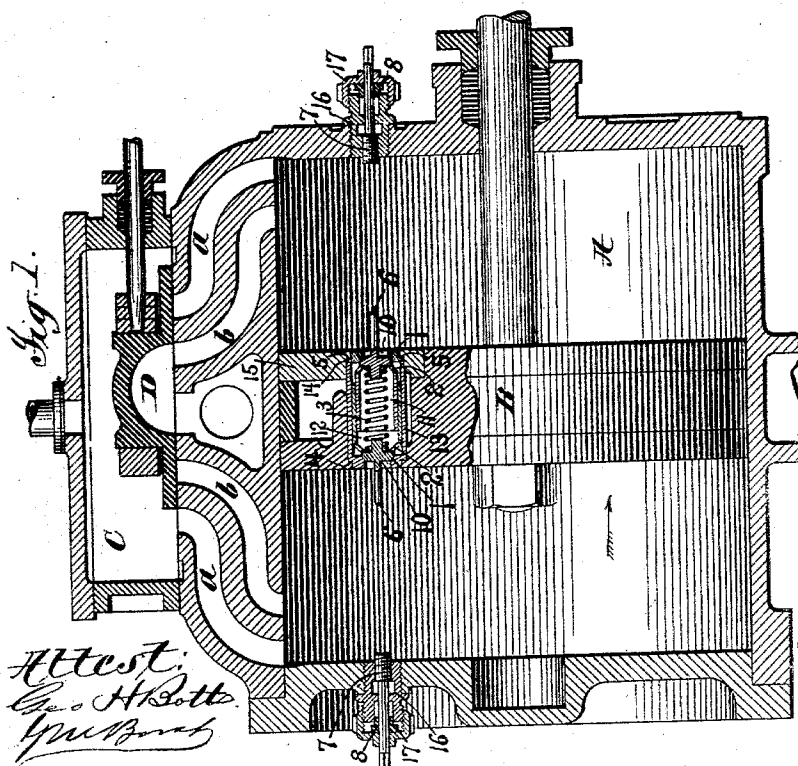
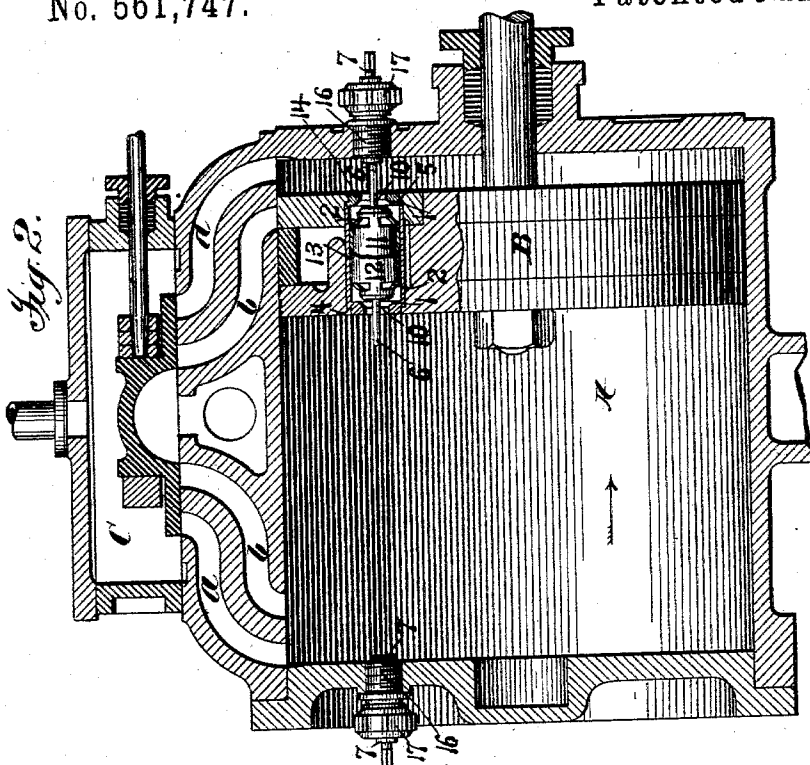


(No Model.)

C. C. WORTHINGTON.
STEAM DASH VALVE.

No. 561,747.

Patented June 9, 1896.



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UNITED STATES PATENT OFFICE.

CHARLES C. WORTHINGTON, OF IRVINGTON, NEW YORK.

STEAM DASH-VALVE.

SPECIFICATION forming part of Letters Patent No. 561,747, dated June 9, 1896.

