

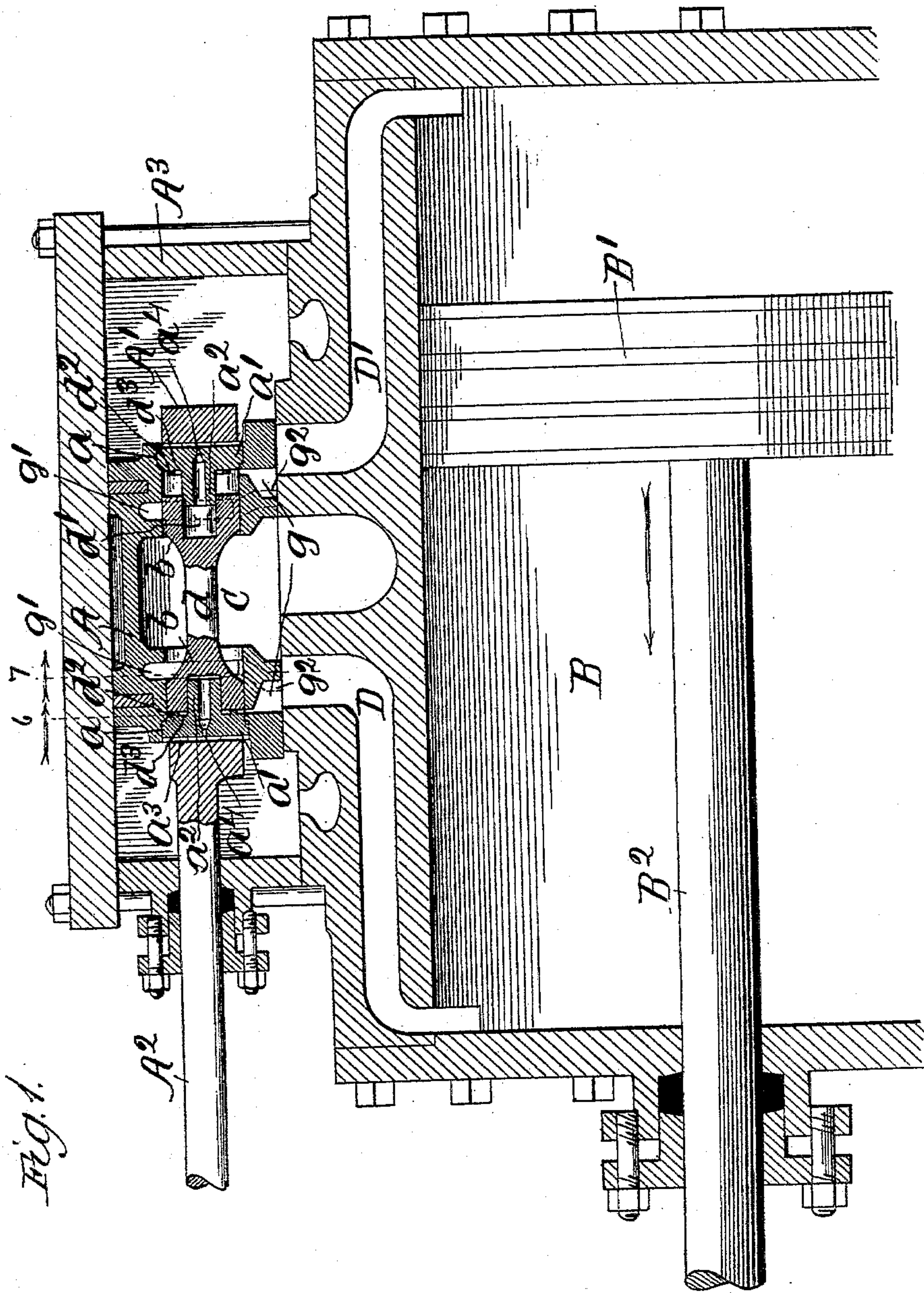
(No Model.)

3 Sheets—Sheet 1.

E. L. SAUER.  
STEAM ENGINE VALVE.

No. 597,436.

Patented Jan. 18, 1898.



Witnesses:  
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Att'y



(No Model.)

3 Sheets—Sheet 2.

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Fig. 3.

