

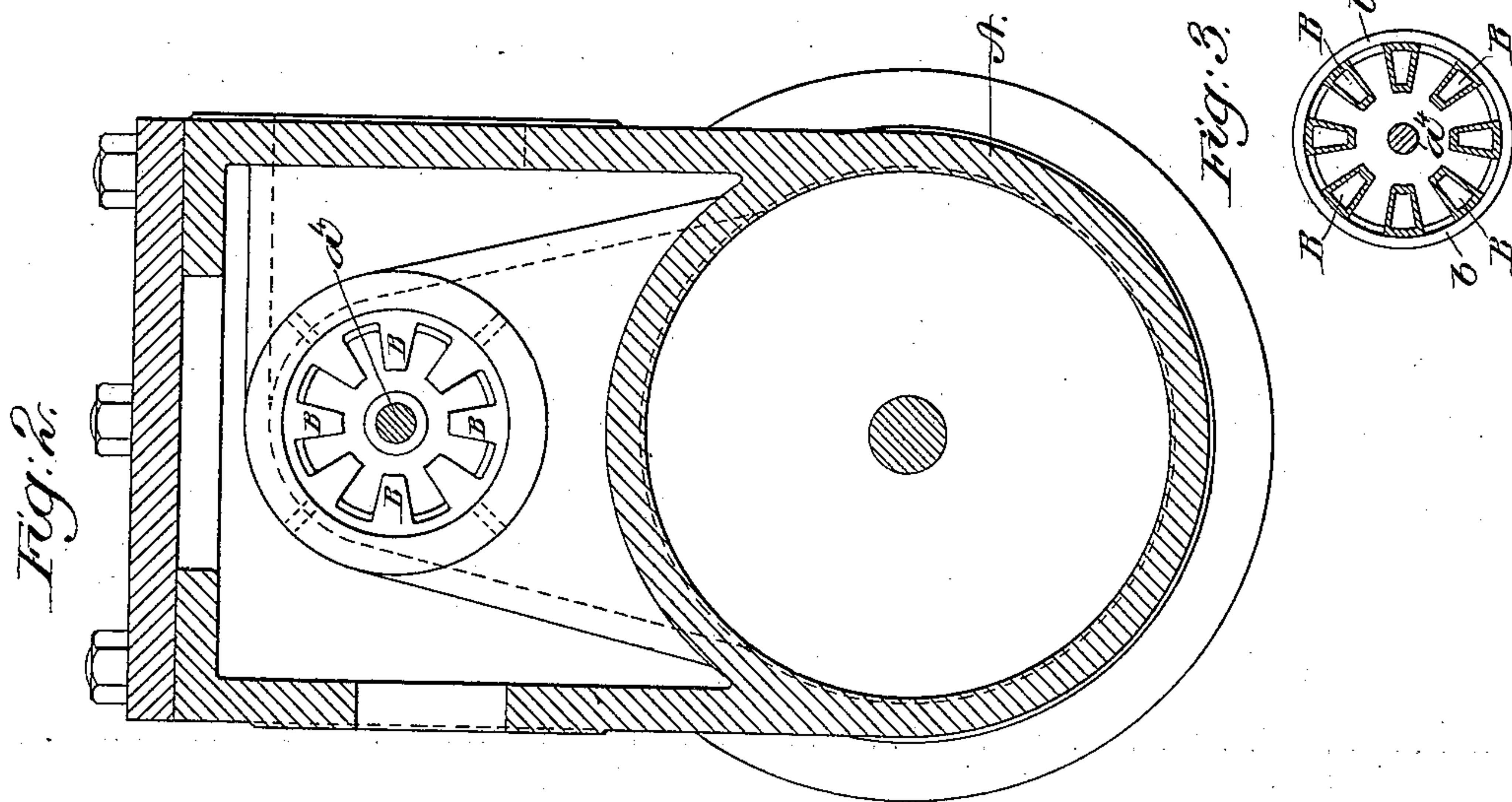
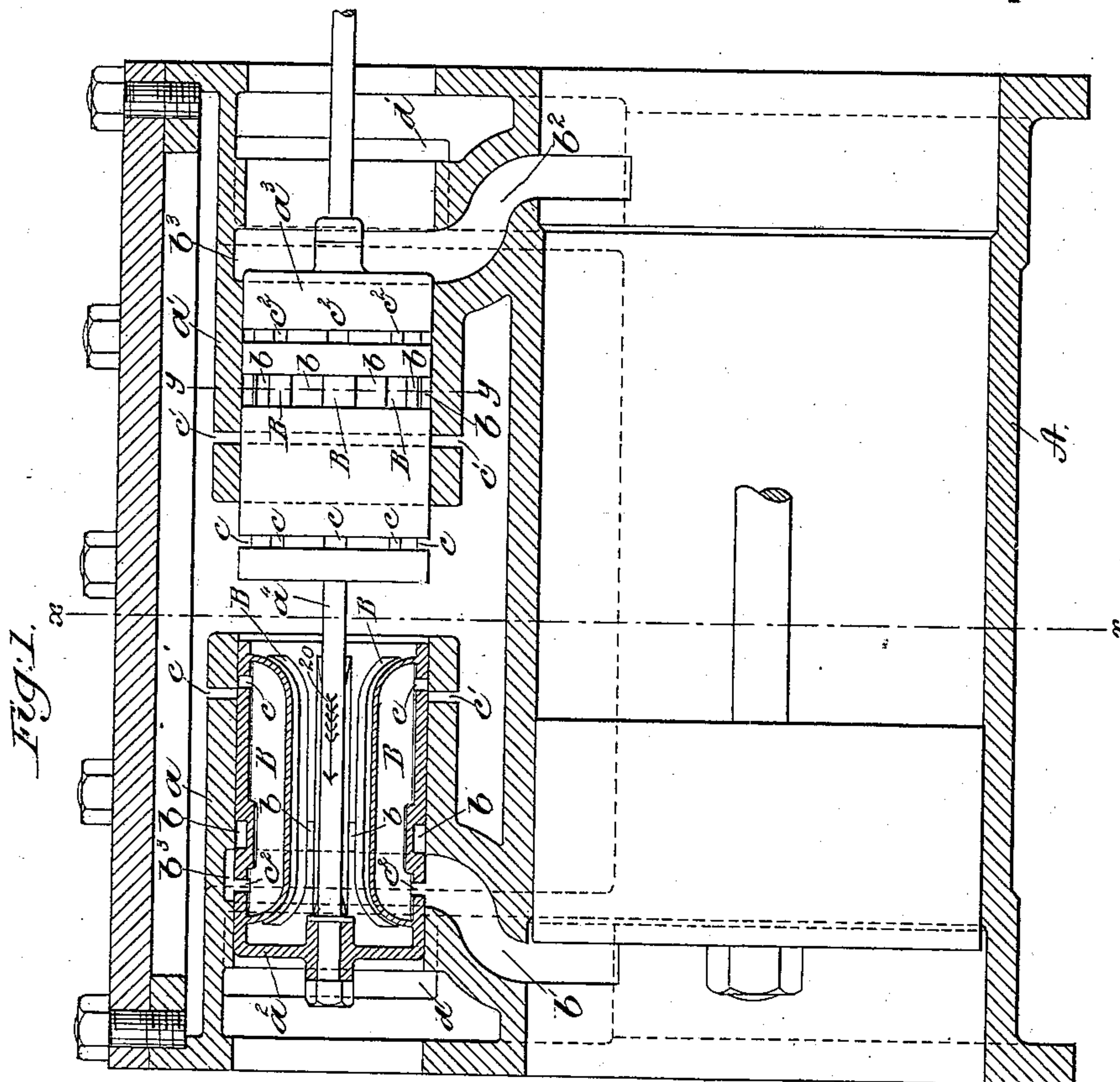
(No Model.)

