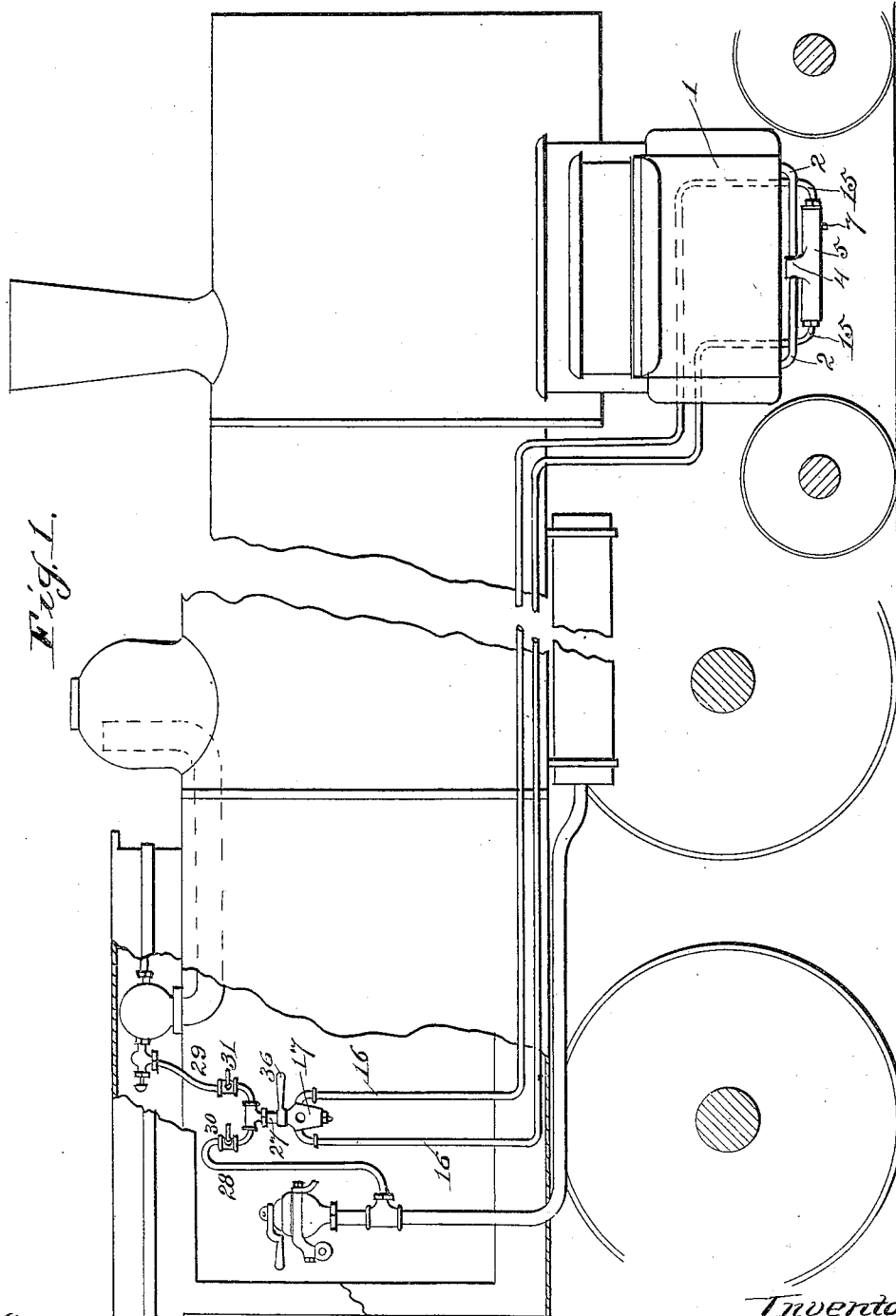


No. 838,835.

PATENTED DEC. 18, 1906.

