C. F. BLAKE & C. W. AVELING.

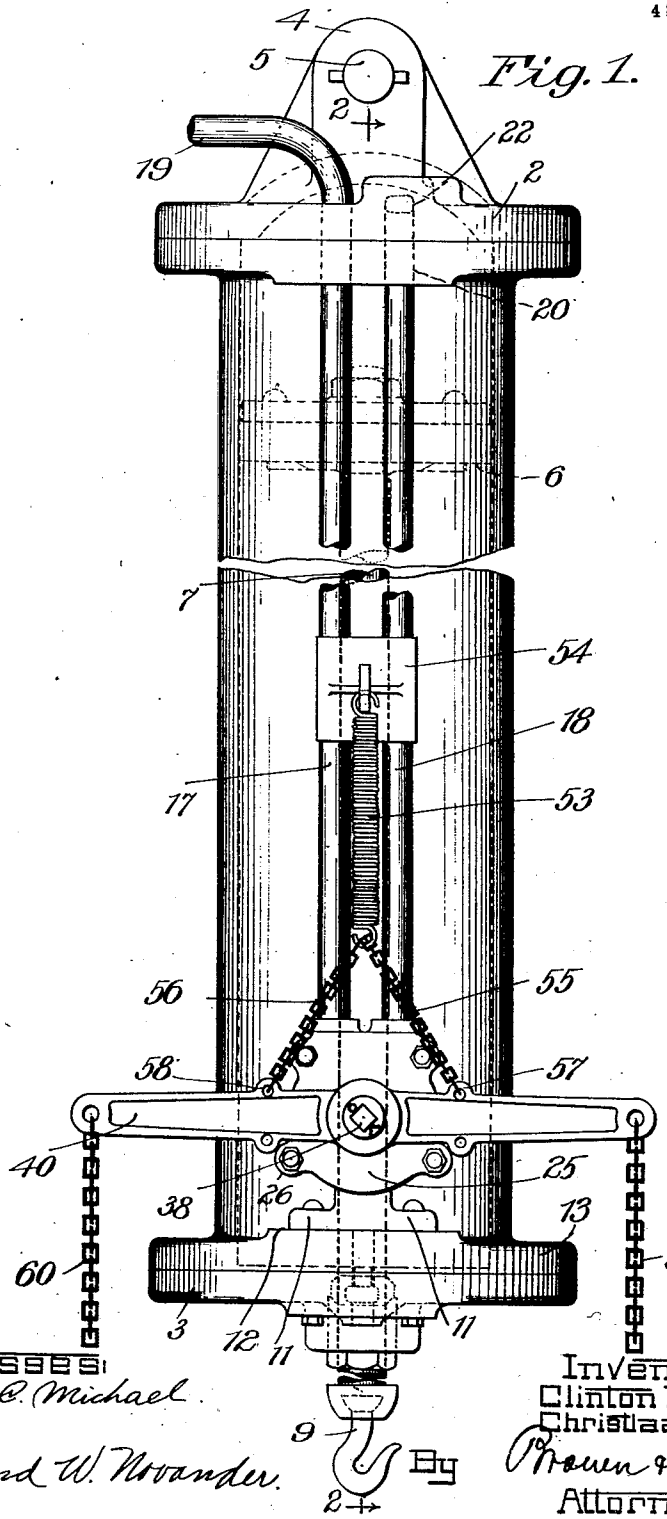
FLUID HOISTING MACHINERY.

APPLICATION FILED JUNE 8, 1908.

917,992. **Patented Apr. 13, 1909.**

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
John C. Michael.
Leonard W. Novander.

By

Inventors
Clinton F. Blake
Christiaan W. Aveling.
Brown & Williams
Attorneys.

C. F. BLAKE & C. W. AVELING.

FLUID HOISTING MACHINERY.

