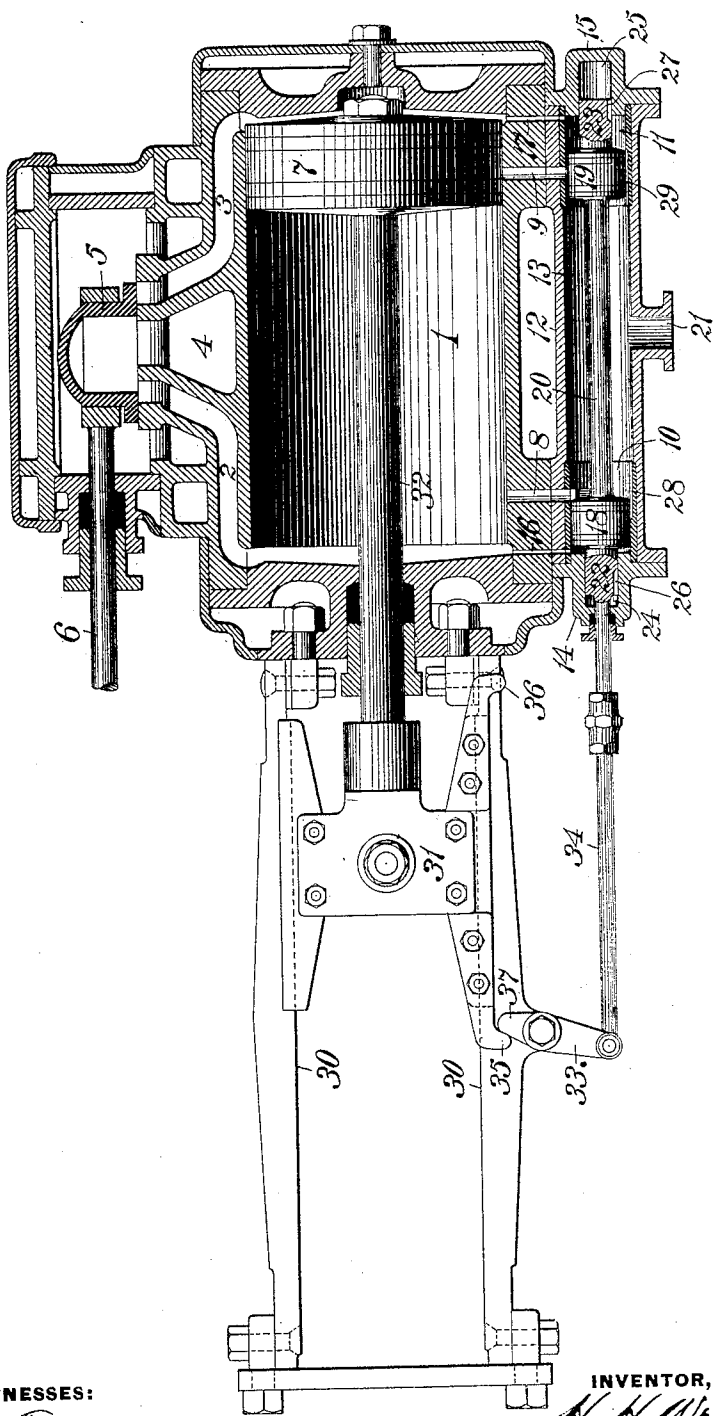


(No Model.)

H. H. WESTINGHOUSE.
VALVE DEVICE FOR FLUID PRESSURE ENGINES.

No. 583,588.

Patented June 1, 1897.



WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY H. WESTINGHOUSE, OF PITTSBURG, PENNSYLVANIA.

VALVE DEVICE FOR FLUID-PRESSURE ENGINES.

SPECIFICATION forming part of Letters Patent No. 583,588, dated June 1, 1897.

Application filed June 11, 1896. Serial No. 595,118. (No model.)

To all whom it may concern:

Be it known that I, HENRY HERMAN WESTINGHOUSE, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Valve Devices for Fluid-Pressure Motors, of which improvement the following is a specification.

The object of my invention is to provide new and improved means for effecting and controlling exhaust of motive fluid from the cylinder of a fluid-pressure motor; and to this end my invention consists in the combination, with an exhaust-valve device which is normally operated by fluid-pressure, of means whereby the device may be positively and automatically operated by a moving part of the motor on a partial or total failure of the fluid-pressure to effect the normal operation; and my invention further consists in certain combinations and features of construction, all as hereinafter fully set forth.

In the application of my invention I employ an exhaust-valve device independent of the main admission-valve and controlling ports or passages for the release of fluid from the cylinder, which are additional to the usual ports or passages, for draining the cylinder and which may constitute the main exhaust-passages or be employed in addition thereto. The exhaust-valve device shown in the drawing is similar to that shown and described in my pending application, Serial No. 577,773, filed February 3, 1896; but my present invention is not limited to this particular construction.

