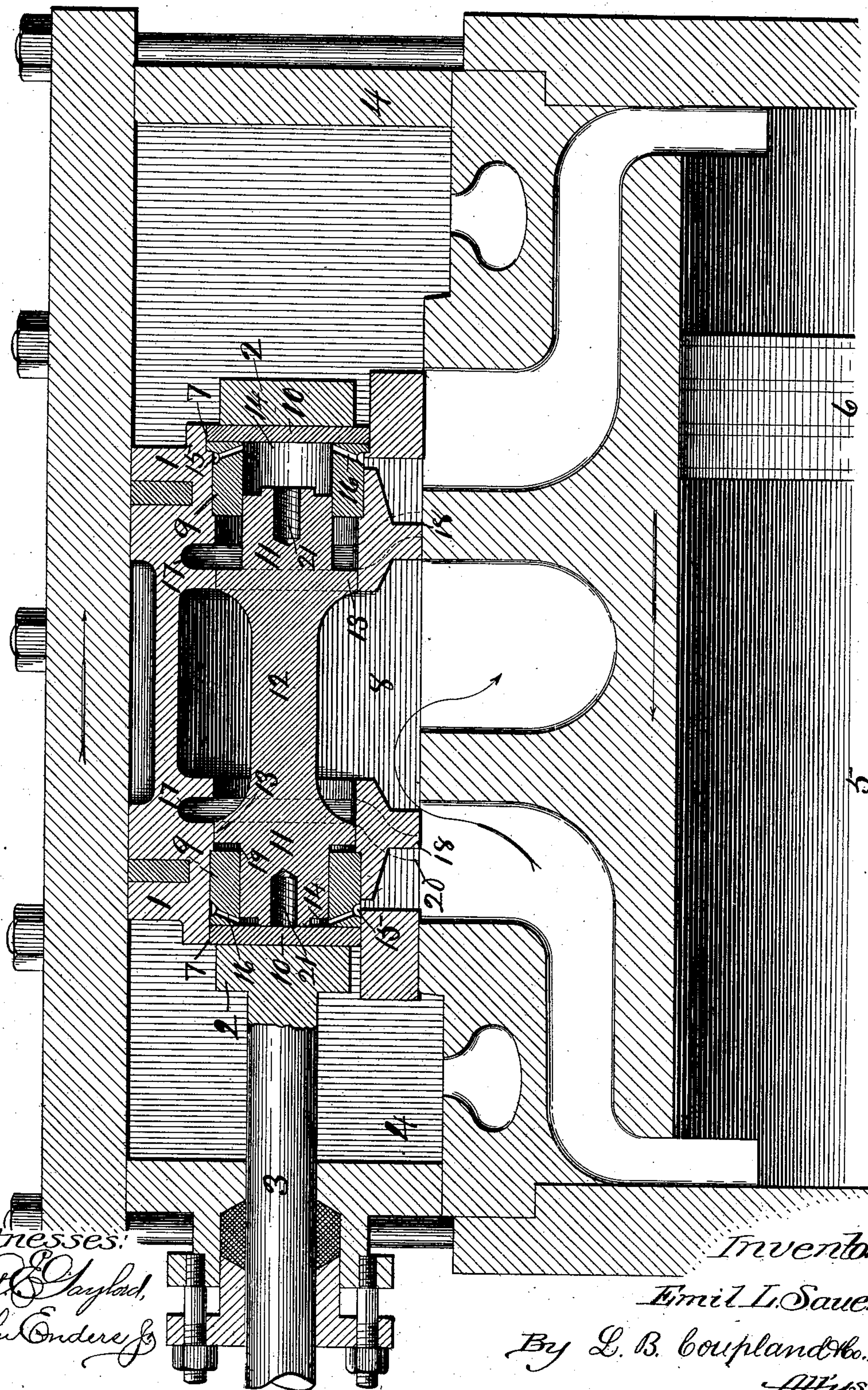


No. 701,626.

Patented June 3, 1902.

E. L. SAUER.
STEAM ENGINE VALVE.
(Application filed July 28, 1901.)

(No Model.)



Witnesses:
Ed. J. Gaylord,
John Enders Jr.

Inventor:
Emil L. Sauer,
By *L. B. Coupland & Co.,*
Attys.

UNITED STATES PATENT OFFICE.

EMIL L. SAUER, OF CHICAGO, ILLINOIS.

STEAM-ENGINE VALVE.

SPECIFICATION forming part of Letters Patent No. 701,626, dated June 3, 1902.

Application filed July 26, 1901. Serial No. 69,762. (No model.)

To all whom it may concern:

Be it known that I, EMIL L. SAUER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Engine Valves; 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 improvements in the class of steam-engine valves set forth in Letters Patent Nos. 529,841 and 597,436, issued to me November 27, 1894, and January 18, 1898, respectively.

Practical working has demonstrated that an engine, and more especially a locomotive-engine, equipped with this improved valve can be run at a very high rate of speed with economical advantages and ease in handling the cut-off and reverse lever. Practical use has also demonstrated that the piston-valves, auxiliary in the main valve, must be positively cushioned to prevent their having an endwise striking or hammering contact with adjacent surfaces of the main valve, and thereby be upset and injured against a free working movement.

The object thereof of this invention or improvement is not to make a radical departure from the essential features set forth in the patents herein referred to, but to make certain changes as will afford increased durability, prevent the liability of damage to and leakage of the auxiliary piston-valves in their reciprocating endwise movement, and thereby more positively prevent compression and back pressure on the engine-piston.

