(No Model.)

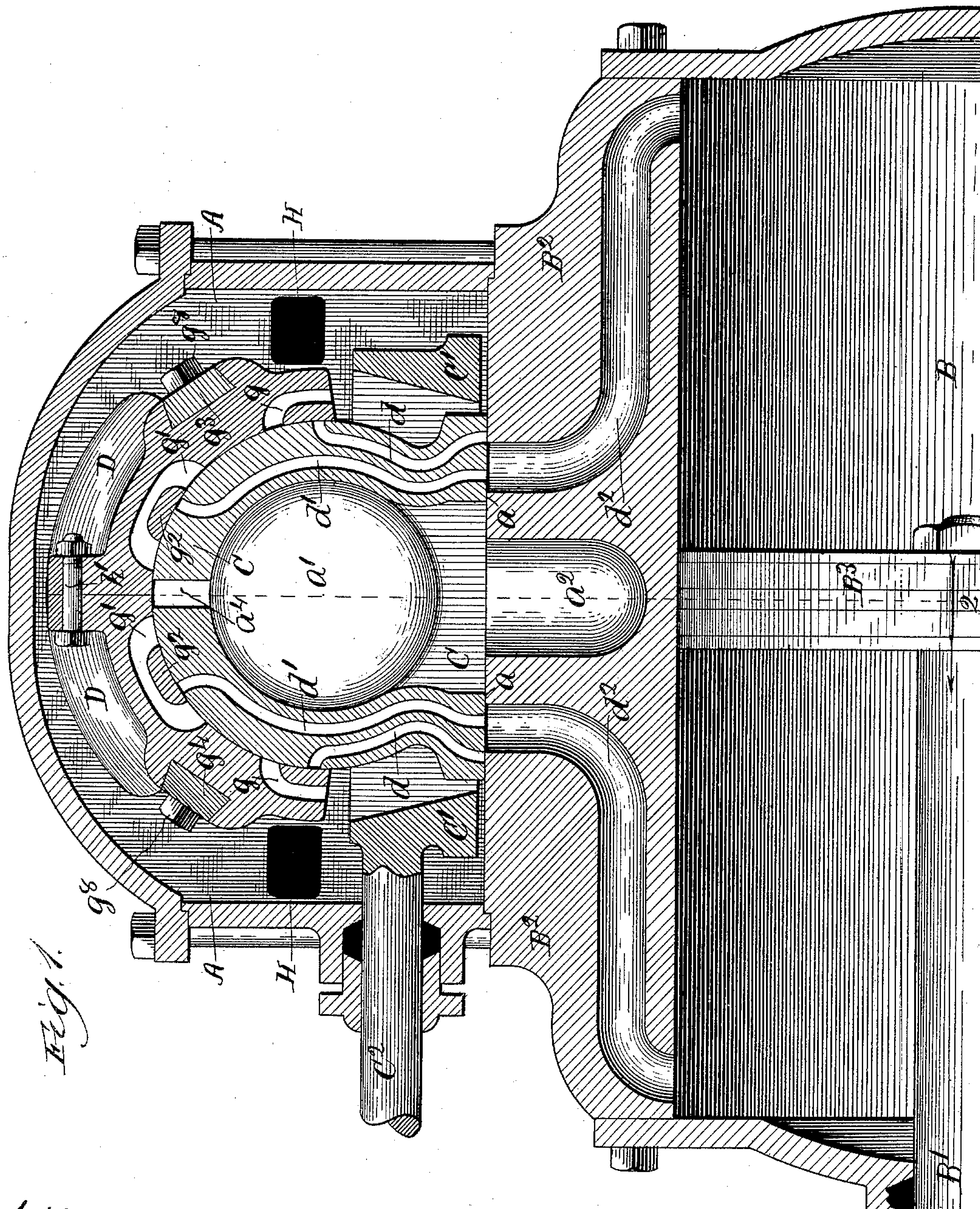
3 Sheets—Sheet 1.