Application filed July 3, 1895. Serial No. 554,829. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. WORTHINGTON, a citizen of the United States, residing at Irvington, county of Westchester, and State of New York, have invented certain new and useful Improvements in Steam Dash-Valves, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to provide an improved steam dash-valve construction for direct-acting engines by which a steam-cushion for the piston shall be secured at the end of the stroke. The cushion is usually provided by arranging the exhaust-port so as to be covered by the piston as the latter approaches the end of its stroke; but it is found in practice that this arrangement is not under all conditions certain and sufficient for the purpose, and provision has sometimes been made for the admission of a small amount of live steam in front of the piston just at the end of the stroke, either on the normal stroke of the piston or when the piston, through failure of the usual steam-cushion, is not stopped at the normal point. In previous constructions of this class this live steam has been taken through or from some part outside of the cylinder; but the present invention provides a construction by which this steam is taken from the cylinder at the opposite side of the piston, and in the preferred embodiment of the invention this connection is made through the piston, a very simple, compact, and efficient construction being thus provided.

For a full understanding of the invention a detailed description will now be given of a construction embodying the same in its preferred form, reference being had to the accompanying drawings, forming a part of the specification, and the features forming the invention specifically pointed out in the claims.

In the drawings, Figure 1 is a central vertical section of a steam-cylinder embodying the invention, the parts being shown on center in the normal operation of the engine, the valves and trips being sectioned. Fig. 2 is a similar view showing the parts at the end of the stroke just before the piston stops, with the steam dash-valves opened, the valves

and trips being shown in elevation and section.

A is the steam-cylinder, B the piston, C the steam-chest, D the main valve, *a* the induction-ports, and *b* the exhaust-ports, of an ordinary direct-acting engine, all of which parts may be of any suitable form other than that shown.

The piston B is provided with a passage extending through the piston so as to connect the opposite ends of the cylinder, and this opening is enlarged within the body of the piston, so as to provide valve-seats 1, on which are seated two hollow cylindrical valves 11, 12, having ports 2 and pressed apart and toward the seats 1 by spring 3, seated within said valves, the hollow bodies of the valves preferably overlapping each other, as shown. The piston may be constructed in any suitable manner to accommodate the valves, but the construction shown is preferable as permitting a convenient insertion and removal of the valves, the valve-chamber and valve-seat at one side of the piston being formed by a sleeve 13, inserted from the other side of the piston against a shoulder 4, formed just inside the body of the piston, and this sleeve 13 being held in place by a cap 14, set into the piston-ring 15 at the opposite side of the piston before the ring is put on, the cap 14 and ring 15 being formed with shoulders 5, holding the cap in place, and the valve-seat 1 at this side of the piston being formed on the cap 14.

The stems 6 of the valves 11 12 may engage the cylinder-heads; but in the preferred construction shown an adjustable valve-trip is provided at each end of the cylinder, so that the amount of dash or cushion may be varied as required. Any suitable construction may be used for this purpose; but that shown is simple and efficient, in which the trip consists of a screw-rod 7, threaded into a plug 16, screwed into the head of the cylinder and packed outside the plug by suitable packing 8, held by a screw-cap 17 on the plug.

The valves and trips will preferably be so constructed and adjusted as to operate at the end of each stroke, thus forming a more effective dash than the usual cushion and at the same time securing greater economy by

filling the clearance-space with steam of approximately the admission pressure. They may be arranged, however, so as to come into action only as a safety device in case the piston passes the point at which it is stopped in the normal operation of the engine. The trips 7 in the latter case will be adjusted so as not to be engaged by the stems 6 of the valves 11 12 when the piston is stopped properly by the usual steam-cushion or otherwise, but to actuate one of these valves if the piston passes this point.

The operation of the construction adjusted to operate at each stroke is as follows: The normal position of the valves 11 12 when there is no pressure in the cylinder and after the pressure on opposite sides of the valve on the admission side of the piston is equalized is that shown in Fig. 1, both valves 11 12 being seated on their respective seats 1 by the springs 3 and the passage 10 closed. When steam is first admitted and the piston is moving to the right, as indicated by the arrow, the pressure of the live steam behind the piston is sufficient to open the valve 12 against the pressure of spring 3 and admit steam through opening 10 and ports 2 into the valve-chamber formed by the space within the valves and behind the valve 11, which is held closed by this pressure and that of spring 3. As soon as the pressure in this valve-chamber is equalized with that on the admission side—that is, behind the piston—valve 12 also is closed by the spring 3, and the parts are again in the position shown in Fig. 1. As the piston approaches the end of its stroke the exhaust-port 6 in advance of the piston is closed by the piston, so as to prevent the escape of steam, and the stem 6 of valve 11 engages the trip 7 and is thus pressed backward from its seat 1 and opened against the steam and spring pressure behind it, and the pressure in the valve-chamber thus being relieved the valve 12 is then opened by the steam-pressure behind the piston, and steam passes from the rear or admission to the front or exhaust side of the piston and fills the exhaust end of the cylinder. The position of the parts as the piston approaches the end of the stroke with the valves 11 12 open is shown in Fig. 2. As the piston advances it compresses the steam thus admitted on the exhaust side, and under this compression of the steam the steam-pressure on the opposite sides of valve 12 is equalized, and the valve closes under pressure of the spring 3. Upon reversal of the piston by shifting the steam-valve D the operation is repeated on the opposite side.

