No. 709,246. Patented Sept. 16, 1902.

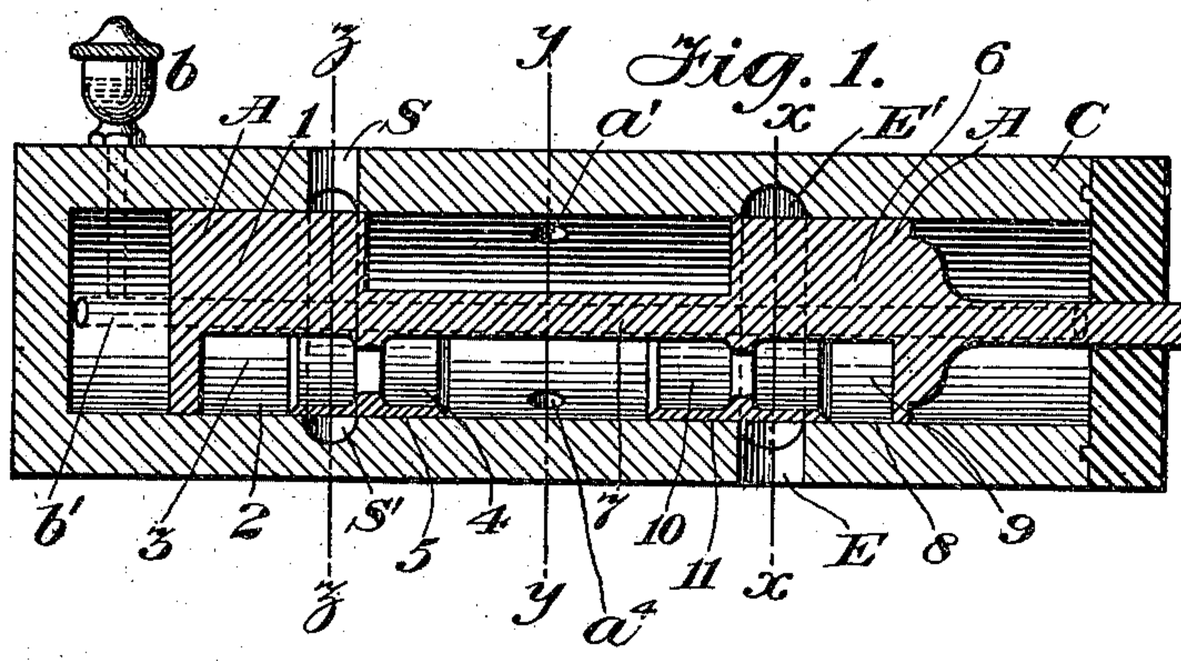
P. T. STILLMAN.

VALVE FOR FLUID PRESSURE ENGINES.

(Application filed June 15, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



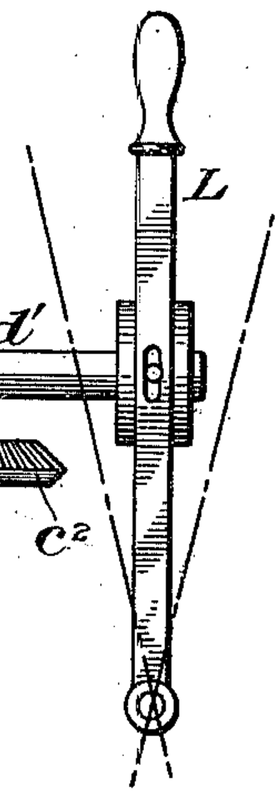


Fig. 2.