E. L. SAUER.

STEAM ENGINE VALVE.

No. 482,415.

Patented Sept. 13, 1892.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

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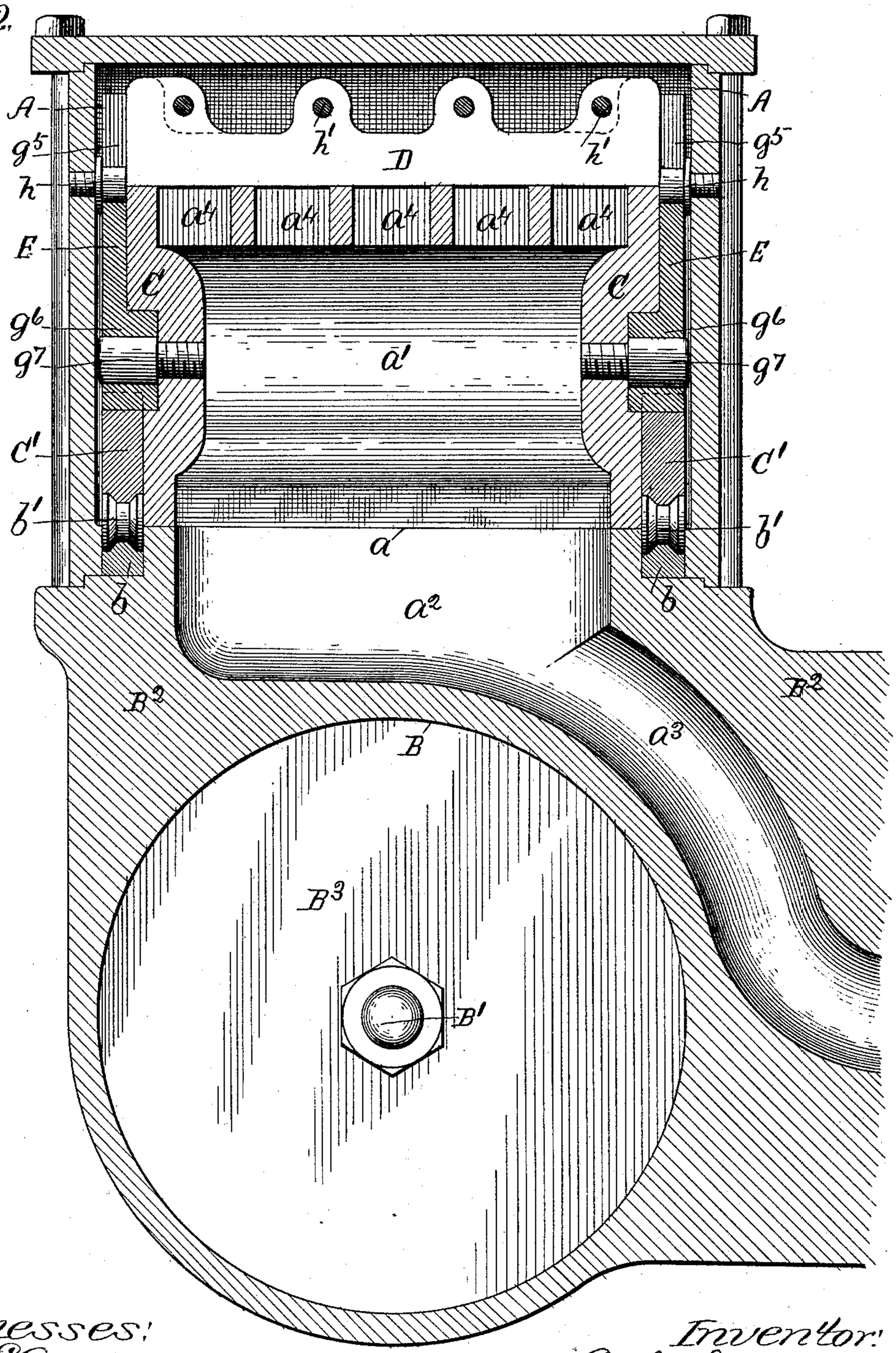
Fig. 2.



