No. 873,452. PATENTED DEC. 10, 1907.

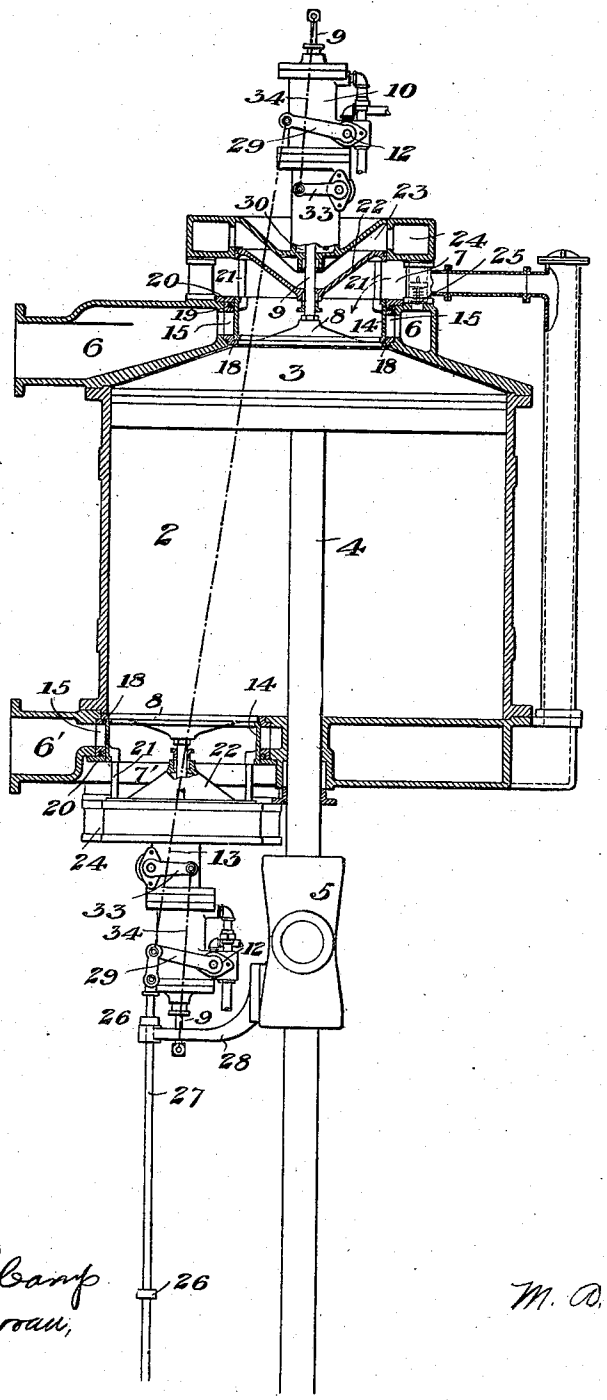
M. A. NEELAND.

PUMPING CYLINDER VALVE.

APPLICATION FILED OCT. 4, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

Cameron Camp

Thomas Moran.

INVENTOR

M. A. Neeland

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2 SHEETS—SHEET 2.

Fig. 2.

