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J. A. DYBLIE.

VALVE MECHANISM.

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Fig. 1.

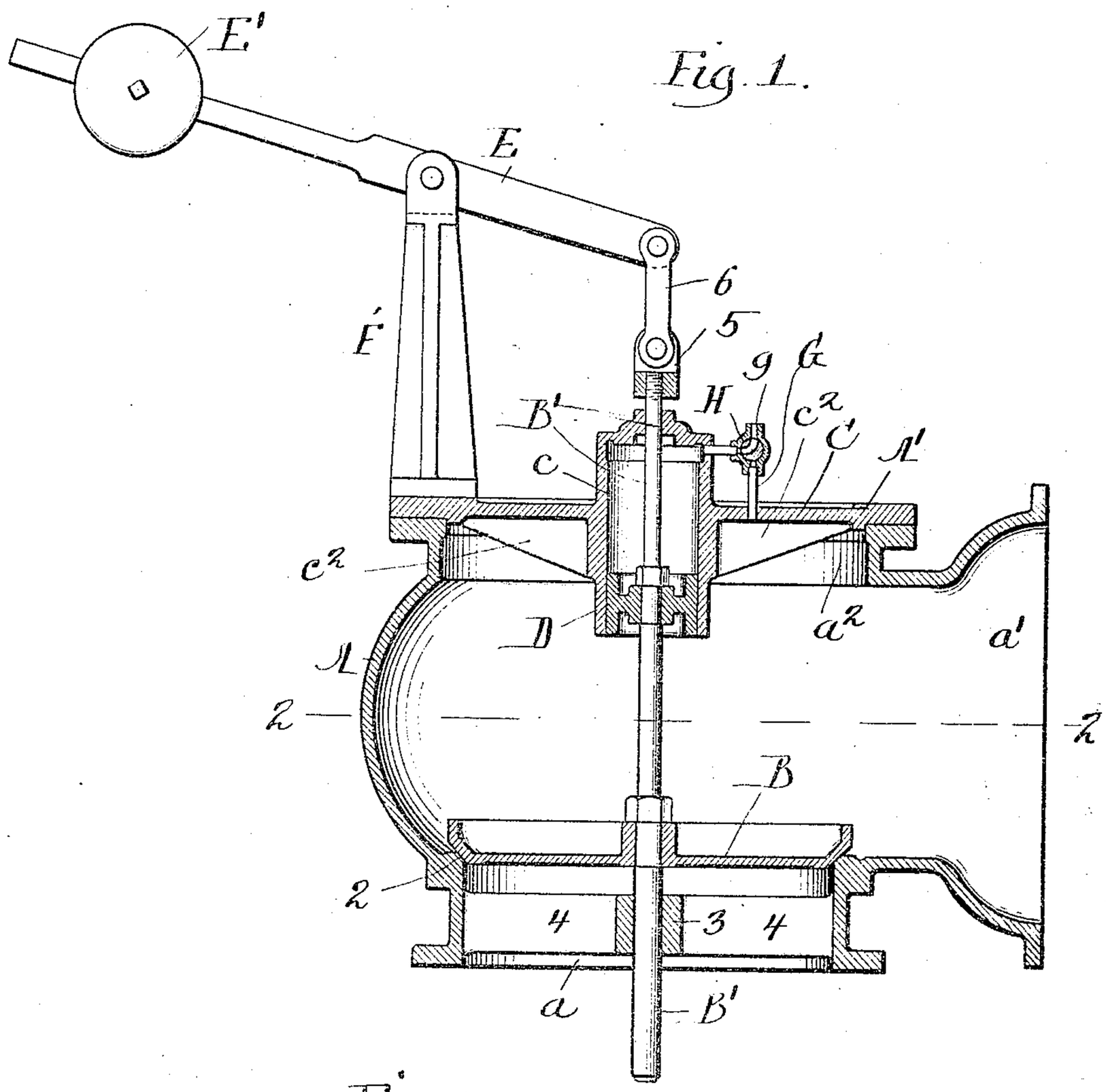
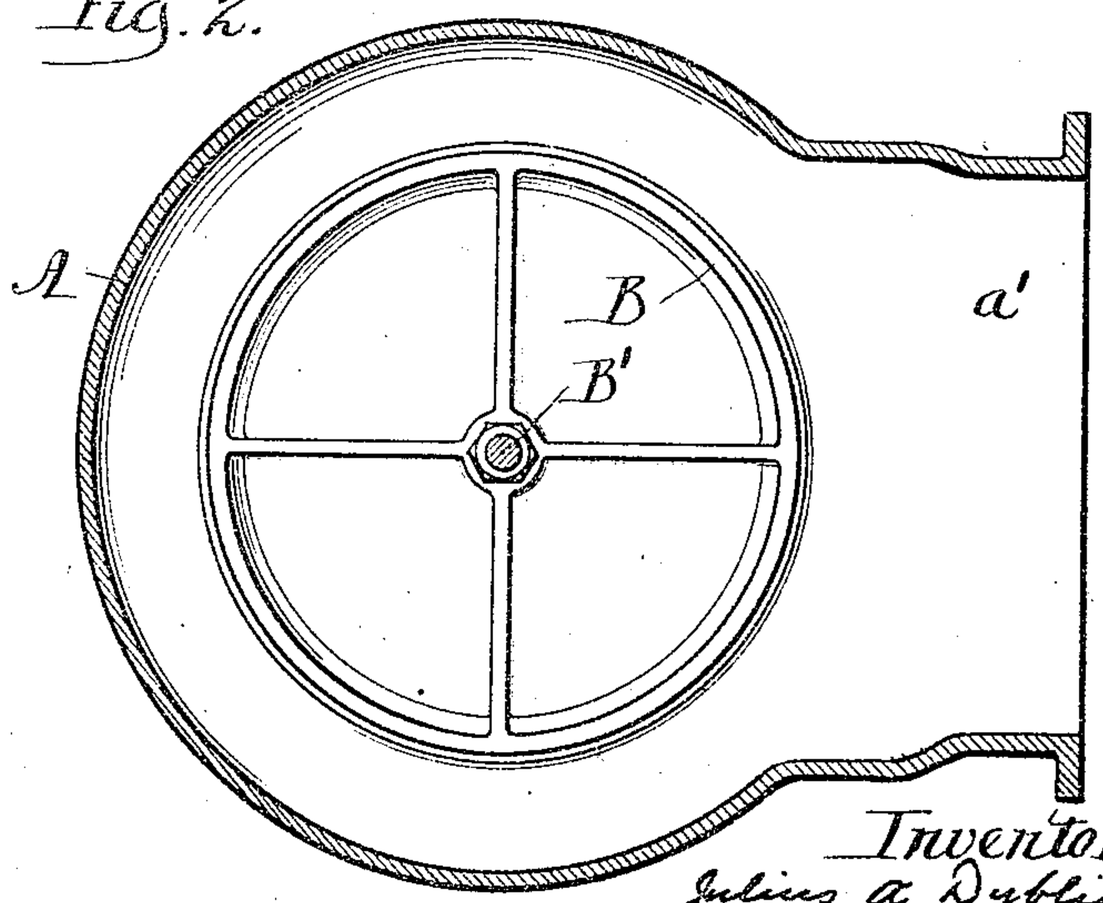


