(No Model.) 2 Sheets—Sheet 1.

# A. L. IDE.

## STEAM ENGINE VALVE.

No. 360,594. Patented Apr. 5, 1887.

Fig. 1.

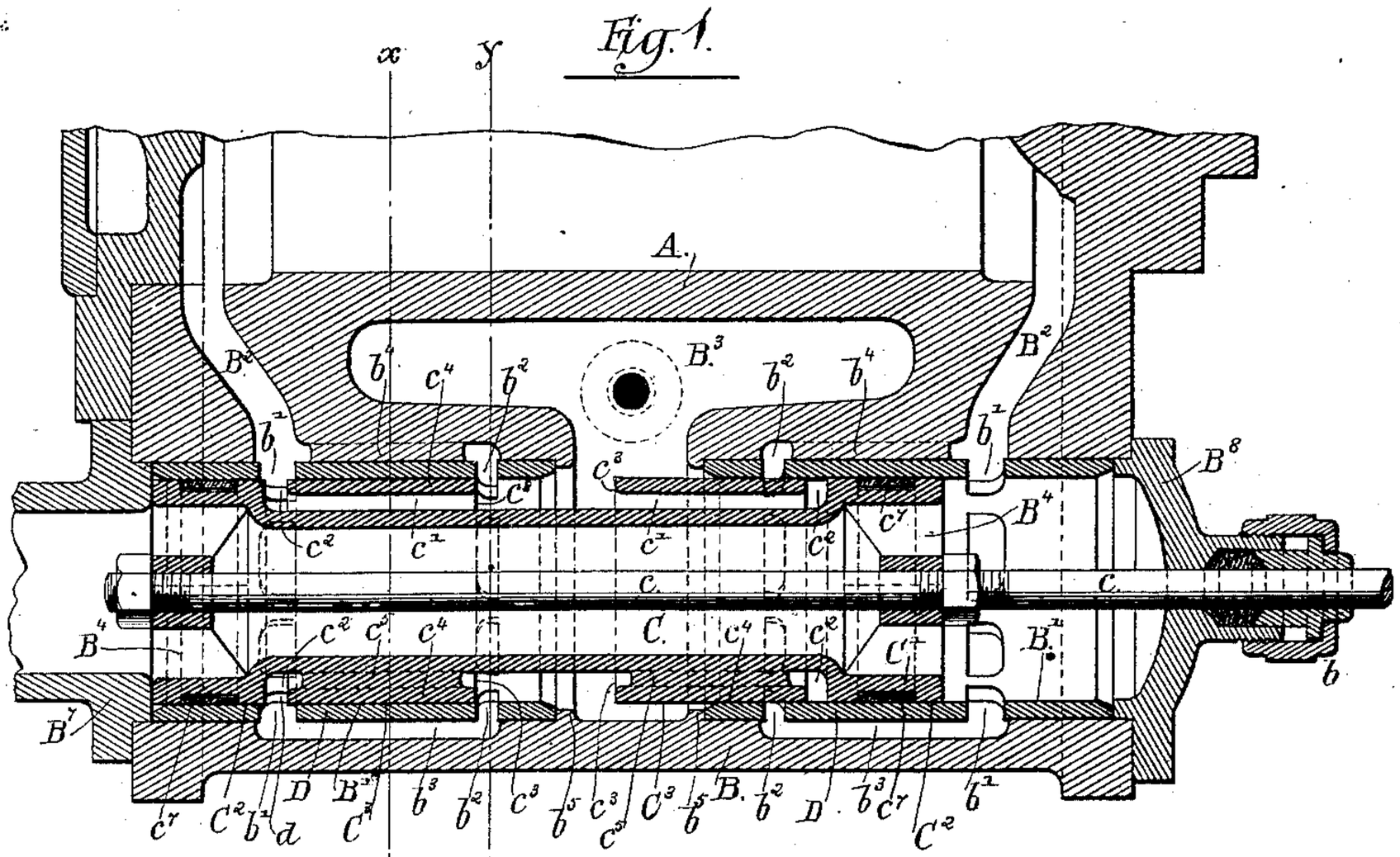



Fig. 2.