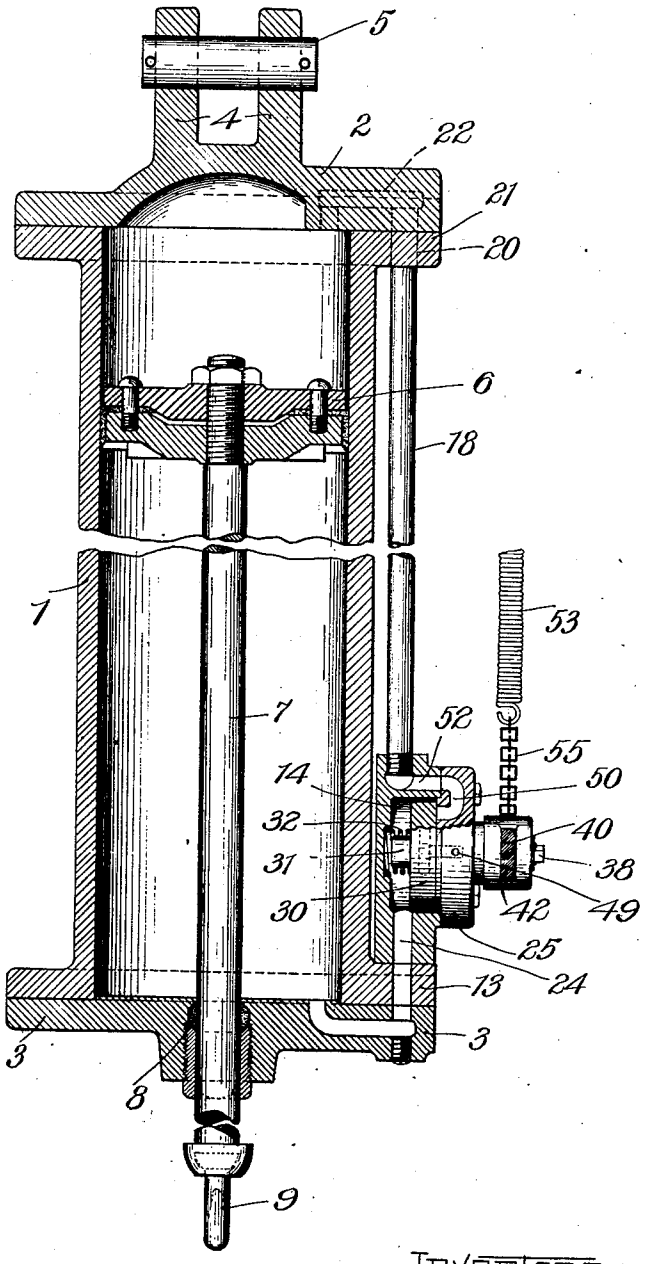
APPLICATION FILED JUNE 8, 1908.

917,992.

Patented Apr. 13, 1909.

4 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
John C. Michael.
Leonard W. Novander.

Inventors
Clinton F. Blake
Christiaan W. Aveling.
By Brown & Williams
Attorneys.

C. F. BLAKE & C. W. AVELING.

FLUID HOISTING MACHINERY.

APPLICATION FILED JUNE 8, 1908.

917,992.

Patented Apr. 13, 1909.

4 SHEETS—SHEET 3.

Fig. 4.

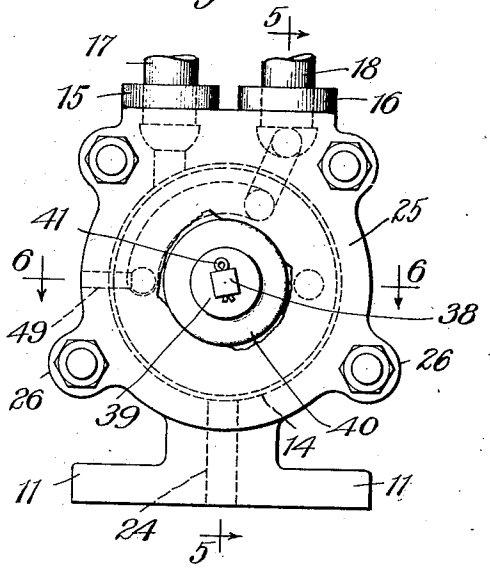


Fig. 3.