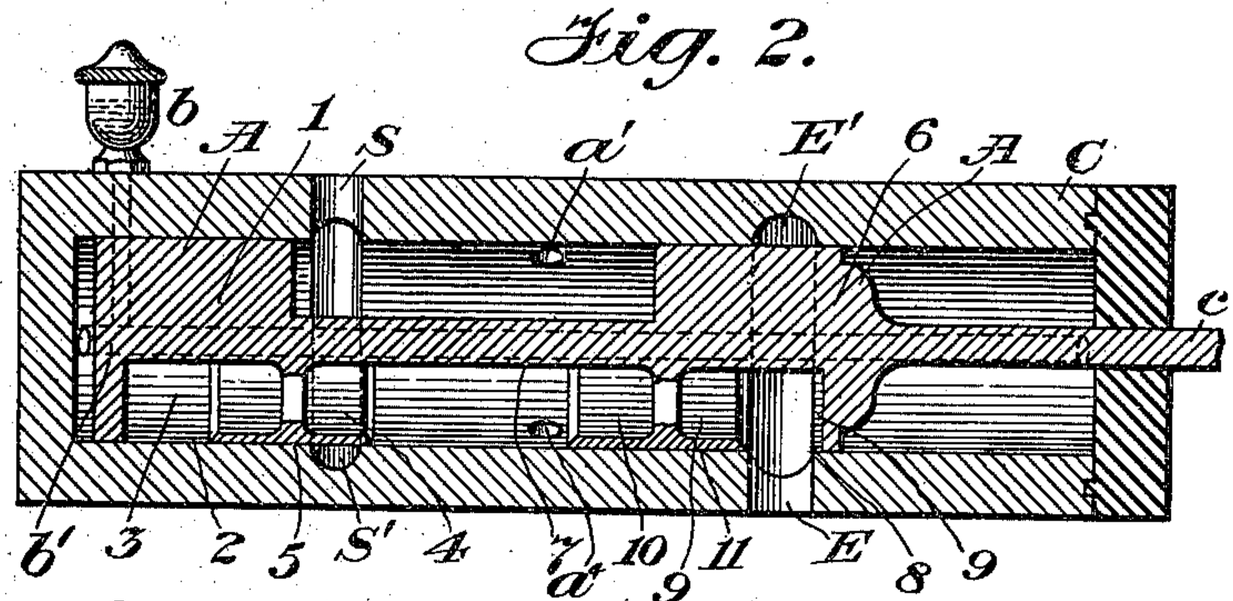


Fig. 3.

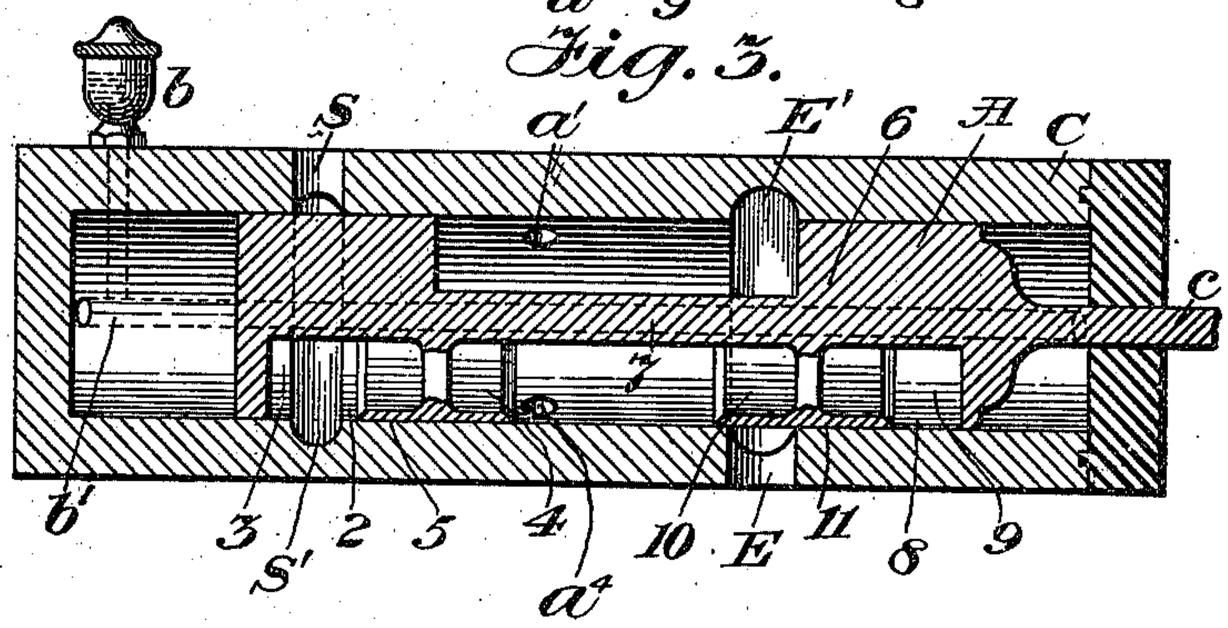


Fig. 11.

