W. H. BUTZ.

FLUID OPERATED HOIST.

APPLICATION FILED JULY 3, 1911.

1,029,849.

Patented June 18, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

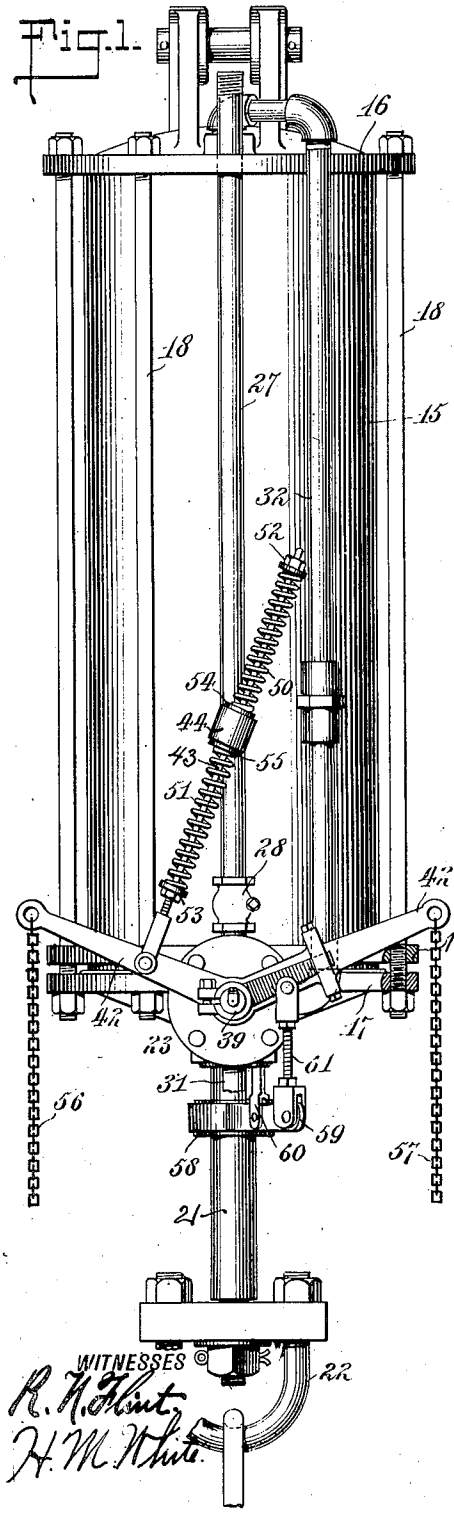
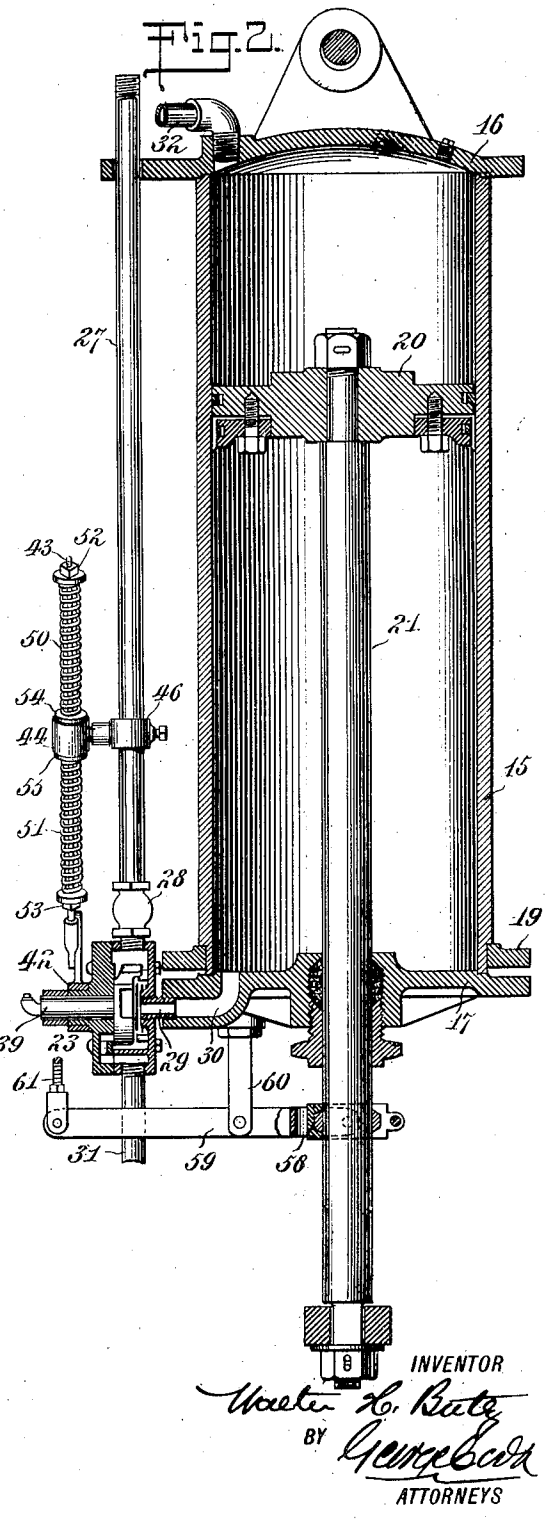