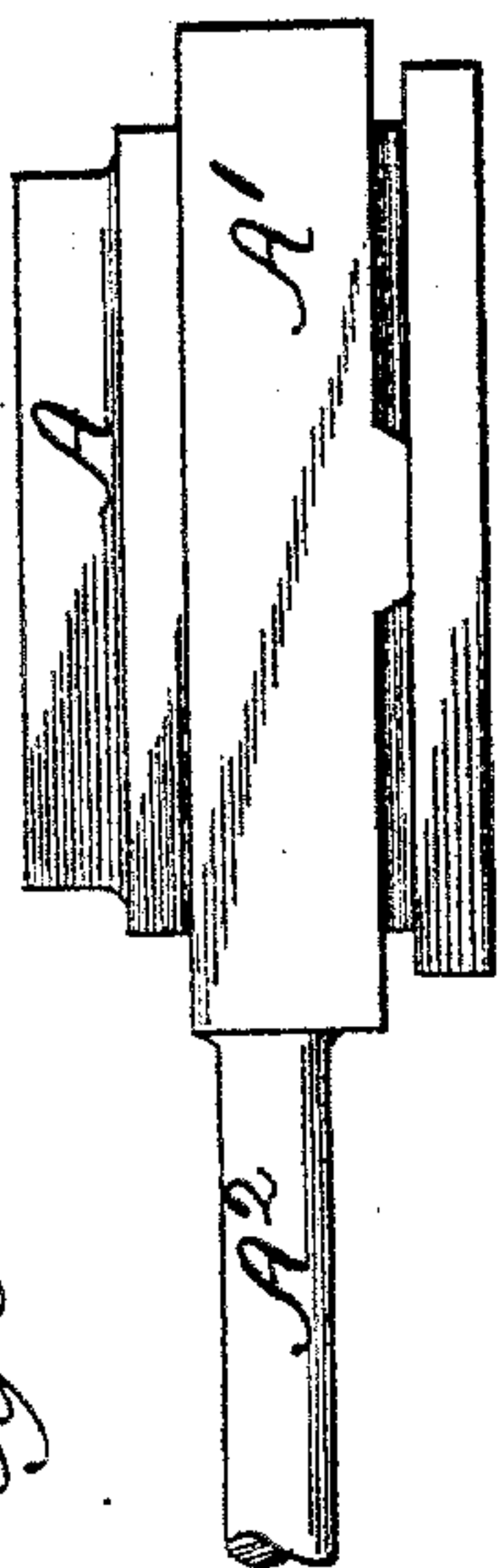
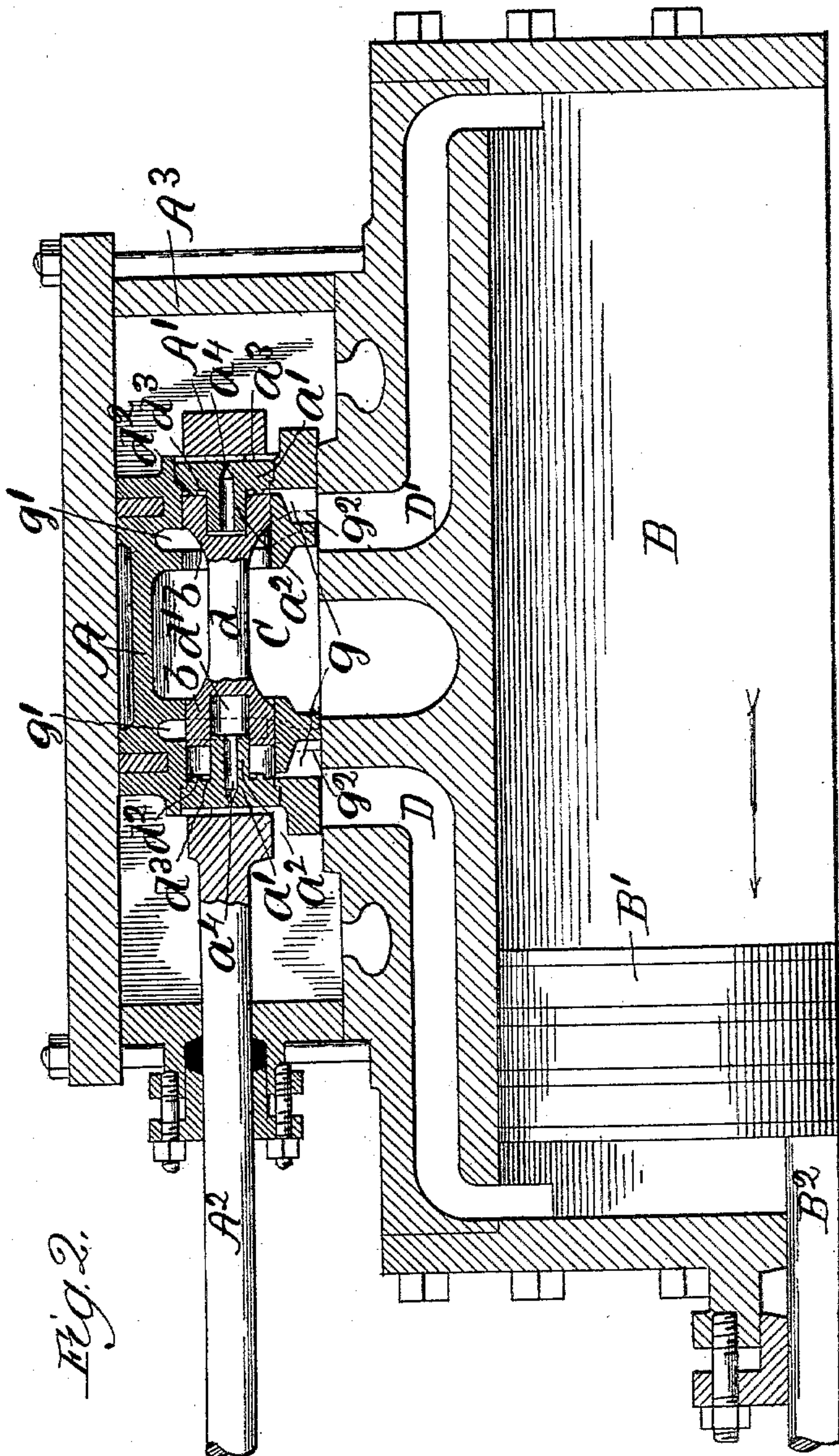