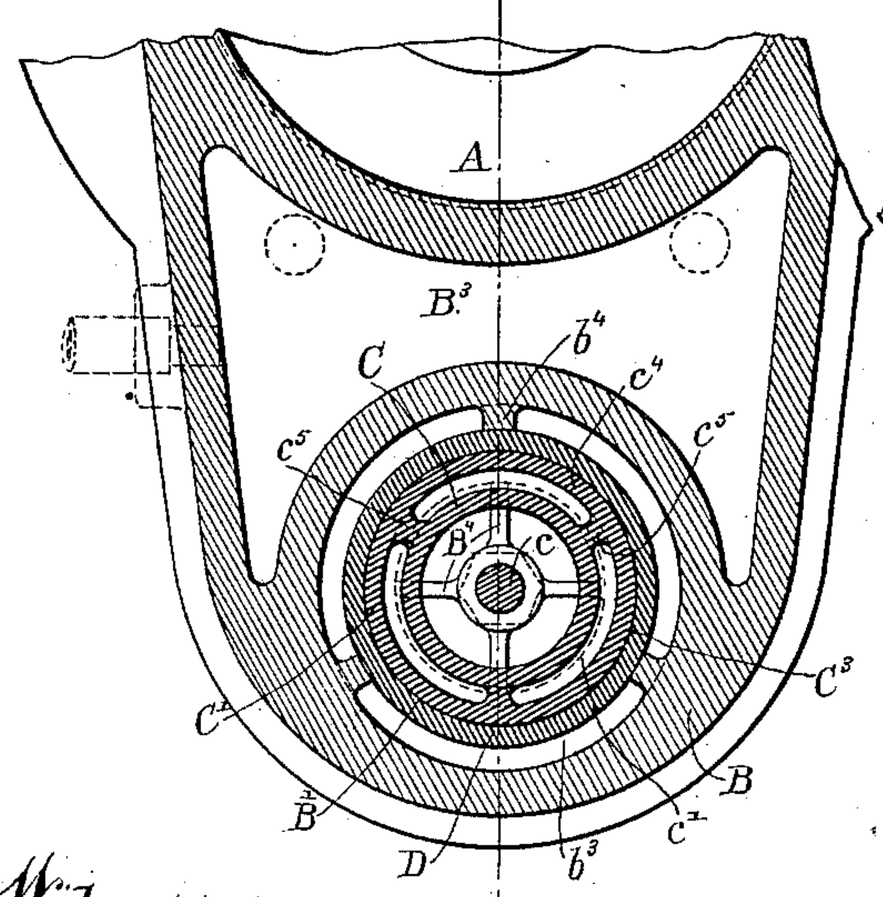
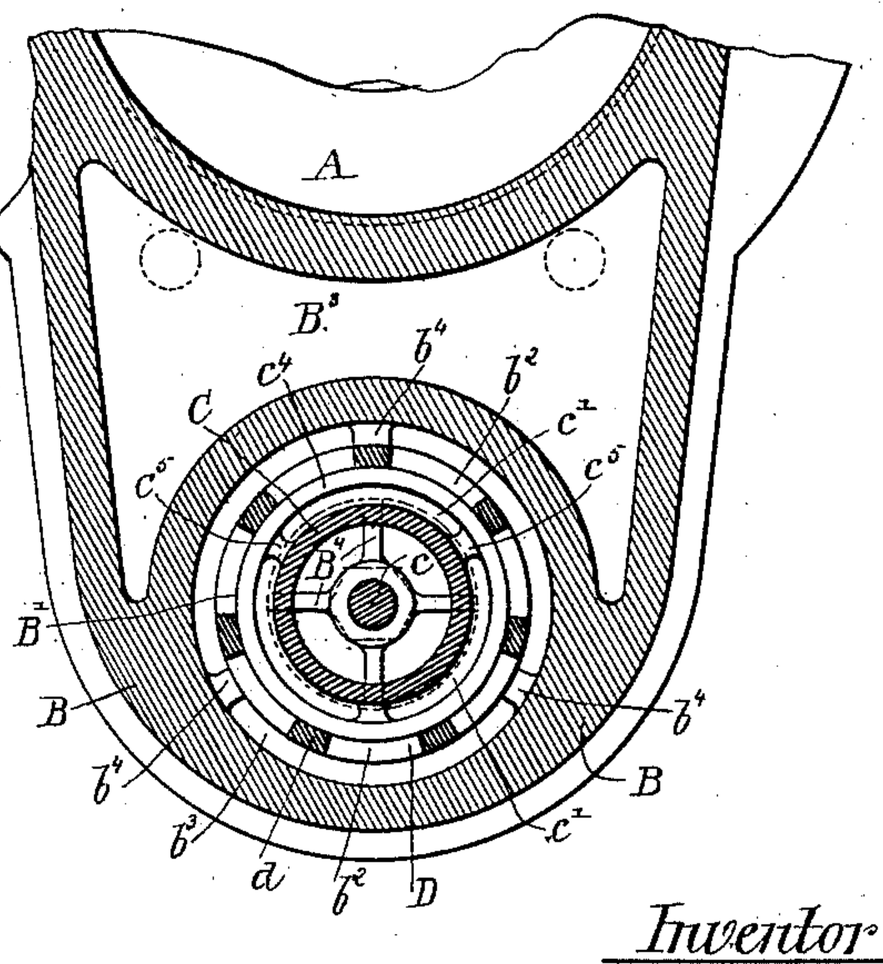



