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L. A. MAXSON

COMPRESSOR CONTROLLING MECHANISM

Filed Jan. 6, 1922

Fig. 1.

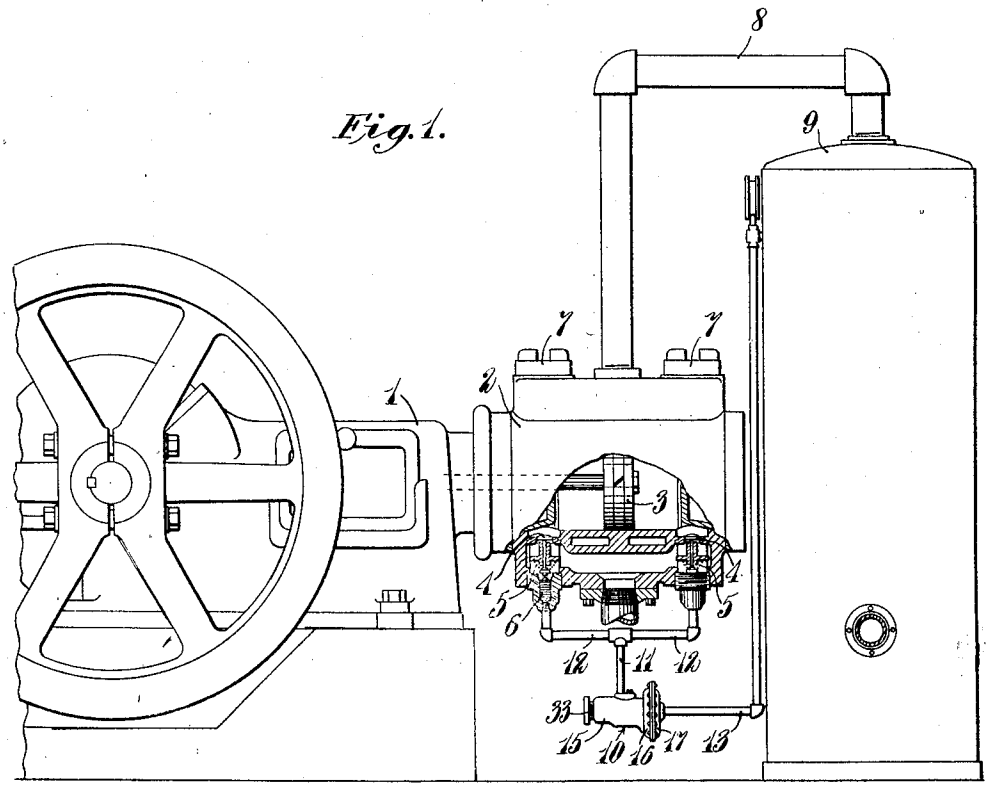
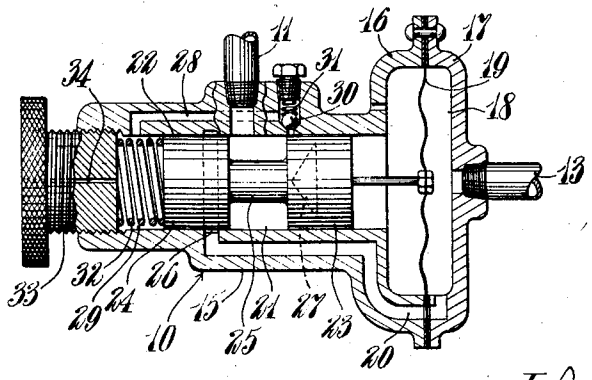



Fig. 2.




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# UNITED STATES PATENT OFFICE.

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## COMPRESSOR-CONTROLLING MECHANISM.

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My invention relates to compressor controlling mechanisms.

An object of my invention is to provide an improved compressor controlling mechanism. Another object of my invention is to provide an improved compressor controlling mechanism which will provide a very quick reloading of the compressor when reloading is necessary. Other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration, one form which my invention may assume in practice.