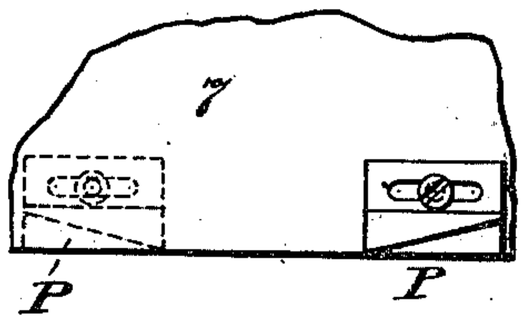
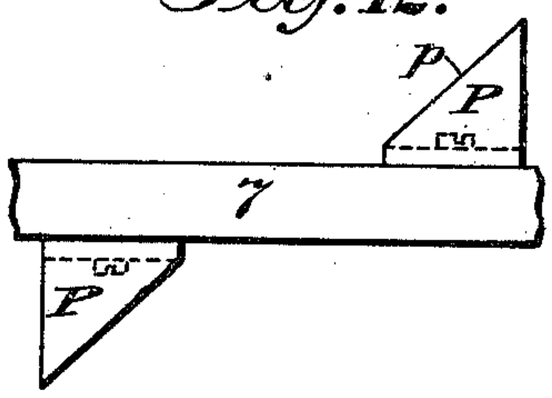


Fig. 12.



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No. 709,246. Patented Sept. 16, 1902.

P. T. STILLMAN.

VALVE FOR FLUID PRESSURE ENGINES.

(Application filed June 15, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 4

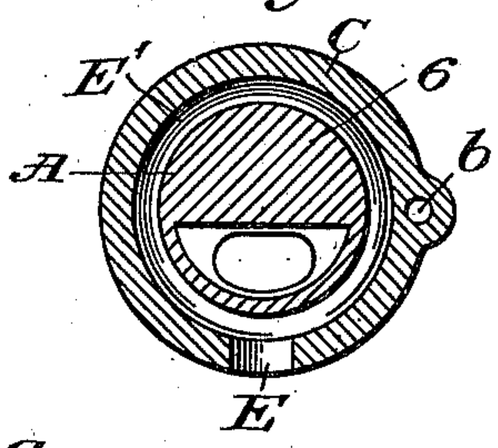


Fig. 5.

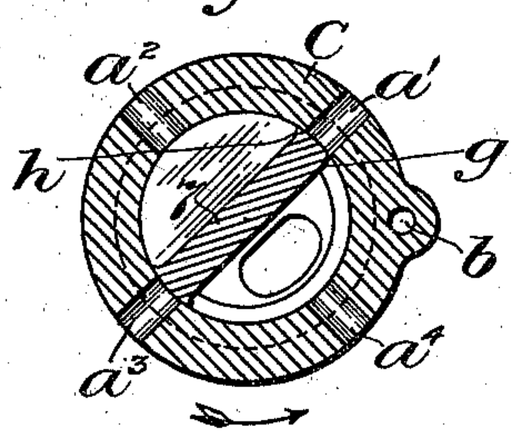


Fig. 6.