Fig. 2.



WITNESSES

R. H. Hunt.

H. M. White.

INVENTOR

Walter H. Butz

BY George Cook

ATTORNEYS

W. H. BUTZ.

FLUID OPERATED HOIST.

APPLICATION FILED JULY 3, 1911.

1,029,849.

Patented June 18, 1912.

4 SHEETS—SHEET 2.

Fig. 4.

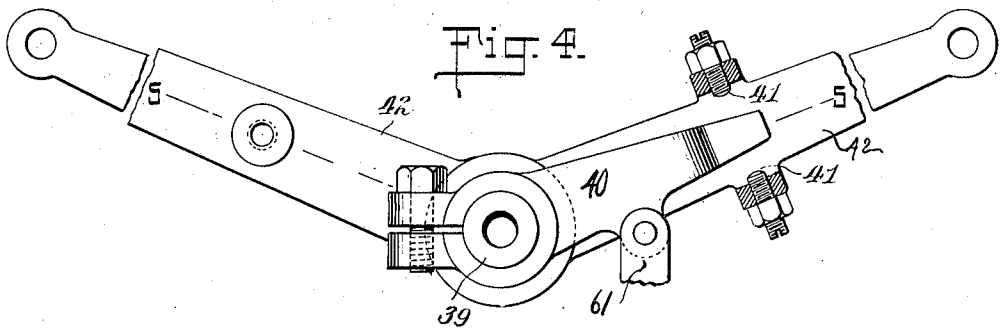


Fig. 5.

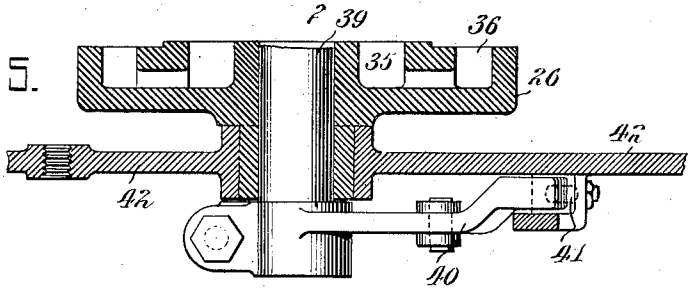
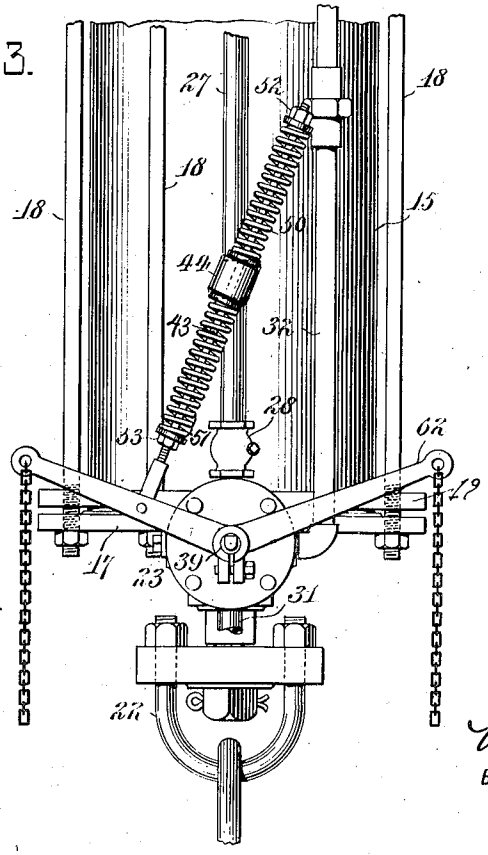