The single view in the drawing is a vertical longitudinal section of a steam chest and cylinder, only the upper half of the cylinder with a part of the piston being shown.

Referring to the drawing, 1 represents the ordinary slide-valve; 2, the valve-yoke; 3, the valve-rod; 4, the steam-chest; 5, the engine-cylinder, and 6 the piston. The respective side walls of the slide or main valve are provided with a number of apertures 7 in accordance with the number of piston-valves to be used in the main valve. These apertures open through the side walls into the exhaust-chamber 8 and are opposite to and in line

with each other. A bushing 9 is inserted in each of these apertures and rigidly secured in place. The outer open ends of the bushings are closed by a solid cap-plate 10, removably seated in the exterior walls of the main valve and form a steam-tight joint, so that there is no leakage exteriorly from the bushings. The valve-yoke also assists in retaining the cap-plates in place, as does the live-steam pressure.

The auxiliary piston-valves 11 have their respective head ends loosely inserted in the bushings and are connected by an integral stem 12, extending across the exhaust-chamber of the main valve. The openings in which the bushings are seated extend into the exhaust-cavity, as shown, and provides for a free reciprocating movement of the piston-valves. Each piston-valve is provided with a shoulder 13, which is of a greater diameter than the reduced piston ends and fills the passage opening into the exhaust-chamber. The ends of the piston-valves are cut away from the edge inward for about one-half of their diameter and provide an annular space 14 for the working pressure to enter in forcing the valve over to the opposite position from that shown. The bushings are provided with an annular groove 15 and orifices 16, opening into the space 14, for the entrance and escape of the steam in the operation of reciprocating the piston-valves and cushioning the movement of the same in preventing any concussion or jar, thus avoiding any injury to these parts and insure a positive working movement of the piston-valves. A semi-annular recess 17 is formed in the walls of the main valve on each side of the exhaust-chamber and into which open auxiliary exhaust-passages 18, as indicated by dotted lines, which start in from the under side of the main valve. The increased area afforded by the recesses 17 quickens the relief, avoiding back pressure, and greatly improves the operation and action.

The double auxiliary piston-valve illustrated, as shown, at the extreme limit of its position on one side—that is, one end is in its closed position and the opposite end wide open. It will be noted on the closed side that the end of the piston-valve comes in contact with the inner side of the closing cap-plate

10, closing the outer ends of the bushings. The contact of the piston ends is very light by reason of the annular cushioning-space 19 between the shoulder 13 of the piston-
 5 valves and the inner ends of the bushings, which feature, taken in connection with the cushion-space 14, provides a noiseless working piston-valve and positively prevents the same from striking or hammering at either end.

10 The piston is moving in the direction indicated by the arrow. The main valve traveling in the opposite direction and is just closing the steam-port on that side, the port on the exhaust side being partially open, but
 15 the auxiliary exhaust-passage is still wide open and will remain open until the back or outer line 20 passes over the surface of the valve-seat, and thus affording an auxiliary exhaust-relief after the main valve has closed
 20 on the exhaust side and relieving the engine-piston of any undue pressure or compression. When the auxiliary port closes, the pressure is relaxed on the inner side of the piston-valve, and the pressure on the outer side or
 25 end is then in access and operates to move the piston-valve over to its opposite position, which operation is continuous in imparting the required reciprocation movement.

It will be understood that any number of
 30 the piston-valves may be used in accordance with the dimensions and capacity of the main valve.

The screw-holes 21 in the respective ends of the piston-valves provide for the recep-
 35 tion of a screw-rod as a matter of convenience in facilitating the insertion and removal of these parts.

Having thus described my invention, what I claim, and desire to secure by Letters Pat-
 40 ent, is—

1. A steam-engine valve, provided in its opposite side walls with openings into the exhaust-chamber, the bushings, inserted in said openings but stopping short of the exhaust-
 45 chamber, means for closing the outer ends

of the bushings, the auxiliary piston-valves, provided with reduced ends, and a cushioning-shoulder and having the respective ends loosely inserted in said bushings, and the cushion-spaces between the adjacent surface
 50 of the piston-valves and bushings, substantially as described.

2. The combination with the main valve, provided with openings in the side walls opposite each other, of the bushings rigidly in-
 55 serted therein, and open to the exhaust-chambers but tightly closed at their outer ends, the piston-valves adapted to have a reciprocating movement in said bushings and provided with a cushioning shoulder and space
 60 adjacent to the inner ends of the bushings, substantially as described.

3. The combination with the main valve, having openings therethrough into the exhaust-chamber, of the bushings, inserted in
 65 said openings, the cap-plates closing the outer ends of the bushings, the piston-valves having their respective ends mounted in the inner open ends of the bushings and having a reciprocating movement across the line of the
 70 exhaust-chamber, and means for imparting such movement, substantially as described.

4. The combination with a steam-engine valve having apertures on opposite sides opening into the exhaust-chamber, bushings, open
 75 at both ends and seated in said apertures, the steam-tight cap-plates closing the outer ends of said bushings, piston-valves, connected by a common stem and seated in said bushings, the annular space around said bushings, and
 80 the orifices leading therefrom in the space between the ends of the piston-valves, and the adjacent surface, substantially as described.

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

EMIL L. SAUER.

Witnesses:

J. B. DONALSON,

L. B. COUPLAND.