Fig. 2.



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3 Sheets—Sheet 3..

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Fig. 4.

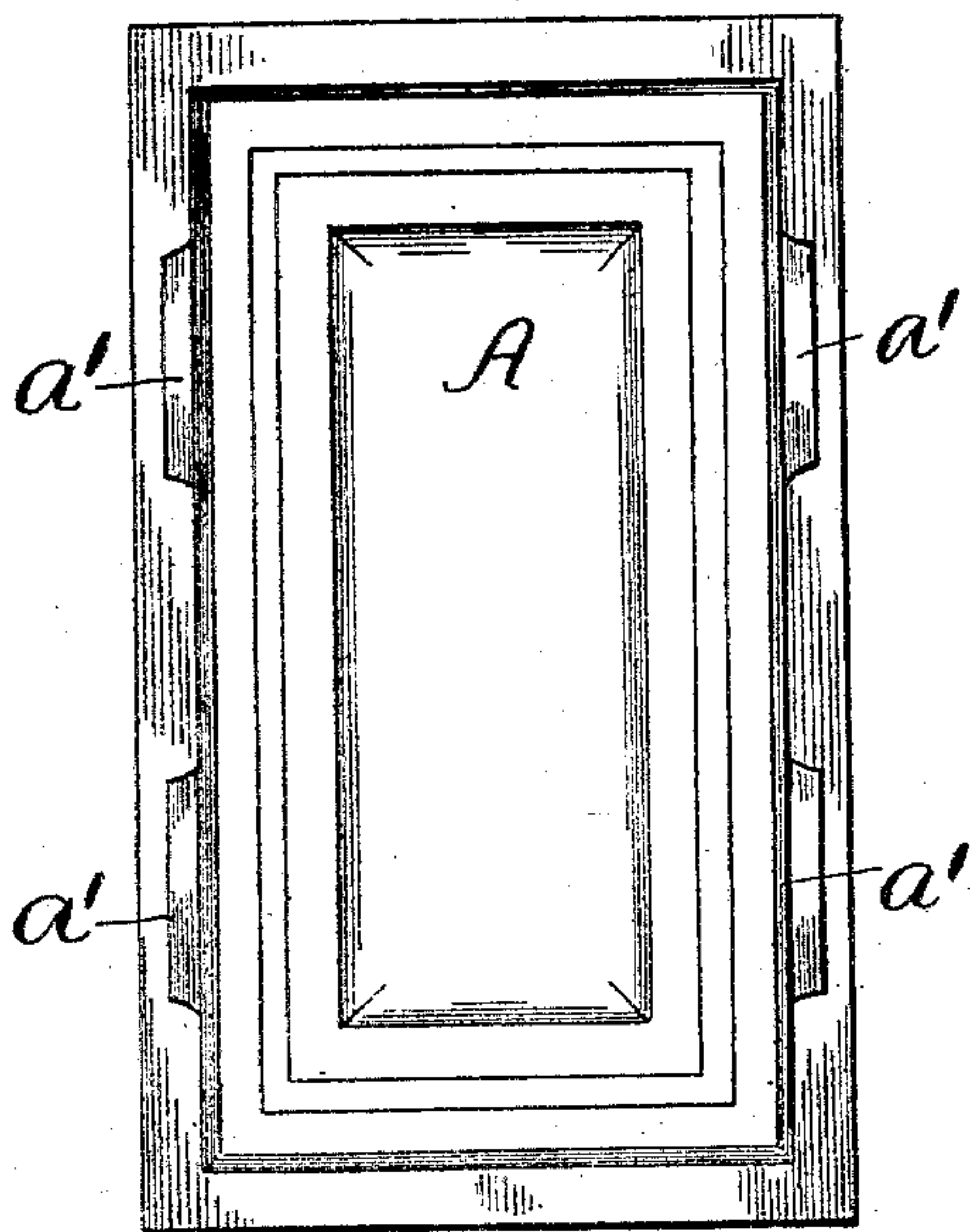


Fig. 5.

