

March 26, 1940.

W. H. WINEMAN
VALVE MECHANISM

2,195,205

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Fig. 1

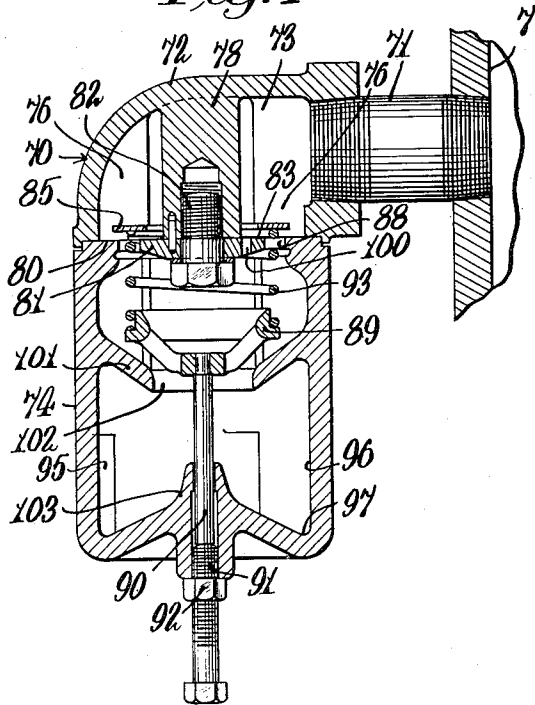


Fig. 2

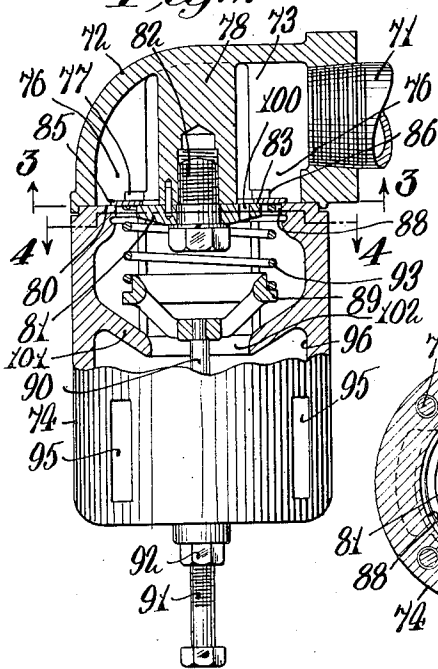


Fig. 3

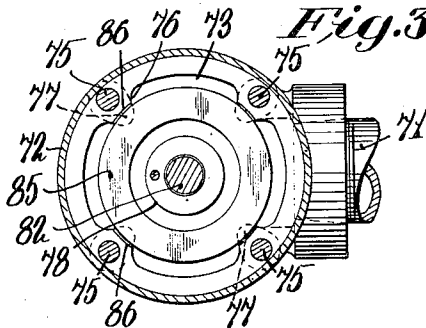
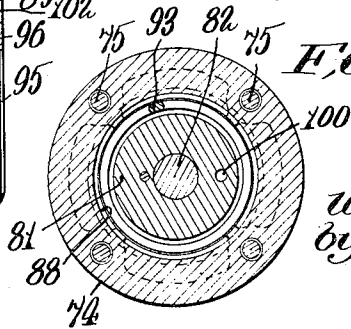


Fig. 4



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UNITED STATES PATENT OFFICE

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VALVE MECHANISM

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Application September 28, 1936, Serial No. 102,987

6 Claims. (Cl. 251—120)

My invention relates to valve mechanisms, and more particularly to valve mechanisms for expandible chamber motors of the type especially adapted for pumping and similar uses. From one aspect, my invention relates to improved distributing means for such motors.

In some oil fields there is available a substantial quantity of oil, but the subterranean pressure is inadequate to cause the oil to flow naturally. Accordingly, pumping motors have to be used for the purpose of raising the fluid to ground level. For this purpose, expandible chamber, single-acting pumping motors have been used to great advantage for actuating, through a suitable pump rod line, pumps arranged in the oil well. Such pumping motors are commonly, though not invariably, arranged in groups adjacent a central source of operating pressure fluid supply; and the individual pumps are not commonly continuously attended by pump runners. As a result, it is very important that the pumping motors be made as nearly completely automatic and self-protecting as possible.