F. ARMSTRONG.
CYLINDER DRAIN VALVE.
APPLICATION FILED AUG. 6, 1906.

4 SHEETS—SHEET 1.



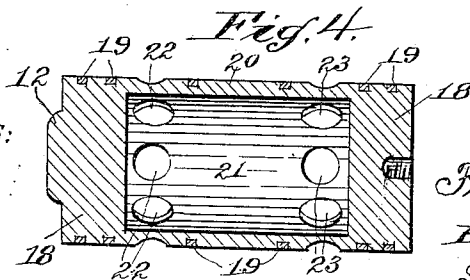
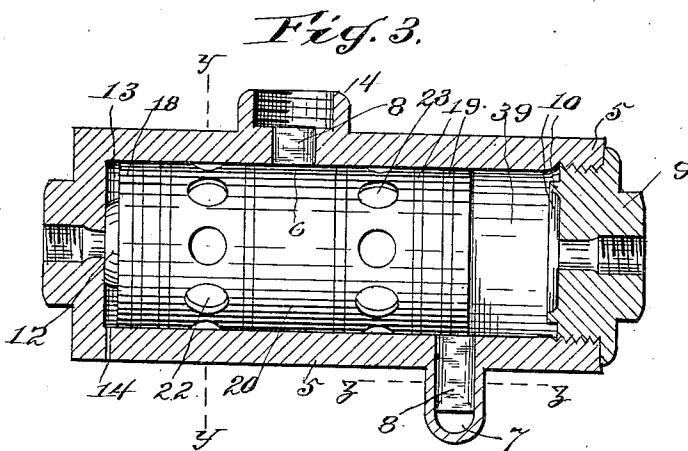
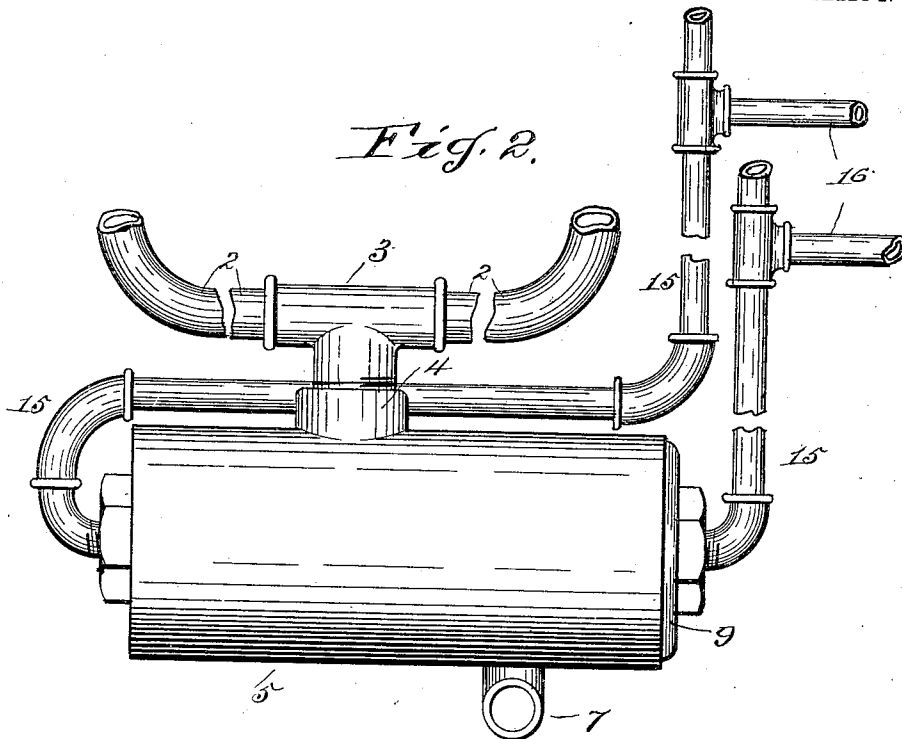
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4 SHEETS—SHEET 2.



