No. 770,785. PATENTED SEPT. 27, 1904.

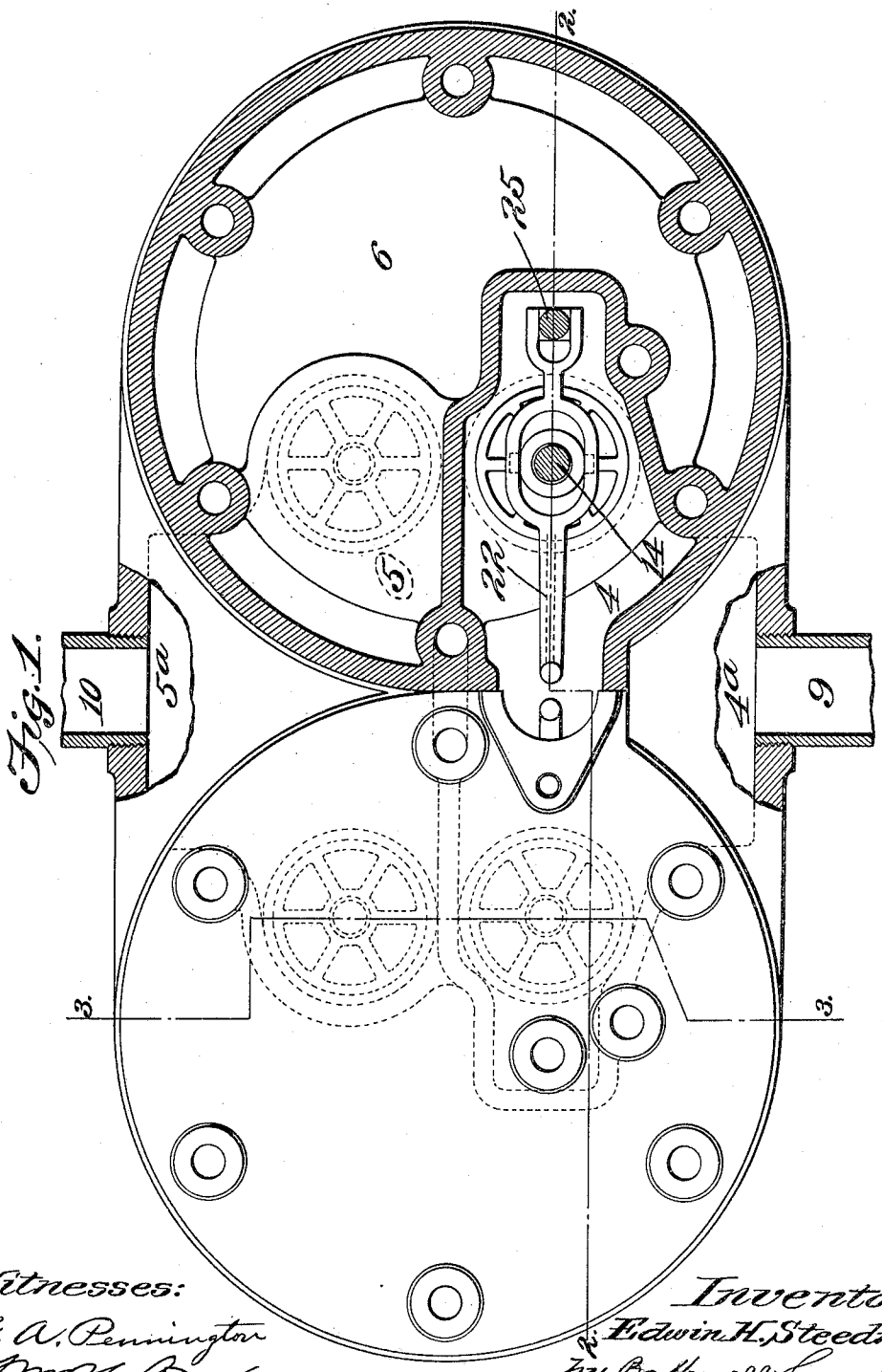
E. H. STEEDMAN.

PRESSURE CONTROL FOR AIR COMPRESSORS.

APPLICATION FILED NOV. 2, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
G. A. Pennington
W. N. Scott

Inventor:
Edwin H. Steedman,
by Bakewell Cornwall
Attys.