Fig. 3.



WITNESSES

R. N. Flint

H. M. White.

INVENTOR

Walter H. Butz

BY George Cook

ATTORNEY

W. H. BUTZ.

FLUID OPERATED HOIST.

APPLICATION FILED JULY 3, 1911.

1,029,849.

Patented June 18, 1912.

4 SHEETS—SHEET 3.

Fig. 6

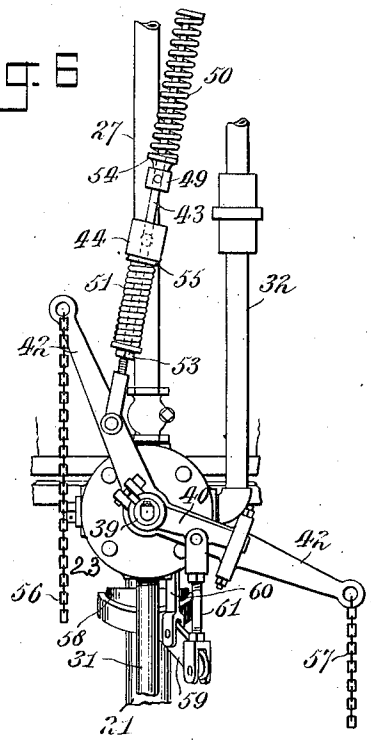


Fig. 7.

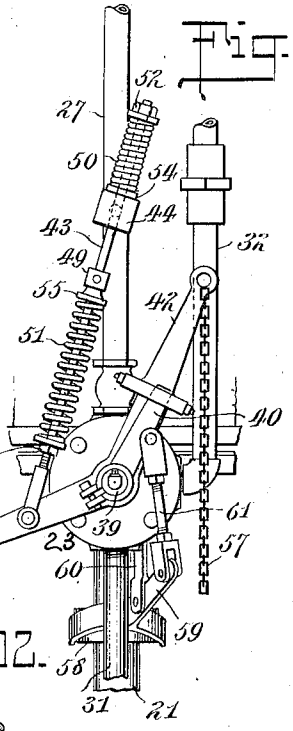


Fig. 12.

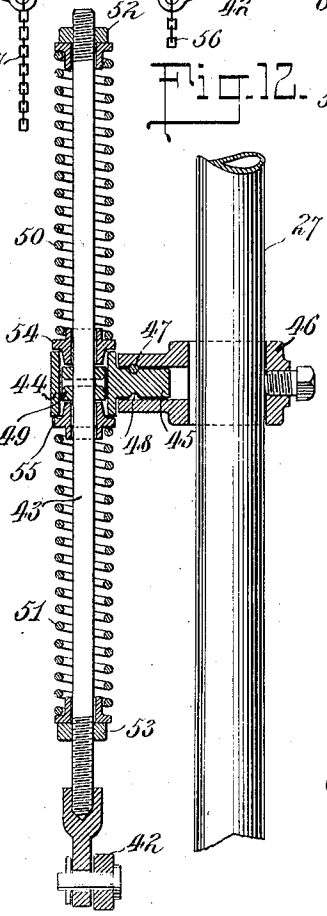


Fig. 13.