P. ARMINGTON.

## PISTON VALVE.

No. 370,442.

Patented Sept. 27, 1887.



Witnesses.  
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# UNITED STATES PATENT OFFICE.

PARDON ARMINGTON, OF PROVIDENCE, RHODE ISLAND.

## PISTON-VALVE.

SPECIFICATION forming part of Letters Patent No. 370,442, dated September 27, 1887.

Application filed March 1, 1887. Serial No. 229,308. (No model.)

*To all whom it may concern:*

Be it known that I, PARDON ARMINGTON, of Providence, county of Providence, and State of Rhode Island, have invented an Improvement in Piston-Valves, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to piston-valves, and has for its object to improve the construction of the same, whereby the port-opening for the admission of steam to the engine-cylinder is maintained substantially constant during the time steam is being admitted to the said cylinder.

Prior to my present invention a balanced slide-valve has been constructed with passages which register with a main and a branch port-opening in the valve seat to maintain a substantially constant supply of steam to the engine-cylinder, the said valve seat also having a depression between the said main and branch port-openings, the said depression communicating with the steam-chest.

My present invention is shown embodied in a piston-valve composed of two independent piston-valves, one for each end of the cylinder, the said independent piston-valves being connected by a single valve-stem and reciprocating in independent valve-cylinders, one end of each piston-valve being closed and the other open to receive steam, it passing therefrom through a main port-opening. Each valve-piston is provided on its inner side with one or more auxiliary chambers, which in practice may be cast with the said valve, the said auxiliary chambers being provided with a steam inlet and outlet port, forming auxiliary port-openings to the main port-opening. The steam-inlet port of the auxiliary chamber referred to is located near one end of the said auxiliary chamber and the steam-outlet thereto near the opposite end thereof and beyond the main port-opening, and the said ports are so arranged relatively to the said main port-opening that the steam is admitted to the engine-cylinder through the auxiliary chamber as the main port is being opened, the steam-ports of the said auxiliary chamber being completely closed when the main port-opening of the piston-valve is wide open. The steam inlet and outlet ports of the auxiliary

chamber are of such area in cross-section that when the said inlet-port is fully opened the outlet-port of the said auxiliary chamber, plus that amount or distance to which the main port has been opened, equals the total area in cross section of the main port. Consequently the maximum amount of steam is being admitted to the engine-cylinder.