Fig. 3.




Witnesses:-
Louis M. T. Whitehead.
C. C. Poole

Inventor:
Albert L. Ide.

by:- Dayton & Poole
Attorneys

(No Model.) 2 Sheets—Sheet 2.

# A. L. IDE.

## STEAM ENGINE VALVE.

No. 360,594. Patented Apr. 5, 1887.

Fig. 4.

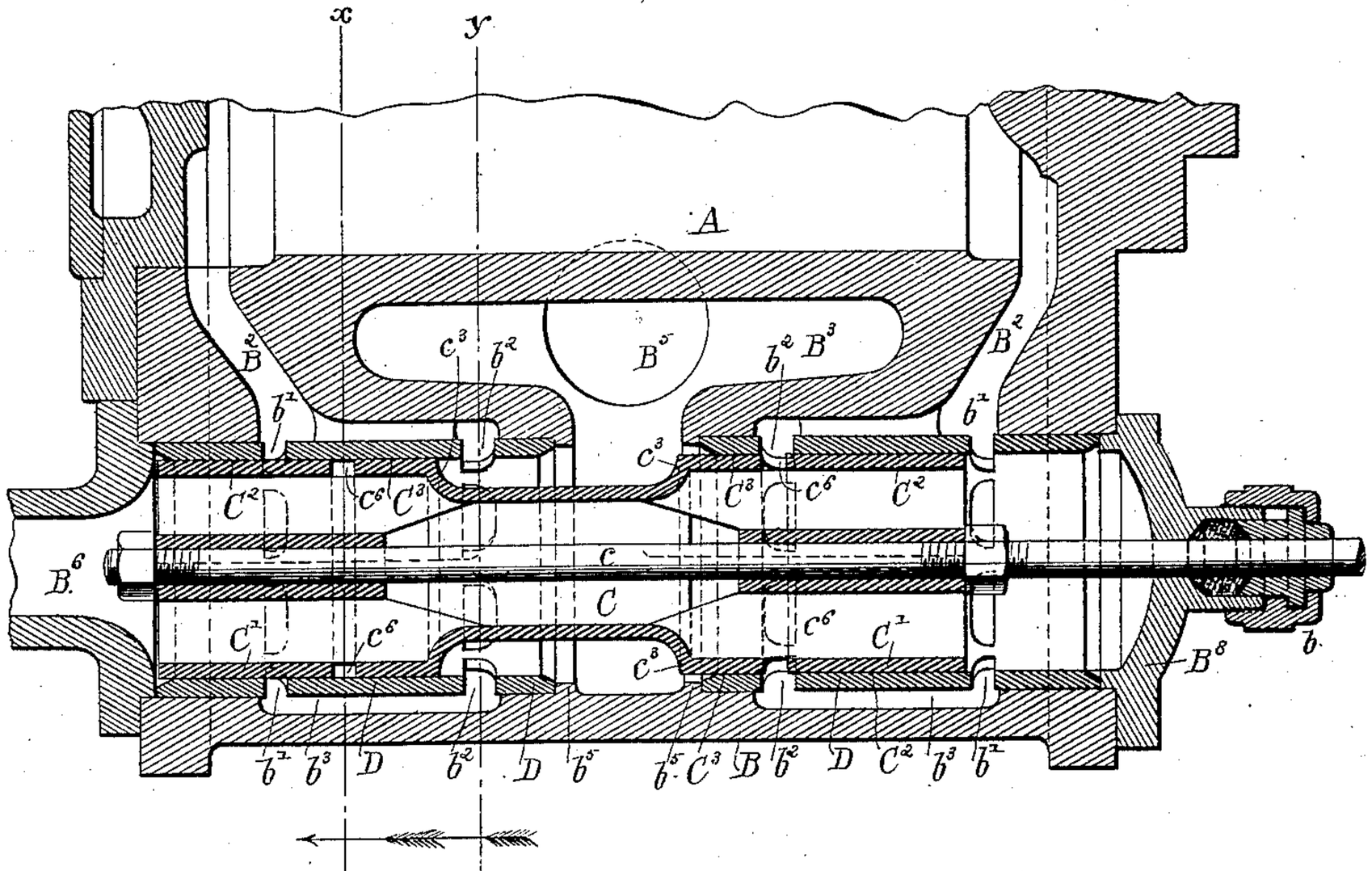



Fig. 5.

