

(No Model.)

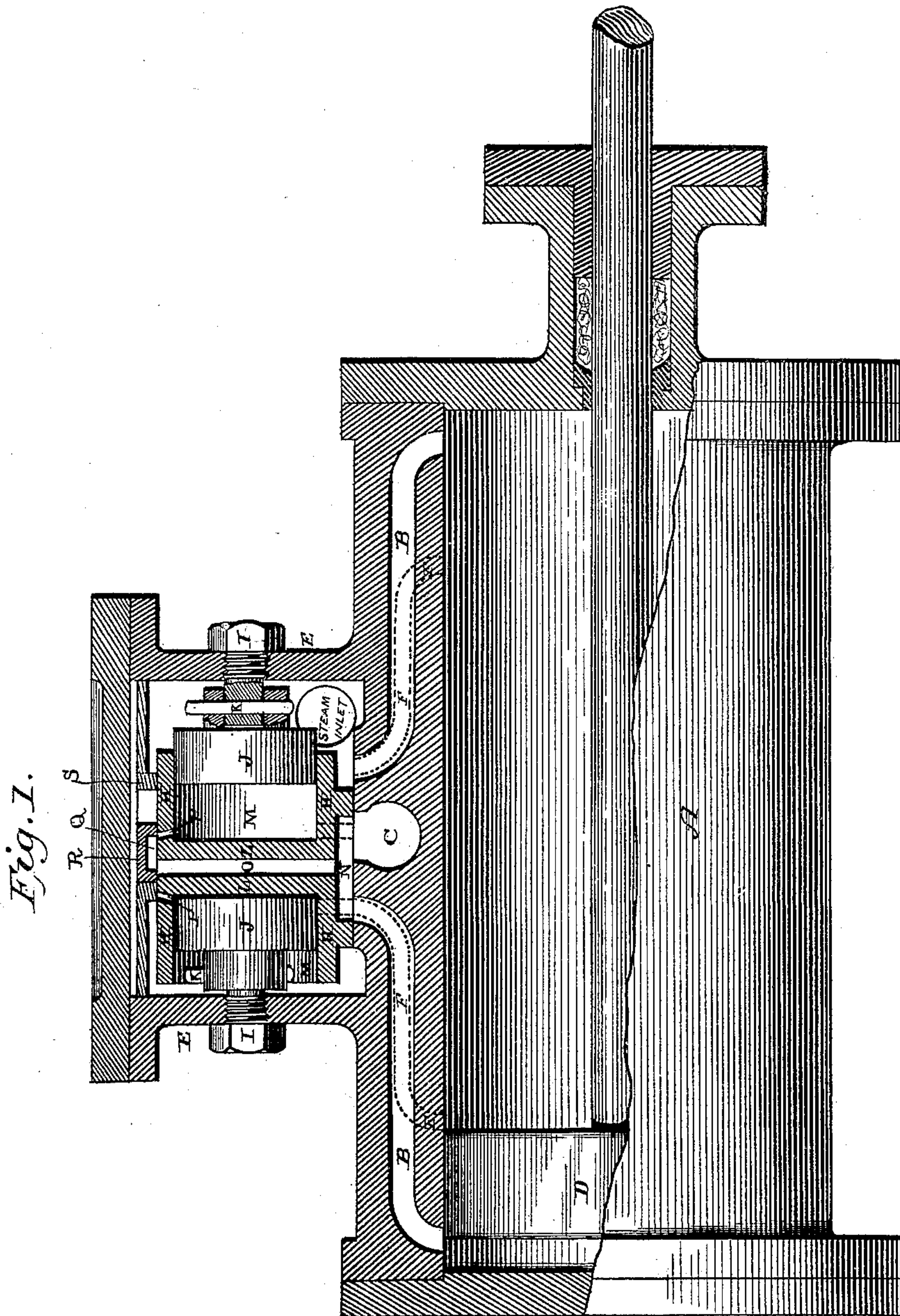
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STEAM ACTUATED VALVE.