In these drawings,—

Fig. 1 is a view mainly in side elevation, but with parts broken away to a central vertical plane, of a compressor system with which my improved unloading mechanism may cooperate.

Fig. 2 is a central vertical section through the illustrative embodiment of my improved controlling mechanism.

For purposes of illustration I have shown the illustrative embodiment of my improved compressor mechanism employed in conjunction with a compressor 1 having a cylinder 2 within which a piston 3 is reciprocable and have shown this compressor as provided with the usual inlet valves 4 which are normally held yieldingly down by springs 5, but which may be positively opened by air operated plungers 6 and maintained open when it is desired to unload the compressor. Air is discharged through any suitable discharge valve mechanism, herein shown in elevation at 7, and by way of a pipe 8 to a receiver 9. For the purpose of controlling the movements of the unloading pistons 6 I have shown the illustrative embodiment of my improved controlling mechanism which is shown in elevation in Fig. 1 at 10, and communicating by way of a passage 11 with branch passages 12 leading to the lower sides of the pistons or plungers 6 and communicating with the receiver by way of a passage 13.

In the form chosen for illustration herein my improved controlling mechanism comprises a casing 15 made in two parts 16 and 17 and forming between the parts a diaphragm chamber 18. A diaphragm 19 is securely clamped between the parts 16 and 17. Herein I have shown a passage 20 extending from the side of the diaphragm 19 which is subjected by way of a pipe 13 to receiver pressure to a bore 21 formed in the portion 16 of the casing 15. Within the bore there is reciprocable a piston valve 22 comprising spaced heads 23 and 24 connected by a reduced portion 25. This piston valve controls the communication of the passage 20, which will be noted to terminate in a groove 26 extending around the internal periphery of the bore 21, with the pipe 11 leading to the unloading mechanism per se and also the valve 22 controls the communication of the pipe 11 with an exhaust port 27 and with a bypass passage 28 leading from an adjacent point to a space 29 behind the piston 22. A check valve 30 suitably loaded by means of a spring 31 controls the passage 28. A spring 32 and an adjustable follower 33 tend to provide adjustable resistance to the force exerted by the diaphragm 19 so that the pressure at which the device may operate may be adjusted. A minute vent port 34 traverses the follower 33. It will be noted that the exhaust port 27 is triangular in outline and that almost simultaneously with the opening of the port 28 by the head 23 of the piston valve the exhaust port 27 will begin to be opened and that as the valve 22 moves toward the right in Fig. 2, the exhaust area of the port 27 will be very rapidly increased.

The mode of operation of this mechanism will be readily apparent. In the position of the ports shown in Fig. 2 the receiver pressure may be assumed to be gradually falling as air is used from the receiver and accordingly the piston 22 is moved toward the right under pressure of the spring 29 as the receiver pressure acting on the diaphragm falls. When the valve has moved sufficiently far to the right to uncover the mouth of the port 28, the pressure which has been retaining the inlet valves open will flow past the valve 30 to the space 29 and acting upon the end of the head 24 will reinforce the spring 32 and force the valve 22 sharply to the right, thereby causing the exhaust port 27 as it opens to be opened sharply and for a material distance. The fluid that goes past the ball valve 30 will escape through port 34 to the atmosphere and then leave the mechanism under the combined control of the spring 32 and the receiver pressure acting upon the diaphragm.

From the foregoing description of my im-

proved mechanism and its mode of operation, it will be clearly apparent that I have provided means which will effect a very prompt and sharp loading of the compressor when the time comes to reload it and accordingly the operation of the machine will be improved and hammering of the valves prevented. It will be understood that this device is also applicable to intake closure type unloading mechanisms and that with them it may be of quite as great advantage for, by reason of the fact that the intake valve will be allowed to open sharply, there will be no tendency to draw in partial charges of air and compress them from a relatively low vacuum to full discharge pressure and thereby generate considerable heat.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various 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 a compressor controlling mechanism, a member movable in opposite directions respectively to effect loading and unloading of a compressor, compressor discharge pressure controlled means for moving it in one direction, and means adapted to be supplied with pressure fluid for accelerating a portion of one of its movements, said supply being cut off during the whole of the other movement.