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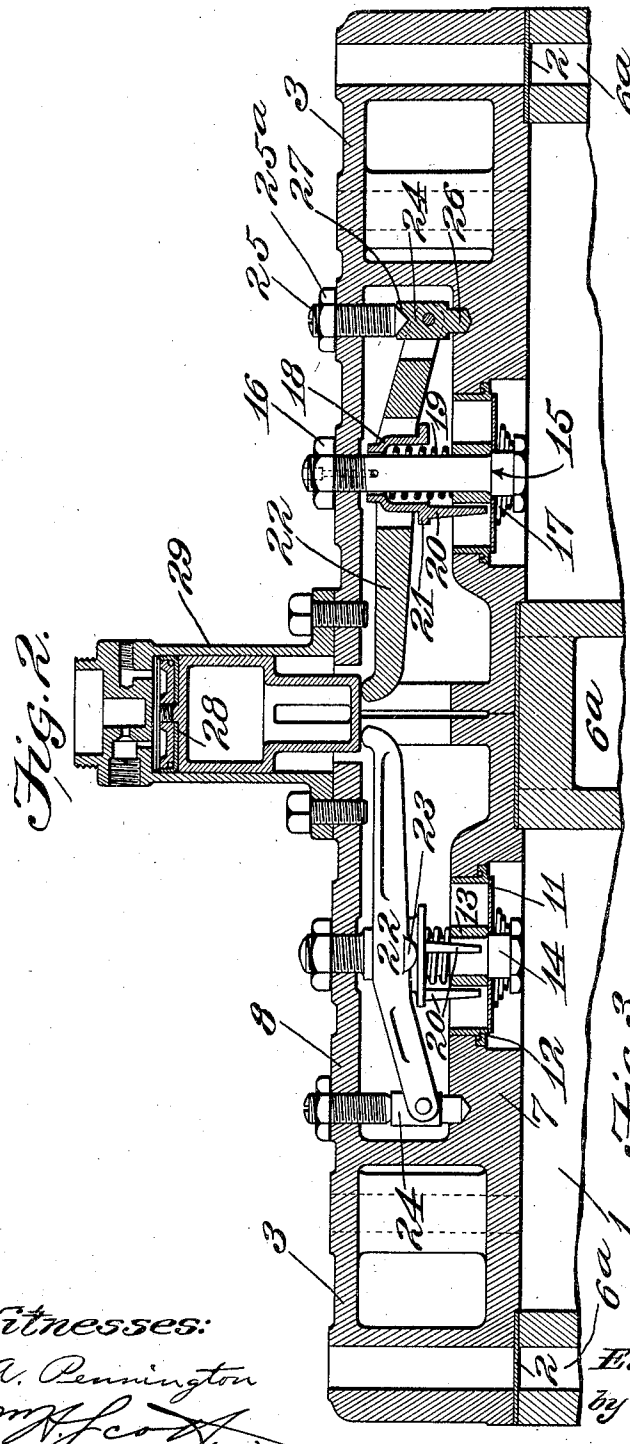
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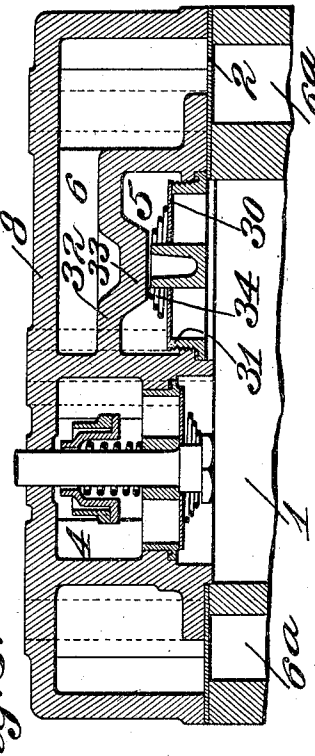
E. H. STEEDMAN.

PRESSURE CONTROL FOR AIR COMPRESSORS.

APPLICATION FILED NOV. 2, 1903.

NO MODEL. 2 SHEETS—SHEET 2.





Witnesses:
G. A. Pennington
Wm. N. Jacobs

Inventor:
Edwin H. Steedman,
by Bakewell Cornwall
Attys.

No. 770,785. Patented September 27, 1904.

UNITED STATES PATENT OFFICE.

EDWIN H. STEEDMAN, OF ST. LOUIS, MISSOURI.

PRESSURE CONTROL FOR AIR-COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 770,785, dated September 27, 1904.

Application filed November 2, 1903. Serial No. 179,599. (No model.)