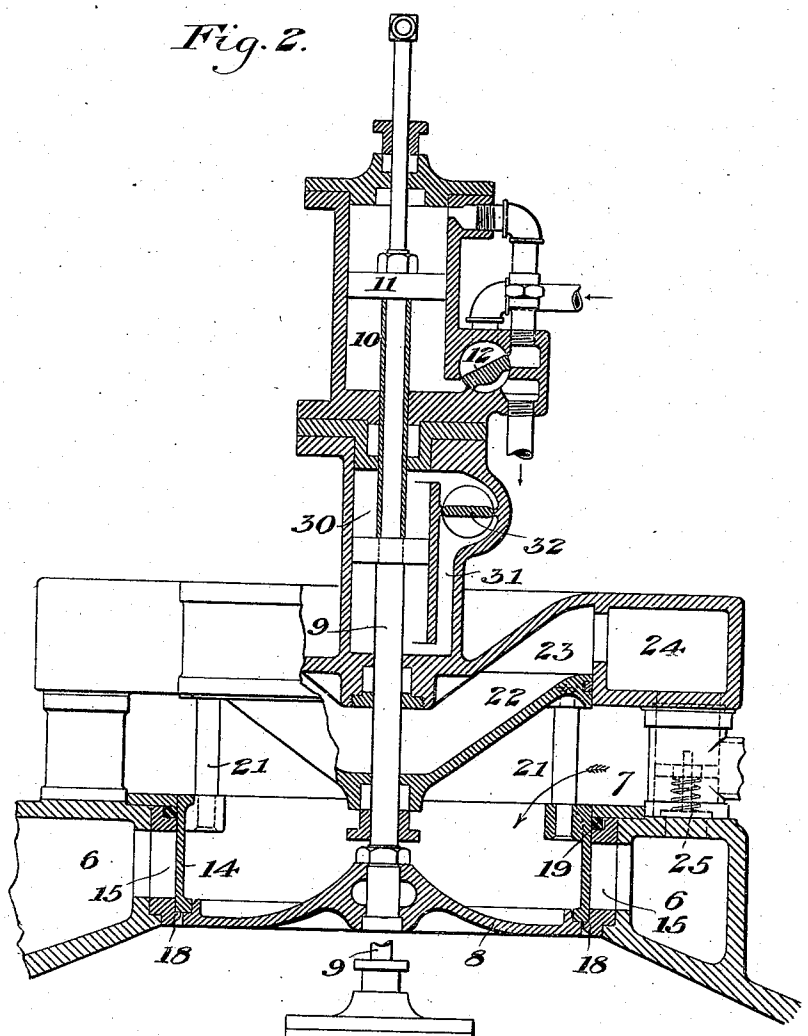
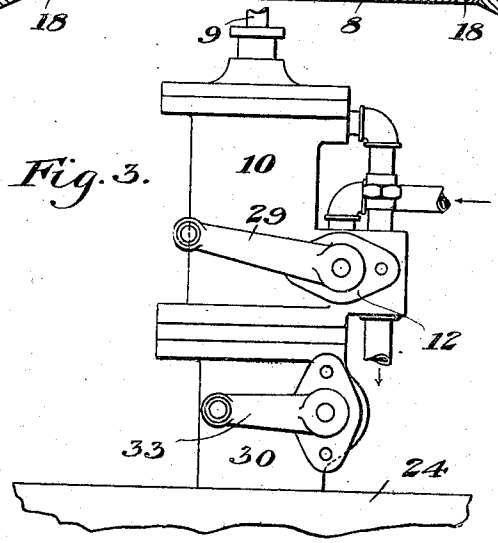


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

MARVIN A. NEELAND, OF YOUNGSTOWN, OHIO.

PUMPING-CYLINDER VALVE.

No. 873,452. Specification of Letters Patent. Patented Dec. 10, 1907.

Application filed October 4, 1904. Serial No. 227,136.

To all whom it may concern:

Be it known that I, MARVIN A. NEELAND, of Youngstown, Mahoning county, Ohio, have invented a new and useful Improvement in Pumping-Cylinder Valves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view of an air-blowing engine cylinder provided with my valves; Fig. 2 is a vertical section of one of the valves and its actuating cylinder; and Fig. 3 is a side elevation of the valve actuating cylinder.

My invention provides a blowing-engine valve-mechanism of novel construction, which is cheaper than valve-mechanisms heretofore employed and enables me to dispense with the eccentrics and like devices heretofore required.

My improved mechanism also enables me to secure larger port areas with less clearance-space in the cylinder than has heretofore been possible.

In the drawing, 2 indicates the blowing cylinder, having a piston 3, piston-rod 4 and cross-head 5. The cylinder has at each end an outlet-port 6, 6′ leading to the compressed air receiver, an inlet-port 7, 7′, and valve-mechanism comprising a combined inlet and outlet valve.

The inlet-valve, or inlet portion of the combined valve, is a disk or cone 8 mounted upon a stem 9 and fitted to a port in the end of the cylinder. The stem 9 extends to an auxiliary power-cylinder 10 for operating the valve, this cylinder having a piston 11 and controlling-valve 12 operated by link-connections 13 from the cross-head 5, the valve being actuated so that the admission of steam or other fluid pressure to the cylinder 10 will be reversed from one end of the cylinder to the other at the end of each stroke of the blowing piston 3.

The outlet portion of each valve consists of a longitudinally-sliding cylinder or ring 14 controlling an annular outlet-port or annular series of outlet-ports 15, and having a stationary seat 18 at one end, and a fixed packing 19 at the other end which bears against the side of the valve and is held by a follower-plate 20. When the outlet-valve 14 is in the closed position shown in Fig. 2, it constitutes a seat against which the inlet disk-valve 8 has a bearing. It is also connected by rods or other suitable devices 21 to a piston 22 which is mounted slidingly on the valve-stem 9 and works within a cylinder 23 which is connected to a receiver 24 of compressed air. This is an auxiliary receiver which derives its compressed air from the main air-receiver of the engine, being connected therewith by a check-valve 25 so that the pressure in the auxiliary receiver 24 will be the maximum pressure of the main receiver connected with outlet-port 6 and will not be quickly diminished by temporary reduction of the pressure in the latter. In this way substantially constant air-pressure is exerted inwardly upon the piston 22 and is transmitted through the rods 21 to the annular outlet-valve 14, thereby pressing it against its seat 18 by yielding pressure as shown in Fig. 2. Within the broad claims of my invention the yielding pressure afforded in this way by the air may be substituted by the yielding pressure of a suitable spring.