It is an object of my present invention to provide an improved valve mechanism. It is a further object of the present invention to provide an improved protective device for an expandible-chamber motor for preventing breakage in the event the motor loses its load suddenly. It is still another object of the present invention to provide an improved automatic vent-check valve in association with an expandible chamber motor for the purpose of protecting the same against breakage in the event of over-stroking, while at the same time interfering practically not at all with the normal operation of the motor. It is still another object of the invention to provide an improved dash-pot means arranged in association with a single-acting motor and effective to preclude the development of substantial pressures by the dash-pot means during normal motor operation, while causing a very quick building up or pressure in the dash-pot in the event that normal motor speeds are materially exceeded at any time. Other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawing, in which for purposes of illustration one embodiment which my invention may assume in practice has been shown,

Fig. 1 is an enlarged vertical section through an automatic check valve, showing the parts thereof in one position, to wit, the normal position.

Fig. 2 is another view of the automatic check

valve shown in Fig. 1, with some parts illustrated in elevation, and showing the automatic check valve in closed position.

Fig. 3 is a horizontal section on the section-line 3—3 of Fig. 2.

Fig. 4 is another horizontal section, on the section-line 4—4 of Fig. 2.

In the operation of single-acting expandible chamber motors such as are above mentioned the non-working end of the motor cylinder is normally continuously vented to atmosphere. As the motor piston reciprocates within the cylinder bore there is, upon each working stroke of the piston, a forcing of air from the non-working end of the cylinder out to atmosphere and upon the return strokes of the piston there is a drawing in of air from the atmosphere into the cylinder.

To provide for this breathing action, and to enable the building up very quickly of a cushion pressure in the event that the motor loses its load, either through the breaking of the sucker rod line, or of the rupturing of a pump piston packing, there is provided as shown in the drawing a suitable automatic vent valve mechanism generally designated 70 and having air cleaning means incorporated therein. This device is connected with the cylinder bore 7, at a point in the latter above the normal end of the working strokes of the motor, by a suitable connecting element or nipple 71, this opening into the interior of the dash pot or cushioning portion of the cylinder bore, that is the portion above the normal stroke of the motor piston, at a point relatively low therein, so that in the event the motor piston over-travels markedly it will over-run the connection 71 and there will then be no escape possible for the fluid in advance of the motor piston. The connection 71, at its end opposite its point of communication with the cylinder bore, opens into the interior of a casing element 72, which provides a chamber 73 closed at its lower end in large measure by an air cleaning device 74, the parts 72 and 74 being suitably connected as by threaded elements 75. The interior of the member 72 is provided with a series of longitudinally extending, inwardly projecting, rib-like portions 76, which are cut away as at 77 adjacent their lower ends. The interior of the member 72 is also provided with a central longitudinally projecting boss-like portion 78, whose function will shortly be described. The upper end of the air cleaner element 74 provides an annular surface 80, which serves as the outer annular portion of a composite valve seat. Another member 81, held as by a screw 82 to the central boss 78, provides another

annular surface 82, co-planar with surface 80 and which forms the inner annular portion of the valve seat of which 80 forms the outer portion. An annular valve 85, guided by surfaces 86 formed at the innermost portion of the cut back parts of the ribs 76, is adapted to seat upon the annular surfaces 80, 83, and thereupon to prevent fluid flow through the annular space 88 between said annular seats. A spring seat 89 is supported upon a suitably adjustable stem 90, whose position is controllable by a screw 91 and lock nut 92, and supports a spring 93 which engages at its upper end the lower surface of the annular valve 85, and normally maintains the latter unseated, while permitting downward seating movement thereof upon the occurrence of a sufficient differential in pressure between the spaces above and below said valve. The air cleaner portion 74 has a series of peripheral slots 95 extending generally tangentially to inner wall 96 of said portion, and these slots cause a whirling of the air passing through said cleaner in such manner as to cause the dust or other solid matter or liquid which may be entrained with the air to follow the periphery of the chamber within said air cleaner, and then drop to the peripheral lowermost groove-like portion 97, from which said solid material or liquid may be swept out upon the next discharge of air.