My invention therefore consists, essentially, in a steam-engine, of a valve-cylinder provided with a main and auxiliary port-opening, combined with a piston-valve provided with a main port-opening and having an auxiliary chamber provided with a steam inlet and outlet port, forming auxiliary port-openings for the main port-opening, as will be hereinafter specified.

Figure 1 is a longitudinal section of a sufficient portion of an engine provided with my improved piston-valve to enable my invention to be understood; Fig. 2, a transverse section of Fig. 1 on line  $x x$ , and Fig. 3 a transverse section of one piston-valve on line  $y y$ .

The engine-cylinder A, as herein shown, has cast integral with it two independent valve-cylinders,  $a a'$ , co-operating to form a single valve-cylinder. Each cylinder  $a a'$  receives within it an independent piston-valve,  $a^2 a^3$ , respectively, joined together to form a single piston-valve by a valve-stem,  $a^4$ , connected to any suitable or well-known valve-gearing to operate the said valve-pistons in unison, the said piston-valves being closed at one end and open at the other to receive steam.

Each piston-valve is provided with an annular channel,  $b$ , forming the main port-opening of the cylinder-ports  $b' b^2$ , an annular groove,  $b^3$ , in the valve-cylinder  $a a'$  forming a continuation of the said cylinder-ports. Each piston-valve is provided on its inner side, as herein shown, with a number of auxiliary chambers, B, preferably cast integral with the said valve.

Each auxiliary chamber B has at one end a steam-inlet port,  $c$ , to register with a ported opening,  $c'$ , in the valve-cylinder, and at its other end a steam-outlet,  $c^2$ , to register with the annular groove  $b^3$ , the main port-opening  $b$  being between the ports of the auxiliary chambers. The main port-opening  $b$  of each piston-valve communicates with the interior thereof between the successive auxiliary cham-



bers B, as shown in Fig. 1, the said ports *b* presenting the only passage of steam from the interior of the piston-valves to the engine-cylinder. As shown in Fig. 1, the piston is supposed to be moving in the direction of arrow 20, the main port *b* and the inlet-port of the auxiliary chamber of the piston-valve *a*<sup>2</sup> being about to be opened to admit steam to the engine-cylinder, steam passing through the center of the piston-valve and out by the main port, and also through the auxiliary chambers and out by the port *c*<sup>2</sup>. The area in cross-section of the ports of the auxiliary chamber is such, as compared to the main port, that when the inlet-port is wide open, which occurs at the first part of the piston-valve stroke, the main port being at such time but partially opened, the steam-outlet of the auxiliary chamber, plus that part of the main port which is open, is equal to the total area in cross-section of the main port. Consequently a full head or amount of steam is being admitted to the engine-cylinder very soon after the commencement of the stroke of the piston-valve.

Now it will be noticed that as the piston-valve continues on its stroke the supply of steam to the engine-cylinder through the auxiliary chamber is cut off as the port-opening is uncovered or opened, so that when the main port is completely opened the inlet and outlet of the auxiliary chamber are closed. When the piston-valve is being moved in a direction opposite to that indicated by arrow 20, the supply of steam to the engine-cylinder is not cut off until the piston-valve occupies the position shown in Fig. 1. In the present embodiment of my invention the steam is exhausted through ports *d d'* at the ends of the valve-cylinders, a very rapid exhaust being permitted by thus locating the exhaust-ports. The valve-cylinders *a a'* present a bearing-surface for their respective piston-valves substantially of the same length of the said piston-valves, thereby securing a smooth and uniform running of the said valves.

I have herein shown an exhaust at the outer

end of each valve-cylinder; but it is evident that a common exhaust located between the cylinders may be employed, and in this case the piston-valves will be reversed and take steam at the outer end of their respective cylinders, the ports of the said cylinders being in a reverse position to that shown in Fig. 1.

I claim—

1. In a steam-engine, a valve-cylinder provided with a main and auxiliary port-opening, combined with a piston-valve provided with a main port-opening and having an auxiliary chamber provided with a steam inlet and outlet port, forming auxiliary port-openings for the main port-opening, as and for the purpose specified.

2. In a steam-engine, the engine-cylinder and independent valve-cylinders provided with a main and auxiliary port-opening and communicating with each end of the engine-cylinder, combined with a piston-valve for each valve-cylinder, the said piston-valve being provided with a main port-opening and having auxiliary chambers provided each with a steam inlet and outlet, forming auxiliary port-openings for the main port-opening, as and for the purpose specified.

3. In a steam-engine, the engine-cylinder and independent valve-cylinders communicating with each end of the engine-cylinder and provided with a main and auxiliary port-opening, combined with a piston-valve for each valve-cylinder, the said piston-valve having a main port-opening and auxiliary chambers B, provided each with a steam inlet and outlet, forming auxiliary port-openings for the main port-opening, the said piston-valve being closed at one end and open at the other to receive steam, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PARDON ARMINGTON.

Witnesses:

G. W. GREGORY,  
J. H. CHURCHILL.