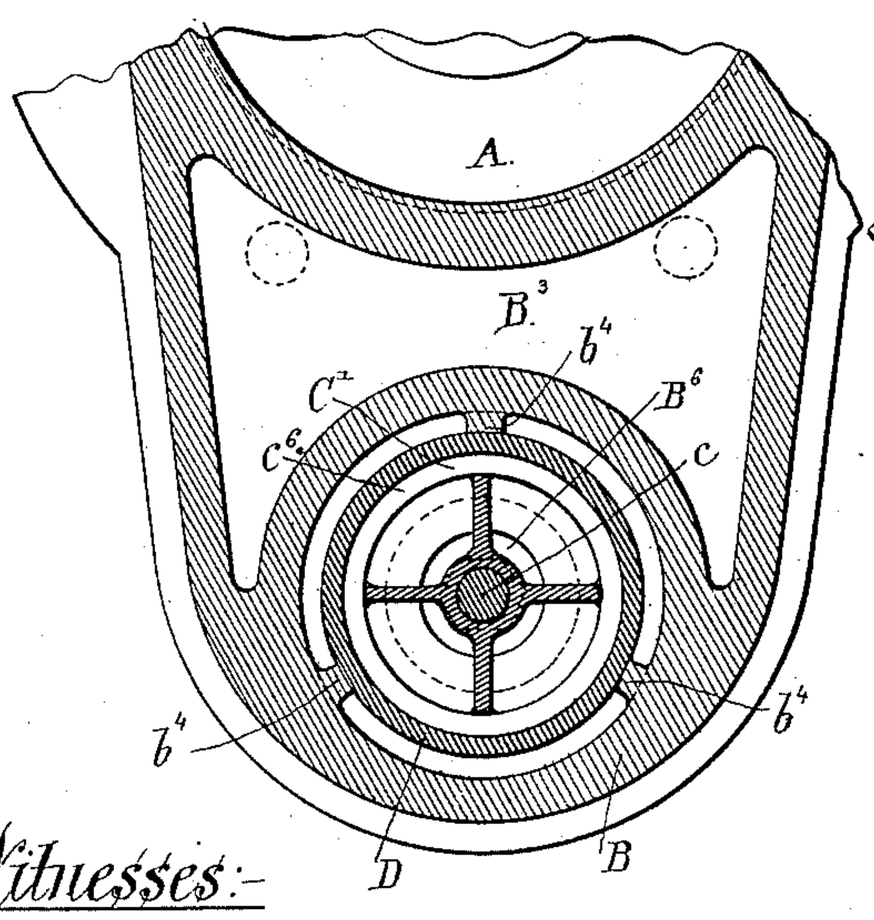
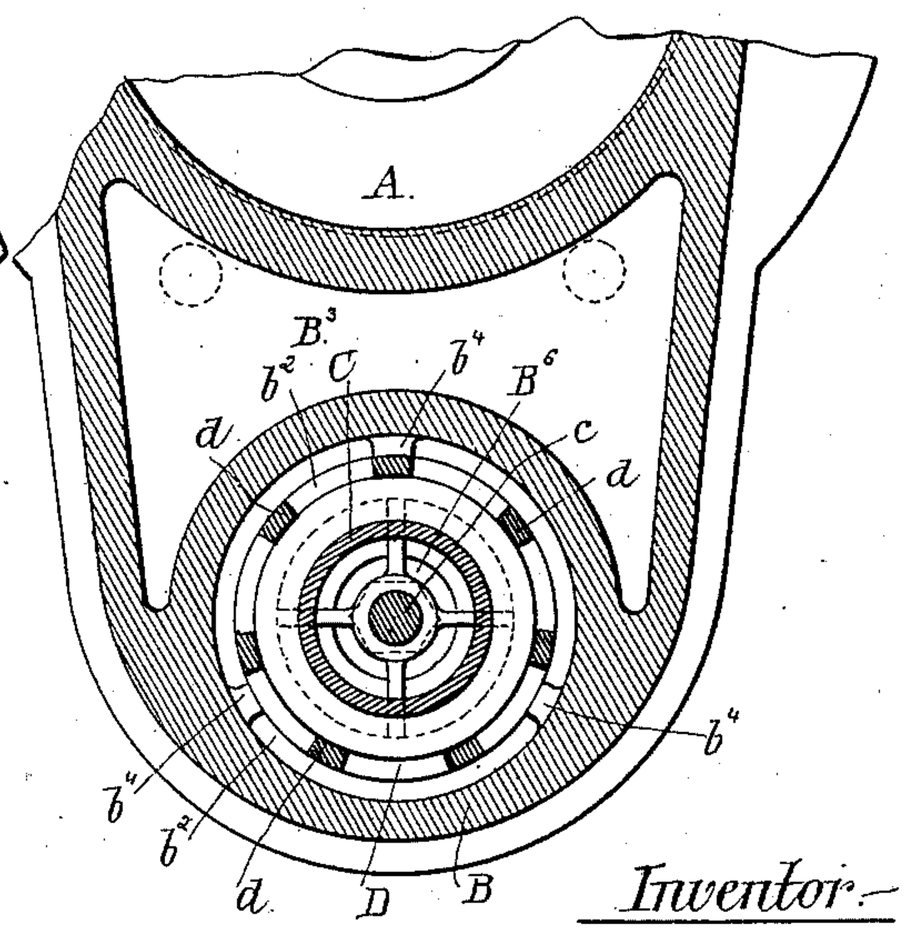



Fig. 6.




Witnesses:-
Louis M. V. Whitehead.
C. C. Poole

Inventor:-
Albert L. Ide.-
by- Clayton & Poole
Attorneys

# UNITED STATES PATENT OFFICE.

ALBERT L. IDE, OF SPRINGFIELD, ILLINOIS.

## STEAM-ENGINE VALVE.

SPECIFICATION forming part of Letters Patent No. 360,594, dated April 5, 1887.

Application filed May 11, 1886. Serial No. 201,823. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT L. IDE, of Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Steam-Engine Valves; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The object of this invention is to provide an improved construction in slide-valves for steam-engines; and it consists in the matters hereinafter described, and pointed out in the appended claims.