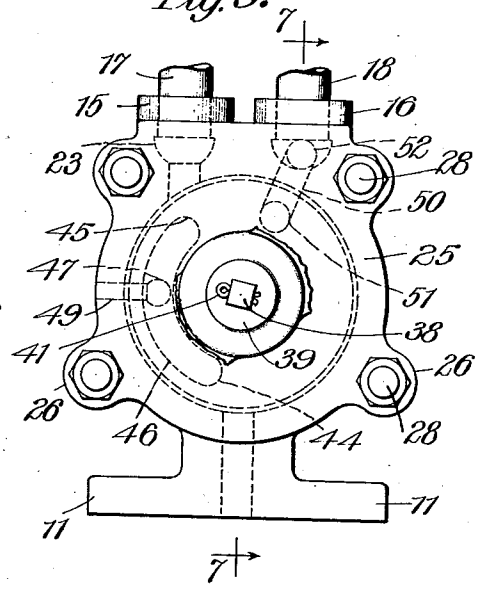


Fig. 6.

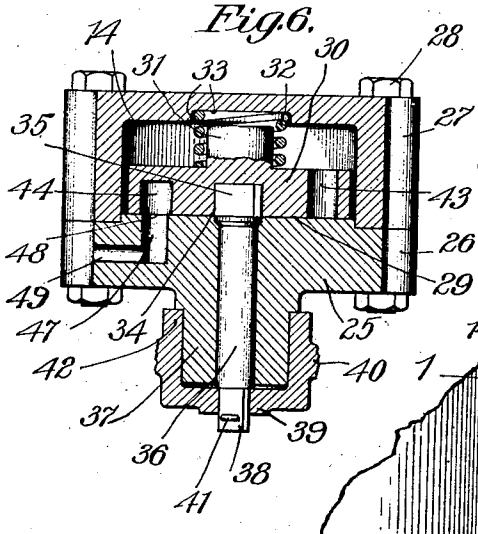
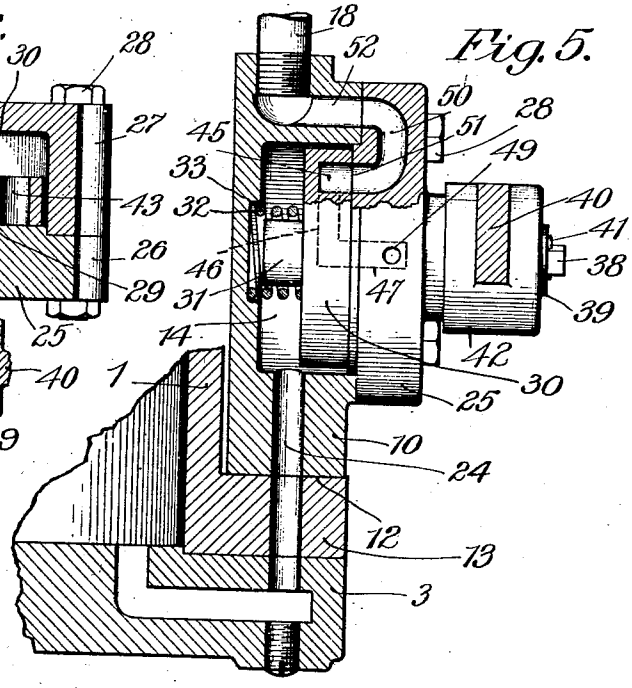


Fig. 5.



Witnesses:

Leonard W. Novander.

John C. Michael.

Inventors

Clinton F. Blake

Christiaan W. Aveling.

By Brown & Williams

Attorneys.