Fig. 2.



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VALVE MECHANISM.

No. 816,306. Specification of Letters Patent. Patented March 27, 1906.

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To all whom it may concern:

Be it known that I, JULIUS A. DYBLIE, a citizen of the United States, and a resident of Joliet, county of Will, and State of Illinois, have invented certain new and useful Improvements in Valve Mechanism, of which the following is a full, clear, and exact description.

The present invention has relation more particularly to that class of valve mechanism used in connection with the blowing-engines of converting and blast furnace plants; and the invention consists in the features of improvements hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the claims at the end of this specification.

Figure 1 is a view in central vertical section through a valve mechanism embodying my invention. Fig. 2 is a view in horizontal section on line 2 2 of Fig. 1.

The casing A of my improved valve mechanism is provided with an induction-port *a* and with a discharge-port *a'*, the induction-port being adapted for attachment to the pipe leading from the blowing-engine, while the port *a'* is adapted for attachment to a pipe leading to the mains whereby the blast of air is delivered to the furnaces. Around the induction-port *a* is formed a valve-seat 2, that is ground to receive a disk-shaped valve B, whereby the port *a* may be closed. Through the valve B passes the stem B', to which the valve B is connected, and one end of the stem B' passes through and is guided by a boss 3 at the center of the spider-arms 4, that are preferably cast integral with the casing A at its induction-port *a*. The opening a^2 in the casing A opposite the port *a* is closed by a head A', formed separate from the casing and conveniently bolted to exterior flanges around the port a^2. This head C is provided with a cylinder *c*, that is preferably formed integral with the head C, and in this cylinder *c* works a piston D, that is fixed to the stem B' of the main valve B. The inner end of the cylinder *c* is open; but, as shown, its outer end is closed, and through this outer end passes the valve-stem B'. In order to counterbalance the weight of the valve B, I prefer to attach to the upper end of the valve-stem B' a counterbalance-weight. As shown, the upper end of the stem B' has attached thereto a coupling 5, to which is pivotally connected the lower end of a link 6, the upper end of this link 6 being pivotally connected to the inner end of the counterbalance-lever E, that carries at its opposite end the counterbalance-weight E', preferably adjustable upon the lever. The counterbalance-lever E is supported by a standard F, that rises from the top of the casing-head C. The inner face of the head C is preferably strengthened by interior webs c^2, as shown in Fig. 1 of the drawings.