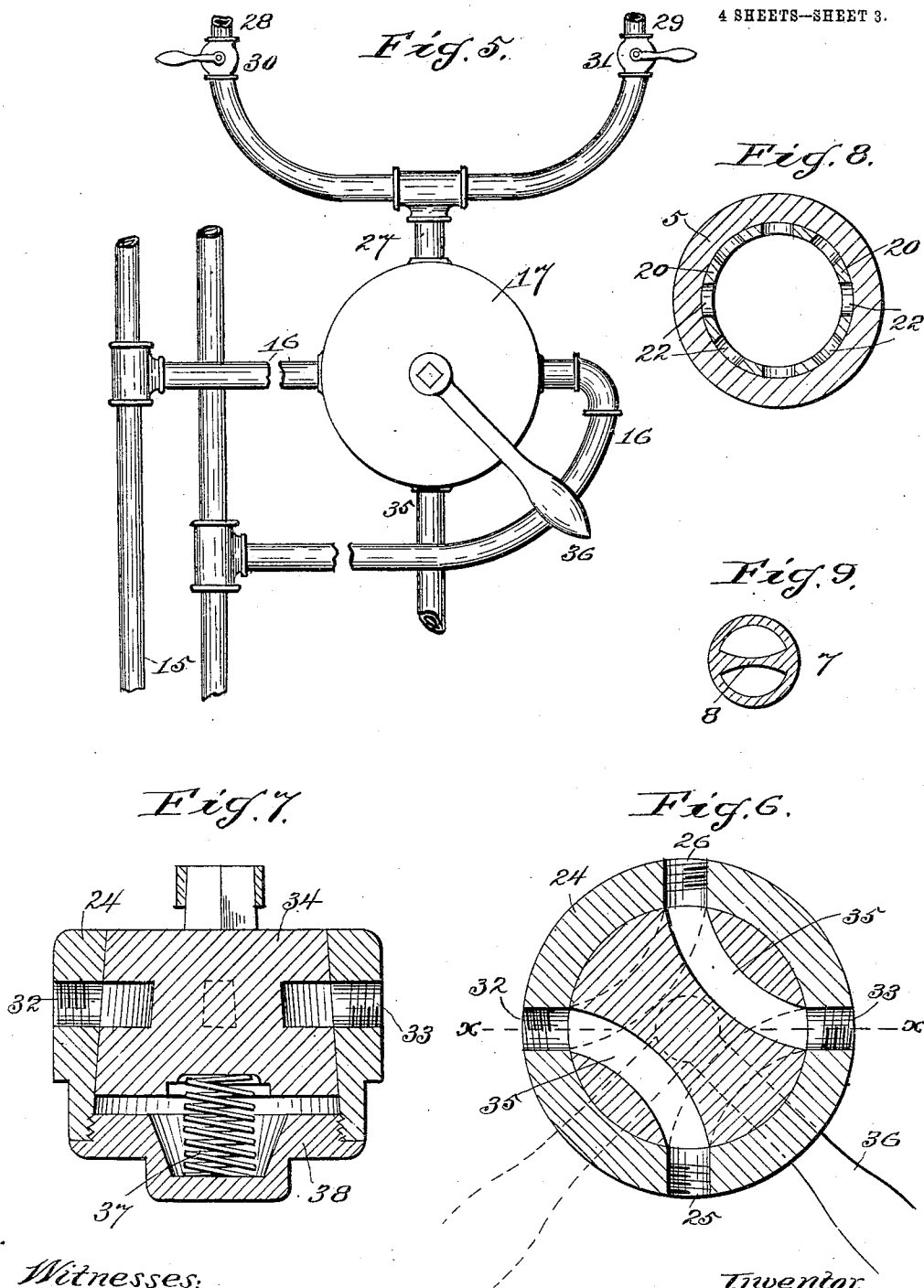
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4 SHEETS—SHEET 3.