No. 395,593.

Patented Jan. 1, 1889.



Witnesses.
Edw. P. Ellis,
L. L. Burkett.

Inventor.
Thos. Small
By his Attorney
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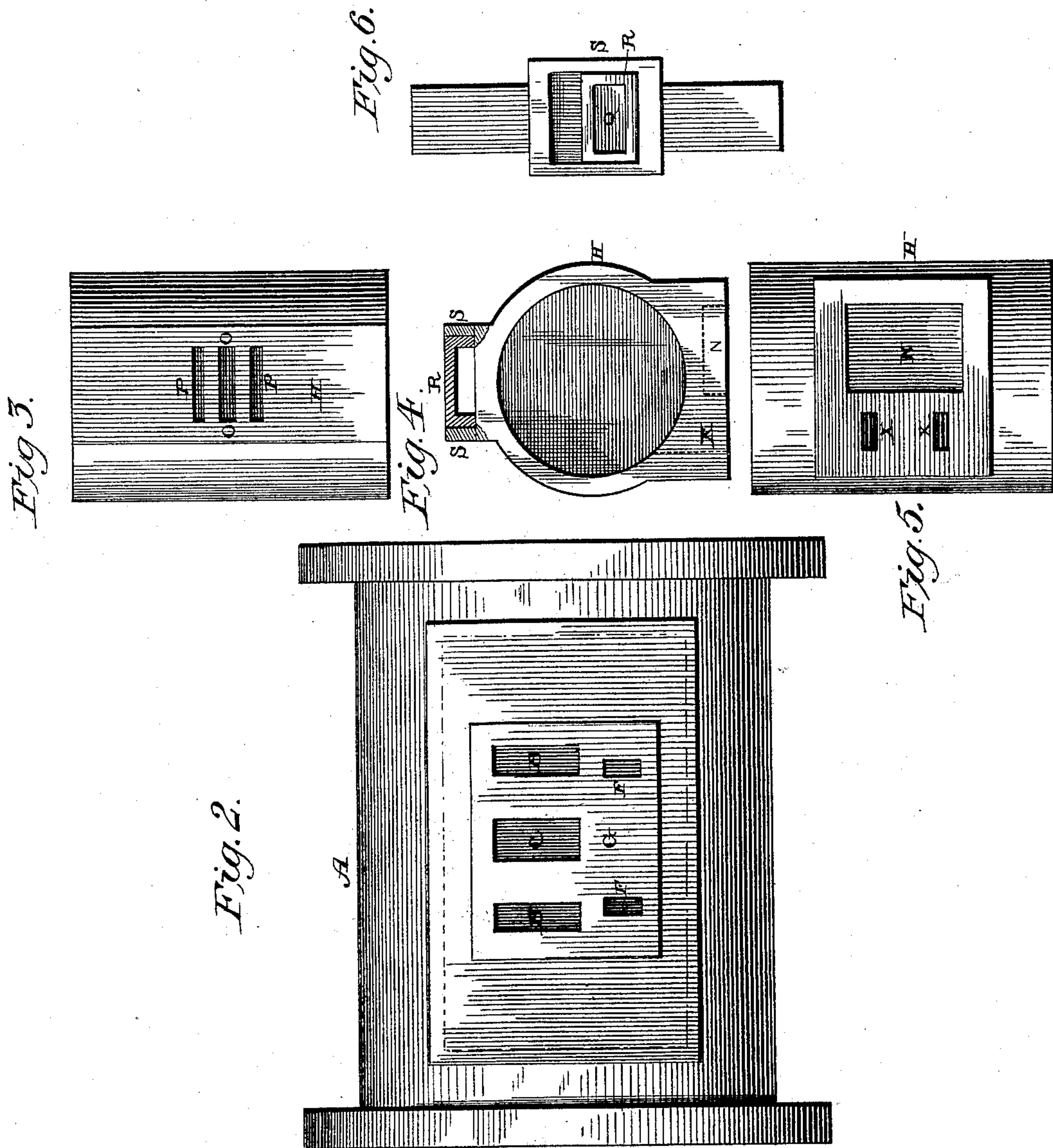
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UNITED STATES PATENT OFFICE.

