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H. B. HALVORSEN

VALVE MECHANISM

Filed July 29, 1919

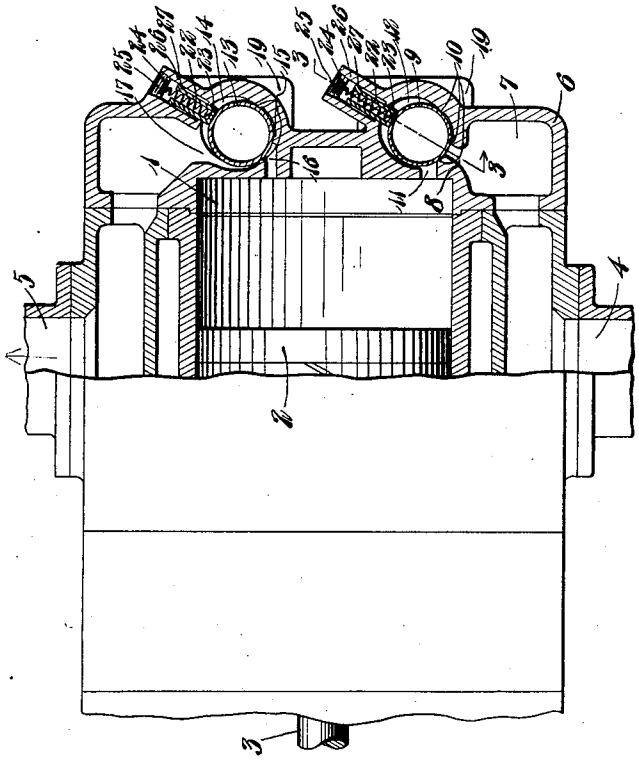


Fig. 1.

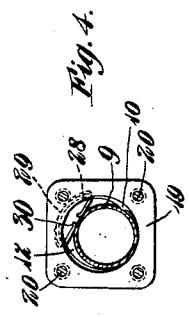


Fig. 4.

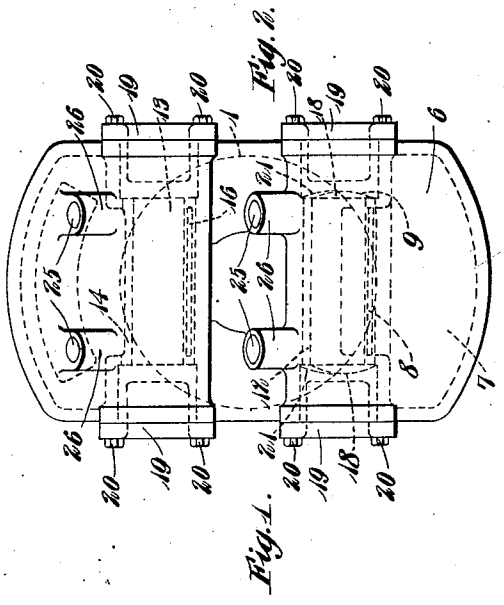


Fig. 2.

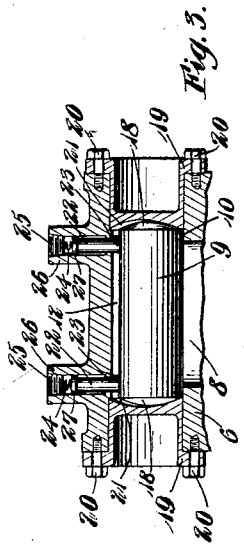


Fig. 3.

Inventor:
Halbert B. Halvorsen.
by
Mace Lachup
atty.

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UNITED STATES PATENT OFFICE.

HALBERT B. HALVORSEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS.

VALVE MECHANISM.

Application filed July 29, 1919. Serial No. 314,177.

My invention relates to valve mechanism.

It has for its object to provide an improved and simplified valve mechanism especially adapted to use in connection with air or gas compressors. A further object of my invention is to provide a valve mechanism including an improved valve member of simple and rugged construction adapted to be manufactured at small expense and to cooperate with an improved ported valve seat in an improved manner whereby the mechanism is adapted efficiently to control the pressure fluid flow as desired without requiring attention on the part of the operator, all danger of breakage of the valve being eliminated through my improved construction. These and other objects and advantages of my improved construction will, however, hereinafter more fully appear.

For purposes of illustration, I have shown in the accompanying drawings several embodiments which my invention may assume in practice, the same being illustrated therein as applied to use in connection with a compressor.

In these drawings,—

Fig. 1 is an end elevation of a compressor cylinder equipped with my improvement, the valve mechanism being shown in dotted lines therein.

Fig. 2 is a side elevation of the same, partially in section and showing the valve mechanism in transverse section.

Fig. 3 is a detail sectional view on line 3—3 of Fig. 2, showing the inlet or suction valve.

Fig. 4 is a similar detail view showing a modified form of seating means.