In a slide-valve embodying my improvement the steam-passage leading from each end of the cylinder to the valve-seat is provided with two or more openings or ports arranged side by side along the valve-seat, or, in other words, in a line extending in the direction in which the valve moves, and the movable part of the valve is provided at each end with working-surfaces corresponding in number and relative position with said several ports, and adapted to open and close the latter during the movements of the valve. By this construction steam may be allowed to pass at the same time through all of the said ports, so that a large area for the admission or exit of steam is obtained without materially increasing the size of the valve and its casing, the width of the ports, or the throw of the valve, and with the obvious advantages of allowing a rapid passage of steam to and from the cylinder and of enabling a high pressure to be quickly established within said cylinder when the ports are opened. A construction affording a large area of passage through the steam-valve is of especial utility in the case of high-speed engines and has important advantages in all engines, inasmuch as it enables them to do a greater amount of work with a less consumption of fuel.

I have illustrated in the accompanying drawings two different forms of valve embodying the same main features of my improvement, one in which the steam is admitted to a central port or passage at the middle of the valve and exhausts at the ends thereof, and another in which the steam enters the steam-chest or valve-casing in the usual manner and passes out through a central exhaust passage or port. The valve is in both cases of that class of type known as a "hollow" piston-valve, or one in which the movable part of the valve consists of a hollow tube having enlarged parts or pistons at both ends fitted to slide in cylindric valve-seats containing annular steam-ports—such, for instance, as is illustrated in the prior Letters Patent No. 319,261, granted to me upon the 2d day of June, 1885. The said hollow piston-valve shown embodies certain features of improvement in addition to the main features of the invention above referred to, and which are made the subject of specific claims herein.

In the accompanying drawings, illustrating my invention, Figure 1 is an axial longitudinal section through a steam chest and valve and adjacent parts of the steam-cylinder, said valve being constructed in accordance with my invention. Fig. 2 is a transverse sectional view of the same, taken upon line $x\,x$ of Fig. 1. Fig. 3 is a similar sectional view taken upon line $y\,y$ of Fig. 1. Fig. 4 is a longitudinal sectional view of a valve constructed to take steam at the end of the valve instead of at the middle. Fig. 5 is a transverse sectional view of the valve shown in Fig. 4, taken upon line $x\,x$ of said Fig. 4. Fig. 6 is a transvese section taken upon line $y\,y$ of Fig. 4.

As shown in said drawings, Figs. 1 to 3, both inclusive, A indicates the steam-cylinder of an engine, B the valve-casing or steam-chest, and C the movable part or valve proper, which is of form or type known as a "hollow" piston-valve, and is provided with the usual stem, *c*, passing through a gland, *b*, in the end of the steam-chest, and by which the valve is operated in a familiar manner, the valve C being provided with the usual enlarged parts or portions, C′, at its ends, which enlarged parts are fitted to slide in the annular cylindric valve-seats B′, formed in the steam-chest B. The said steam-chest is connected with the ends of the cylinder by means of the usual steam-passages, $B^2$, and the said valve-seats B′ are each provided with two annular steam-ports, $b'\,b^2$, connected with each other and with the passages $B^2$ by means of longitudinal passages $b^3$, formed in the walls of the steam-chest and preferably extending entirely around the

valve, as clearly shown in the sectional views, Figs. 2 and 3. The said enlarged portions C′ are provided with two separate annular working or bearing surfaces, $C^2$ $C^3$, the bearing-surfaces $C^2$ $C^2$, adjacent to the outer ends of the valve, being constructed to operate in connection with the outermost ports, $b'$, and the surfaces $C^3$ $C^3$ acting in connection with the ports $b^2$ adjacent to the middle of the valve. In the particular construction illustrated in Figs. 1, 2, and 3 live steam is admitted to the valve through a central chamber, $B^3$, of the steam-chest and gains access to the ports $b^2$, which are adjacent to the middle of the valve, through the space between the reduced or smaller middle part of the valve C and the inner portion of the seat B′, and passage is afforded for the steam to the outer ports, $b'$, by means of passages $c'$, formed in the wall of the valve C and leading from the step or shoulder $c^3$ at the inner end of the surfaces $C^3$ $C^3$ to annular openings or ports $c^2$, formed between said bearing surfaces $C^2$ and $C^3$, the bearing-surfaces $C^3$ $C^3$ in this case being formed on rings $c^4$, sustained from the body of the valve by radial ribs or rings $c^5$, so as to form the passages $c'$ above referred to. The width of the inner bearing-surfaces, $C^3$ $C^3$, of the valve is in this case so proportioned relatively to the distance between and width of the ports $b'$ $b^2$ that when the opening $c^2$ coincides with the outer port, $b'$, of the valve-seat the inner port, $b^2$, of said seat will be uncovered by the piston, as clearly shown at the left hand in Fig. 1, it being entirely obvious that when the parts are in the position described steam will have free access from the chamber $B^3$ to the ports $b'$ $b^2$.