The upper end of the cylinder *c* is connected with the interior of the casing A, so that substantially the same air-pressure may be delivered to the top and to the bottom of the valve-controlling piston D. Preferably the connection between the upper end of the cylinder *c* and the interior of the casing A is effected by a pipe or channel G, that leads from the top of the cylinder *c* through the head C of the casing, and, as shown, this pipe or channel G is provided with an exhaust-port *g* and with a three-way valve H, that will be furnished with a suitable handle, whereby it may be conveniently manipulated.

When the blowing-engine is to be started, the attendant should turn the three-way valve H so as to open communication between the upper end of the cylinder *c* and the atmosphere. When this has been done, the air-pressure from the blowing-engine lifts the valve B from its seat, and the air-pressure that is within the casing and main pipes connected therewith from other engines, if such there be, acts on the under side of the piston D, that is attached to the valve-stem B', and maintains the valve B in its full-open position. If no other blowing-engines are attached to the delivery-mains of the system, the pressure of air admitted from the blowing-engine through the induction-port *a* will after a few strokes of the engine accumulate sufficiently to cause the piston D to hold the valve B in its raised position. In open position the pressure on both sides of the valve is balanced, but that on the piston D is not balanced, and the pressure on the under side of the piston will be sufficiently larger than that on the upper side to hold the valve in open position. When the blowing-engine delivering air through the casing A is to be shut down and it is desired to close the valve B, the attendant will turn the three-way valve H from the position shown in Fig. 1 a quarter-revolution, thereby establishing communication between the top of the cylinder *c* and the interior of the casing A, so as to equalize the pressure on both sides of the

piston D, and thus allow the valve B to close to its seat by gravity. The purpose of the counterbalance-lever E and its weight E' is to partially balance the valve B, and this feature is desirable particularly with large valves in order to prevent the violent closing of the valve B upon its seat. If in starting up the blowing-engine that is connected to the induction-port *c* the attendant should fail to turn the three-way valve H, so as to establish communication between the top of the cylinder *c* and the atmosphere, the valve B will nevertheless be raised by the air-pressure from the blowing-engine, but with each pulsation of the engine, will fall to its seat, and this will call the [illegible] attention to his neglect, to the end that he promptly turn the three-way valve H so as to establish communication between the top of the cylinder *c* and the atmosphere, after which the pressure upon the under side of the piston D will maintain the valve B in closed or open position; but the failure of the attendant to open communication between the top of the cylinder *c* and the atmosphere upon the starting up of the blowing-engine can cause no injury to the parts, because the valve B will yield to the air-pressure beneath it from the engine. It should also be noticed that the valve is arranged on the discharge side of a valve-seat and is not only exposed on one side to the inlet-pressure so as to be automatically opened thereby to prevent injury to the parts, but the valve is exposed on its opposite side to the exhaust-pressure, so that when the engine is shut down or if for any other reason the inlet-pressure falls below that in the main the valve may be closed and will be held in closed position by the exhaust-pressure, so that there will be no loss of air from the main. The piston D is smaller in area than the valve, so that the valve is effectually held to its seat when closed by the pressure on the discharge side of the valve.

It is manifest that the details of construction above set out may be varied without departing from the spirit of the invention.

As stated, the improved valve is designed for use for blowing-engines of blast-furnace plants and the like, and one of these valves is interposed between each engine and the main blast-pipe. The valve B is arranged on the discharge side of the valve-seat and is held on its seat by gravity or an equivalent force, so that whenever the blowing-engine to which it is connected is started up it will automatically open as soon as the inlet-pressure slightly exceeds the discharge or back pressure in the main blast-pipe, even though the attendant failed to shift the cock H, so that no damage can occur due to carelessness of the attendant. Also by arranging the valve on the discharge side of the seat it is securely held in closed position by the discharge or back pressure in the main pipe whenever the engine to which it is attached is shut down or if for any other reason the inlet-pressure falls considerably below the back pressure. As stated, the valve is automatically opened whenever the inlet-pressure slightly exceeds the discharge-pressure; but as this inlet-pressure fluctuates by the stroke of the engine the valve will also fluctuate unless the cock H is turned to expose the opposite sides of the piston D to different pressures—that is to say, on its upper side to the atmosphere and on its lower side to the discharge-pressure. When the valve B is opened, the pressure on its opposite sides is of course equalized; but the excess pressure on the under side of the piston D is sufficient to overcome the weight or like closing force of the valve and hold the valve open. The valve is closed, as described, by equalizing the pressure on opposite sides of the piston D, so as to permit the valve to shift to closed position under the pressure of the closing force, which in the form illustrated may be gravity. It will be noted that the piston D is considerably smaller than the valve B, so that even though the cock H is turned to expose the upper side of the piston to the atmosphere the valve will be still held in its seat by the pressure of the discharge unless the inlet-pressure is equal to the discharge-pressure. This is essential, for if the piston D were larger than the valve B it would open as soon as the attendant turned the cock H, and if the inlet-pressure were lower than the discharge the air in the main pipe would blow back through the engine. So, also, if the attendant carelessly left the valve H open the valve B is nevertheless held closed by the back pressure should the engine attached thereto be shut down, inasmuch as the valve B is larger than the piston D. It will therefore be seen, as is desired, the valve B will always open when the inlet-pressure exceeds the discharge-pressure and will always be held closed when the discharge-pressure exceeds the inlet-pressure irrespective of the position of the cock H, so that no damage can be done to the engine or air lost in the main pipe due to the carelessness of the attendant.