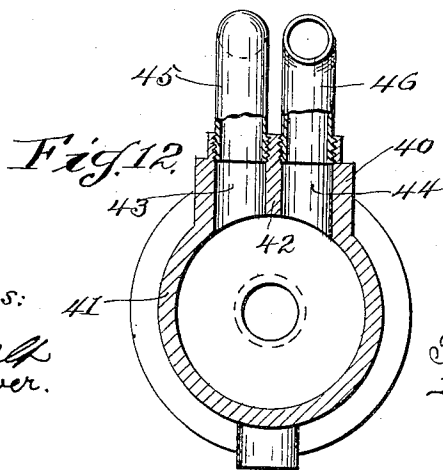
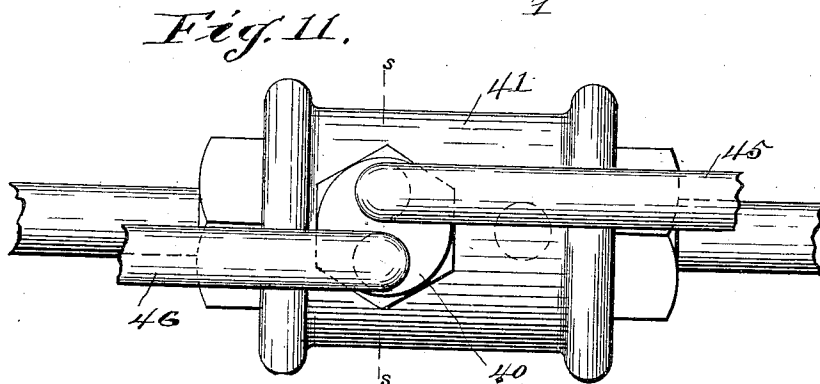
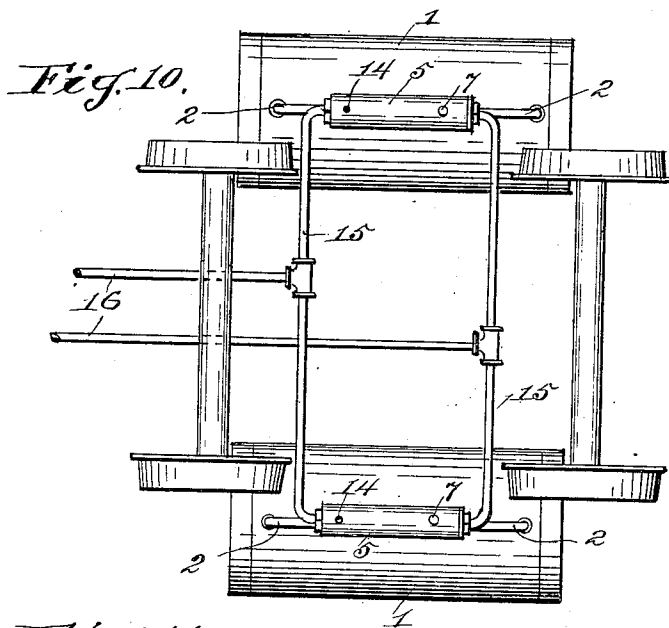


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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

FRANK ARMSTRONG, OF SEDALIA, MISSOURI.

CYLINDER DRAIN-VALVE.

No. 838,835.

Specification of Letters Patent.

Patented Dec. 18, 1906.

Application filed August 6, 1906. Serial No. 329,419.

To all whom it may concern:

Be it known that I, FRANK ARMSTRONG, a citizen of the United States, residing at Sedalia, in the county of Pettis and State of Missouri, have invented certain new and useful Improvements in Draining-Valves for Steam-Cylinders and Means for Operating the Valve, of which the following is a specification.

10 This invention relates to drain-valve attachments for steam-engine cylinders, and pertains especially to the class of such valves having a piston operated by steam or air from the air or steam reservoirs of the engine.

15 The invention comprises one cylindrical piston-valve for each steam-cylinder of an engine, one four-way cock to control the element for operating the piston-valves jointly, and special pipe connections from the steam and air reservoirs of the engine through said 20 cock to the piston-valves.

The object of the invention is to provide a drain-valve cylinder having a single or partitioned induction-port leading from the two 25 drain-ports of an engine-cylinder, a piston operated in the valve-cylinder solely by either steam or air pressure from the engine and having two sets of ports, one of said sets receiving from said induction-port and the other of said sets discharging through the 30 valve-cylinder.

The object, further, of the invention is to provide a drain-valve cylinder having a single induction-port connected to the drain- 35 ports of an engine-cylinder and a single exhaust-port, a hollow piston loose within the valve-cylinder and having ports certain of which register with said induction-port, while the others register with the said exhaust- 40 port.

The object, still further, of the invention is to provide an arrangement of pipes connecting the drain-valve of the steam-cylinder on each side of the engine with one and the same 45 four-way cock located in the engine-cab for directing air or steam to the corresponding end of the drain-valve on opposite sides of the engine.