Ordinarily the spring-seat member 89 will be so adjusted by means of the adjusting screw 91 and stem 90, that it will take a differential in pressure of about two pounds between the pressure within the chamber 73 and the pressure within the air cleaner portion of the device 70 before the valve 85 will be seated. This differential is sufficient so that during normal reciprocation of the motor piston seating of the valve 85 will not occur. However, in the event of a sharply increased upstroke velocity of the motor piston, such as would result from the parting of the sucker-rod line, or the rupturing of a pump plunger packing, the valve element 85 will be moved sharply to its seat and thereafter there will be only such escape of fluid from within the chamber 73 as is possible through a small opening 100 formed in the inner seat member 81. This small opening 100 will permit the cushion pressure built up above the motor piston in the space within the cylinder, gradually to leak away after the upward travel of the motor piston has been checked if the motor piston is stopped before the connection 71 is reached—or after it is again uncovered. It may be noted that the space within the air cleaner portion 70 is partially divided into two chambers by a septum 101, having an opening 102 through its central portion opposite an upwardly extending cone like portion 103 formed at the bottom of the chamber member, this construction of the parts operating to cause the air discharged during upstrokes of the motor piston to assume an advantageous movement, and in like manner an air movement will take place through the cleaner during the downstroke of the motor piston in such manner as to keep solid matter from entering the motor cylinder.

From the foregoing description it will be evident that I have provided an improved protective device for an expansible chamber motor operative to permit breathing of the motor during normal operation, but to provide a very effective cushioning in the event that the motor piston tends to make an unduly rapid upstroke. It will be observed that I have provided a device in which a very easy adjustment of the pressures at which

the cushioning shall commence is possible, and a device in which the parts are simply constructed and in which breakage will be minimized. The use of a valve of the present type—a mere annular stamping—both because of the lightness and of the possible material from which it may be constructed, and because of the spring cushioning of its seating, reduces breakage to a negligible amount. The adjustable spring seat permits change in the operating pressures of the device very simply to be made. The air cleaning attachment permits the use of the device in dusty and windy country without serious likelihood of the entrance of abrasives into the motor cylinder.

While in the accompanying drawing I have shown and have herein described, for purposes of illustration, one embodiment which my invention may assume in practice, it is to be understood that the same may be modified and embodied in various other forms without departing from the spirit of the invention or the scope of the appended claims.

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

1. In combination, a casing having an end portion providing guideways, a valve guided for reciprocation by said guideways, an element supported by the end portion of said casing providing one portion of a seat for said valve, a separate casing portion providing another portion of a seat for said valve, said valve seat portions arranged in a common plane, and means for providing an adjustable pressure tending to hold said valve in open position.

2. In combination, a casing comprising upper and lower portions, each of said portions supporting an annular valve seat, said annular valve seats arranged in a common plane, an annular valve guided for reciprocation by said upper portion and adapted to seat on said valve seats, and adjustable means for yieldingly holding said valve in open position carried by said lower portion.

3. In combination, a casing portion providing guiding means for a reciprocable annular valve, a reciprocable annular valve guided by said portion, another casing portion providing a portion of the valve seat for said valve, a disc carried by said first mentioned portion providing another portion of the valve seat, said valve seat portions arranged in a common plane, yielding means supported by said second mentioned casing portion for normally holding said valve off said seat, and a continuously open vent providing communication between said casing portions and located within the annular zone surrounded by said valve.

4. In combination, a casing portion, an element supported by said casing portion and providing one portion of a valve seat, a separate casing portion providing another portion of a valve seat, said valve-seat portions arranged in a common plane, a valve for controlling fluid flow through the casing provided by said casing portions and adapted to seat on said valve-seat portions to cut off such flow, and means for providing an adjustable pressure tending to hold said valve in open position.

5. In combination, a casing comprising upper and lower portions, each of said portions supporting an annular valve seat, said annular valve seats arranged in a common plane, an annular plate valve for controlling the flow of fluid through said casing and adapted to seat on said valve seats to cut off such flow, and adjustable means carried by said lower casing portion for

yieldingly urging said valve toward open position.

6. In combination, a casing portion, another casing portion providing a portion of a valve seat, a separate member secured to said first mentioned casing portion and providing another portion of a valve seat, said valve-seat portions arranged in a common plane, a valve for controlling fluid flow through the casing provided by said casing

portions and adapted to seat on said valve-seat portions to cut off such flow, said valve having an open center, yielding means tending to hold said valve off said seat, and a continuously open vent providing communication between said casing portions and located within the zone surrounded by said valve.

WADE H. WINEMAN.

CERTIFICATE OF CORRECTION.

Patent No. 2,195,205.

March 26, 1940.

WADE H. WINEMAN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, lines 4, 5, and 6, strike out the sentence "From one aspect, my invention relates to improved distributing means for such motors."; line 43, for "or" read --of--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of September, A. D. 1940.

(Seal)

Leslie Frazer,
Acting Commissioner of Patents.