No. 702,979. Patented June 24, 1902.

G. E. MARTIN.

PNEUMATIC HOIST.

(Application filed Aug. 15, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

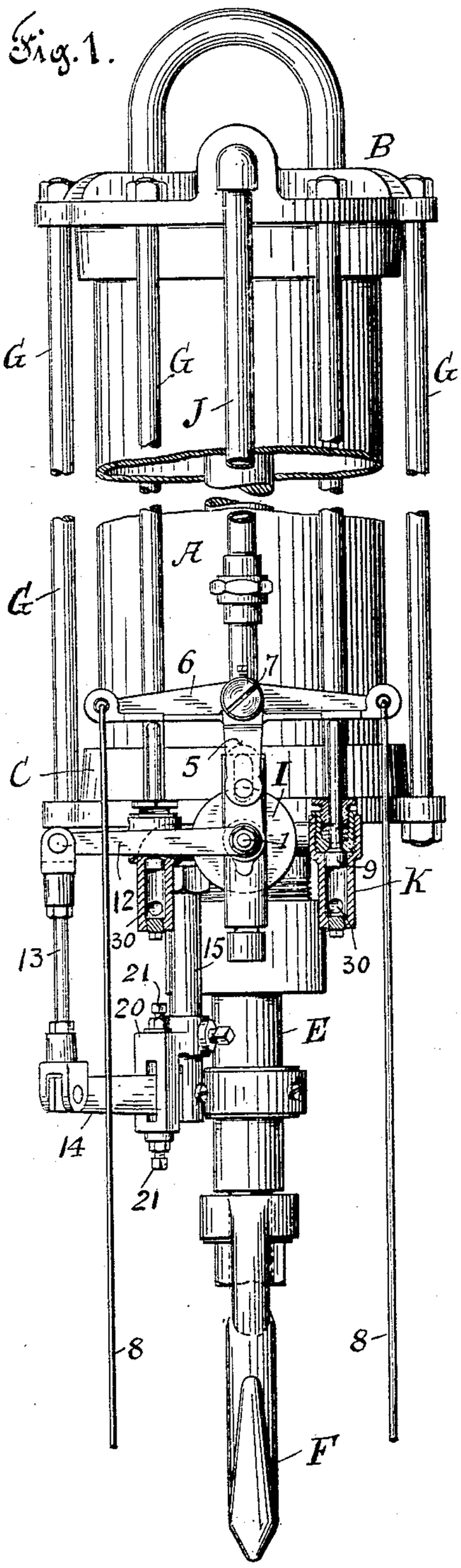
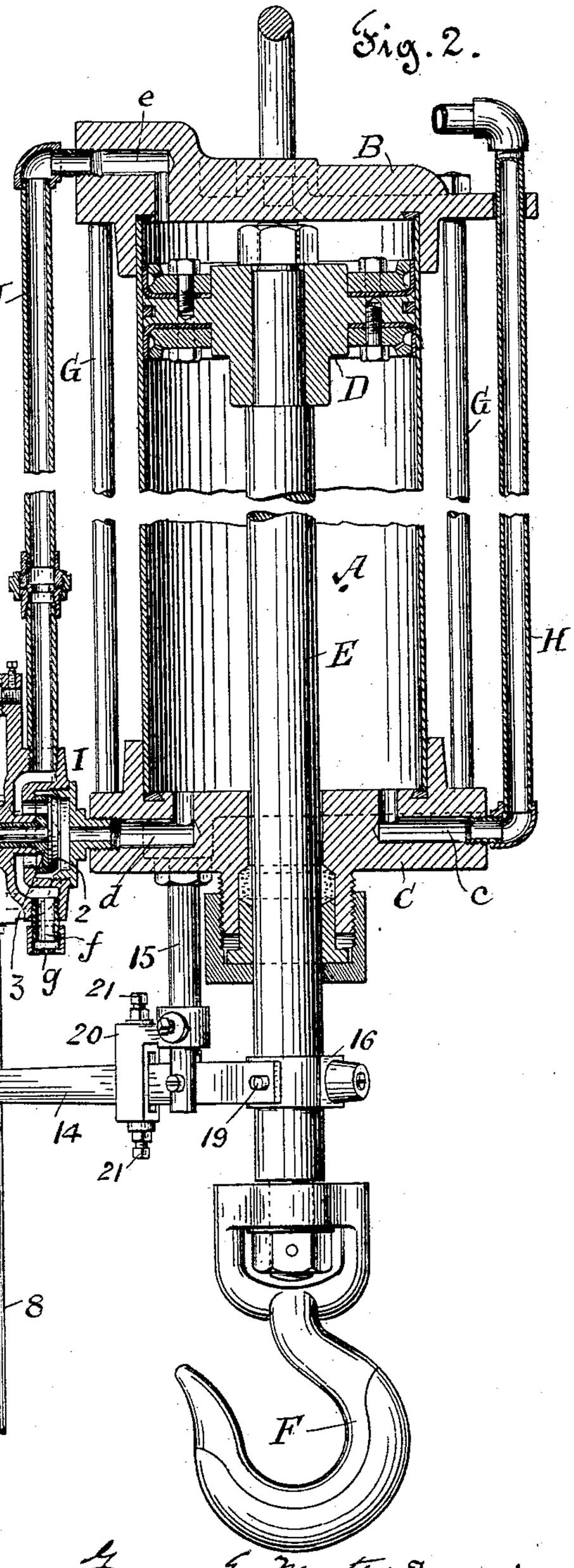