To all whom it may concern:

Be it known that I, EDWIN H. STEEDMAN, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Pressure Control for Air-Compressors, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top plan view of an air-compressor, showing one of the heads in horizontal section to more clearly show a part of my improved valve for use in connection with governors for air-compressors. Fig. 2 is a sectional view on the line 2 2 of Fig. 1, and Fig. 3 is a sectional view on the line 3 3 of Fig. 1.

This invention relates to a new and useful improvement in pressure-controlling devices for air-compressors, the objects being to unseat the suction-valves when the pressure in the reservoir reaches or exceeds a predetermined maximum, the unseated suction-valves permitting the pistons to reciprocate, drawing air from the exterior and forcing the air back through the suction-valves to the exterior, thus relieving the compressor of its load.

With these objects in view the invention consists in the construction, arrangement, and combination of the several parts, all as will be hereinafter described, and afterward pointed out in the claims.

In the drawings, 1 indicates the cylinders of a duplex single-acting air-compressor upon whose ends are arranged the usual gaskets 2.

3 represents the cylinder-heads, fitted to the casting 1, said cylinder-heads being made hollow and divided by webs or partitions to form three chambers 4, 5, and 6. The chamber 4 contains a suction-valve and its coöperating mechanism, chamber 5 contains the discharge-valve, and chamber 6 is a water-chamber through which water is caused to circulate to cool the incoming air in chamber 4 and the outgoing air in chamber 5. For purposes of distinction I will also indicate the inner wall of the cylinder-head by the character 7 and the outer wall of the cylinder-head by 8.

The casting 1, in which the cylinders are formed, is provided with a chamber 4^a, communicating with both of the suction-chambers 4 in the cylinder-heads, and the air to be compressed is drawn through a pipe 9, the cylinder-chamber 4^a, into one or the other of the suction-chambers 4 in the cylinder-heads, and into the bore or space in the cylinder when the piston in said cylinder is descending. Upon the ascent of the piston the suction-valve identified therewith, which is an inwardly-opening check-valve, is closed, and the air is forced out through the discharge-valve, through the discharge-chamber 5, down into and through the discharge-chamber 5^a in the cylinder, (which communicates with both discharge-chambers in the cylinder-heads,) and thence through a pipe 10 into a reservoir. (Not shown.) The water-chamber 6, above referred to, is in communication with the water-space 6^a in the cylinders, and water is forced to pass around the cylinders and through this space 6^a for well-understood purposes. In this manner no pipe connections are made with the cylinder-heads. The inlet and discharge pipes 9 and 10, respectively, communicate with the suction and discharge chambers in the cylinder, and the water-pipes connect with the water-spaces in the cylinder, which water-spaces communicate with the spaces 6, respectively, in the cylinder-heads.

The suction-valve 11 is a metallic disk, preferably made from a thin metal plate, which coöperates with a valve-seat 12, which seat is loosely inserted into an appropriate opening formed in the inner wall of the cylinder-head, said seat being of spider form and having a central hub 13, through which passes a bolt 14, said bolt serving to clamp the seat in position and at the same time acting as a guide for the disk valve 11. Bolt 14 is formed with an appropriate head by which the same may be turned and is also formed with a shoulder 15, which shoulder coöperates with the valve-seat and clamps the same in position. The bolt is received in a threaded opening in the wall 8 of the cylinder-head, whereby it may be screwed home, after which a lock or jam nut 16 is screwed down on the protruding end of the bolt for obvious reasons. The head of the

bolt also affords a seat for a spiral spring 17, preferably conical in contour, whereby the disk valve may freely open and permit the air to be drawn into the cylinder, after which said disk valve is seated by the spring, the broad bearing end at the base of the cone preventing said valve from becoming tilted or canted in its movement, which might tend to bind the same and retard its action. The bolt 14 also serves as a guiding-stem for a spring-follower 18 in the form of a pronged thimble. This thimble, as will be seen at the right-hand side of Fig. 2, receives a spring 19, the opposite end of said spring being seated against the hub 13 of the valve-seat, whereby the thimble is normally held in an elevated position and its prongs out of engagement with the disk valve. Prongs, which are indicated at 20, are preferably three in number equidistantly spaced apart and extend down along side of the hub 13, whereby they assist in guiding the thimble in its movement.