The parts are shown in Fig. 2 in middle position, when both the inlet-valve 8 and outlet-valve 14 are closed, the outlet-valve being closed against its end seat 18, and the inlet-valve being seated against the end of the outlet-valve.

Suppose the piston of the blowing engine to be on its stroke away from the valve 8. When the piston begins this stroke, the valve 12 has been reversed so as to admit steam or other motive fluid to the upper end of the cylinder 10, thus moving down the piston 11 and unseating the inlet-valve 8, so that throughout the stroke of the piston air is drawn into the blowing cylinder from the inlet 7. Just before the blowing piston reaches the end of its stroke the valve 12 is reversed so as to admit motive fluid to the lower end of the cylinder 10, and exhaust at the other end, thereby raising the piston 11 and seating the valve 8 against the end of the outlet-valve 14. The upward pressure exerted on the piston 11 in the cylinder 10 is insufficient in amount to overcome the down-pressure which the piston 22 exerts holding the valve 14 to its seat, and the outlet and inlet valves are therefore held in the closed position shown in Fig. 2. When however the pressure in the blowing cylinder reaches substantially the pressure in the main receiver, the outward pressure thus exerted upon the inlet-valve 8 combined with the force exerted by the valve-actuating piston 11, becomes sufficient to overcome the down-

pressure of the piston 22 and to move the valve 8 together with the valve 14 outwardly as a unitary valve-structure, thus opening the outlet-valve.

Just before the blowing piston reaches the end of its in-stroke the auxiliary valve 12 is reversed, pressure is admitted to the upper end of the cylinder 10 and exhaust at the other end, and the valve 8 is moved down, the pressure on the back of the piston 22 causing the outlet-valve 14 to move with the valve 8 as a unitary structure until the end of the valve 14 reaches its stationary seat 18, whereupon the parts are restored to the position first above described.

The valve-mechanism at the other end of the cylinder operates in the same way and reciprocally with the valve-mechanism just described, that is to say, substantially at the time when the inlet-valve at one end of the cylinder is closing the outlet-valve at the other end of the cylinder is closing, and immediately after the closing of the inlet-valve at one end of the cylinder the inlet-valve at the other end of the cylinder starts to open. The operation of the valves is controlled by tappets 26 on a tappet-rod 27, engaged by a projection 28 on the cross-head 5. The tappet-rod 27 operates the valve 12 through the connections 13 and arms 29, and the tappets may be adjusted by shifting them on the tappet-rod in order to vary the time of operation of the valves.

For the purpose of cushioning the seating of the valves, I provide the valve-stem 9 with a dash-pot cylinder 30 charged with oil, the ends of the cylinder being connected by a passage 31 controlled by a throttling-valve 32 which in its middle position restricts said passage so as to check the motion of the valve-stem and when in its extreme position leaves the passage fully opened. This throttling-valve is operated by a connection which extends to the upper end of the valve-stem 9 and which consists preferably of an arm 33 on the throttling-valve and a link 34 extending to the upper end of the valve-stem.

The parts are so timed that when the valves 8, 14, are seated as shown in Fig. 2, the valve 32 will throttle the connecting passage of the dash-pot to its greatest extent, and will thus cushion the seating of the valves.

It will be noticed that in the construction shown in the drawings, the single port at each end of the blowing cylinder serves alternately as an inlet-port and outlet-port. It is connected with the air-receiver and acts as an outlet-port when the inlet-valve 8 and outlet-valve 14 are raised together above the seat 18, and it is open to the atmosphere and is closed to the air-receiver when the outlet-valve 14 is seated on its seat 18, and the inlet-valve 8 is moved inwardly away from the outlet-valve.

By the term pumping-cylinder herein employed I intend to include any engine for compressing or pumping air or other gas or liquids.

The simplicity of my invention and its many advantages will be appreciated by those skilled in the art, and within the scope of the invention as defined in the claims the parts may be modified in many ways, since

What I claim is:—

1. The combination with the outlet valve of a pumping cylinder, of an inlet valve, and a power cylinder, the inlet valve and power cylinder being associated with the outlet valve for opening the same by the combined action of the power cylinder and the opening movement of the inlet valve, substantially as described.