Fig. 2.



Witnesses
Charles Hanimann
Joseph A. Durkin

George E. Martin Inventor
By his Attorney Thos. H. Dorsey

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Fig. 5.

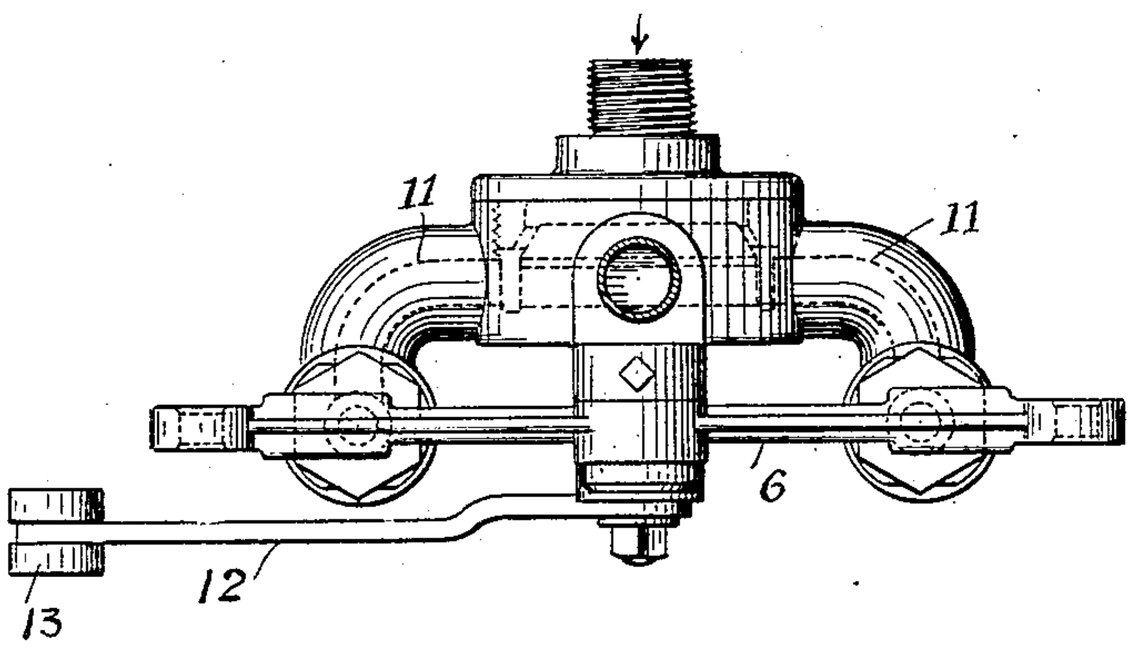


Fig. 3.