THOMAS SMALL, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 395,593, dated January 1, 1889.

Application filed August 20, 1888. Serial No. 283,204. (No model.)

To all whom it may concern:

Be it known that I, THOMAS SMALL, of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Steam-Actuated 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in valves for single-cylinder steam-pumps; and it consists in, first, the combination of the steam-chest, two stationary pistons secured thereto, a combined slide-valve and cylinder provided with a central partition, having starting-ports at its inner end, and which slide-valve and cylinder are moved back and forth between the two pistons by the action of the steam; second, a combined slide-valve and cylinder having an exhaust-port at the inner end of each of the chambers, which is formed therein with the partition which separates the two chambers and which communicates with the exhaust of the engine, and a slide-valve which is operated entirely by the movement of the combined slide-valve and cylinder, all of which will be more fully described hereinafter.

The objects of my invention are to provide a valve motion for single-cylinder steam-pumps in which the valve is operated entirely by the action of the steam, thus dispensing with all mechanical appliances for the purpose of moving the valve; to so construct the valve motion that it can be entirely removed at any time by removing the steam-chest cover without taking apart any other portion of the engine, and to provide the combined slide-valve and cylinder with exhausts by means of which the air which is in the chambers of the combined valve and cylinder can be discharged directly into the exhaust of the engine.

Figure 1 is a vertical section of an apparatus which embodies my invention complete. Fig. 2 is a plan view of the valve-seat. Fig. 3 is a plan view of the combined cylinder and slide-valve. Fig. 4 is a vertical section taken through the slide-valve and cylinder. Fig. 5 is an inverted view of the face of the slide-

valve and cylinder. Fig. 6 is a plan view of the stationary valve and the auxiliary slide-valve which is placed in it.

A represents the cylinder; B, the two inlet-ports; C, the exhaust; D, the piston, and E the steam-chest, which may be of any desired construction. Extending from the cylinder A are two small auxiliary live-steam ports, F, shown in dotted lines in Fig. 1, and which have their upper ends extending through the valve-face G to one side of the inlet and exhaust ports B C, as shown in Fig. 2. These two live-steam ports F, through which steam passes for the purpose of starting the movement of the combined slide and cylinder H, are much smaller than the ports B C, and all of the ports are preferably placed relatively in the position shown in Fig. 2.

Passing through each end of the steam-chest is a screw, I, which has a hole through its inner end, and secured to the inner end of each of the screws I, by means of suitable pins, K, are the stationary pistons J, which snugly fit the chambers M, formed in the combined slide-valve and cylinder H.

The slide-valve and cylinder H is divided at its center by means of the partition L into chambers M, in which the pistons J fit steam-tight. The pistons J have no movement whatever; but the combined slide-valve and cylinder H is made to reciprocate by the action of steam upon the two pistons J for the purpose of alternately letting on and cutting off the steam from the cylinder A. In the face of the slide-valve H is made the usual recess, N, for controlling the escape of the steam from the cylinder, and through the partition L and communicating with this exhaust-recess N is an exhaust-passage, O; also, extending from the inner end of each of the chambers M in the slide-valve H is a small exhaust-port, P, through which the air contained in the chambers M is forced, and which air passes through the recess Q in the under side of the small slide-valve R, through the exhaust O, and into the exhaust C of the engine. If the exhaust O P Q were not used, the air contained in the chambers M would be compressed when the slide-valve was moved endwise by the pressure of the steam, and then this compressed air in the chamber would cause the slide-valve

to spring or move back to a central position, and thus cover both ports and thus stop the working of the engine.