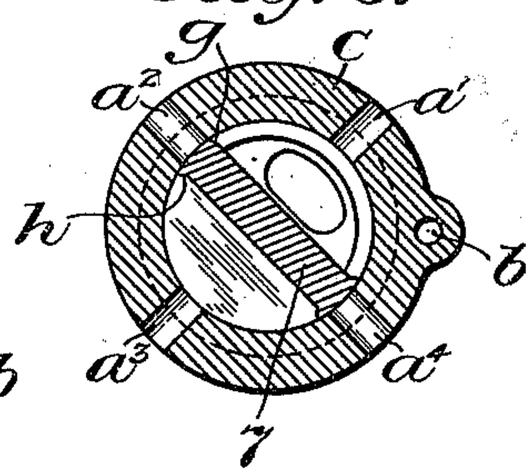


Fig. 7.

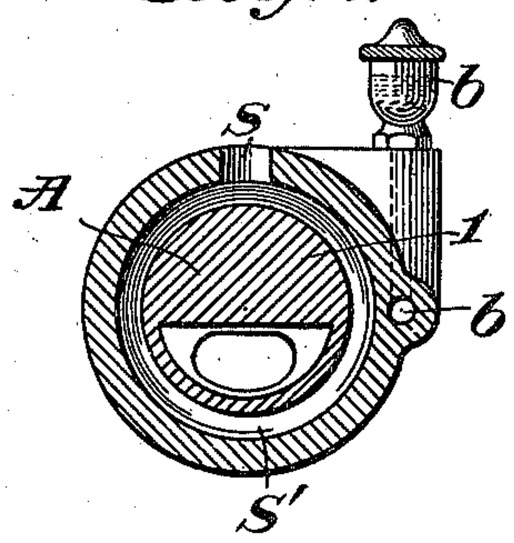


Fig. 8.

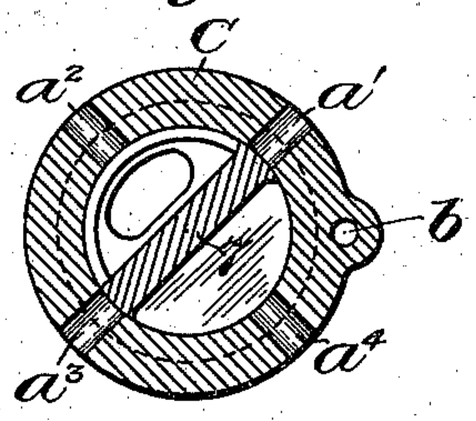


Fig. 9.

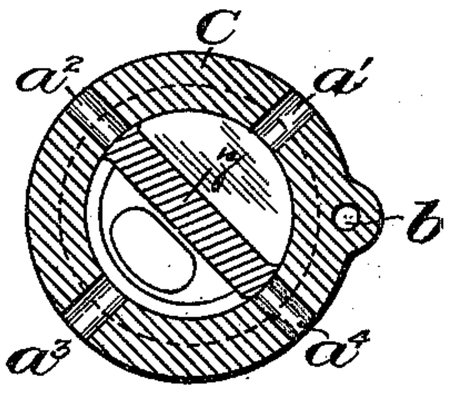
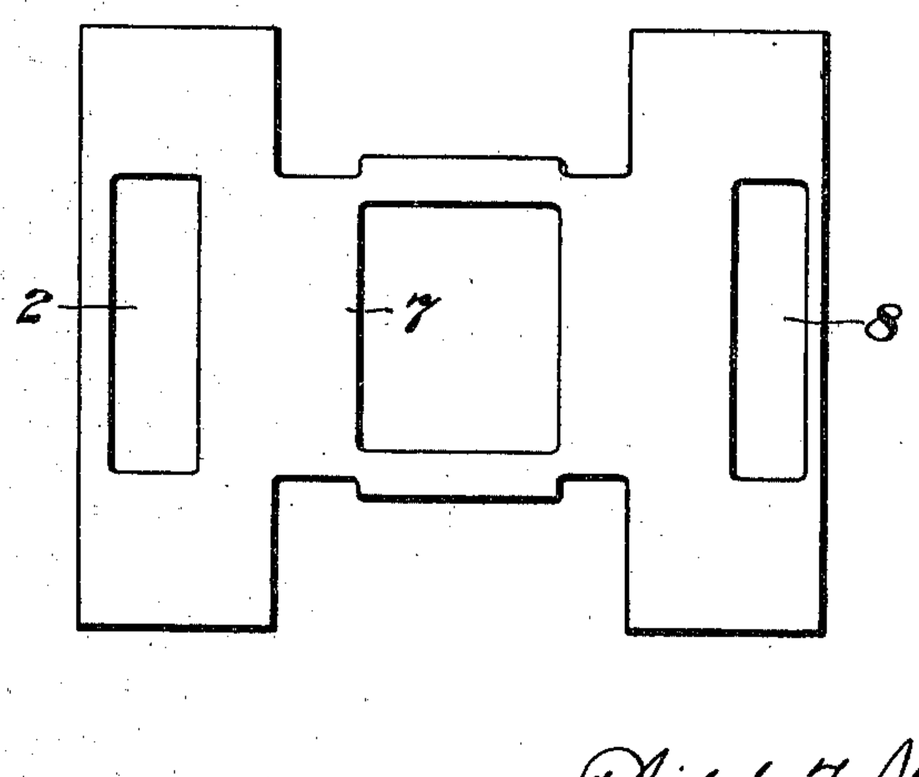


