

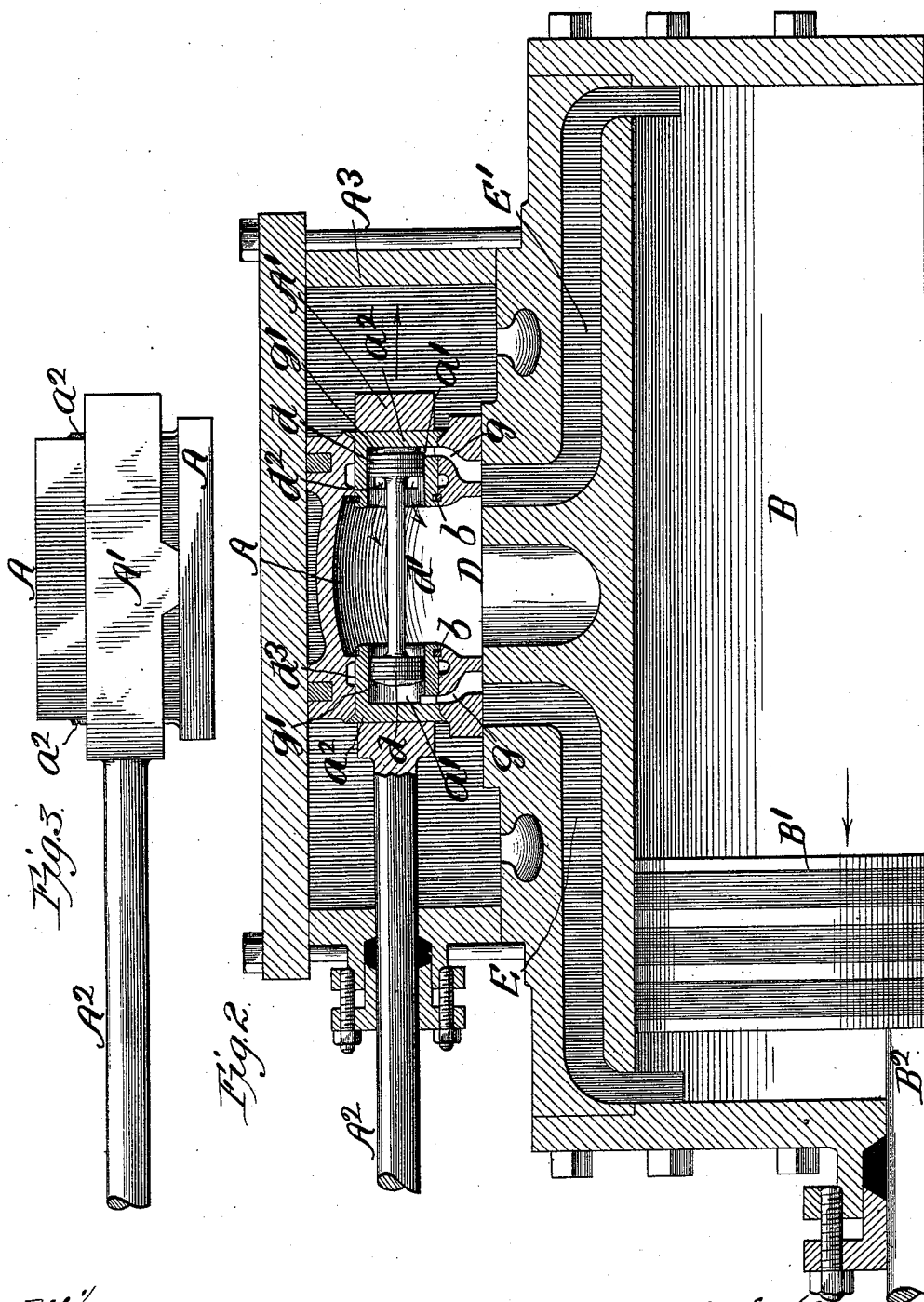
(No Model.)

3 Sheets—Sheet 2.

E. L. SAUER.
STEAM ENGINE VALVE.

No. 529,841.

Patented Nov. 27, 1894.



Witnesses:
L. M. Freeman.
Kate L. Allen

Inventor:
J. L. Sauer
By G. B. Coupland & Co
Attys.