C. F. BLAKE & C. W. AVELING.

FLUID HOISTING MACHINERY.

APPLICATION FILED JUNE 8, 1908.

917,992.

Patented Apr. 13, 1909.

4 SHEETS—SHEET 4.

Fig. 8.

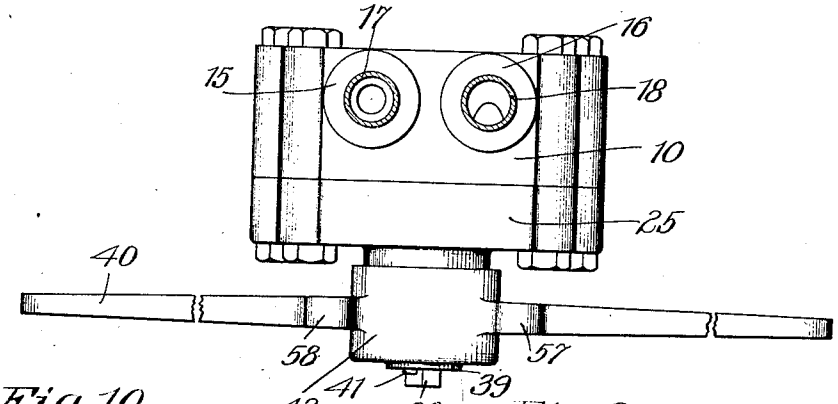


Fig. 10.

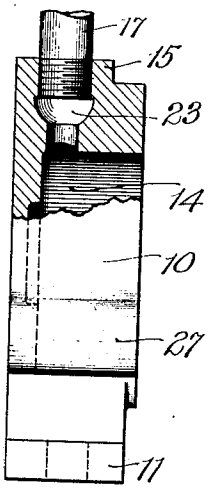


Fig. 9.

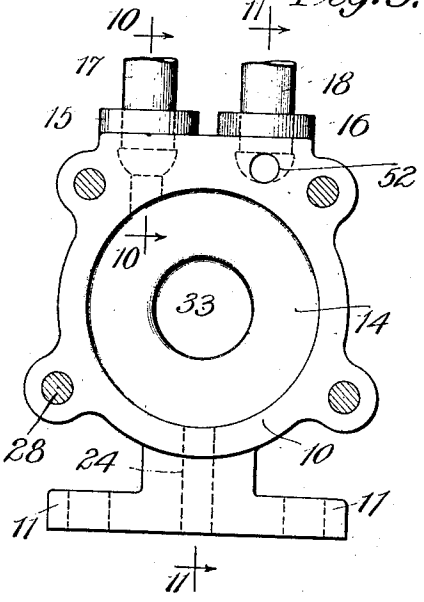


Fig. 11.

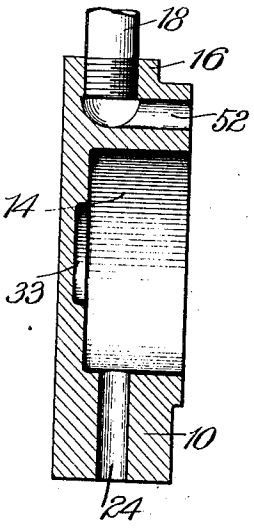
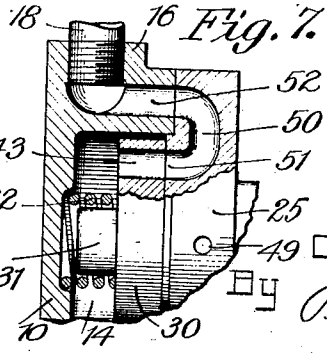


Fig. 7.



Witnesses:
Leonard W. Novander.
John C. Michael.

Inventors:
Clinton F. Blake
Christiaan W. Aveling.
By Brown & Williams
Attorneys.

UNITED STATES PATENT OFFICE.