Fig. 10.



Witnesses
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W. A. Stahlnecker

Philip T. Stillman Inventor
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UNITED STATES PATENT OFFICE.

PHILIP T. STILLMAN, OF ELIZABETH, NEW JERSEY.

VALVE FOR FLUID-PRESSURE ENGINES.

SPECIFICATION forming part of Letters Patent No. 709,246, dated September 16, 1902.

Application filed June 15, 1901. Serial No. 64,694. (No model.)

To all whom it may concern:

Be it known that I, PHILIP T. STILLMAN, a citizen of the United States, residing at Elizabeth, in the county of Union, State of New Jersey, have invented certain new and useful Improvements in Valves for Steam or other Fluid-Pressure Engines, of which the following is a specification.

In steam or other fluid-pressure engines, either stationary or movable, the desire of engineers has been to reduce to a minimum consistent with safety the weight of all reciprocating parts. More especially is this true of engines of small capacity and high speed. Coupled with this desire the wish has been to eliminate as many parts as possible and to simplify the method of control or operation. Such are the general objects of my invention, by means of which the following improvements may be accomplished.

In a steam or other expansive or non-expansive fluid-pressure engine of either reversing or non-reversing type using my improvements, which comprise a continuously-revolving axially-movable valve, the common link-motion and eccentric are dispensed with and a train of spur-gears or a system of bevel-gears is substituted. These gears may be so designed that the number of revolutions of the engine and of the valve may be the same.

The mode of operation of my improved valve is disclosed in the accompanying drawings, which show the invention embodied in a form that is deemed to be a suitable and efficient one for a two-cylinder single-expansion engine. Variations in structure may, however, be made by those skilled in the art without departing from the invention.

Figure 1 is a longitudinal section showing the valve in a central position, in which steam is cut off from the cylinders; Fig. 2, a like view showing the valve shifted longitudinally for a predetermined direction of rotation of the engine; Fig. 3, a like view showing the valve in position for running the engine in reverse direction; Fig. 4, a cross-section on the line $x\,x$ of Fig. 1. Figs. 5, 6, 8, and 9 are cross-sections on the line $y\,y$ of Fig. 1, showing, respectively, the valve in different radial positions; Fig. 7, a cross-section on the line $z\,z$ of Fig. 1; Fig. 10, a flat development of the face of the peripheral part of the valve. Figs. 11 and 12 are respectively a detail elevation and plan showing an arrangement to vary the cut off.

The valve A, fitting in the cylindrical casing C, has a projecting stem c, connected by a keyway with the pinion c', which is driven continuously by a pinion c^2, deriving its motion from the main shaft of the engine. The valve is capable of being moved axially to start, stop, and reverse the engine, as will hereinafter appear, by means of a hand-lever L or otherwise.

S is the steam-admission port, which opens to an annular groove or recess S′ in the inner face of the casing.