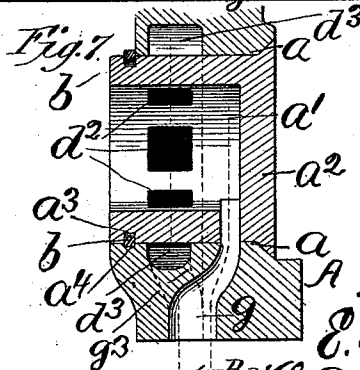
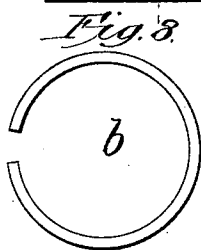
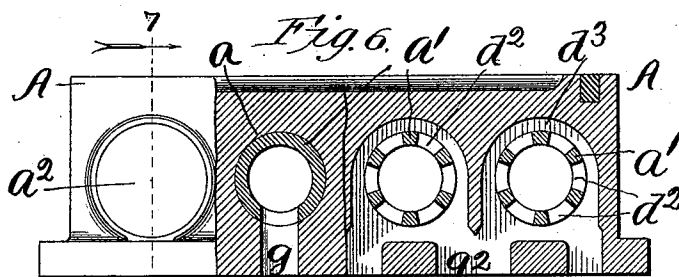
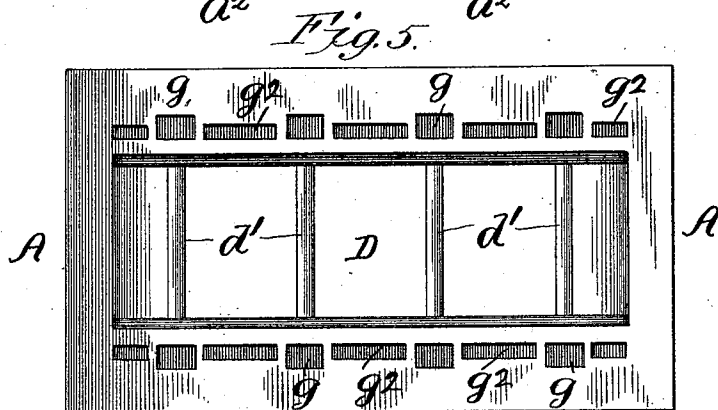
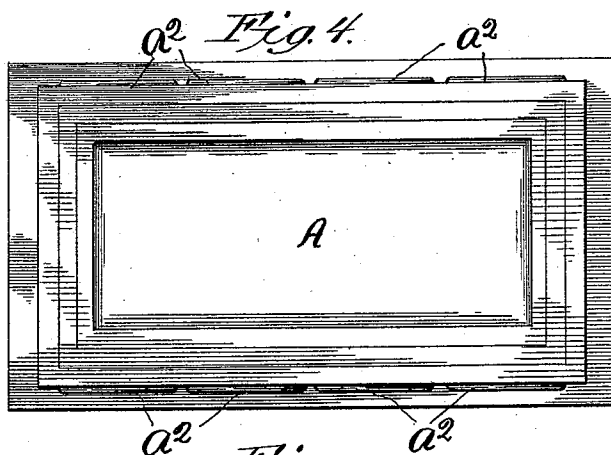
(No Model.)

3 Sheets—Sheet 3.

E. L. SAUER.
STEAM ENGINE VALVE.

No. 529,841.

Patented Nov. 27, 1894.



Witnesses:
L. M. Freeman,
L. S. Allen

Inventor:
E. 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. 529,841, dated November 27, 1894.

Application filed March 28, 1894. Serial No. 505,431. (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, reference being had to the accompanying drawings, forming a part of this specification.

The object of this invention is to provide the ordinary slide-valve with an improved arrangement to relieve the piston from any undue compression or back pressure, and is especially adapted for use in connection with locomotive engines.

In the drawings:—Figure 1 is a broken-away longitudinal section of a cylinder and steam-chest showing the valve in position; the piston being in elevation; Fig. 2, a similar view; the piston and valve being shown in a different relative position; Fig. 3, an end elevation of a slide-valve and its yoke; the valve-rod being broken away; Fig. 4, a top or plan view of the valve; Fig. 5, a bottom plan; Fig. 6, a part side elevation and part section of the valve; the section part being in the two different planes 6, 6; Fig. 7, a transverse section on line 7, Fig. 6; and Fig. 8, a detached detail of a locking-ring.

A is the slide-valve; A', the valve-yoke; A², the valve-rod; A³, the steam-chest; B, the cylinder; B', the piston, and B² the piston-rod.

As the cylinder, piston and steam-chest are of the usual ordinary construction, the description will be limited to the improved valve.