21 indicates a flange around the base of the thimble, which flange affords a seat for a yoke-lever 22, which lever at its bearing-point upon the thimble is preferably provided with rounded lugs 23 for well-understood purposes. The pivot end of lever 22 is preferably bifurcated, as shown at the right in Fig. 1, the ends passing on each side of the pivot-block 24, the pivot-pin of the lever passing through these ends and this block. In order to place this pivot-block in position and hold it firmly in place, I drill an opening through the wall 8 and down into but not through the wall 7. The opening in wall 8 is tapped for coöperating with the threads of a clamp-screw 25. The lower end of the pivot-block is formed with a stem-seat 26, which is designed to be received in the blind opening in wall 7. This enables the lever to be arranged on its pivot-block and inserted in position through the chamber 4, and after the stem 26 is in its seat the clamping-screw 25 is turned down until its pointed end is received in a recess or seat 27 in the upper end of the pivot-block. The pivot-block is now firmly secured in position and affords a fixed pivotal support for the lever 22. A lock or jam nut 25^a is preferably screwed down upon the protruding end of screw 25 for well-understood purposes.

As clearly shown in the drawings, the two cylinder-heads are separate, their chambers 4 registering with each other, so that when the heads are removed the levers 22 may be introduced into position through the openings thus provided. After the levers are inserted in place the bolt 14 is fitted up with its associate parts—to wit, spring 17, the disk valve 11, the valve-seat 12, the spring 19, and the thimble 18—which are respectively arranged in position on the bolt and the parts inserted through the opening in the wall 7 from the inside of the cylinder, relatively speaking, the bolt being screwed home in the opposite wall 8 until the valve-seat for the suction-valve is clamped firmly home. Of course the flange on the thimble should be properly adjusted with respect to the bearing-points 23 on the yoke-lever in the final adjustment of the parts.

The ends of the levers 22 protrude from the two heads toward each other, they extending through their respective chambers 4, their extremities being provided with bearing-knobs, which bearing-knobs are in the path of movement of a piston or plunger 28. This plunger is mounted in a cylinder 29, bolted in position on top of the cylinder-heads, and is designed to be moved inwardly by pressure when the pressure in the reservoir reaches or exceeds a predetermined maximum. The inward movement of the piston will depress the outer ends of the levers 22 and through the engagement between said levers and thimbles will cause the prongs on the thimbles to engage the disk valves, so as to unseat said disk valves and hold them unseated until the pressure in the reservoir is reduced and the piston 28 permitted to rise. The instant that the piston rises the springs 19 exert their energies to force the levers upwardly, restoring the piston 28 and at the same time placing the thimble-prongs out of engagement with the disk valves. The air-compressor can now operate normally—that is, draw the air in through the suction-valves, which under these conditions act as inwardly-opening check-valves and force the air out through the discharge-valves, which under all circumstances act as outwardly-opening check-valves.

The discharge-valves are indicated at 30 and are in the form of disks made from a plate of thin sheet metal, said discharge-valves cooperating with seats 31, which seats are screwed into position in the inner walls 7.

As before stated, the discharge-valve is located at the chamber 5, said chamber being formed in part by a web or horizontally-arranged partition-wall 32, which is preferably provided with a projection 33 in axial alinement with the discharge-valve. The central hub of the valve-seat 31 in this instance is formed imperforate and extends upwardly in close proximity to the projection 33, so as to center the cone-shaped spring 34, which is seated against said projection.

To lock the valve-seat 31 in position and avoid any accidental displacement thereof, I arrange the same to one side of the cylinder-head, so that its flange will overlap the casting 1. In this manner when the cylinder-head is placed in position on the casting and screwed home the casting 1 and its carried gasket 2 will form an effectual lock to prevent backward rotation of the valve-seat 31. For these reasons it is unnecessary to provide any special form of separate lock for this valve-seat. It will be observed in this connection that the valve-seat for the dis-

charge-valve is introduced from the inside of the cylinder-head, and the discharge-valve as an entirety is very simple in form and easily and quickly assembled, requiring no special finish except to thread the flange of the seat and finish the valve-seat where it coöperates with the disk valve. There are only three parts or pieces constituting the discharge-valve—to wit, the valve-seat, the disk valve, and its spring. It will also be observed that when the parts are assembled and the head is in position on the cylinder it is impossible for the discharge-valve to become displaced, and by reason of the simple arrangement and construction of the parts said valve is not liable to get out of order. It will be observed also that while I have shown a double-cylinder air-compressor where there are enlarged cylinder-heads with two or more suction-valves in each head it is possible to control a plurality of suction-valves in the same cylinder-head by a single fluid-actuated piston. Therefore I do not wish to be understood as limiting my present invention to a single suction-valve for each cylinder of a double-cylinder air-compressor, so far as pressure control is concerned, except in so far as such limitations may be expressed in the claims.