CLINTON F. BLAKE, OF CHICAGO, AND CHRISTIAAN W. AVELING, OF MORGAN PARK, ILLINOIS, ASSIGNORS TO CALUMET ENGINEERING WORKS, OF HARVEY, ILLINOIS, A CORPORATION OF ILLINOIS.

FLUID HOISTING MACHINERY.

No. 917,992. Specification of Letters Patent. Patented April 13, 1909.

Application filed June 8, 1908. Serial No. 437,212.

To all whom it may concern:

Be it known that we, CLINTON F. BLAKE and CHRISTIAAN W. AVELING, residing, respectively, at Chicago and Morgan Park, both in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Fluid Hoisting Machinery, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to fluid hoisting machinery, particularly to air hoists and covers the improved construction arrangement and operation of the controlling mechanism therefor, particularly the valve mechanism.

Air hoists usually comprise a cylinder, in which is a piston rod which extends downwardly and terminates in a lifting hook. In the class to which our invention is applied, the controlling valve mechanism is usually mounted on the outside of the cylinder and has connection with the cylinder so that adjustment thereof will connect the cylinder ends in various ways with the source of pressure or vacuum, and with atmosphere. The valve body frame is usually mounted at the lower end of the cylinder and is connected through piping with the cylinder ends and with the source of compression. The valve body frame forms a valve chamber and is finished to form a valve seat. The valve rests against this seat with its stem extending outwardly through the valve bonnet or cap, the stem terminating at the outside in an actuating lever. In some devices, the valve stem is hollow to form a passageway or port but this construction is open to several objections. In the first place, in order that the valve seat can be reground it is necessary to disturb and remove the piping in order that the valve body frame can be taken from the cylinder. In the second place, owing to the wear on the valve stem, leakage will result. In some cases, to lessen the liability to leakage, stuffing boxes are employed, but leakage is bound to occur sooner or later as the stem wears.

The main object of our invention is to overcome these objections and deficiencies which exist in prior devices of this kind. To overcome the first objection, we do not have the valve seat on the valve body part which is connected with the piping but put the valve seat on the inside of the valve bonnet or cover. The cap bonnet is held in place by bolts or cap screws and can be readily removed at any time so that its seat may be reground, it being unnecessary to disturb in any way the valve body or the piping connecting therewith. The valve in the form of a cylindrical disk seats against the bonnet with its stem extending outwardly to be connected with the adjusting lever. To overcome the second objection noted above, we keep the valve stem free from ports or passageways, all the ports and passageways being in the valve or in the bonnet. There is, therefore, no chance for leakage as all wear is taken up by the valve which is held against its seat. Under working conditions, the pressure in the valve chamber will hold the valve on its seat but we also provide a spring which will insure seating of the valve at all times.

In the accompanying drawings, which clearly illustrate our invention and its applicability—Figure 1 is an elevation view of an air hoist cylinder showing the valve mechanism when placed thereon and in neutral position; Fig. 2 is a sectional view taken on line 2, 2 of Fig. 1; Fig. 3 is an enlarged front view of the valve mechanism showing the position thereof for causing lowering of the piston; Fig. 4 is a similar view showing the valve mechanism in hoisting position; Fig. 5 is a sectional view taken on line 5, 5 of Fig. 4, showing also a section of the lower end of the cylinder; Fig. 6 is a sectional view taken on plane 6, 6 of Fig. 4; Fig. 7 is a sectional view of the upper part of Fig. 3 taken on plane 7, 7; Fig. 8 is a top view of the valve mechanism; Fig. 9 is a front view of the valve mechanism, the valve bonnet and valve being removed. Fig. 10 is a side view of the valve mechanism, the top view being shown in section along plane 10, 10, Fig. 9, and Fig. 11 is a sectional view taken on plane 11, 11, Fig. 9.