The side walls of the valve are provided with a number of apertures *a* opening horizontally therethrough. In each of these apertures is inserted a fixed bushing *a'* of cylindrical form. The inner ends of these bushings open into the exhaust-chamber D; the outer ends being closed by a flanged head *a²* which bears against the exterior surface of the valve and prevents the bushings from entering too far when inserted in place, as shown in Figs. 1 and 2. The bushings are provided near their inner ends with an annular exterior groove *a³*. The adjacent valve surface is provided with a corresponding groove *a⁴*. An open spring-

ring *b* (Fig. 8) is seated in said grooves and serves the purpose of assisting in locking the bushings in position against an outward endwise movement. The bushings are located directly opposite each other and have piston-valves *d d* inserted therein, each pair of which is mounted on the respective ends of a common rod *d'* extending across the exhaust-chamber of the main valve. The piston-valves are adapted to have a limited reciprocating endwise movement. The bushings are provided with a number of exhaust-ports *d²*, which open on one side into the annular space *d³*, (Fig. 6) and exhaust through the open ends of the bushings into the exhaust-chamber of the main valve, as indicated by the arrows in Figs. 1 and 2. The annular space in the adjacent valve surface around the bushings provides for a free and quick escape, as the exhaust is distributed to the different ports alike.

The main valve is provided with the steam-ports *g* (Fig. 5) starting in from the under side and opening into the closed (Fig. 6) ends of the bushings back of the piston-valves. This end of the piston-valves is beveled or rounded off, as at *g'*, so that the steam can enter and force the same over to their opposite position. The rectangular exhaust-ports *g²* alternate with reference to the steam-ports and open into the steam-port or passage *g*, as indicated by dotted oblique lines *g³*.

E E' are the usual steam-passages connecting the steam-chest and cylinder.

Supposing the piston (Fig. 1) to be moving in the direction indicated by the arrow, the valve moving in the opposite direction has just closed the steam-passage E' and opened up the ports *g*, which admit steam back of the piston valves and force the same over to the position shown, that is, in the direction in which the piston is moving. This opens the exhaust or relief-ports in the bushings on that side; the piston-valves covering and closing the companion-ports on the opposite side. Now, when the piston is near the end of its stroke (Fig. 2) and the valve has traveled far enough to open the narrow exhaust-ports *g²*, the pressure, back of the piston-valves *d*, will be relieved and escape down into the passage leading to the cylinder. The excess of pressure, entering back of the piston-valves *d*,

forces the same over to their other position, shown in Fig. 2, thus relieving the piston from compression or back pressure which escapes into the exhaust-chamber through the ports 5 in the circular wall of the bushings, which are alternately opened and closed.

The steam-ports *g* in the under side of the valve, which lead into the bushings back of the piston-valves, are much wider than the 10 alternating exhaust-ports, which provides for the admission of steam while the valve is moving the required distance before the alternating exhaust-ports are uncovered to relieve the pressure on the piston-valves on that 15 side.

The adjustment of the piston-valves is such that they are automatically shifted from side to side in accordance with the direction in which the main valve and piston are moving, 20 so that there will be but little, if any, compression on the exhaust side and no waste of steam force on the acting side.

Any number of piston-valves may be used, one or more, as practical working may require.

25 The connecting-rods may be made in two parts and joined in the center by means of a screw-threaded sleeve, to facilitate insertion and removal from the main valve without being compelled to take out the bushing.

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

1. A steam-engine-valve, provided in its respective sides with a number of apertures, bushings, seated in said apertures and open 35 at one end and closed at the other and having exhaust-ports in the sides, piston-valves, inserted in and having a reciprocating movement in said bushings and connected by rods extending across the exhaust-chamber, and 40 steam-ports or passages, starting in from the bottom of the main valve and communicating with said bushings, substantially as set forth.

2. A steam-engine-valve, having steam and exhaust passages starting in from the bot- 45 tom and stopping short in the respective side walls, bushings, seated in the side walls and provided with exhaust openings, piston-valves, adapted to have a reciprocating movement in said bushings, in accordance with the 50 movement of the main valve, substantially as set forth.

3. The combination with the bushings, having an annular exterior groove, the main valve, having a corresponding groove in the 55 adjacent surface, and a spring-ring inserted in said grooved parts and locking said bushings in place, substantially as set forth.

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

EMIL L. SAUER.

Witnesses:

L. M. FREEMAN,
L. B. COUPLAND.