2. In a compressor controlling mechanism, a controller member movable in opposite directions respectively to effect loading and unloading of a compressor, means for moving it in one direction including a diaphragm adapted to be subjected to compressor discharge pressure, and means for accelerating a portion of the movement thereof which effects loading whereby reloading will be sharply effected comprising means for adding a force to accelerate such movement.

3. In a compressor controlling mechanism, a valve operative in opposite positions to cause loading and unloading of a compressor, means for normally moving the same to compressor loading position, compressor discharge pressure controlled means for moving the same to compressor unloading position, and supplemental means adapted to be supplied with pressure fluid for accelerating a portion of one of said movements, said supply being cut off during the other of said movements.

4. In a compressor controlling mechanism, a valve operative in opposite positions to cause loading and unloading of a compressor, means for normally moving the same to compressor loading position, compressor discharge pressure controlled means for moving the same to compressor unloading position, and supplemental means for accelerating the movement of said valve to cause reloading to take place sharply.

5. In a compressor controlling mechanism, a controller member movable in opposite directions to effect loading and unloading of a compressor respectively, means for effecting movement thereof in one direction including a diaphragm adapted to be subjected to compressor discharge pressure, and means operated by fluid pressure to accelerate the movement of said member in the opposite direction.

6. In a compressor controlling mechanism, a valve movable in opposite directions to cause loading and unloading of a compressor, means for moving said valve to unload the compressor including a diaphragm adapted to be subjected to compressor discharge pressure, means for moving said valve in the opposite direction when compressor discharge pressure falls, and fluid pressure means for accelerating the latter movement of said valve.

7. In a compressor controlling mechanism, a valve movable in opposite directions to cause loading and unloading of the compressor, means for moving said valve to unload a compressor controlled by compressor discharge pressure, means for moving said valve in the opposite direction when compressor discharge pressure falls, and fluid pressure means for accelerating the latter movement of said valve effective only during such movement thereof.

8. In a compressor controlling mechanism, a fluid pressure controlled element operative on the supply of fluid pressure thereto to unload a compressor, a casing, a valve in said casing, connections with said element, with the atmosphere, and with a source of pressure communicating with said casing, said valve controlling the communication of said second and third connections with said first mentioned connection, means governed by compressor discharge pressure for effecting movement of said valve to connect said first and third mentioned connections, means resisting said first mentioned means and operative to move said valve to connect said first and second mentioned connections on a drop in compressor discharge pressure, and means controlled by movement of said valve for positively accelerating said last mentioned movement.

9. In a compressor controlling mechanism, a fluid pressure controlled element operative on the supply of fluid pressure thereto to unload a compressor, a casing, a valve in said casing, connections with said element, with the atmosphere, and with a source of pressure communicating with said casing, said valve controlling the communication of said second and third connections with said

first mentioned connection, means governed by compressor discharge pressure for effecting movement of said valve to connect said first and third mentioned connections, means resisting said first mentioned means and operative to move said valve to connect said first and second mentioned connections on a drop in compressor discharge pressure, means associated with said valve and operative when subjected to fluid pressure to accelerate said last mentioned movement of said valve, and means controlled by said valve for conducting fluid pressure to said last mentioned means.

10. In a compressor controlling mechanism, a fluid pressure controlled element operative on the supply of fluid pressure thereto to unload a compressor, a casing, a valve in said casing, connections with said element, with the atmosphere, and with a source of pressure communicating with said casing, said valve controlling the communication of said second and third connections with said first mentioned connection, means governed by compressor discharge pressure for effecting movement of said valve to connect said first and third mentioned connections, means resisting said first mentioned means and operative to move said valve to connect said first and second mentioned connections on a drop in compressor discharge pressure, means associated with said valve and operative when subjected to fluid pressure to accelerate said last mentioned movement of said valve, and means controlled by said valve for conducting fluid pressure to said last mentioned means, but preventing escape of fluid therefrom.