It will be seen that by taking the cushioning-steam from the steam-cylinder on the pressure side of the piston a single connection may be used for cushioning at both ends of the cylinder, and a simple and compact construction be thus provided. It should also be observed that by utilizing the steam just before it is exhausted from the cylinder

to fill the waste clearance-space a decided gain is secured in the economy of the engine. The temperature of the clearance-walls of the cylinder is raised to a point corresponding to that of the steam on the opposite side of the piston, thereby reducing, largely, the condensation of the fresh steam admitted for the return stroke. While it is preferable that this connection be made through the piston and controlled by valves of the form shown, and this construction forms a part of the invention, it will be understood that the invention is not to be limited to a construction in which connection is made through the piston nor to the special devices shown, but that modifications may be made by those skilled in the art without departing from the invention.

What I claim is—

1. The combination with a steam-cylinder and piston, of a steam-passage connecting the cylinder ends on opposite sides of the piston, a valve mechanism controlling said passage and under a constant pressure less than the steam-pressure on the admission side of the piston tending to close the passage, and normally closing the passage during the stroke, and means for actuating said mechanism to open the passage at the desired point in the movement of the piston, substantially as described.

2. The combination with a steam-cylinder and piston, of a steam-passage connecting the cylinder ends on opposite sides of the piston, valves controlling said passage, said valves operating independently and opening from the opposite ends of the cylinder and seated by a constant pressure less than the steam-pressure on the admission side of the piston, and means for opening the valve on the exhaust side of the piston at the desired point in the movement of the piston, substantially as described.

3. The combination with a steam-cylinder and piston having a steam-passage through it, of valves controlling said passage, said valves opening from the opposite ends of the cylinder and seated by a constant pressure less than the steam-pressure on the admission side of the piston, and means for opening the valve on the exhaust side of the piston at the desired point in the movement of the piston, substantially as described.

4. The combination with a steam-cylinder and piston having a steam-passage through it, of valves controlling said passage, said valves operating independently and opening from the opposite ends of the cylinder and seated by a constant pressure less than the steam-pressure on the admission side of the piston, and means for opening the valve on the exhaust side of the piston at the desired point in the movement of the piston, substantially as described.

5. The combination with a steam-cylinder and piston having a steam-passage through it, of valves controlling said passage, said valves operating independently and opening from

the opposite ends of the cylinder, and means for opening the valve on the exhaust side of the piston at the desired point in the movement of the piston, substantially as described.

5 6. The combination with the cylinder A and piston B having steam-passage 10, of the valves 11, 12 seated by a spring-pressure less than the steam-pressure on the admission side of the piston, and means for opening the valve
10 on the exhaust side of the piston at the end of the stroke, substantially as described.

7. The combination with the cylinder A and piston B having steam-passage 10, of the valves 11, 12, and spring 3 between said valves
15 and by which said valves are seated having a pressure less than the steam-pressure on the admission side of the piston, substantially as described.

8. The combination with the cylinder A
20 and piston B having steam-passage 10, of the valves 11, 12, spring 3 between said valves and by which said valves are seated having a pressure less than the steam-pressure on

the admission side of the piston, and adjustable valve-trips 7 at each end of the cylinder, substantially as described. 25

9. The combination with a steam-cylinder and piston, of a steam-passage connecting the cylinder ends on opposite sides of the piston, a valve mechanism controlling said
30 passage and under a constant pressure less than the steam-pressure on the admission side of the piston tending to close the passage, and normally closing the passage during the stroke, and adjustable means for actuating
35 said valve mechanism to open the passage whereby the point of the stroke at which the passage is opened can be varied, substantially as described.

In testimony whereof I have hereunto set
40 my hand in the presence of two subscribing witnesses.

CHARLES C. WORTHINGTON.

Witnesses:

LOUIS R. OLBERGER,
B. W. PIERSON.