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(No Model.)

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E. L. SAUER.

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Fig. 3.

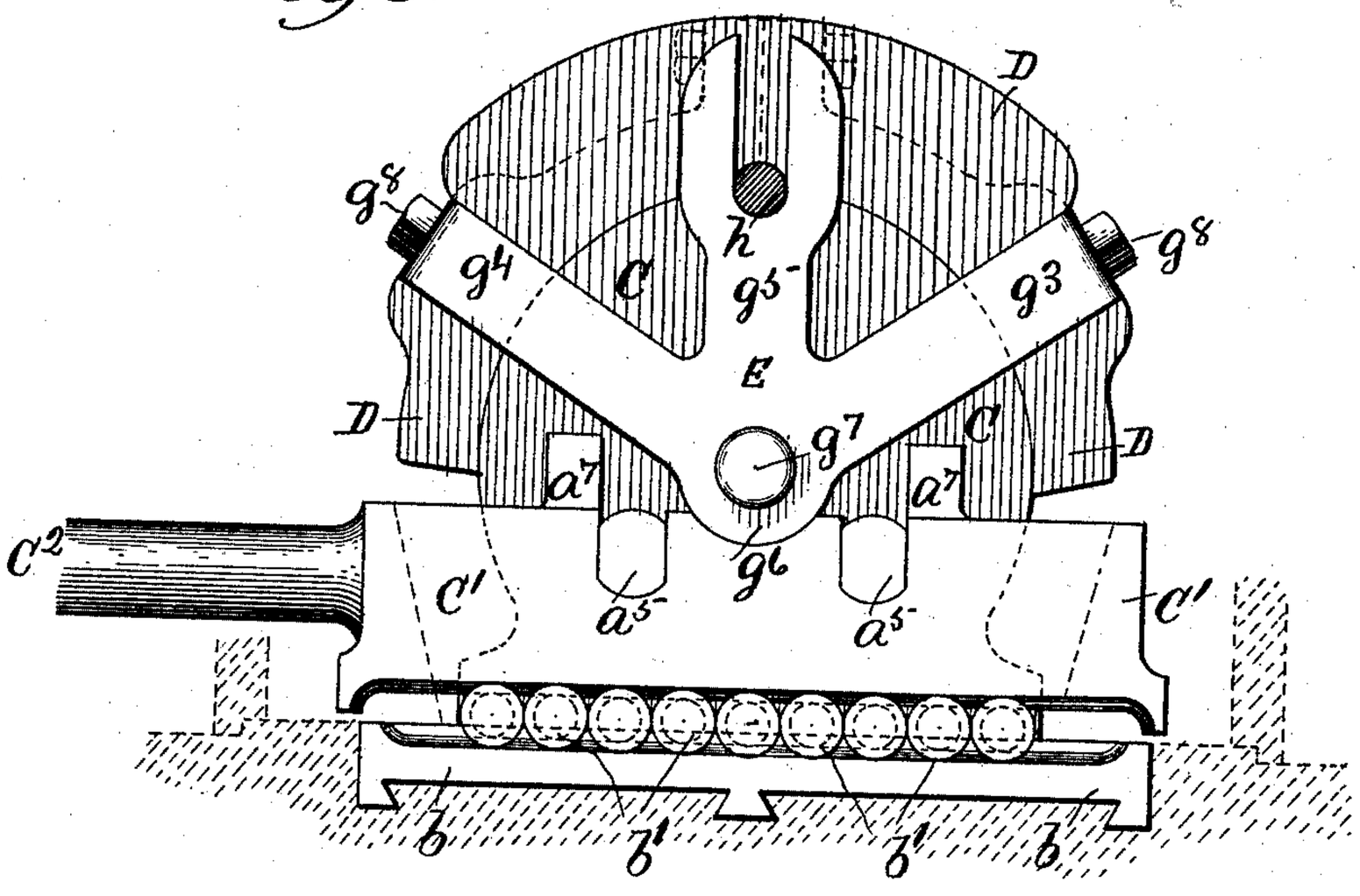
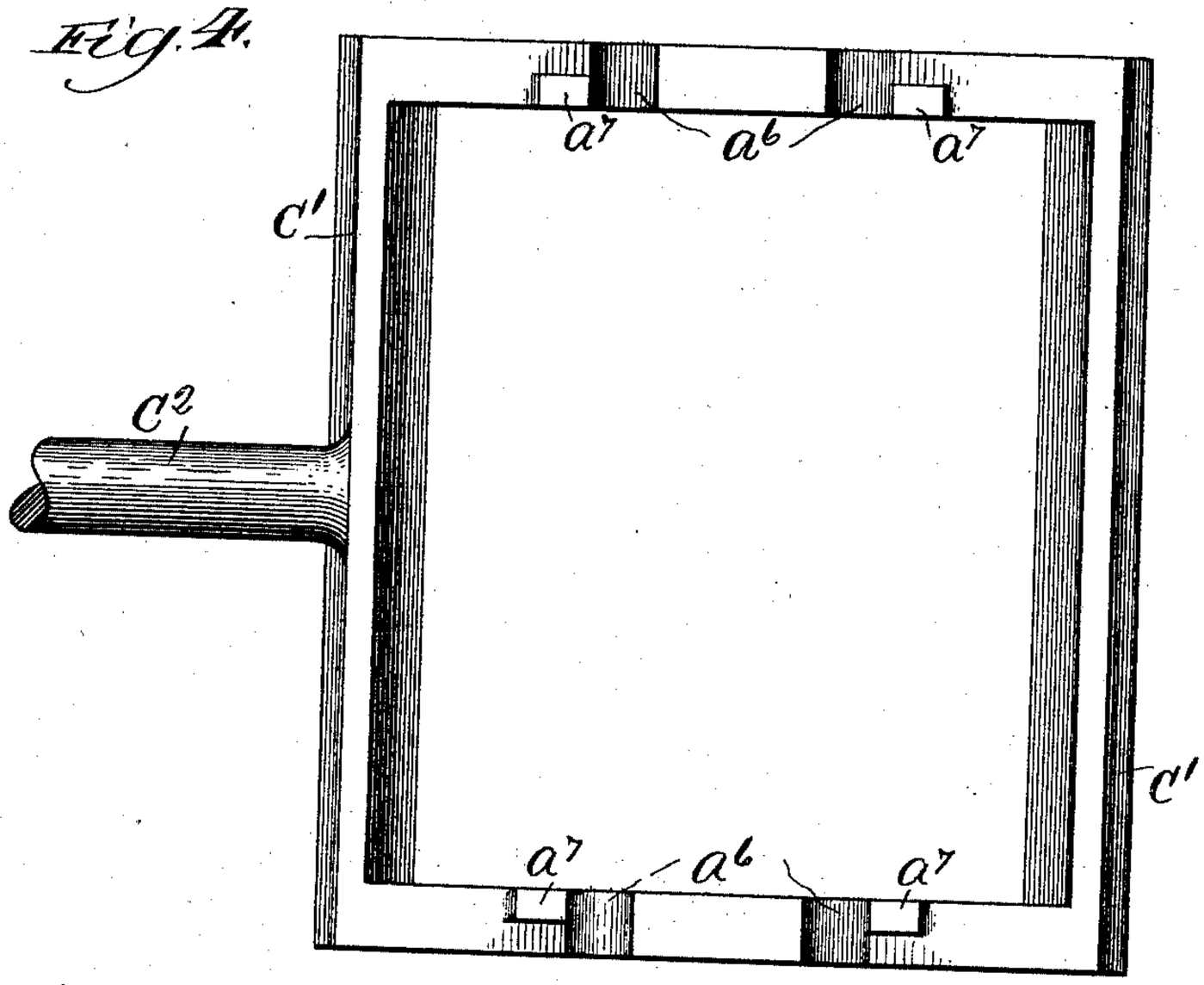


Fig. 4.