11. A compressor controlling mechanism comprising a controlling valve having fluid supply and exhaust functions on opposite movements thereof and adapted to control a passage communicating with compressor unloading means, means including a surface transverse to the movement of said valve adapted to be subjected to fluid pressure to effect movement of said valve to effect its fluid supply function, and means for controlling the opposite movement of said valve including a transverse surface and a passage for conducting fluid to the same, said passage being closed during fluid supply and being opened previous to exhaust.

12. A compressor controlling mechanism comprising a member having a passage flow through which controls the operations of the compressor and a movable controlling member controlling on movement in opposite directions flow in opposite directions through said passage, means including a surface transverse to the movement of said member and means for subjecting said surface to a fluid at a pressure above atmospheric to effect movement of said controlling member to effect one of said flow functions, and means including a transverse surface and means for subjecting the same to fluid flowing through said passage during the opposite function thereby to control the opposite movement of said member.

13. A compressor controlling mechanism comprising a member having a passage flow through which controls the operations of the compressor and a movable controlling member controlling on movement in opposite directions flow in opposite directions through said passage, means including a surface transverse to the movement of said member and means for subjecting said surface to a fluid pressure to effect movement of said controlling member to effect one of said flow functions, and means including an opposite transverse surface and means for subjecting the same to fluid flowing through said passage during the opposite function thereby to expedite the opposite movement of said member.

14. A compressor controlling mechanism comprising a valve movable in opposite directions, means including a diaphragm adapted to be subjected to compressor discharge pressure and operative on a predetermined variation in compressor discharge pressure for actuating said valve in one direction to permit fluid under pressure to pass, and means operative on another predetermined variation in compressor discharge pressure to permit fluid to exert for a limited period a force tending to move said valve in an opposite direction.

15. A compressor controlling mechanism comprising a member having a passage flow through which controls the operations of a compressor, and a valve movement of which in opposite directions controls flow in opposite directions through said passage, means for actuating the valve in one direction whereby fluid under pressure is permitted to pass, and means for applying fluid passed to the valve in its movement in the opposite direction, such application continuing into the time when return flow through said passage takes place.

16. A compressor controlling mechanism comprising a member having a passage flow through which controls the operations of a compressor and a valve movement of which in opposite directions controls flow in opposite directions to said passage, means for actuating the valve in one direction whereby fluid under pressure is permittted to pass including a diaphragm adapted to be subjected to compressor discharge pressure, and means for applying fluid passed to the valve in its movement in the opposite direction, such application continuing into the time when return flow through said passage takes place.

17. A compressor controlling mechanism comprising a valve whose movements in op-

posite directions control loading and unloading, actuating means therefor adapted to be subjected to fluid pressure to move the same, means whereby said movement allows flow of said fluid relative thereto, and a passage adapted to be uncovered by said valve whereby to conduct the fluid which flows relative to said valve to an opposed side thereof to control movement of the same.

18. A compressor controlling mechanism comprising a valve member having an annular space adapted constantly to communicate with an unloading device to be controlled by fluid pressure, fluid pressure responsive means for acting upon one end of said valve, a passage through which said annular space may be filled with fluid under pressure substantially equal to said actuating pressure, means for exhausting fluid from said space, and means for imparting a controlling force to said valve, said means continuing to operate after the exhausting of fluid begins.

19. A compressor controlling mechanism comprising a movable valve member having a passage therein, means providing a valve controlling passage, inlet and outlet fluid passages and an exhaust passage, said outlet passage adapted for connection with the compressor unloading mechanism, means whereby said valve passage is adapted to allow communication between said inlet and outlet passages and between said outlet and exhaust passage, and means whereby said valve controlling passage is operative to transmit fluid prior to complete opening of said exhaust passage.