The essential feature of my present invention is the combination, with a valve device normally actuated by fluid-pressure, of means whereby the operation of the valve device may be automatically and positively effected by the action of a moving part of the motor, either acting alone or assisted by the action of the fluid-pressure, such means being brought into action only on a partial or total failure of the fluid-pressure to effect the complete operation.

The accompanying drawing, which illustrates an application of my invention, is a longitudinal central section through the cyl-

inder and valve-chests of a steam-engine provided with my improvement, the guide-bars, cross-head, and means for positively actuating the valve device being shown in elevation. 55

As shown in the drawing, the main cylinder 1 is provided with the usual admission-passages 2 and 3 and exhaust-passage 4, and any ordinary form of valve, such as the slide-valve 5, may be employed to control the admission of fluid to the cylinder. The main piston 7 of the motor is connected, by means of a piston-rod 32, with a cross-head 31, fitted to slide between the guide-bars 30. 60

At some distance from the ends of the main cylinder and in position to be covered by the main piston 7 before it reaches the end of its stroke are passages 8 and 9, which open into chambers 10 and 11, formed in the casing 12. These chambers may be connected with a chamber or space 13, which in turn opens to the atmosphere or elsewhere through the passage 21. The chambers 10 and 11 are closed at their outer ends by caps 14 and 15, and fitted within the chambers are piston-valves 18 and 19, which are connected together by a stem 20 and control the outer ends of the passages 8 and 9. 75

On the outer ends of the pistons 18 and 19 are formed smaller pistons or cylindrical extensions 22 and 23, which are fitted to slide in the chambers 24 and 25, formed in the caps 14 and 15. 80

The outer end of each of the chambers 10 and 11 communicates with the interior of the main cylinder 1 through a passage 16 or 17, which may be the usual drainage-passage or a passage similarly located which opens into the main cylinder at its ends or at some point between the ends of the main cylinder and the passages 8 and 9. 85

Grooves or passages 26 and 27 are formed in the pistons or extensions 22 and 23 and are so formed and disposed as to open the chambers 24 and 25 to the chambers 10 and 11, respectively, when the piston 18 or 19 makes its full stroke away from the adjacent head 14 or 15. These passages or grooves 26 and 27 permit the admission of steam to the chambers 24 and 25 when the pistons 18 and 19 are moved inward and away from the heads 14 and 15, and each is adapted to be closed as 90 95 100

the extension 22 or 23 on which it is formed moves outward toward the head 14 or 15, thereby confining steam in the chamber 24 or 25, which acts as a cushion to prevent shock.

Any water which may collect in the chambers 24 and 25 will be drained into the chambers 10 and 11 when the passages 26 and 27 are opened. The passages 16 and 17 may serve to drain the main cylinder into the chambers 10 and 11, and any water collecting in the chambers 10 or 11 may be drained off through the passages or grooves 28 and 29.

It will be obvious that the grooves or passages 28 and 29, instead of being formed in the walls of the chambers 10 and 11, may be formed in the pistons 18 and 19 in like manner as the grooves 26 and 27 are formed in the extensions 22 and 23, and also that the grooves 26 and 27, instead of being formed in the extensions 22 and 23, may be formed in the walls of the chambers 24 and 25.

Pivoted to one of the guide-bars 30 or to any convenient stationary part of the engine is a lever 33, one arm of which is connected with a rod 34, secured to the extension 22 of the piston-valve 18, or otherwise connected so as to transmit motion from the lever to the pistons 18 and 19. Projections or tappets 35 and 36 are formed on or secured to the cross-head 31 and are adapted to move therewith so as to come in contact with the arm 37 of the lever when the cross-head and the main piston are near the ends of their stroke.

When the parts are in the positions shown in the drawing, the valve 5 has just opened the port or passage 3 to admit live steam to the main piston 7. The pressure in the chamber 11, admitted thereto through the passage 17, has moved the piston-valves 19 and 18 to the left, so as to close the outer end of the passage 9 and to open the outer end of the passage 8, and the steam on the left of the piston 7, which has performed its work, is escaping through the passages 2 and 4 and through the passage 8.

As the main piston 7 moves to the left the valve 5 will cut off the admission of steam through the passage 3, and as the main piston approaches the end of its stroke the exhaust through the passages 2 and 4 will be cut off. The cut off of the exhaust through the passages 2 and 4 may occur before or at the same time or after the piston 7 covers the exhaust-port 8. In any case the pressure on the left of the piston 7 will rise after the passage 2 is closed, and before the piston 7 reaches the end of its stroke the increasing pressure on the outer side of the piston-valve 18 will overcome the diminishing pressure on the outer side of the piston-valve 19, and the piston-valves 18 and 19 will be shifted so as to close the passage 8 and open the passage 9.