2. A pumping-cylinder outlet-valve arranged to be seated by air-pressure and to be opened by the joint action of an inlet-valve and a power-cylinder, and means for reversing the pressure in said power-cylinder; substantially as described.

3. The combination with a pumping-cylinder, of an inlet-valve, an outlet-valve constituting a seat therefor, an actuating piston for said inlet valve, and means for reversing the pressure thereon; substantially as described.

4. The combination with a pumping-cylinder, of an inlet-valve, an outlet-valve constituting a seat therefor, an actuating piston and a dash-pot for said inlet-valve, and means for reversing the pressure on said piston; substantially as described.

5. The combination with a pumping-cylinder, of an inlet-valve, an outlet-valve constituting a seat therefor, an actuating piston and an adjustable damping device for said inlet-valve, and means for reversing the pressure on said piston; substantially as described.

6. In a blowing engine, the combination of a pumping-cylinder, an inlet-valve, an outlet-valve, a piston under the air pressure of the engine for actuating one of the valves, another piston under pressure other than that of the engine for actuating the other valve, and means for reversing the pressure on said other piston, substantially as described.

7. The combination with a pumping cylinder, of an inlet-valve, an outlet-valve, an actuating piston for each valve, means for maintaining substantially constant pressure on the outlet-valve piston and means for reversing the pressure on said inlet-valve piston; substantially as described.

8. A cylindrical valve, a disk-valve seating on the cylindrical valve, a pressure cylinder for seating the cylindrical valve, and another pressure cylinder for seating the disk valve against the cylindrical valve; substantially as described.

9. A cylindrical valve having a stationary

end-seat, and a valve seating on the end-seat having reversible actuating means connected therewith; substantially as described.

10. A cylindrical outlet-valve having open ends, a disk inlet-valve seating on and closing one end of the cylindrical outlet-valve, a piston actuated by air-pressure connected with the outlet-valve, and a piston connected with the inlet-valve, the two valves being associated for simultaneous actuation by the piston of the inlet valve; substantially as described.

11. A cylindrical outlet-valve, a disk inlet-valve seating on the cylindrical outlet-valve, a piston actuated by air-pressure and connected with the outlet-valve for normally seating the same, and a power cylinder and piston connected with the inlet-valve for opening and closing the same; substantially as described.

12. A cylindrical outlet-valve, a disk inlet-valve seating on the cylindrical outlet-valve, a piston actuated by air-pressure and connected with the outlet-valve, a power cylinder and piston connected with the inlet-valve, and means for reversing the pressure in said power cylinder; substantially as described.

13. A pumping-cylinder having a cylindrical valve seating at its end, a piston actuated by air-pressure for holding the valve to its seat, and means including an auxiliary piston to alternately oppose and assist said first piston; substantially as described.

14. A pumping-cylinder having an outlet-valve, means actuated by air-pressure for holding it to its seat, an inlet-valve arranged to transmit opening pressure to the outlet-valve, and means alternately assisting and opposing said opening pressure; substantially as described.

15. A pumping cylinder having an outlet valve, an inlet valve, a power cylinder tending to open the outlet valve, a piston subject to air pressure and acting on the outlet valve to hold it to the seat, the piston being of greater capacity than the power cylinder, the combined power of the pumping cylinder and the power cylinder being sufficient to overcome the pressure of the air-pressed piston, substantially as described.

16. A cylindrical outlet-valve, a disk inlet-valve seating on the cylindrical outlet-valve, provided with actuating and damping pistons having separately actuated controlling valves; substantially as described.

17. A pumping cylinder having an outlet valve, an inlet valve seated on the outlet valve, a power cylinder operating through the inlet valve and tending to open the outlet valve, an air-pressed piston to hold the outlet valve closed and of greater power than the power cylinder, the combined power of the pumping cylinder and the power cylinder being sufficient to overcome the pressure of the air-pressed piston, substantially as described.

18. A pumping cylinder having a valve, means operating continuously to yieldingly hold the valve to its seat and comprising an air receiver and a check valve connecting the same with the compressed air supply, and means for opening the valve against the action of its seating means, substantially as described.

19. A pumping engine having an outlet valve, fluid pressure actuated means continuously operating to yieldingly hold the valve closed and including mechanism to prevent reduction of pressure when the pressure is reduced in the main receiver, substantially as described.

20. A blowing engine having an outlet valve, an inlet valve, and a power cylinder for opening and closing the inlet valve, the three elements being related to open the outlet valve by the combined action of the power cylinder on the inlet valve and the compression within the compressor cylinder of the engine, substantially as described.

In testimony whereof, I have hereunto set my hand.

MARVIN A. NEELAND.

Witnesses:

GEO. B. BLEMING,

JOHN MILLER.