The hoisting mechanism comprises the cylinder 1, to which are bolted the upper and lower ends 2 and 3. The top end 2 has the parallel lugs 4, through which passes a shaft or pin 5 for receiving the hook or other connecting part from which the cylinder may be suspended, the cylinder being usually suspended from a traveling crane. Within the cylinder is the piston head 6, from which the

piston rod 7 extends downwardly through stuffing box 8 formed in the lower end 3, the lower end of the piston rod terminating in a lifting hook 9 in suitable construction.

The valve mechanism for controlling the operation of the piston comprises the valve frame 10 having flanges 11 whereby it may be bolted to the seat 12 formed on the flange 13 at the lower end of the cylinder. This valve frame forms a cylindrical valve chamber 14 and at its upper end are two threaded lugs 15 and 16 for receiving pipe 17 and 18 respectively. The pipe 17 extends upwardly to the top of the cylinder where it is secured and where it is adapted for connection with other piping or hose 19 and connecting with a compressor usually. The piping 18 extends upwardly parallel to the cylinder and to piping 17, its upper end threading into an opening 20 in the flange 21 at the upper end of the cylinder, this opening communicating with one end of passageway 22, whose other end communicates with the top of the cylinder. A passageway 23 through the upper wall of the valve frame connects the valve chamber with the piping 17, and the valve chamber is therefore always in connection with the compressor. A passageway 24 leads from the lower end of the valve chamber through the valve frame wall, through the flange 13 and through the end 3 to communicate with the lower end of the cylinder, the lower end of the cylinder being therefore always connected with the valve chamber and with the compressor. The valve bonnet 25 is also cylindrical and has bolt lugs 26 for registering with lugs 27 on the valve frame, bolts 28 passing through these lugs to securely hold the bonnet to the frame. The inner face 29 of the bonnet is finished and ground to form a seat for the valve 30, which is in the form of a cylindrical disk. A guide stem 31 extends rearwardly from the valve and is encircled in a compression spring 32 whose end engages in the pocket 33 formed in the rear wall of the valve frame. When the pressure is on, the valve will be held against its seat by the pressure, and the spring 32 is provided only for holding the valve against the seat when the pressure is off. In the outer side of the valve is a square opening 34 for receiving the square end 35 of the valve stem 36 which projects through the valve bonnet and the lug 37 extending therefrom. The outer end 38 of the stem is also squared and is engaged by the hub 39 of the actuating lever 40, the lever being held in place on the valve stem by the cotter pin 41. An annular flange 42 extends rearwardly from the hub 39 of the lever and has bearing engagement with the lug 37, the lever being thus securely pivoted entirely independently of the valve stem, which is thus relieved of all strains. Upon turning of the actuating lever, the valve will be rotated on its seat. A port passageway extends entirely through the valve, while passageways 44 and 45 terminate in the valve face and extend into the body of the valve a distance and are connected by the passageway 46. Through the valve bonnet is a passageway 47 which terminates in the valve seat at the port opening 48 and which connects with atmosphere at the outlet 49. Through the valve bonnet, there is also a D passageway 50 which terminates in the port opening 51 in the valve seat, and which at its other end connects with the passageway 52 leading to the pipe 18 which connects with the top of the cylinder.

If it is desired to lower the hook so that connection may be made with material to be lifted the controlling lever 40 is rotated in counter-clockwise direction to carry the valve to position shown in Figs. 3 and 7. In this position, the valve passageway 43 will be in register with the end 51 of passageway 50. This brings the piping 18, and consequently the top of the cylinder, into communication with the valve chamber, which, as before shown, is always connected with the compressor through piping 17. As has also been shown, the valve chamber is always connected with the lower end of the cylinder through passageway 24. Both the upper and lower ends of the cylinder are therefore now connected with the valve chamber and with the compressor. On account of the connection of the piston rod with the piston, the lower face of the piston will have less available area for the pressure to work against, and the top of the piston having more available area, the result will be that although the pressure per square inch is alike at both sides of the piston the piston will be moved downwardly. As soon as the hook has been lowered sufficiently to make connection with the work to be lifted, the valve is rotated in clock-wise direction to disconnect the passageway 43 from passageway 50, and the piston will therefore stop. After connection is made the lever is turned in clock-wise direction to carry the passageways 44 and 45 into register with the passageways 46 and 50 respectively. The passageway 50 will now be connected with atmosphere through passageway 45 connecting passageway 46, passageway 44 and passageway 47. The top of the cylinder is therefore connected with atmosphere, but the lower end of the piston remains connected with the valve chamber and the compressor, the result being that the piston will be raised and the work lifted. When the work has been lifted to a sufficient height, the valve is rotated counter-wise a sufficient distance to disconnect the passageway 50 from atmosphere and the piston will come to rest. After the hoist with the work has been transported to the proper place and it is de-