In the various devices for draining steam-engine cylinders it is usual to attach a drain- 50 cock to each exhaust-port of the cylinder or to connect said ports independently with one drain-cock having spring-controlled pistons, to provide separate four-way cocks to control the passage of air or steam to the drain-cocks 55 separately, and to provide the drain-cocks

with valves of various character. In the invention hereinafter more fully disclosed it will be found that I employ but one drain-cock for each engine-cylinder and one four- 60 way cock for the pair of drain-cocks, that the drain-cock piston is constructed to carry within it exhaust-steam or condensation, and that said piston is free to slide solely under pressure of compressed air or steam and is 65 limited in its movement only by the ends of its inclosing cylinder.

Therefore it is the purpose of this invention to overcome the various difficulties, objections, and disadvantages found in many 70 of the devices for draining steam-engine cylinders, to obviate the use of certain cocks and valves heretofore employed, and to furnish a pair of drain-cocks one on each side of an engine and means to operate them simul- 75 taneously from the engine-cab.

In the accompanying drawings, forming part of this application, Figure 1 is a sectional side elevation of part of a locomotive, showing the application of the invention. Fig. 2 80 is an elevation of the drain-cylinder with the pipes partly broken away. Fig. 3 is a detail longitudinal sectional view of the drain-cylinder, showing its piston in elevation. Fig. 4 is a longitudinal sectional view of the piston 85 Fig. 5 is an end view of the four-way cock, showing its pipes. Fig. 6 is a cross-section of the four-way cock. Fig. 7 is a sectional view taken on the plane indicated by the dotted line *x x*, Fig. 6. Fig. 8 is a sectional view on the line *y y*, Fig. 3. Fig. 9 is a 90 sectional view on the line *z z*, Fig. 3. Fig. 10 is a bottom view of the truck shown in Fig. 1. Fig. 11 is a top view of a modification. Fig. 12 is a section on the line *s s*, Fig. 11. 95

The same reference-numerals denote the same parts throughout the several views of the drawings.

The engine-cylinders 1 have suitable drain-pipes 2 leading therefrom and coupled by a 100 pipe-union 3, screwed into a boss or projection 4 on the valve-cylinders 5. An induction-port 6 leads from the projection 4 into the cylinder 5, and the latter is provided with an exhaust-port 7. These ports have a partition 8, the inner edge of which forms a piston-bearing or bridge across the ports 6 and 7 105 to prevent their obstructing the piston-packing. One end of the cylinder 5 is permanently closed, and the other end has a removable nut-cap 9, provided with an abutment- 110 ring 10 for one end of the cylinder-piston, (to

be later described in detail,) the other end of the piston being provided with a central lug 12 to engage this end of the cylinder and leave a drain-chamber 13 therebetween. Said chamber is provided with a drain-vent 14, and the other end chamber 39 of the cylinder is drained by means of the port 7, which slightly overreaches this end of the piston when the lug 12 on the other end engages its cylinder end. Each end of the cylinders 5 is provided with pipes 15, coupled together and to supply-pipes 16 in pairs, so that the corresponding ends of the drain-cylinder on both sides of the engine may be supplied with steam or air simultaneously. The pipes 16 are connected to a four-way cock 17, hereinafter to be described in detail.

The piston 18 of the valve or drain cylinders 5 is provided with packing-rings 19. It has a central cored or shell-like body 20, closed at each end to form a receiving-chamber 21, having a set of ports near each end thereof. One set 22 are induction-ports, which conduct steam or air from the port 6 into the chamber 21, and the other set 23 are exhaust-ports, which conduct steam or air from the said chamber to the port 7. The piston 18 is of such length with respect to the length of the cylinder that in its sliding movement the ports 23 are placed over or opposite the port 7 when the ports 22 are under or opposite the port 6.

The casing 24 of the cock 17 has an exhaust-port 25, an induction-port 26, to which is attached a supply-pipe 27, coupled to air or steam pipes 28 and 29, respectively, having cut-out cocks 30 and 31, and ports 32 and 33 have the pipes 16 attached thereto. The plug or body 34 of the cock 17 has a pair of curved or segmental openings there-through, forming ports 35, which are made to register with the ports in the casing by operating a suitable handle 36. The plug 34 is cushioned by means of a spiral spring 37, held in place by a screw-cap 38.

