portions E E of the valve with spring-rings *c c*, to prevent the leakage of steam from the steam to the exhaust side of the valve. The exhaust-chamber D, it will be seen, is quite large, and affords a free and easy exhaust for the engine, the exhaust-opening F being provided from the said chamber to the exhaust-pipe proper.

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

1. A cylindrical valve to each end of which the steam is admitted at an equal pressure, and having a reduced middle portion about which is formed an exhaust-chamber, said valve being provided at either end with small circular ports in the periphery thereof and a longitudinal passage connecting said ports through the said exhaust, said ports being located on the exhaust end of said valve, said valve formed without lap between said ports and the exhaust-chamber, substantially as specified.

2. A balanced valve, substantially as set forth, having a longitudinal passage provided at either end with small openings or ports adapted to register with the main cylinder-ports, said valve being formed without exhaust lap between the small openings or ports and the exhaust-chamber in said valve, whereby the terminal pressure of each piston-stroke is transferred from the front to the back of the piston to produce an automatic cushion, substantially as set forth.

3. A cylindrical balanced valve provided with piston-shaped ends adapted to open and close the main ports, as described, the reduced central portion adapted to form the exhaust-chamber with which the cylinder-ports are adapted to register as the valve moves in either direction, premature exhaust-ports in said piston ends connected together through said reduced central portion, said premature exhaust-ports being adapted to register with the main cylinder-ports without lap between the premature exhaust-ports and the main exhaust-ports, substantially as specified.

In testimony whereof I have hereunto set my hand this 5th day of September, A. D. 1887.

WALTER J. ALLEN.

Witnesses:
CHASE STEWART,
PAUL A. STALEY.