sired to lower the work in order to release the hook, the valve is again turned to the position shown in Figs. 3 and 7 to connect the top of the cylinder with the valve chamber and compressor, whereupon the piston will move downwardly and the work can be disconnected. The positions indicated in Figs. 3 and 4 are, of course, the maximum positions of the valve. It is clearly understood that the valve can be lapped, that is, the passageways can be brought gradually and more or less into engagement to start or stop slowly and with any speed. In the normal position of the valve, the lever is horizontal, as shown in Fig. 1, and the passageways 43 and 45 will be disconnected from passageway 50, the lower part of the cylinder being in connection with the compressor and all openings above the piston being closed. The lever is usually held in its neutral position by centering mechanism which comprises the spring 53 which is secured at its upper end to the frame 54 mounted on the piping 17 and 18 and which at its lower end engages the ends of chain sections 55 and 56, whose other ends engage with the controlling lever 40 at points 57 and 58 which are equidistant from the valve stem. Chains 59 and 60 also extend from the ends of the lever, by means of which the lever may be rotated. After each rotation of the lever, it will be restored to its normal position by the centering attachment and the piston will come to rest.

By our improved construction and arrangement, two very important features result: first, that the valve mechanism can be taken apart for repair and regrinding without in any way disturbing the piping and other connections of the valve mechanism with the cylinder; and secondly, that the connections are accomplished by the valve independently of ports or passageway through parts which are subject to wear, such as the valve stem. In our valve, no amount of wear on the stem will have any effect on the operation of the valve, which is always held against its seat either by the pressure in the valve chamber or by the spring 32, and all wear on the valve seat or valve is thus taken up and a tight connection always maintained. No stuffing box is necessary as in other valves where there are ports or passageways through the valve stem or controlled by the valve stem. In order to disconnect the various parts of the valve mechanism, all that is necessary is the removal of the bolts 28 and the cotter pin 41, and these parts can as readily be connected together again. If the parts are worn, they could quickly be replaced by other parts in very short time. In other hoisting mechanisms to which I have referred, the part which wears the most, namely, the valve frame, is connected rigidly with the piping and can not be removed or replaced without consuming a great deal of time.

We do not wish to be limited to the precise arrangement of ports and passageways herein shown, as the broad features of our inventions are equally applicable to valve mechanisms having differently arranged ports and passageways. Our valve mechanism would also be equally efficient for controlling the flow of fluids other than air.

Having thus described our invention, we desire to secure the following claims by Letters Patent:

1. In a device of the class described, the combination of fluid lifting mechanism, a valve frame forming a valve chamber and connected with a source of fluid, connections between said valve frame and fluid lifting mechanism, a valve bonnet for said valve frame, and a valve carried by and seated on said bonnet, said bonnet being independent of the connections between the valve frame and fluid lifting mechanism whereby said bonnet may be removed without disturbing such connections.

2. In a device of the class described, the combination of fluid lifting mechanism, a valve structure comprising a stationary part and a removable part, said stationary part forming a valve chamber and being supported by the fluid lifting mechanism, connections between said valve chamber and the fluid lifting mechanism, said removable part forming a valve bonnet, a valve carried by and seating against said bonnet and disposed within the valve chamber upon application of the bonnet to said stationary part, said bonnet being entirely independent of said connections between the valve chamber and fluid lifting mechanism.