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

1. A valve of the character described comprising a casing having a valve-seat, a disk valve on the outlet or discharge side of said valve-seat, exposed on its opposite sides to the inlet and discharge pressures respectively and arranged to automatically open when the inlet-pressure exceeds the discharge-pressure, a stem connected to said valve, a piston on said stem, a cylinder for said piston, and means for exposing the opposite sides of said piston to different fluid-pressures to hold the valve open and for equalizing the pressure on opposite sides of the piston to permit the

shift of the valve to closed position, substantially as described.

2. A valve of the character described comprising a casing having a valve-seat, a disk valve arranged on the discharge side of said valve-seat, exposed on opposite sides to the inlet and discharge pressures respectively and arranged to be automatically opened when the inlet-pressure exceeds the discharge-pressure, a stem connected to said valve, a piston of less area than said valve on said stem and a cylinder for said piston, said cylinder having valve mechanism and ports for placing the opposite ends of the cylinder in communication with the interior of the valve-casing and with the atmosphere respectively to hold the valve open, and for equalizing the pressure on opposite sides of said piston to permit the shift of the valve to closed position, substantially as described.

3. A valve of the character described comprising a casing having a valve-seat, a disk valve on the discharge side of said valve-seat, exposed on its opposite sides to the inlet and discharge pressures respectively and a stem connected to said valve and provided with a piston of less area than said valve, a cylinder for said piston, said cylinder being open at one end and having a by-pass leading from the valve-casing and a port leading from the atmosphere both opening into its opposite end, and valve mechanism controlling said by-pass and port arranged to expose the opposite sides of the piston to different fluid-pressures to hold the valve open and to equal fluid-pressures to permit the shift of the valve to closed position, substantially as described.

4. A valve of the character described comprising a casing having a valve-seat, a disk valve arranged on the discharge side of said valve-seat, exposed on its opposite sides to the inlet and discharge pressures respectively and arranged to be automatically opened when the inlet-pressure exceeds the discharge-pressure, a stem connected to said valve and provided with a piston of less area than said valve, a cylinder for said piston, a by-pass or channel leading from the discharge side of the valve-casing and a port leading from the atmosphere or opening into one end of said cylinder and valve mechanism controlling said by-pass and port for exposing the opposite sides of said piston to different pressures to hold the valve open and to equal pressures to permit the shift of the valve to closed position, substantially as described.

5. A valve of the character described comprising a casing having inlet and outlet ports and a valve and valve-seat intermediate said ports, said valve being arranged on the discharge side of said valve-seat and exposed on opposite sides to the inlet and discharge pressures, a stem connected to said valve and provided with a piston, a cylinder for said piston communicating at one end with said valve-casing, a by-pass leading to the opposite end of said cylinder from the discharge side of the valve-casing having a port opening to the atmosphere, and a three-way valve controlling said ports, substantially as described.

6. A valve of the character described comprising a casing having inlet and outlet ports and a valve and valve-seat intermediate said ports, said valve being arranged on the discharge side of said valve-seat and exposed on opposite sides to the inlet and discharge pressures, a stem connected to said valve and provided with a piston, a detachable casing-head provided with a cylinder for said piston, said cylinder communicating at one end with the discharge side of said valve-casing, a by-pass pipe or channel leading from the discharge side of said casing to the opposite end of said cylinder and a manually-controllable valve in said by-pass pipe or channel, substantially as described.

7. A valve of the character described comprising a casing having inlet and discharge ports, a horizontally-disposed valve-seat and disk valve interposed between said inlet and discharge ports, a vertical valve-stem extending through the valve-casing, a counter-balance-lever connected to said stem, a piston of less area than said valve on said stem, a cylinder for said piston communicating at one end with the valve-casing, a by-pass pipe or channel leading from said valve-casing to the opposite end of said cylinder and a manually-controllable valve in said by-pass whereby the closed end of said cylinder may be placed in communication with the interior of the casing or with a lesser air-pressure, substantially as described.

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