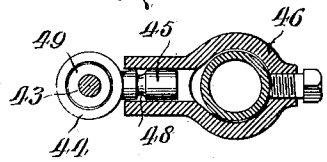
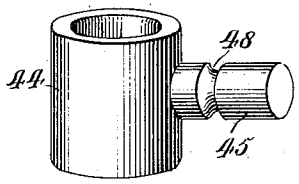


Fig. 14.



WITNESSES

R. N. Flint.

H. M. White.

INVENTOR

Wash H. Butz

BY Georgeberg

ATTORNEYS

W. H. BUTZ.

FLUID OPERATED HOIST.

APPLICATION FILED JULY 3, 1911.

1,029,849.

Patented June 18, 1912.

4 SHEETS—SHEET 4.

Fig. 8.

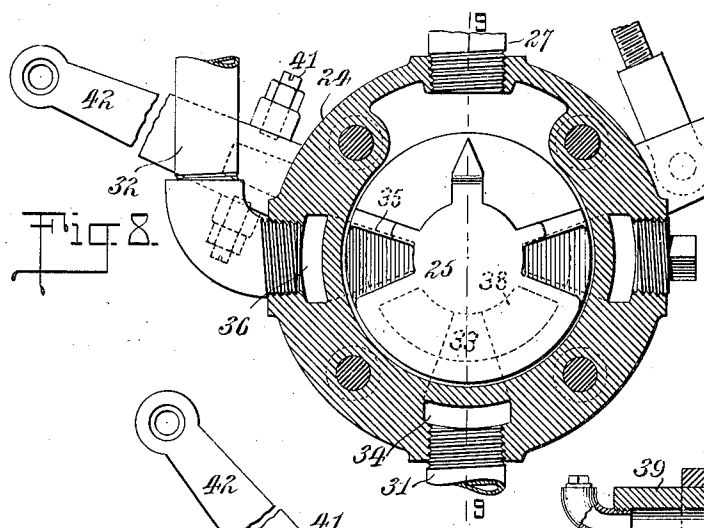


Fig. 9.

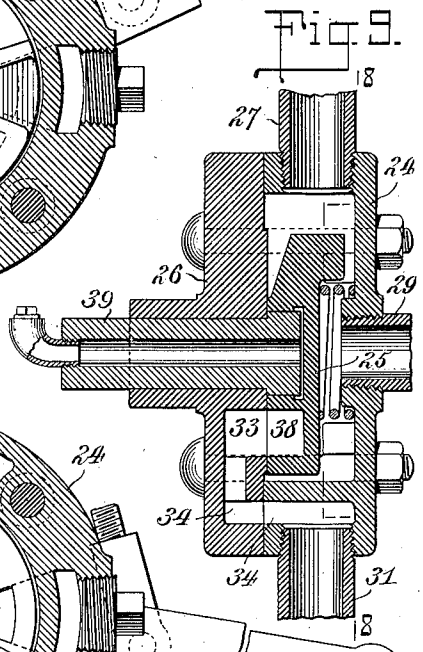
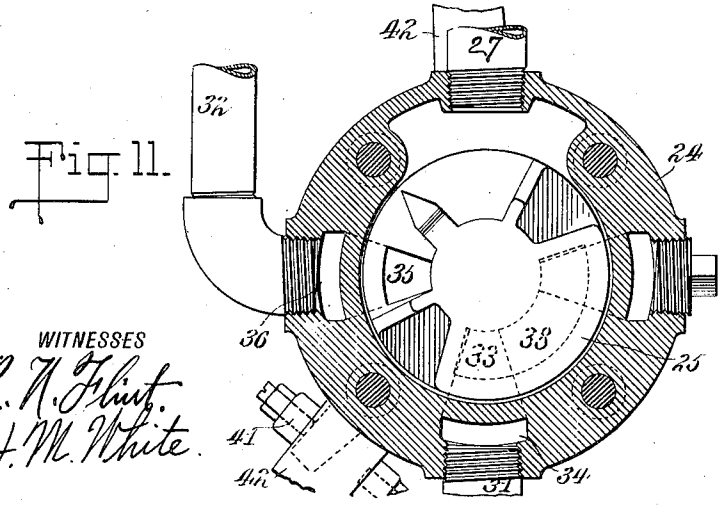


Fig. 10.