In this illustrative construction I have shown a compressor cylinder 1 having a piston 2 operatively connected to a piston rod 3 movable therein, the air or gas to be compressed being received through an intake 4 and delivered through improved valve mechanism, hereinafter described, to the cylinder, and, after compression by the piston, delivered through improved cooperating valve mechanism to the discharge 5, it being understood that in a double acting cylinder similar valve mechanism is provided at the opposite ends of the latter.

In considering this form of my improved construction, I will first describe the inlet valve mechanism. It will be observed that the cylinder head 6 is provided with a chamber 7 communicating with the intake, and that this chamber is in turn provided with a valve inlet 8, herein, for example, in the form of a slot extending transversely across the cylinder head and below the center line thereof. Cooperating with this inlet 8 and normally disposed thereover in a valve chamber, hereinafter described, is a valve member 9, herein of tubular form and preferably made of light steel tubing ground on the outside surface and herein resting on its side on a correspondingly shaped seat 10 formed in the cylinder head on opposite sides of the inlet 8 and extending throughout the length thereof, the seat preferably being reamed exactly to the same size as the periphery of the valve. Herein it will also be observed that a valve outlet 11, herein similar to the inlet 8, is provided within the seat 10, herein above the inlet 8, and with the seat 10 forms part of the transverse housing chamber 12, which is generally elliptical in cross section, the construction being such that the inlet 8 is in line with the major axis of the elliptical chamber so that the valve member may as a result be rolled to one side of the chamber by the pressure acting through the valve inlet in such a manner as to uncover the valve inlet 10 without covering the outlet 11 and thereby permit the free flow of air from the intake into the cylinder, and when the pressure flow ceases, roll back into its normal closed position.

Cooperating with the intake valve mechanism just described, is improved discharge valve mechanism. This mechanism, as shown, includes a valve member 13 corresponding to the valve member 9 and movable in an approximately elliptically bored chamber 14, corresponding to the chamber 12, and relative to a seat 15, similar to the seat 10, to control the discharge of the compressed fluid from the cylinder through a valve inlet 16 and from the valve chamber through a valve discharge opening 17, the latter leading to the compressor discharge 5. In a preferred form, this discharge valve member 13 is preferably open at both ends and both the discharge and inlet valves may, if desired, be of this open ended construction. However, in view of the need for high efficiency, I find it desirable from a practical standpoint usually to close both ends of the inlet or suction valves, the latter preferably being provided with closed and convex ends

as shown at 18 in Fig. 3. Here attention is also directed to the fact that provision is also made whereby each of these valves is maintained in operative position endwise with respect to its port or ports and adapted to be readily removed whenever desired, such provision herein assuming the form of removable plugs 19 seated in and closing the ends of the chambers 12, 14, and removably attached to the cylinder head by means of screws 20, the plugs for the inlet valves preferably being provided with concave ends 21, as shown, in order to adapt them to receive the convex ends 18 on the inlet valves.

While the above mechanism is entirely automatic in its action, the valves in response to the fluid flow rolling into open position and rolling back into their closed positions due to gravity, and such a construction is sufficient for use on compressors running at comparatively slow speeds. I have also provided improved cooperating or supplemental seating means for use in connection with the valves when the same are used on high speed compressors. These means may, obviously, assume various forms. Herein it will be noted that in Figs. 1 to 3, inclusive, I have shown a plurality of resilient means adapted to perform this function and also to position the valves, the same preferably being spaced apart longitudinally of the cylindrical valve members in such a manner as accurately to locate the same in their chambers and in respect to their seats. These means, as shown, each include a hollow plunger 22 having a closed concave end 23 adapted to engage the surface of the valve member and normally being held in engagement therewith by means of a spring, herein in the form of a coiled spring 24 having one end acting against the plunger and the other acting against a plug 25 threaded into the outer end of a bored out extension 26 formed on the cylinder head and in which the plunger is guided by means of flanges 27 engaging and slidable longitudinally of the bore therein. Herein attention is also directed to the fact that these cooperating seating means are preferably located, as shown, diametrically opposite the inlets 8 and 16 through which the free or compressed fluid respectively acts upon the valve members 9 and 13, the construction being such as thereby to balance the valves and to apply the seating pressure most effectively thereto. In Fig. 4 it will also be observed that I have illustrated a modified form of these seating means, the same herein assuming the form of bowed leaf springs 28 seated in suitable apertures 29 above the valve members and having their ends 30 bent over into adjacency, as shown, in such a manner as to form a substantially elliptical spring which engages the valve member with its ends 30 at points closely adjacent and on opposite sides of a diameter extending through the inlet port.

In the operation of my improved construction, it will be observed that as the piston is reciprocated the inlet and discharge valves will operate alternately to admit atmospheric pressure to the cylinder and to discharge the compressed fluid from the cylinder, the inlet and discharge valves when subjected to suction or pressure, rolling back in their elliptically bored chambers to open the port or ports in question, and as soon as the suction or pressure is released, automatically resuming their seats either due to the action of gravity as described, when the same are used on compressors running at relatively slow speeds, or through the action of my improved seating means where a more rapid seating of the valves is required, as when the same are used on high speed compressors.