The exhaust-steam in the construction of the parts above referred to and shown in Figs. 1, 2, and 3, passes through the ports $b'$ only, the ports $b^2$ at one end of the valve obviously being closed at the time that the latter is in position for the admission of steam to the ports $b'$ $b^2$ at the opposite end of the valve. To allow sufficient area for the passage of the exhaust-steam, the said ports $b'$ are desirably made wider than the ports $b^2$. An exhaust passage or pipe, $B^4$, is shown as attached to one end of the steam-chest, the exhaust-steam from the ports at the end of the steam-chest opposite said exhaust-passage obviously passing through the hollow piston-valve to the said exhaust-passage in a well-known manner.

In Figs. 4, 5, and 6 a construction is illustrated in which the live steam is admitted at the end of the steam-chest and through the hollow interior of the valve. In this case the ports $b'$ $b^2$ in the valve-seats and the bearing-surfaces $C^2$ $C^3$ of the valve are arranged generally in the manner before described; but passage for live steam to the inner ports, $b^2$, is provided by means of annular openings $c^6$, extending through the walls of the valves between said surfaces $C^2$ $C^3$, as clearly shown in the drawings. In this instance the exhaust-steam passes from the inner series of ports, $b^2$, to the chamber $B^3$ of the steam-chest, the said ports $b^2$ being made wider and of larger area than ports $b'$, to allow the free exit of the exhaust-steam therefrom. The steam passage or opening $c^6$ in the valve $c$ is in this case so located relatively to the end of the valve that when one of the ports $b'$ is uncovered by said valve the said passage $c^6$ will coincide with the adjacent ports $b^2$, and thereby permit the free passage of steam from the interior of the valve to both of said ports. The step or shoulder $c^3$ at the junction of the enlarged end portion of the valve of the smaller middle part thereof is, in the construction last described, so arranged relatively to the passages $c^6$ that when the valve is moved in position for the admission of steam at the opposite end of the steam-chest the said ports $b^2$ will be uncovered and in communication with the chamber $B^3$. $B^5$ in this case indicates an exhaust-pipe, which is connected with the chamber $B^3$, and $B^6$ a live-steam inlet communicating with one end of the cylindric passage of the steam-chest.

As far as the general operation of the valve is concerned, the ports $b'$ $b^2$ may be made continuous or in the form of annular grooves in the surface of the valve-seat; or said ports may be divided by cross-bars or partitions into a series of separate apertures communicating with an annular passage in the wall of the steam-chest. A preferred construction in the parts is herein shown in Figs. 1 to 6, in which the surfaces of the steam-chest against which the annular bearing-surfaces $C^2$ $C^3$ of the valve C operate are formed by separate annular rings or bushings D, which are fitted into suitable recesses in the said chest, and are provided with apertures forming the steam-ports $b'$ $b^2$, said apertures being divided by cross-bars $d$, which serve to connect the parts of the bushings upon opposite sides of the ports. In case bushings D are employed, the passages $b^3$, connecting the ports $b'$ and $b^2$ with the passage $B^2$, will be formed by a wide annular groove or recess extending around the inner face of the casting forming the steam-chest, and of sufficient width to include both the said passages $b^3$ and the ports $b'$ $b^2$, said grooves or recesses being covered in their middle parts by the said bushings, which thus form the inner walls of the said passages $b^3$. The walls of the valve-casing are desirably provided within the said spaces or passages $b^3$ with longitudinal ribs $b^4$, as clearly shown in Figs. 2, 3, 5, and 6, said ribs serving to sustain the middle parts of the bushing D in its part between the ports in an obvious manner. The said bushings D are preferably held from displacement at their inner edges by means of annular projections $b^5$, formed at the inner margins of the valve-seat B′, and are held from outward movement by the heads or caps $B^7$ $B^8$, which close the ends of the cylindric valve-seats, said caps being provided with inwardly-projecting flanges constructed to rest against the outer edges of the bushings. The

exhaust-steam pipe $B^4$ in Fig. 1 and the steam-inlet pipe $B^5$ in Fig. 3 are shown as attached to or cast integral with the said caps $B^6$.