Fig. 11.



WITNESSES

R. N. Flint.

H. M. White.

INVENTOR

Walter H. Butz

BY George Cook

ATTORNEY

UNITED STATES PATENT OFFICE.

WALTER H. BUTZ, OF NORTH PLAINFIELD, NEW JERSEY, ASSIGNOR TO THE Q M S COMPANY, OF PLAINFIELD, NEW JERSEY, A CORPORATION OF NEW JERSEY.

FLUID-OPERATED HOIST.

1,029,849. Specification of Letters Patent. Patented June 18, 1912.

Application filed July 3, 1911. Serial No. 636,644.

To all whom it may concern:

Be it known that I, WALTER H. BUTZ, a citizen of the United States, and a resident of North Plainfield, in the county of Somerset and State of New Jersey, have made and invented certain new and useful Improvements in Fluid-Operated Hoists, of which the following is a specification.

My invention relates to hoists designed to be operated by air or similar fluid under pressure, and the objects thereof are to provide various improvements hereinafter specifically pointed out in and relating to the valve and valve operating mechanism whereby the hoist is controlled, and to otherwise improve hoists of the type to which my invention relates.

With the objects of invention above referred to in view, my invention consists in the improved pneumatic hoist illustrated in the accompanying drawings, described in the following specification, and particularly claimed in the concluding claims, and in such variations and modifications thereof as will be obvious to those skilled in the art to which my invention relates.

In the drawings wherein the preferred embodiment of my invention is illustrated; Figure 1 is a view showing my improved hoist in front elevation; Fig. 2 is a view showing the same in side elevation with certain of the parts in section; Fig. 3 is a view showing the lower portion of the operating cylinder in side elevation with another form of valve operating mechanism; Fig. 4 is a view showing the valve operating lever of my device in side elevation; Fig. 5 is a view showing a section upon a plane indicated by the line 5—5, Fig. 4, this view showing also a portion of the valve casing whereupon the valve lever is supported; Fig. 6 is a view showing the valve operating mechanism of my improved hoist in the position it is made to assume when the load is to be lowered; Fig. 7 is a similar view showing the position assumed by the parts when the load is to be raised; Fig. 8 is a view taken upon a plane indicated by the line 8—8, Fig. 9, looking to the left and showing the controlling valve of my device in elevation with its casing in section, the parts being enlarged and the valve being in the position it occupies when the load is held in a fixed position; Fig. 9 is a view showing the controlling valve upon a plane indicated by the line 9—9, Fig. 8. Fig. 10 is a view similar to Fig. 8, but showing the position the controlling valve is made to assume when the load is to be raised; Fig. 11 is a view similar to Fig. 8, but showing the position the controlling valve is made to assume when the load is to be lowered; Fig. 12 is a view showing closing mechanism for returning the controlling valve of my device to its middle position after having been moved to raise or lower the load; and, Figs. 13 and 14 are views showing details of such closing mechanism.

Referring to the drawings 15 is the cylinder of my improved hoist, the same having heads 16, 17 held together by a plurality of rods 18, the lower ends of which are in threaded engagement with a supporting ring 19, so that the lower head 17 may be removed without disassembling the cylinder and upper head or supporting them by auxiliary devices.

A piston 20 moves within the cylinder 15, and 21 is a piston rod connected therewith and extending through the lower head 17 and having a shackle 22 at its lower end from which the load is supported. The upper head 16 is provided with suitable supporting means for the hoist as a whole as shown.