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UNITED STATES PATENT OFFICE.

EMIL L. SAUER, OF CHICAGO, ILLINOIS.

STEAM-ENGINE VALVE.

SPECIFICATION forming part of Letters Patent No. 482,415, dated September 13, 1892.

Application filed December 21, 1891. Serial No. 415,766. (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, of which the following is a full, clear, and exact description, that will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a vertical transverse section of the valve parts and steam-chest, the cylinder being shown in longitudinal section; Fig. 2, a vertical longitudinal section on line 2, Fig. 1, looking in the direction indicated by the arrow, the cylinder being in cross-section; Fig. 3, an end elevation of the valve, and Fig. 4 a plan of the valve-yoke.

This invention is in the form of a double valve and comprises what might be termed a "combined slide, rotary cut-off, and balance valve" adapted to be used in connection with different types of steam-engines, but is more especially designed for locomotives.

Referring to the drawings, A represents the steam-chest; B, the cylinder; B′, the piston-rod; B^2, the cast stock of the cylinder.

The slide-valve C is of a semicircular form—that is, round on the top and sides and flat on the under side—and rests on the valve-seat *a*. This valve is provided with the central exhaust-chamber *a*′, Figs. 1 and 2, opening from the under side into the compartment a^2, communicating with the exit-passage a^3. The exhaust-openings a^4 through the top of the slide-valve communicate with the exhaust-chamber *a*′. The valve C is seated in the yoke C′, Fig. 4, having the valve-rod C^2 connected thereto. The valve C is retained in proper relative position with reference to its yoke by tap-bolts a^5, inserted in the respective ends of the valve, the projecting head ends of which engage with notched-out recesses a^6 in the corresponding sides of the yoke, as shown in Figs. 3 and 4. The projecting or head part of tap-bolts a^5 are flattened on two sides to facilitate insertion and removal. The slide-valve is, also, further secured in place by vertical lugs or toes a^7, formed on the yoke and recessed in shoulder end of valve, Fig. 3, projecting a little over onto the upper edge of the yoke.

The companion track-rails *b b*, Figs. 2 and 3, are beveled on each side from the top downwardly and are recessed in the cast part below the main valve-seat and located at the respective ends of said valve and immediately under the corresponding frame parts of the valve-yoke. The series of antifriction-rollers *b*′ are spool-shaped and rest loosely on the track-rails. The inner faces of their beveled flanges correspond to the beveled bearing-surfaces of said rails and serve to retain said rollers in a proper working position.

d d are the steam or induction ports in the slide-valve, and which opens into the same at a point about midway between the top and bottom, extending down through the wall of the valve and opening out through the underside, as shown in Fig. 1. The exhaust or eduction ports *d*′ *d*′ run through the wall of the valve from the bottom upwardly and open out through the top on the respective sides of the exhaust-opening a^4 in the center.

d^2 d^2 are the steam passages between the steam chest and cylinder.

The rotary or cut-off valve D is of a concavo-convex form and is seated on top of the slide or main valve. The concave surface corresponds to that of the exterior of the slide-valve and forms a close bearing between the two. The rotary valve when in a central position extends down far enough on the respective sides of the slide-valve to cover the steam-ports therein, as shown in Fig. 1. The steam-ports *g g* start inwardly and upwardly through the edges of the rotary valve and then curve inwardly, opening against the surface of the slide-valve. These ports are somewhat larger than the corresponding ports in the slide-valve, so that the excess volume of steam will insure a continuous full pressure through the ports of the main valve. In the upper inner surface of the rotary valve are the curved exhaust-ports *g*′ *g*′, having the division-rib g^2 between the receiving and discharge sides, as shown in Fig. 1. The rotary valve is actuated by the movement of the main valve, as will now be described.