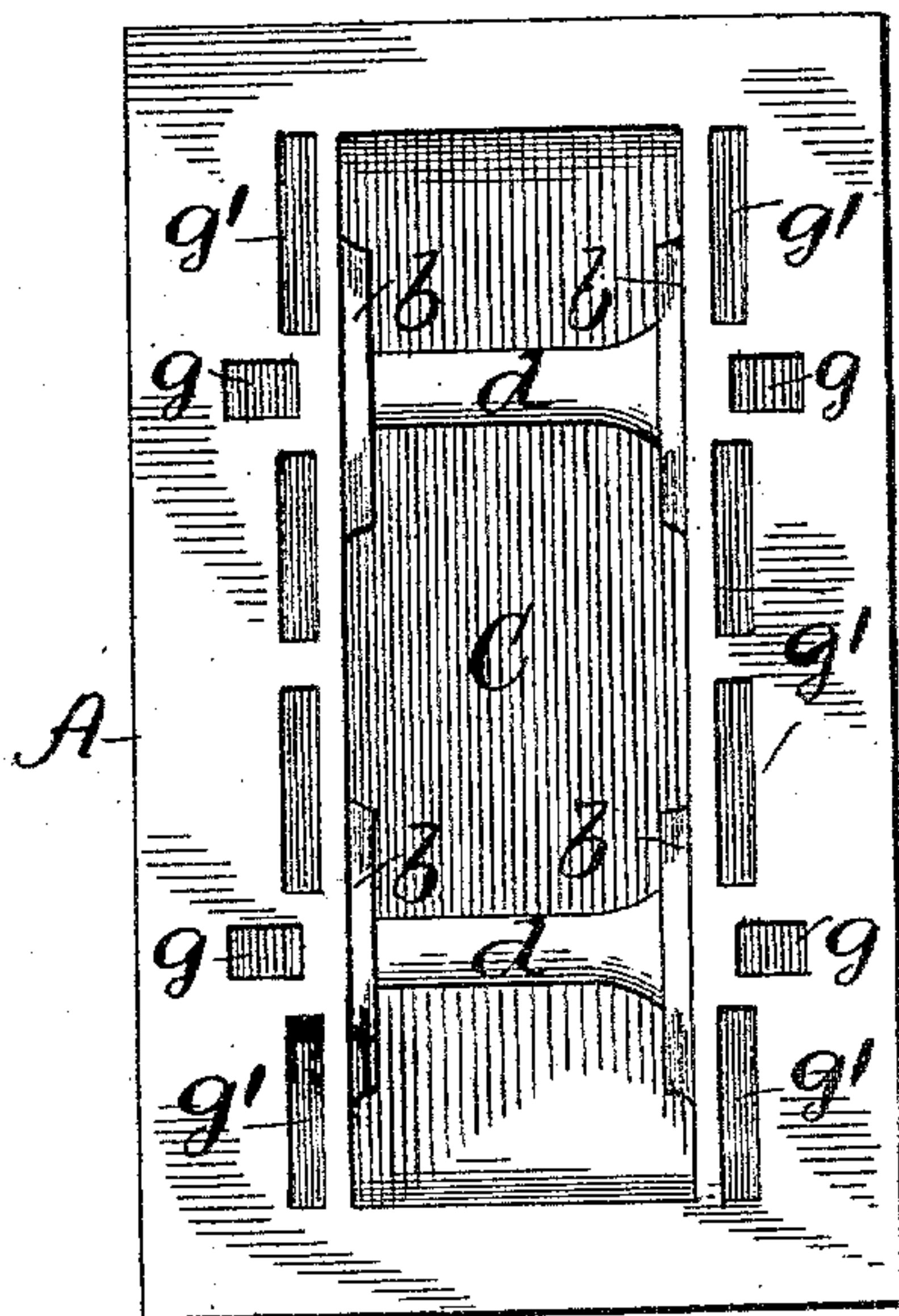


Fig. 6.