The reference character 23 designates the valve whereby my improved hoist is controlled, the same comprising a valve body or casing 24, an oscillating valve disk 25 within said casing; and a cover 26 for said casing and upon which said valve rests, all as shown in detail and enlarged in Figs. 8 to 11, together with operating means for said valve to be hereinafter described. Air or similar fluid under pressure is supplied through a pipe 27 preferably provided with a downwardly opening check valve 28, which supply pipe leads into the valve casing 24 and from which casing the air flows through a pipe 29 and passage 30 into the cylinder 15, the under side of the piston 20 being thus always subjected to the pressure of the air in the source of supply and the flow of air into the cylinder being unobstructed and not directly controlled by the valve mechanism of my device.

The reference character 31 designates an exhaust pipe leading from the valve casing and controlled by the valve disk 25 and through which pipe air may flow from the

upper end of the cylinder 15; and 32 is a circulating pipe connecting the valve casing with the upper end of the cylinder 15, and through which air may flow from the lower to the upper end of the cylinder 15 when the load is to be lowered, or from the upper end thereof to and through the exhaust pipe 31 when the load is to be raised, the flow through this pipe 32 being controlled by the valve disk 25.

The cover 26 is provided with a port 33 which communicates with the exhaust pipe 31 through registering passages 34 formed in the cover and valve body as shown in Fig. 9, and with a port 35 which communicates by means of a passage 36, similar to the passage 34, with the circulating pipe 32.

The oscillating valve disk 25 is provided with relatively thin flat portions 37 which move in contact with the inner surface of the cover 26, which, as will be understood, forms the seat for said valve, one of which flat portions moves over the port 35 to establish or interrupt the flow of air therethrough. Said valve is also provided with a segmental passage 38 isolated from the interior of the valve 23 and through which air may flow from the port 35 to the port 33 when the valve disk is in a position such that said passage connects said ports with one another.

From the above it will be understood that when the valve 25 is in its normal central position, shown in Fig. 8, the port 35 will be closed, thus preventing a flow from the upper end of the cylinder 15 through the circulating pipe 32, and the load on the shackle 22 will be sustained by air beneath the piston 20, the pressure of which is maintained, because of the fact that air may, at all times, flow freely and uncontrolled from the source of supply through the pipe 27, valve 23, pipe 29, and passage 30. In order to raise the load the valve 25 is moved into the position shown in Fig. 10 in which the ports 33 and 35 are connected through the segmental passage 38; whereupon the upper end of the cylinder is connected with the exhaust pipe 31 through the pipe 32, passage 36, port 35, segmental passage 38, and passage 34, and air under pressure flows through the supply pipe 27, pipe 29 and passage 30 into the cylinder beneath the piston 20 and lifts the load. When the load is to be lowered the valve 25 is moved into the position shown in Fig. 11 in which the port 35 is opened; whereupon the air within the lower end of the cylinder passes to the upper end thereof through the passage 30, pipe 29, port 35, passage 36, and circulating pipe 32, as the load descends.

The valve 25 is operated by mechanism as follows: 39 is an operating spindle supported in a bearing formed in the cover 26 of the valve 23, the inner end of which is in operative engagement with the valve disk 25 and the outer end of which has an arm 40, the extremity of which plays between adjustable stops 41 carried by a lever 42 supported at its middle portion upon the bearing for the spindle 39, as shown in Fig. 5, whereby as the lever 42 is oscillated upon its support movement is transmitted through one of the stops 41 to the spindle 39, and to the valve disk, there being a certain amount of lost motion before a stop comes into contact with the end of the arm 40 for reasons to be hereinafter explained.