At each end of the valves is located a spider E, consisting of three arms g^3 g^4 g^5, Fig. 3, radiating from the common hub g^6. These companion spiders are pivotally secured to the respective ends of the slide-valve by a

stud g^7, passing through the hub part, as shown in Figs. 2 and 3. The outer ends of the arms g^3 g^4 are bent at right angles and dovetailed in the (Fig. 1) exterior surface of the rotary valve on each side and at a point equidistant from the center. These arms are rigidly fastened by bolts g^8. The middle arm g^5 is bifurcated at its outer end and loosely embraces the stud or studs h, rigidly inserted in the inclosing ends of the steam-chest, as shown in Fig. 2. One of the studs h is shown in section, Fig. 3. By this arrangement both valves have a simultaneous action. The reciprocating movement of the slide-valve imparts a reciprocating rotary movement to the cut-off valve and alternately brings the steam and exhaust ports in the two valves into a coincident relation.

The rotary or cut-off valve is shown as being made in two parts and secured together by a number of bolts h'. It is, however, obvious that the same may be made in one piece.

H H are the openings through which the steam enters from the boiler into the steam-chest.

In the position illustrated in Fig. 1 the steam and exhaust ports in both valves are closed. Now when the slide-valve is moved the cut-off rotates at the same time and brings the two valves into such relative position that the steam-ports coincide on the opposite side from that in which the slide-valve is moving and opens the exhaust-ports on the other side.

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

1. A steam-engine slide-valve having rounded sides and top, steam-ports opening in through the respective sides at a point about midway between the top and bottom and extending down through the wall and out at the under side, exhaust-ports opening in higher up with reference to the steam-ports and extending down parallel therewith, and an exhaust-port through the top of said valve and communicating with the chamber therein, in combination with a cut-off valve seated on the slide-valve and covering the steam and exhaust ports and provided with ports corresponding thereto and adapted to have a rotary movement simultaneously with the reciprocating movement of the slide-valve, whereby the different steam and exhaust ports are alternately brought into coincident relation, substantially as set forth.

2. In a steam-engine valve of the character described, the combination, with a reciprocating slide-valve having a rounded top and sides, of a cut-off valve concavo-convex in form and seated upon and corresponding to the exterior surface of the slide-valve and adapted to have a reciprocating rotary movement simultaneously with the movement of said slide-valve, substantially as set forth.

3. The combination, with a slide-valve having exterior rounded top and sides and provided with steam and exhaust ports in its walls on each side of the central exhaust-chamber and an exhaust-port opening downwardly through the top into said chamber, of a cut-off valve seated upon the slide-valve and provided with steam and exhaust ports corresponding to those in the slide-valve, whereby the steam first enters through the cut-off, is exhausted back through the slide or main valve into the cut-off or rotary valve, and finally returned through the slide-valve into the central exhaust-chamber, substantially as set forth.

4. The combination, with a slide and rotary cut-off valve, of companion spiders located at the respective ends of said valves and consisting of a number of arms and a hub and connected to the slide-valve by pivot-bolts inserted through the hub part, the ends of the outside arms being rigidly secured to the rotary valve and the central arm having a bifurcated end, and tap-bolts rigidly inserted in the walls of the inclosing steam-chest and projecting into said forked end of the central arm, whereby a reciprocating rotary movement is imparted to the cut-off valve by the movement of the slide-valve, substantially as set forth.

5. In a steam-engine valve, the combination, with a valve-yoke, of the companion track-rails recessed in the cast part below the valve-seat and beveled on their respective sides from the top downwardly and the spool-shaped friction-rollers interposed loosely between said yoke and track-rails, substantially as set forth.

6. The combination, with a slide-valve, of a valve-yoke provided with recesses in the upper edge and vertical lugs, as described, and tap-bolts inserted in said valve and having the head ends resting in said recesses, substantially as set forth.

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