E is the exhaust-port, which similarly opens to an annular groove or recess E′ in the inner face of the casing.

a' a^2 a^3 a^4 are ports in the casing, which in the construction shown are intermediate the admission and exhaust ports, connecting with the cylinders of the engine (not shown) and serving either as inlet or exhaust ports, according to the position of the valve. The valve is formed with two ends or cylindrical heads 1 and 6, connected centrally by a diametric web 7. The end 1 has an opening 2 in its periphery communicating with a chamber 3, which is extended, as shown at 4, in the direction of the ports a', &c., by the peripheral wall 5. In the position shown in Fig. 1 it will be observed that steam from S S′ will be cut off from the chamber 3. Similarly the other head or end 6 has a peripheral opening 8, communicating with the chamber 9, which is extended toward the other end of the valve, as shown at 10, by a peripheral wall 11. As shown in Fig. 1, the exhaust port or passage E E′ is cut off from this chamber. When the valve is moved to the left, as shown in Fig. 2, the chamber formed between the heads or ends 1 and 6 at one side of the web 7 is opened to the steam-port S, while the exhaust-port E then registers with the peripheral opening 8, and is therefore in connection not only with the chamber 9 10, but also with the space between the heads at that side of the central web 7. Steam is then admitted to drive the engine in a given direction. When the valve is

moved to the right, as shown in Fig. 3, these conditions are reversed and the engine will be driven in the opposite direction. The operation may be readily followed from the sectional views, Figs. 4 to 9, inclusive, and may be briefly described as follows: The ports a' a^2 a^3 a^4 are to be connected to the two cylinders as follows: a' to the top of one cylinder, which may be designated as the one on the right, and a^3 to the bottom thereof; a^2 to the top of the other cylinder, which may be designated as the one on the left, and a^4 to the bottom thereof. On moving the valve A to the left, as shown in Fig. 2, it will be seen by reference to Fig. 5 that the port a^2 is open to the admission-port S and that a^4 is open to the exhaust-port E. a' a^3 are momentarily closed while the piston in the right cylinder is reversing its stroke. A further rotary movement of A in the direction indicated by the arrow in Fig. 5 will open a' to the exhaust-port E, and a^3 to the admission-port S. Further rotary movement of the valve A in the same direction will close a^2 and a^4, as seen in Fig. 6. Fig. 8 shows the port a' just cut off from the exhaust E and about to be opened to the admission-port S, while a^2 a^4 are fully open to E and S, respectively. Fig. 9 shows a' open to S, and a^3 open to E, while a^2 a^4 are closed. In Fig. 3 the position of the valve A is for a direction of rotation of the engine opposite to that afforded by the position of the valve as shown in Fig. 2. The cycle of action will of course occur in inverse order to that already described.

An oil-cup b, mounted on the valve-casing, may supply oil to a duct b', communicating with the ends of the casing.

With my construction one valve may be designed to control all the cylinders of like class of an engine, the cylinder-ports being placed circumferentially around the valve-casing at the same angle apart as the cranks. If it is desired to obtain a given invariable lead for a non-reversing engine, the cylinder-ports may be placed at the desired angle. In a reversing engine the lead may be obtained by cutting away a portion of the web 7 of the valve, as shown at g, or a lap obtained by extending the edge of the web, as at h. In either a reversing or non-reversing engine the lead and lap may be changed by longitudinally moving the valve.

In Fig. 1 the ends d' of the key d on the spindle of the valve are curved, as shown, for the purpose of obtaining a lead by the slight axial movement of the valve. This construction may or may not be used, as may be desired.

In Figs. 11 and 12 are shown cut-off plates P, curved to conform to the interior of the casing and cut away at an angle, as shown at p. The function of these plates is, in cooperation with the port, to effect the proper cut off. They are preferably removably attached to the web 7 and may be replaced by similar plates of different dimensions to meet the exigencies of any special condition.