The reference character 43 designates a valve closing rod, the lower end of which is pivotally connected with the lever 42 and which rod extends through a guide 44 having a projecting arm 45, which is pivotally supported in an opening formed in a bracket 46 secured to the supply pipe 27, so that the guide 44 may oscillate upon the axis of the arm 45 as a center, as the angularity of the valve closing rod 43 varies during the operation of the valve operating mechanism, as will be understood from Figs. 6 and 7. The arm 45 is held in place within the bracket 46 by means of a transverse pin 47 engaging a groove 48 in said arm. The valve closing rod 43 has a collar 49 secured to its middle portion and which collar lies normally within the guide 44; and 50, 51 are springs upon the rod 43 the outer ends of which bear against fixed abutments 52, 53 respectively on the rod while the inner ends bear against washers 54, 55 respectively loose upon the rod and normally in contact with the collar 49, but which washers are of such a diameter that they may not pass through the guide 44. Chains or equivalent operating means 56, 57 are connected with the respective ends of the lever 42.

In view of the above, it will be obvious that upon pulling the chain 57, the end of the lever to which it is attached will be depressed and the rod 43 moved through the guide 44, the washer 55 being stopped by the guide and the collar 49 engaging the washer 54 and moving it away from the guide, all as illustrated in Fig. 6; and that a reverse series of operations, as shown in Fig. 7, occur when the chain 56 is pulled. Motion imparted to the lever 42 is transmitted to the valve disk 25 as hereinbefore explained. A downward pull upon the chain 56 is given when the load is to be raised, and a downward pull upon the chain 57 when the load is to be lowered.

The arrangement of springs and elements coöperating therewith above explained forms a device for closing the valve 25, that is, for returning it to its normal central position after having been moved therefrom in either direction, in which each spring acts independently of the other, and an arrangement in which the two springs are not required to

balance or act in opposition to one another. As a consequence each spring begins to act independently of the other as soon as the rod 43 begins to move, and each spring in returning the valve to its initial middle position acts with its full force to that end and does not expend a portion of its energy in compressing another spring as when similar closing springs act in opposition to one another. Finally each spring may be adjusted entirely independent of the other to secure the exertion of equal forces in moving the valve to raise or lower the load, or to provide for an operation of the valve with a less pull in one direction than in the other.

My improved fluid operating hoist includes in its preferred form mechanism for automatically keeping the load in a definite position as to height should it tend to rise due to a decrease in the load supported by the hoist, or to leakage into the exhaust pipe, or other circumstances, or should it tend to fall because of leakage past the piston or through the circulating pipe or at other places; the construction of said automatic position maintaining mechanism for keeping the load at a constant height being as follows: The reference character 58 designates a friction collar surrounding the piston rod 21 and which moves with the rod until it meets with an opposing force of definite magnitude dependent upon the amount of friction between it and the rod, after which the rod moves through said collar. Pivotally connected at its inner end with the collar 58 is a lever 59 fulcrumed to a support, 60 extending from the lower head 17, and the outer end of which is connected with the arm 40 upon the valve spindle 39 by means of a link 61, the joints between the link and the lever and arm being sufficiently loose to permit the parts to assume the extreme positions in which they are illustrated in Figs. 6 and 7.

In view of the premises and remembering that the valve mechanism will be in the central position shown in Figs. 1, 2, 8 and 9 when the load is at rest, it will be obvious that should the load move downward, the sleeve 58 will move with the rod 21, and the arm 40 will be moved upward, thus moving the valve disk 25 in a direction to open communication between the ports 35 and 33, and permit fluid to flow from the upper end of the cylinder through the circulating pipe 32, segmental passage 38 and exhaust pipe 31. The consequent reduction of pressure in the upper end of the cylinder permits the pressure within the lower end of the cylinder to predominate and raise the load to its original position, the under side of the piston 20 being always subjected to the pressure of the source of supply of the operating fluid. Should the load upon the hoist move upward, the arm 40 will be moved downward, thus moving the valve into a position to establish communication between the lower and upper ends of the cylinder through the passage 30, pipe 29, interior of the valve casing, port 35, passage 36, and circulating pipe 32, and permit the load to move downward as hereinbefore explained, as the air circulates from the lower to the upper end of the cylinder through the circulating pipe 32.