3. In a device of the class described, the combination of a cylinder, a lifting piston within the cylinder, a frame secured to the cylinder and forming a valve chamber, piping secured to said frame and cylinder and communicating with the upper end of the cylinder, a connection between said valve chamber and the lower end of the cylinder, a detachable valve bonnet carried by the frame, a valve within the valve chamber, passageways in said bonnet, passageways in said frame connected with said piping and passageways in said valve, and means for moving said valve, said passageways cooperating upon movement of said valve to control the connection of said valve chamber with the cylinder, said bonnet being entirely independent of said piping whereby said bonnet may be removed without disturbing said piping.

4. In a device of the class described, the combination of a cylinder, a lifting piston within the cylinder, a frame carried on said cylinder and forming a valve chamber, a con-

nection between said valve chamber and one end of the cylinder, a passageway in said frame, piping secured to the frame and cylinder and connecting said passageway to the other end of the cylinder, a detachable valve bonnet carried by the frame, a valve within the valve frame carried by and seated on said bonnet, a passageway through said bonnet connected with the passageway in said frame, passageways through said valve, and means for moving said valve on its seat to control the coöperation of said passageways and thereby the connection of the valve chamber with the cylinder.

5. In a device of the class described, the combination of a cylinder, a lifting piston within the cylinder, a frame carried on said cylinder and forming a valve chamber, a connection between said valve chamber and one end of the cylinder, a passageway in said frame, piping secured to the frame and cylinder and connecting said passageway to the other end of the cylinder, a detachable valve bonnet carried by the frame, a valve within the valve frame carried by and seated on said bonnet, a passageway through said bonnet connected with the passageway in said frame, passageways through said valve, and means for moving said valve on its seat to control the coöperation of said passageways and thereby the connection of the valve chamber with the cylinder, said valve bonnet being entirely independent of said piping and thereby removable from the frame without disturbing said piping.

6. In a device of the class described, the combination of a cylinder, a piston within the cylinder, a frame carried on said cylinder and forming a valve chamber, a passageway in said frame, piping secured to the cylinder and to the frame for connecting said passageway at one end of the cylinder, an additional pipe secured to said frame and cylinder for connecting said valve chamber with a source of fluid, a passageway connecting said valve chamber with the other end of said cylinder, a valve within the valve chamber, a detachable bonnet carried by said frame, a passageway through said bonnet connected with the passageway through said frame, a passageway through said valve, and means for moving said valve to cause coöperation of the passageways to control the connection of said cylinder with the valve chamber, said bonnet being entirely independent of said pipes to thereby be detachable from said frame without disturbing said pipes.

7. In a device of the class described, the combination of a cylinder, a piston within the cylinder, a valve frame secured to the cylinder and forming a valve chamber, a bonnet for said valve frame having a lug extending outwardly therefrom, a valve within the valve chamber, a stem extending from said valve through the bonnet and lug thereon, and an actuating lever pivoted on and supported by said lug and having connection with said valve stem.

8. In a device of the class described, the combination of a cylinder, a lifting piston within the cylinder, a valve frame secured to the cylinder and forming a valve chamber, a bonnet for the frame, a lug extending outwardly from said bonnet, a valve within the valve chamber, a stem extending from said valve through the bonnet and lug, an actuating lever, a flange extending from said actuating lever and receiving the lug, whereby said lever is entirely pivoted on said lug, and means connecting said lever with said valve stem whereby actuation of said lever will cause actuation of the valve.

In witness whereof, we have hereunto subscribed our names this 29th day of May A. D. 1908.

CLINTON F. BLAKE.
CHRISTIAAN W. AVELING.

Witnesses:
CHARLES J. SCHMIDT,
GEORGE E. HIGHAM.