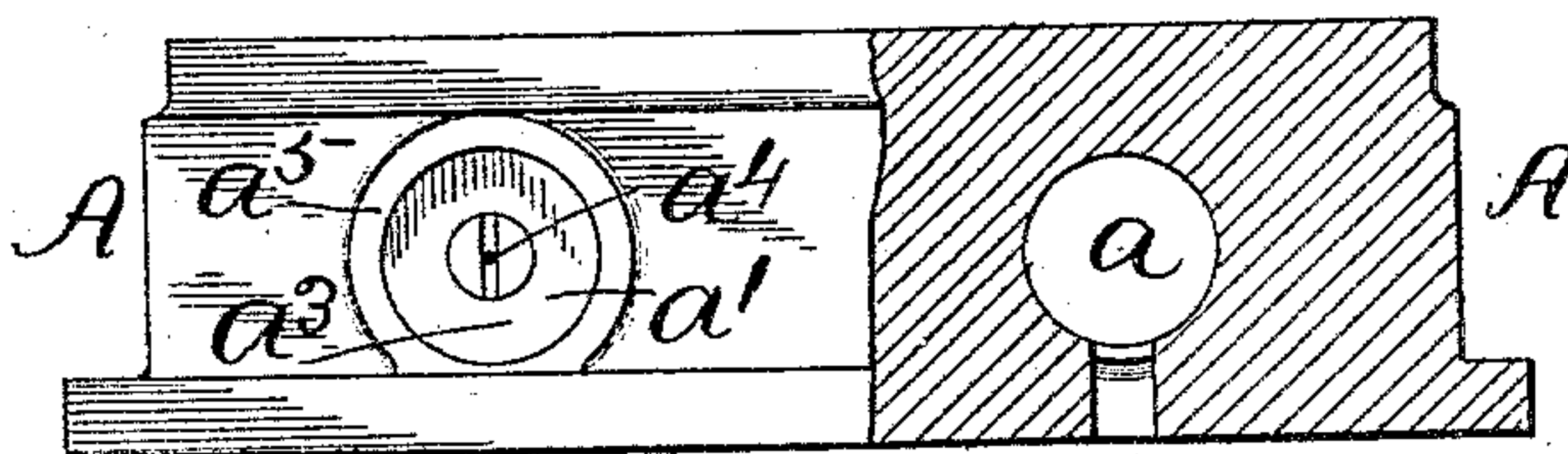
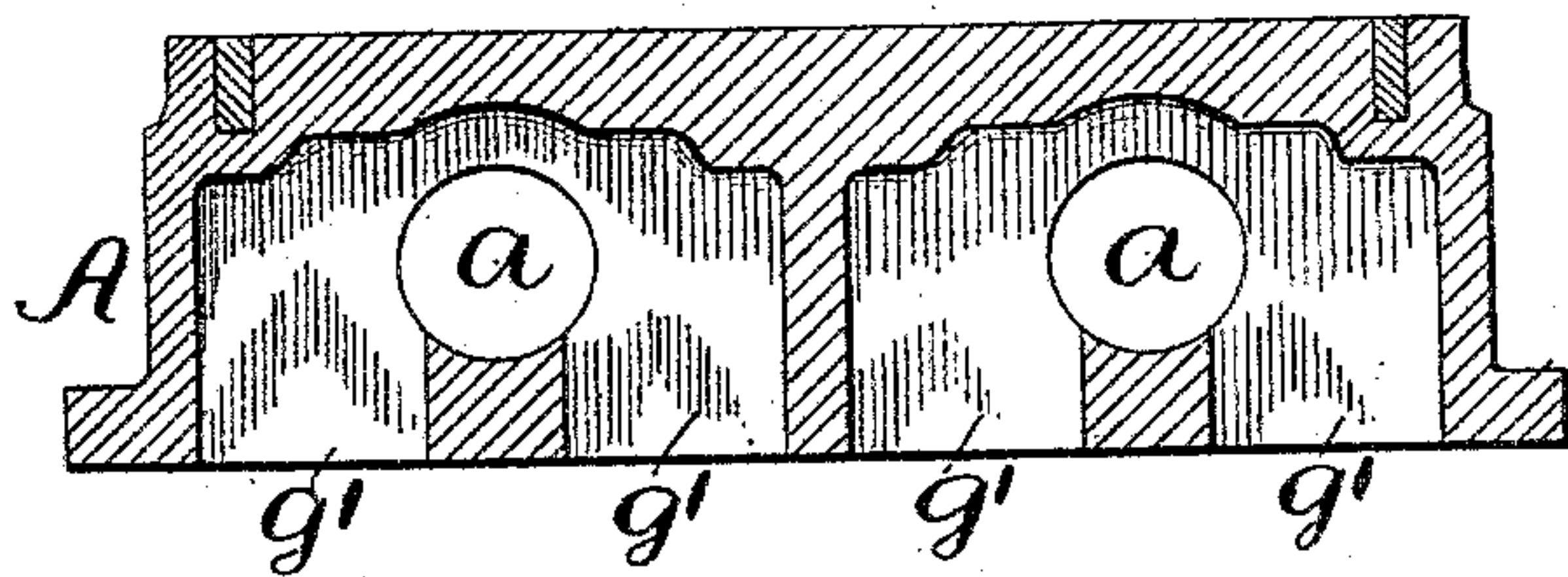


Fig. 7.



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# UNITED STATES PATENT OFFICE.

EMIL L. SAUER, OF CHICAGO, ILLINOIS.

## STEAM-ENGINE VALVE.

SPECIFICATION forming part of Letters Patent No. 597,436, dated January 18, 1898.

Application filed May 6, 1897. Serial No. 635,292. (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 that class of steam-engine valves set forth in Letters Patent No. 529,841, issued to me November 27, 1894.

The object of this invention is to improve certain construction features and further relieve the back pressure and compression on the piston and proportionately lessen the consumption of fuel.

Figure 1 is a broken-away longitudinal section of an engine-cylinder and steam-chest, showing an ordinary slide-valve embodying the improved features in a working position, the piston and rod being shown in elevation; Fig. 2, a similar view, the valve parts and piston being shown in a different relative position; Fig. 3, an end elevation of the slide-valve and yoke, the valve-stem being shown broken away; Fig. 4, a plan of the same, the yoke being omitted; Fig. 5, a bottom plan; Fig. 6, a part elevation and part section on line 6, Fig. 1, looking in the direction indicated by the arrow; and Fig. 7, a vertical section on line 7, Fig. 1.

A may represent the slide-valve; A', the valve-yoke; A<sup>2</sup>, the valve-rod; A<sup>3</sup>, the steam-chest; B, the cylinder; B', the piston, and B<sup>2</sup> the piston-rod.