20. A compressor controlling mechanism comprising a member adapted to effect a compressor controlling function, yieldable means for moving the same, and valve controlled means for subjecting said member to a fluid pressure actuating force in the same direction as exerted by said spring, said valve being adapted to cause said pressure to be exerted only when said compressor controlling function is reversed.

21. A compressor controlling mechanism comprising a spring actuated member, means for subjecting the same constantly to compressor discharge pressure in a direction opposed to the action of the spring and intermittently when compressor discharge pressure falls below a predetermined value to pressure acting in the same direction as that in which the spring acts, and means providing a constantly open atmospheric leak for fluid so intermittently acting.

22. A compressor controlling mechanism comprising a casing having disposed therein a fluid pressure actuated element adapted to control a compressor function, and a spring adapted to act on said element, a device mounted in said casing and adapted to adjust the tension of said spring, and pressure fluid connections to said spring chamber whereby to supplement the action of the spring upon said element.

23. A compressor controlling mechanism comprising a casing having disposed therein a fluid pressure actuated element adapted to control a compressor function and a spring adapted to act on said element, a device mounted in said casing and adapted to adjust the tension of said spring, and pressure fluid connections to said spring chamber whereby to supplement the action of the spring upon said element, and a vent extending through said device mounted in said casing.

24. In a compressor controlling mechanism, a valve movable from a median position to effect unloading of a compressor, means responsive to compressor discharge pressure to effect such movement upon increase in pressure beyond a predetermined point, means tending to move the valve in the opposite direction past its median position to effect unloading, and means for accelerating a portion of the latter movement.

25. In a device for controlling fluid pressure operated mechanism, a valve casing providing a valve chamber, a port leading to the mechanism to be controlled and a discharge port, said discharge port being so shaped that flow therethrough increases at a rate greater than the product of the initial width of the port multiplied by the distance it is uncovered, and a plunger valve movable in opposite directions in said chamber for controlling said ports, said valve casing providing a further passage controlled by said valve for supplying fluid under pressure against a surface tending to move said valve so as to open communication between said ports, the application of fluid to the said surface continuing into the time when flow through said discharge port takes place.

26. In a device for controlling fluid pressure operated mechanism, a valve casing providing a valve chamber, a port leading to the mechanism to be controlled, a supply port and a discharge port, said discharge port being so shaped that flow therethrough increases at a rate greater than the product of the initial width of the port multiplied by the distance it is uncovered, a plunger valve movable in opposite directions in said chamber for controlling said ports, means for actuating said valve in one direction whereby fluid under pressure is permitted to pass from the supply port to the port leading to the mechanism to be controlled, and means for actuating the valve in the opposite direction whereby the port leading to the mechanism to be controlled is connected to the discharge port, said valve casing providing a passage controlled by said valve and adapted to supply fluid under pressure against a surface tending to move said valve in the second mentioned direction, the ap-

plication of fluid to the said surface continuing into the time when flow through said discharge port takes place.

27. A compressor controlling mechanism comprising a valve movable in opposite directions to effect different compressor controlling functions, a fluid pressure motor continuously supplied with fluid under compressor discharge pressure for actuating said valve in one direction to permit fluid under pressure to pass, and a pressure responsive device operative at a predetermined value of said discharge pressure to supply fluid under pressure against a surface tending to move said valve in the opposite direction.

28. A compressor controlling mechanism comprising a valve casing providing a valve chamber, a plunger valve movable in opposite directions in said chamber, yielding means for biasing said valve in one direction, and means operative on a predetermined variation in compressor discharge pressure for actuating said valve in the opposite direction to permit fluid under pressure to pass, said valve casing providing a passage controlled by said plunger valve and adapted to supply fluid under pressure against a surface tending to move said plunger valve in the direction in which it is biased by said yielding means.

In testimony whereof I affix my signature.

LOUIS A. MAXSON.