I am aware that minor changes in the construction, arrangement, and combination of the several parts of my device may be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

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

1. In an apparatus of the character described, the combination with the cylinders of a duplex single-acting air-compressor, of separate hollow cylinder-heads arranged thereon, a suction-chamber in each of said heads, said suction-chambers communicating with each other between the two heads, a suction-chamber in the walls of the cylinders also in communication with the said suction-chambers in the heads, a suction-valve in each suction-chamber, which valve is introduced from the cylinder side into the inner wall of the cylinder-head, and a common means for stopping the operation of said suction-valves; substantially as described.

2. In an apparatus of the character described, the combination with the cylinders of a duplex single-acting air-compressor, of separate cylinder-heads therefor arranged in juxtaposition to each other, said cylinder-heads being formed hollow, the suction-chambers thereof registering and communicating with each other, suction-valves in said chambers, means for displacing said suction-valves, and a common means for operating said valve-displacing mechanism; substantially as described.

3. In an apparatus of the character described, the combination with the cylinders of a duplex single-acting air-compressor, of cylinder-heads therefor, said cylinder-heads being formed with suction-chambers which communicate with each other, suction-valves in said chambers, levers for positively displacing said suction-valves, said levers extending toward each other and having their free ends in proximity, and a common means coöperating with the free ends of said levers for displacing said suction-valves; substantially as described.

4. In an apparatus of the character described, the combination with two cylinders and two hollow cylinder-heads therefor, each head having a suction-chamber and a discharge-chamber, suction and discharge valve seats introduced into the inner walls of said heads from the cylinder side, means for preventing the displacement of said valve-seats, valves coöperating with said seats, and means common to both suction-valves for holding them from their seats; substantially as described.

5. In an apparatus of the character described, the combination with a hollow cylinder-head, of a valve-seat arranged in the inner wall thereof, a shouldered bolt secured in said cylinder-head and clamping said valve-seat in position, said bolt protruding inwardly beyond said valve-seat, a disk valve arranged on the inwardly-protruding end of said bolt, a head at the inner extremity of said bolt, a spring interposed between said head and said disk valve, and means slidingly arranged on said bolt for displacing said disk valve and holding it away from its seat; substantially as described.

6. In an apparatus of the character described, the combination with the seat of a suction-valve, of a bolt for securing the same in position, a spring-follower arranged on said bolt, a valve and a lever coöperating with said follower; substantially as described.

7. In an apparatus of the character described, the combination with a cylinder-head, of a bolt arranged therein, a spring-follower in the form of a thimble slidingly arranged on said bolt, prongs on said thimble, a valve and a lever coöperating with said thimble; substantially as described.

8. In an apparatus of the character described, the combination with a suction-valve, of a lever for displacing the same, a block upon which said lever is pivoted, and means for clamping said pivot-block in position; substantially as described.

9. In an apparatus of the character described, the combination with a hollow cylinder-head, of a suction-valve, a lever mounted in a chamber in said cylinder-head, a pivot-block upon which said lever is pivoted, and means accessible from the exterior for clamping said pivot-block in position in said chamber; substantially as described.

10. In an apparatus of the character described, the combination with a hollow cylinder-head whose inner wall is formed with a blind opening, of a pivot-block seated in said opening, a clamping-screw passing through the outer wall for holding said pivot-block in position, a lever pivoted upon said block, and a suction-valve with which said lever coöperates; substantially as described.

11. In an apparatus of the character described, the combination with a cylinder-head, of a valve-seat arranged therein, a valve coöperating with said seat, and a cylinder overlapping said valve-seat for holding the same in position; substantially as described.

12. In a pressure control for air-compressors, the combination with a plurality of suction-valves, of displacing-levers coöperating therewith, and a fluid-actuated piston common to all said displacing means and movable and independent with relation thereto, substantially as described.

13. In a pressure control for air-compressors, the combination with a plurality of suction-valves, of displacing-levers coöperating therewith having their free ends adjacent each other, and a fluid-actuated piston adapted to simultaneously contact with the free ends of the levers; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 26th day of October, 1903.

EDWIN H. STEEDMAN.

Witnesses:

F. R. CORNWALL,

GEORGE BAKEWELL.