In a stationery or non-reversing engine the variation in steam admission or cut off may be effected by the axial movement of the valve, which may of course be automatically controlled in any of the many well-known ways. Such an arrangement has the advantage not commonly possessed by other systems of control of causing variation of engine speed to act immediately on the cut off, and the engine may be so controlled that material variations of speed will not occur.

In the drawings I have shown my invention as adapted to a single-expansion double-acting two-cylinder engine. I do not, however, wish to so limit its application, as it is evident that the number of ports and their disposition may be varied to adapt the valve to engines of a different style or type.

I claim as my invention—

1. In a steam or other fluid-pressure engine, the combination of a cylindrical valve seat or casing having admission, exhaust and cylinder ports permanently acting as such while the engine is running in either direction, and a continuously-rotating axially-movable valve seated in the casing and controlling the respective ports therein to reverse the engine by axial movement of the valve.

2. In a steam or other fluid-pressure engine, the combination of a cylindrical valve seat or casing having admission, exhaust and cylinder ports, and a continuously-rotating axially-movable valve seated in the casing and having heads connected by a diametric web and formed with peripheral apertures and chambers for the purpose set forth.

3. In a steam or other fluid-pressure engine, the combination of a cylindrical valve seat or casing containing an admission-port communicating with an interior annular groove, an exhaust-port also communicating with an interior annular groove, and cylinder-ports intermediate the two grooves, and a continuously-rotating axially-movable valve having heads connected by a diametric web and containing peripheral apertures and chambers communicating therewith extending beyond the heads toward the transverse center line of the valve for the purpose set forth.

4. In a steam or other fluid-pressure engine, the combination of a cylindrical valve seat or casing having admission, exhaust and cylinder ports, and a continuously-rotating axially-movable valve seated in the casing, means for varying the normal relation of the valve, in its rotation, to the cylinder-ports to obtain a "lead."

5. In a steam or other fluid-pressure engine, the combination of a cylindrical valve seat or casing having an admission-port communicating with an interior annular groove, an exhaust-port communicating with an interior annular groove and cylinder-ports interme-

diate said grooves, and a continuously-rotating axially-movable valve seated in the casing, comprising a central diametric web and cylindrical heads coöperating respectively with the admission and exhaust ports and each having a peripheral aperture, and a contained chamber extending axially beyond the head, the operation being substantially as described.

6. In a steam or other fluid-pressure engine, the combination of a cylindrical valve seat or casing having an admission-port communicating with an interior annular groove, an exhaust-port communicating with an interior annular groove and cylinder-ports intermediate said grooves, and a continuously-rotating axially-movable valve seated in the casing, comprising a central diametric web and cylindrical heads coöperating respectively with the admission and exhaust ports, and each having a peripheral aperture and a contained chamber extending axially beyond the head, and cut-off plates attached to the central web and coöperating with the cylinder-ports to determine the cut-off, the operation being substantially as described.

7. In a steam or other fluid-pressure engine, the combination with a valve seat or casing having an admission-port, an interior annular passage or groove into which it opens, an exhaust-port, an interior annular groove into which it opens and cylinder-ports, of a continuously-rotatable axially-movable valve seated therein and constructed to coöperate with the respective ports in the casing for the purpose set forth.

8. In a steam or other fluid-pressure engine, the combination with a valve seat or casing having an admission-port, an interior annular passage or groove into which it opens, an exhaust-port, an interior annular groove into which it opens and cylinder-ports, of a continuously-rotatable axially-movable valve seated in the casing and having two parts respectively coacting with the admission and exhaust ports to control the passage of steam between them and the cylinder-ports, each said part having a solid peripheral portion which in one position cuts off steam from, and in another position permits passage of steam to, a cylinder-port, and a chambered portion with a peripheral aperture, which chambered part in one position cuts off steam from, and in another position permits the passage of steam to, a cylinder-port, whereby the admission-port and exhaust-port constantly act as such when the engine is running in either direction and the engine may be reversed by the axial movement of the valve.

In testimony whereof I have hereunto subscribed my name.

PHILIP T. STILLMAN.

Witnesses:
F. W. STILLMAN,
EDWARD OLMSTED.