If the exhaust through the passage 4 be cut off before the main piston 7 covers the passage 8, the degree of compression of the steam will depend on the capacity of the

passage 8, as well as on its distance from the end of the cylinder. The passages 8 and 9 may be employed as the main exhaust-ports and the exhaust-passage 4 dispensed with or contracted to any degree desired, and instead of employing an admission-valve of the form shown in the drawing any other form may be employed, or more than one valve may be employed for this purpose.

In case the piston-valves 18 and 19 fail to be operated properly and at the proper time by the difference in the fluid-pressures in the main cylinder the arm 37 on the lever 33 will be struck by one of the tappets 35 or 36 and moved on its pivot, so as to shift the pistons 18 and 19 in the same direction that they would be moved in the normal operation of the device by the difference in the fluid-pressures.

The location, proportions, and relation of the lever 33 and the tappets 35 and 36 are such that the arm 37 of the lever will be operated by the tappets only when the main piston 7 is very near the end of its stroke or when it has passed beyond that point in its travel at which the piston-valves 18 and 19 should be operated. The distance apart of the heads 14 and 15, the proportions of the lever 33, and the positions of the lever and tappets are such that the positive movement of the pistons 18 and 19, effected by and during the contact of the tappets with the lever, will not be great enough to bring the pistons 18 and 19 into contact with the heads 14 and 15, respectively. The movement is, however, great enough to effect the desired opening and closing of the ports 8 and 9 and to leave but a small clearance-space between the piston-valves and the heads 14 and 15 when the movement is completed.

It will be obvious that the rod 34 may be otherwise connected with the pistons 18 and 19 and that it is not essential that the rod 34 or the pistons 18 and 19 should be positively connected with the lever 33.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, with the main cylinder of a fluid-pressure motor, of a valve device normally operated by fluid-pressure in the cylinder, and means for automatically and positively operating the valve device in case of the partial or total failure of the fluid-pressure to effect the operation.

2. The combination, with the main cylinder of a fluid-pressure motor, of a valve device normally operated by fluid-pressure in the cylinder, and means for automatically operating the valve device by a moving part of the motor in case of the total or partial failure of the fluid-pressure to effect the operation.

3. The combination, with a fluid-pressure motor, of a valve device controlling exhaust of fluid from the cylinder of the motor and which is normally operated by fluid-pressure in the cylinder, and means for positively and

automatically operating the valve device, in case of the partial or total failure of the fluid-pressure to effect the operation.

4. The combination, with a fluid-pressure motor and a main admission-valve, of a valve device controlling exhaust of fluid from the cylinder of the motor and which is normally operated by fluid-pressure in the cylinder of the motor, and means for positively and automatically operating the valve device in case of the partial or total failure of the fluid-pressure to effect the operation.

5. The combination, with a fluid-pressure motor, of a valve device controlling exhaust of fluid from the cylinder of the motor and which is normally operated by fluid-pressure in the cylinder of the motor, and means for positively and automatically operating the valve device by a moving part of the motor in case of a partial or total failure of the fluid-pressure to effect the operation.

6. The combination, with a fluid-pressure motor, of a valve device adapted to be normally operated by fluid-pressure, and mechanism interposed between the valve device and a moving part of the motor, but normally inoperative thereby, whereby the operation of the valve device may be effected on the failure of the fluid-pressure to effect the desired operation.

7. The combination, with a fluid-pressure motor, of a valve device adapted to be normally operated by fluid-pressure, and mechanism interposed between the valve device and a reciprocating part of the motor, but normally inoperative thereby, whereby the opera-

tion of the valve device may be effected on the failure of the fluid-pressure to effect the desired operation.

8. The combination, with a fluid-pressure motor, of a valve device controlling exhaust of fluid from the cylinder of the motor and adapted to be normally operated by fluid-pressure, and mechanism interposed between the valve device and a reciprocating part of the motor, but normally inoperative thereby, whereby the operation of the valve device may be effected on the failure of the fluid-pressure to effect the desired operation.

9. The combination, with a fluid-pressure motor, of a valve device adapted to be normally operated by fluid-pressure, and a lever interposed between the valve device and a moving part of the motor in position to be actuated thereby and to transmit movement to the valve device only on the failure of the fluid-pressure to effect the normal movement of the valve device.

10. The combination, with a fluid-pressure motor, of a valve device adapted to be normally operated by fluid-pressure, and a lever adapted to be actuated by the movement of the cross-head of the motor and to impart movement to the valve device only on the partial or total failure of the fluid-pressure to effect the operation of the valve device.

In testimony whereof I have hereunto set my hand.

HENRY H. WESTINGHOUSE.

Witnesses:

L. E. LOVE,

T. J. HOGAN.