Placed upon the top of the slide-valve H, which is provided with the three ports O P Q, is the stationary valve S. This stationary valve S rests upon the top of the slide-valve H and alternately closes the ports P for the purpose of preventing the live steam in the steam-chest E from passing into the chambers M of the slide-valve H, and also serves to regulate the endwise movement of the small auxiliary slide-valve R. The opening through this stationary valve S is sufficiently large to allow the auxiliary valve R to move freely back and forth therein, as shown in Fig. 6. The combined slide-valve and cylinder H reciprocates under this stationary valve S, and the valve R, resting upon the top of the cylinder, is moved back and forth by the combined cylinder and valve H. When the cylinder and valve H have moved the auxiliary valve R against one end of the opening in the valve S, the slide-valve H continues its movement, while the valve R remains stationary. When the slide-valve H moves in the opposite direction, it carries the auxiliary valve R with it toward the opposite end of the opening in the stationary valve S, and then this valve R again stops and remains stationary long enough to allow the air in the chamber M to be forced through the exhaust O P Q into the exhaust C of the engine.

The operation of my machine is as follows: The piston D having been moved by the steam into the position shown in Fig. 1, the steam is exhausted from one end of the cylinder at the same time that the live steam is passing into the other end. When the piston D reaches the position here shown, the live steam which is being admitted into the left-hand end of the cylinder passes through the right-hand auxiliary port F, through the inlet-port X in the bottom of the cylinder and valve H, so as to admit steam directly into the chamber M, and thus force the cylinder and valve endwise into the position shown in Fig. 1 by pressure against the end of the piston J, and thus brings the recess N over the left-hand inlet B and the exhaust C. The moment the slide-valve and cylinder H is moved by the pressure of the steam in the chamber M against the end of the right-hand piston J the inlet-port X of the chamber M is moved beyond the right-hand auxiliary port F, and the inlet X of the left-hand chamber M is moved over the left-hand auxiliary inlet F, so as to be ready to allow the live steam to pass into the left-hand chamber P as soon as the piston D moves beyond the lower end of the left-hand auxiliary port F. The combined slide-valve

and cylinder is reciprocated entirely by the action of the steam, thus dispensing with all mechanical means usually employed for this purpose, greatly simplifying and cheapening the construction of the engine.

Should it be desired at any time to remove the valve motion, it is only necessary to take off the cover Z of the steam-chest, when the parts can be removed without having to take apart any other portion of the engine.

By means of the construction here shown the valve motion is made to take up but a very small amount of space. The division of the cylinder serves the purpose of the two cylinder covers, and thus reduces the number of steam-tight joints. When it is required to take the valve motion out, there is only one joint to break, and that is the steam-chest cover. The valve and cylinder being combined prevents lost motion, always found where the slide-valve is between the pistons. The steam-ports P being so short, less steam is used than would otherwise be the case.

Having thus described my invention, I claim—

1. The combination of the steam-chest, two stationary pistons secured therein, and a combined slide-valve and cylinder provided with a chamber for each piston, and having inlet and exhaust ports, and the port O, with both a stationary and a movable valve, and an extra steam-port extending from each end of the cylinder, and which slide-valve and cylinder is moved back and forth by the action of the steam between the two pistons, substantially as set forth.

2. The combination of the steam-chest, two stationary pistons secured therein, the combined slide-valve and cylinder, which is moved back and forth between the pistons by the action of the steam, and which is provided with inlet and outlet ports, a stationary valve, which rests upon the top of the slide-valve and cylinder, and a movable valve placed inside of the stationary valve, and which is operated by the movement of the slide-valve and cylinder, substantially as described.

3. The combination of the steam-chest, the two pistons secured thereto, a slide-valve and cylinder provided with the two chambers M, the inlet-ports X, the outlet-ports P, the exhaust-port O, extending through the partition L, the stationary valve S, and the movable valve R, placed in the opening in the valve S, substantially as set forth.

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

THOMAS SMALL.

Witnesses:

F. A. LEHMANN,
EDM. P. ELLIS.