The movements imparted to the valve 25 as above to return the load to its initial position and maintain it at a constant height is slight, and the port 35 is opened to an extent sufficient to permit but a slight volume of air to flow through it in the operation of the automatic maintaining mechanism to keep the load at a constant height. The end of the arm 40 moves between the stops 41 on the lever 42 in the operation of the automatic load maintaining mechanism as above explained. When, however, the valve 25 is to be operated through the lever 42 to raise or lower the load the stops 41 engage the end of the arm 40 and carry it with the lever as hereinbefore explained.

Fig. 3 shows a form of my improved hoist in which the mechanism for maintaining the load at a constant height is omitted, the valve operating lever 62 being secured directly to the outer end of the valve operating spindle 39. The spring mechanism for returning the valve to its middle position after it has been moved to raise or lower the load is the same as hereinbefore referred to and described.

The controlling valve used in connection with my improved hoist is a valve designed with reference to providing a single valve structure capable of being used for a variety of purposes, this application illustrating one only of many uses to which such valve may be put. The valve *per se* is described and claimed in an application for patent filed by me upon the 3rd day of July, 1911, Serial No. 636,645, and some features thereof are not utilized in adapting the valve to use with the pneumatic hoist disclosed in this application, and consequently appear as elements or features without function in the mechanism disclosed in this application.

Having thus described my invention and explained the operation thereof, I claim and desire to secure by Letters Patent:

1. In a fluid operated hoist, a valve for controlling the flow of fluid; means for moving said valve in either direction from an initial central position; a spring adapted to oppose movement of said valve in one direction; a second spring separate from and independent of said first mentioned spring and adapted to oppose movement of said valve in a reverse direction; and means for relieving said valve from the action of one of said springs when the other is acting thereupon.

2. In a fluid operated hoist, a valve for controlling the flow of fluid; a lever for moving said valve in each direction from an initial central position; two springs acting upon said valve to oppose movement thereof in the two directions aforesaid, said springs being separate from one another and each adapted to operate independent of the other; and means whereby each of said springs is rendered inactive when the other is acting upon said valve.

3. In a fluid operated hoist, a valve for controlling the flow of fluid; means for moving said valve in each of two directions from an initial central position; a spring adapted to oppose movement of said valve in one direction; a second spring separate from and independent of said first mentioned spring and adapted to oppose movement of said valve in a reverse direction; and means whereby one only of said springs is permitted to act upon said valve at a time.

4. In a fluid operated hoist, a valve for controlling the flow of fluid; means for moving said valve in each of two directions from an initial central position; a spring adapted to oppose movement of said valve in one direction; a second spring separate from and independent of said first mentioned spring and adapted to oppose movement of said valve in a reverse direction; a stationary element against which either of said springs may bear in opposing movement of said valve as aforesaid; and means whereby either of said spring may be prevented from acting upon said valve when the other is acting thereupon.

5. In a fluid operated hoist, a valve for controlling the flow of fluid; a lever for moving said valve in each direction from an initial central position; a rod connected with said lever; a guide member through which said rod moves; two springs surrounding said rod one located upon one side of said guide member and one located upon the other side of said guide member; abutments for the outer ends of said springs; washers adapted to rest upon said guide member and against which the inner ends of said springs abut; and a collar secured to said rod and located between said washers and slidable through the guide member.

6. In fluid operated hoists, a valve for controlling the flow of fluid; a lever for moving said valve in each direction from an initial central position; a rod connected with said lever; two springs surrounding said rod; abutments for the outer ends of said springs, two washers slidable upon said rod and against which the inner ends of said springs abut; a collar secured to said rod and located between said washers; and a stationary member located between said washers and adapted to prevent the movement of either of said washers when the other is moved by said collar.

Signed at New York, borough of Manhattan, in the county of New York and State of New York, this 29th day of June, A. D. 1911.

WALTER H. BUTZ.

Witnesses:
R. N. FLINT,
MARY B. JUSTICE.