While I have in this application specifically described several forms which my invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be modified and embodied in other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In combination with a compressor cylinder, a valve mechanism comprising a valve housing enclosing a valve containing chamber provided with ports respectively communicating with the interior of said cylinder and with a suction space, and a hollow closed valve in said chamber cooperating with the second of said ports, said valve when unseated changing its position in said chamber while leaving the volume of the latter in communication with said cylinder unchanged.

2. In a valve mechanism, in combination, a curved ported valve seat, a hollow cylindrical valve member normally seated thereon and movable in response to fluid pressure, and cooperating means acting upon the opposite ends of said valve member for returning said valve member to said seat.

3. In a valve mechanism, in combination, a curved ported valve seat, a hollow cylindrical valve member normally seated thereon and movable in response to fluid pressure, and resilient means acting upon the opposite ends of said valve member for returning said valve member to said seat.

4. In a valve for gaseous fluid pumping mechanism, in combination, an elliptically bored ported valve chamber, a hollow cylindrical valve member normally disposed over a port therein and movable transversely of said chamber, and means for permitting the

removal of said valve member through one end of said chamber, said means having a curved portion cooperating with the adjacent end of the valve to seat the same.

5. In a valve for gaseous fluid pumping mechanism, in combination, an elliptically bored ported valve chamber, a hollow cylindrical valve member normally disposed over the ports therein and movable transversely of said chamber, and means adapted to engage the end of said valve at a plurality of longitudinally disposed points for locating said valve member longitudinally in said chamber including a removable plug in one end of said chamber.

6. In a valve mechanism, a ported valve chamber, a cylindrical valve member movable transversely of said chamber, and curved means for engaging the end of said valve during a transverse movement thereof.

7. In a valve mechanism, a ported valve casing providing a chamber, a cylindrical valve member movable transversely of said chamber, said casing and valve member including portions cooperating to guide the movements of the valve, one of said portions providing a recess and the other constituting a guiding portion projecting into the recess.

8. In a valve for gaseous fluid pumping mechanism, in combination, an elliptically bored ported valve chamber, a hollow cylindrical valve member normally disposed over a port therein and movable transversely of said chamber, and means for locating said valve member longitudinally in said chamber including a plurality of removable plugs located in opposite ends of said chamber at least one of said plugs having a longitudinally extending surface to engage an end of said valve member.

9. In a valve mechanism, in combination, a cylinder head having a plurality of transversely disposed ports therein and elliptically bored valve chambers communicating with said ports, and cylindrical hollow valve members carried in said chambers normally disposed over said ports and movable transversely of said chambers in response to fluid pressure, one of said valve members having open ends and the other having closed ends.

10. In a valve mechanism, in combination, a cylinder head having a plurality of transversely disposed ports therein and elliptically bored valve chambers communicating with said ports, cylindrical hollow valve members carried in said chambers normally disposed over said ports and movable transversely of said chambers in response to fluid pressure, one of said valve members having open ends and the other closed ends, and automatic means for instantly seating said valve members upon cessation of fluid pressure.

11. In a valve mechanism, in combination, a cylinder head having a plurality of transversely disposed ports therein and elliptically bored valve chambers communicating with said ports, cylindrical hollow valve members carried in said chambers normally disposed over said ports and movable transversely of said chambers in response to fluid pressure, one of said valve members having open ends and the other closed ends, and resilient seating means acting upon each of said valve members at a plurality of points between their ends.

12. In a valve mechanism, in combination, a cylinder, a cylinder head having transverse inlet and discharge slots therein adapted to communicate with said cylinder and elliptically bored transversely disposed valve chambers communicating with said slots, and hollow cylindrical valve members normally disposed over the slots in said chambers and movable transversely of said chambers in response to variations in fluid pressure in said cylinder.

13. In a valve mechanism, in combination, a cylinder, a cylinder head having transverse inlet and discharge slots therein and communicating elliptically bored transversely disposed valve chambers and an inlet communicating with one of said chambers, and hollow cylindrical valve members normally disposed over the slots in said chambers and movable in opposite directions transversely of said chambers in response to variations in fluid pressure in said cylinder.

14. In a valve mechanism, in combination, a curved ported valve seat, a hollow cylindrical valve member normally seated thereon and movable in response to fluid pressure, and cooperating means for returning said valve member to said seat, said means being removable in an outward direction from the periphery of said valve member.

15. In a valve mechanism, a ported valve chamber, a fluid actuated cylindrical valve adapted to cover said port, and means for uncovering said port by initially subjecting the periphery of said valve substantially tangentially to pressure fluid.

16. In a valve mechanism, a ported valve chamber, a cylindrical valve directly movable by pressure fluid adapted to cover said port by its periphery, and means whereby the initial movement of said valve to uncover said port has a component of rotary motion.

17. In a valve mechanism, a housing having a valve chamber therein of substantially elliptical cross section and a fluid passage communicating with said chamber and substantially tangential thereto, and a cylindrical valve directly movable by pressure fluid flowing through said passage.

In testimony whereof I affix my signature.

HALBERT B. HALVORSEN.