The bushings D are in practice preferably made of steel and hardened and are ground to accurately fit the valves, whereby perfect valve-surface having great durability is obtained. The ports $b'$ $b^2$ are preferably made straight upon their sides at which the steam is first admitted when they are uncovered by the valve, for the purpose of giving the maximum initial of steam-inlet and quick cut-off, and the opposite or exhaust sides of the ports are desirably curved, in order to increase the area of the bearing-surfaces adjacent to the ports and to give greater strength to the connecting parts $d$ between the ports.

Important advantages are gained by the use of the bushings D, for the reason that this construction enables the ports to be easily and conveniently constructed, and the said bushings, or either of them, may be readily taken out and new bushings inserted, with the result of avoiding the necessity of taking the engine to a machine-shop and having the valve-seats rebored in case they become cut or worn. The bearing-surfaces C′ of the valve may be provided with the packing $c^7$, Fig. 1, consisting of a steel spring-ring, preferably made wider than the ports over which it passes, so that any connection with the cross-bars between the ports or liability of the edges of the ring catching upon the edges of the ports is entirely obviated.

I am aware that a valve-seat has been provided heretofore with a plurality of ports in communication with each end of the steam-cylinder, and that a slide-valve provided with a plurality of bearing-surfaces acting to open and close said ports has been used in connection therewith, and a valve embracing this general feature of construction is not, therefore, broadly claimed as new; but my invention is restricted to the particular features of construction in the valve shown, which are set forth in the appended claims.

I claim as my invention—

1. The combination, with an engine-cylinder, of a steam-chest or valve-casing provided with a central annular steam-space and cylindric valve-seats at each side of said space, each of said valve-seats being provided with two or more annular ports in communication with the cylinder, and a hollow piston-valve having a reduced central part and provided with two or more annular cylindric surfaces separated by an annular opening or openings for steam, said annular surfaces being arranged to correspond in relative position with said annular ports and adapted to severally open and close the latter, substantially as described.

2. The combination, with an engine-cylinder, of a valve-chest having two cylindric valve-seats, each provided with two steam-ports communicating with a steam-passage leading to each end of the cylinder, a hollow piston-valve provided with two annular bearing-surfaces, forming between them an annular port or passage, $c^2$, located in position to communicate with one of said steam-ports at the time the other steam-port is uncovered by the valve, and a longitudinal passage, $c'$, in the wall of the valve, affording communication between the said passage $c^2$ and a central steam-space of the steam-chest, substantially as described.

3. The combination, with a steam-chest having a cylindric recess provided with a broad annular passage, $b^3$, of a removable bushing covering said passage $b^3$ and provided with two or more series of apertures arranged circumferentially and forming two or more separate steam-ports, substantially as described.

4. The combination, with a steam-chest having cylindric recesses, of removable bushings covering said recesses and forming passages $b^3$ and ribs $b^4$ in said passages, sustaining said bushings, substantially as described.

5. The combination, with a cylindric valve-seat provided with two steam-ports, of a hollow piston-valve provided with annular bearing-surfaces $C^2$ $C^3$, the surfaces $C^3$ being formed upon rings $c^4$, sustained from the body of the valve by ribs $c^5$, substantially as described.

6. The combination, with a cylindric valve and valve-chest provided with cylindric seats having an annular steam-passage, $b^3$, of removable bushings provided with two or more series of apertures forming steam-ports, said apertures being straight upon the inlet sides of the ports and curved upon the opposite or exhaust sides of said ports, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ALBERT L. IDE.

Witnesses:
C. CLARENCE POOLE,
CHARLES E. FISHER.