It will be observed that either steam or air pressure may be used independently, that freezing is entirely prevented, that the arrangement of the packing-rings so that one will be on each side of the port 6 when closed, which prevents escape of steam, that the travel of the piston is governed entirely by length of cylinder, that the piston is operated solely by steam or air pressure, and that when the piston-ports and cylinder-ports register there is direct communication between the induction-port 6 and the exhaust-port 7.

Referring to the modification shown in Figs. 11 and 12, the connection 40 of the valve-cylinder 41 has a dividing-wall 42, forming two separate induction-ports 43 and 44, having pipes 45 and 46, respectively, which separately connect the ends of a steam-engine cylinder with the valve-cylinder 41.

The dividing-wall 42 separates the steam-coming from the engine-cylinder. When the drain-valve is open, both drain-outlets of the engine-cylinder are in open communication with the valve-cylinder, and when said valve is closed the steam in one end of the engine-cylinders is separated from the steam in the other end of the engine-cylinder by the dividing-wall 42, thus preventing passage of steam from one drain-port to the other of the engine-cylinder and forming a double induction-port having independent connections to the respective drain-ports of the engine-cylinders.

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

1. In a draining-valve for steam-cylinders, the combination, with the valve-cylinder having an induction-port and an exhaust-port, and a connection between said induction-port and the drain-ports of the steam-cylinder, of a chambered piston having an imperforate body portion, a series of ports in each end of the piston and forming the only means of communication with said chamber, and means for operating the piston to open and close communication between the said valve-cylinder ports and the piston-ports.

2. In a draining-valve for steam-cylinders, the combination, with the valve-cylinder having an induction-port and an exhaust-port, and a connection between said induction-port and the drain-ports of the steam-cylinder, of a piston having a hollow imperforate central body with the ports only at each end thereof, and means for operating the piston to close the said induction and exhaust ports and to establish communication between the piston-ports and the said induction and exhaust ports.

3. In a draining-valve for steam-cylinders, the combination, with the valve-cylinder having an induction-port and an exhaust-port, and independent connections between said induction-port and the drain-ports of the steam-cylinder, of a piston, having closed ends each of which engage the ends of the valve-cylinder to limit the stroke of the piston and to leave a chamber between the ends of the piston and the ends of the cylinder, a chamber closed central of the piston and having a set of ports at each end, one set of which lead from the induction-port of the valve-cylinder into the chamber and the other set of which lead from the chamber to the exhaust-port of the valve-cylinder.

4. In a drain or relief valve for steam-cylinders, the combination, with the valve-cylinder having a closed end, a removable screw-cap closing the other end and having an abutment-ring, an induction-port in the top of the cylinder, an exhaust-port in the bottom of said cylinder with a length of cylinder-space between said ports, and a piston-

bearing bridge in these ports, of a piston having an imperforate hollow body provided with end ports leading therethrough to open and close communication between the said induction and exhaust ports, and means to operate the piston.

5 5. The combination, with a steam-valve cylinder having induction and exhaust ports, of a steam-controlled piston having a chamber provided with end ports and adapted to hold and to carry steam from the cylinder induction-port to the cylinder exhaust-port, and means for operating the piston.

10 6. The combination, with a steam-valve cylinder having induction and exhaust ports, of a steam-controlled piston having an imperforate chambered body adapted to alternately open and close said induction and exhaust ports with respect to said chamber, and a set of ports at each end of said body to alternately open and close communication

between the chamber and the said induction and exhaust ports.

7. In a drain or relief valve for steam-engine cylinders, the combination, with the valve-cylinder having a double induction-port, and an exhaust-port, and a separate pipe connecting each part of the double port with the drain-ports of the engine-cylinder to prevent communication between said drain-ports, of a piston having a shell-like body provided with two sets of ports for opening and closing communication between the drain-ports and the said exhaust-port, and means to operate the piston.

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

FRANK ARMSTRONG.

Witnesses:

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N. H. ROGERS.