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

The side walls of the main valve are provided with a number of apertures  $a$ , opening horizontally therethrough into the exhaust-chamber. In each of these apertures, from the outer side, is inserted a cap-plug  $a'$  of cylindrical form. The term "cap" is synonymous with that of "bushing" in the patent herein referred to, the construction being different. The inner side of these caps is provided with a stem  $a^2$ , as shown in Figs. 1 and

2. The caps  $a'$  are provided on their outer face with an annular recess  $a^3$ , forming a steam-space on the inner side of the valve-yoke, so that steam may enter in and escape back through an orifice  $a^4$ , extending clear through the cap and its stem part, the valve-yoke bearing against the raised edge  $a^5$  and leaving the orifice  $a^4$  open.

The piston-valves  $b$   $b$  are seated in the inner side of the apertures  $a$  and are connected by a rod  $d$  common to each pair of valves and extending across the exhaust-chamber C of the main valve. The ends of the piston-valves are bored out to provide a recess  $d'$  for the reception of the stems  $a^2$  of the caps  $a'$ . The piston-valves have a limited reciprocating endwise movement, but always remain in engagement with the plug part of the caps. The caps are provided on their inner face with an annular stop-shoulder  $d^2$ , which prevents the adjacent surfaces from coming together and provides for the annular space  $d^3$  when the piston-valves are in their closed position on one side, so that the pressure can enter and force the valves over to their opposite position at the proper time with reference to the movement of the piston and main valve. The shoulders  $d$  also prevent the recess-bottom from striking and upsetting the adjacent ends of the stems  $a^2$ . These stems also form a guide or bearing for the piston-valves in their movement and retain the same in the exact center, so that the wear is distributed evenly.

The stop-shoulder  $d^2$  may be formed on the respective ends of the piston-valves instead of on the inner sides of the caps, as shown.

The main valve is provided on opposite sides with steam-ports  $g$ , Fig. 5, starting in from the under side and which open in back of the piston-valves. The exhaust-ports  $g'$  open into the steam-ports  $g$ , as indicated by dotted oblique lines  $g^2$ .

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

The operation is as follows: Suppose the piston, Fig. 1, to be moving in the direction indicated by the arrow and has just closed the steam-passage D' and opened 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  $g'$  on that side into the exhaust-chamber of the main valve and for a part of the stroke communicates with the steam-passage leading into the cylinder, thus affording a double relief. Now when the piston is near the end of its stroke, Fig. 2, the pressure at that end will be in excess of the pressure on the opposite ends of the piston-valves and they will be forced over to their opposite position, and so on alternately. When the piston-valves are closed on one side, the steam enters the orifice in the caps and fills the recess in the valves. Now when forced over to the opposite side the excess of pressure overcomes this volume of steam and is expelled through the same passage back into the steam-chamber of the steam-chest. It will be noted that the orifice is contracted at its outer end so as to provide for a gradual escape of the steam. This arrangement forms a cushion for the action of the piston-valves, and not only imparts a nicely-balanced action, but also prevents any noise or jar, thus lessening the wear and causing a smooth and uniform movement.

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

30 1. A steam-engine valve, provided in its respective side walls with a number of apertures opening therethrough into the exhaust-chamber, the cap-plugs, inserted in said apertures from the outside and provided on their inner

side with stem ends stopping short in said apertures, piston-valves, seated in said apertures from the exhaust-chamber and having recessed ends loosely engaging with the stem ends of the cap-plugs, said piston-valves being connected by a rod common to each pair and adapted to have a reciprocating movement, substantially as described. 35 40

2. The combination with the main valve, provided with apertures in its walls on opposite sides which open clear through into the exhaust-chamber, of the cap-plugs, inserted in and closing said apertures from the outer side but stopping short therein, the piston-valves, loosely inserted in said apertures from the inner side and having a reciprocating movement with reference to the movement of the main valve and piston, substantially as described. 45 50

3. The combination with the main valve, of the reciprocating piston-valves, located therein and provided with recesses in the ends, the cap-plugs, having steam-orifices therethrough which open into said recesses, and the steam-ports, in the main valve communicating with the piston-valves, substantially as described. 55 60

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

EMIL L. SAUER.

Witnesses:

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