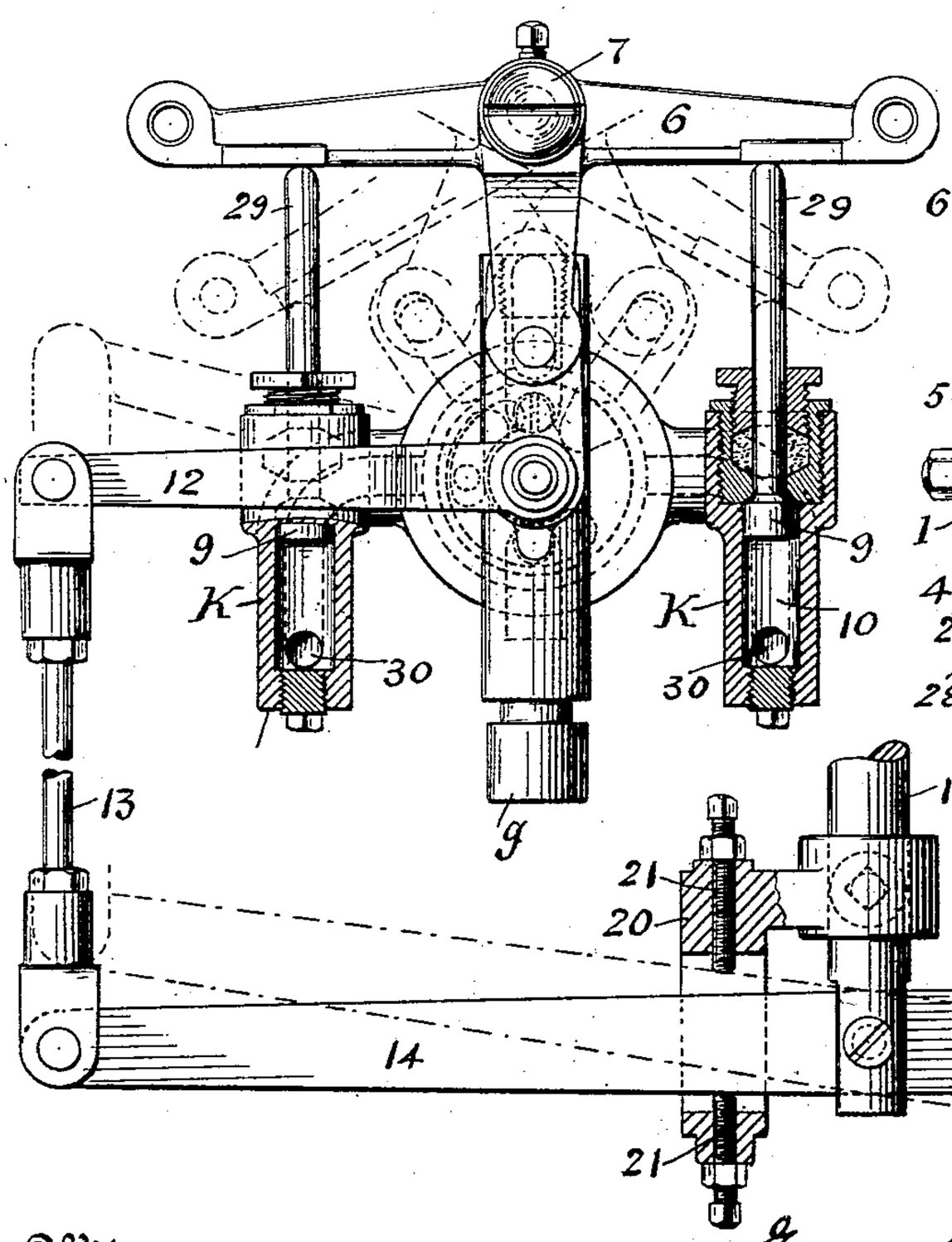
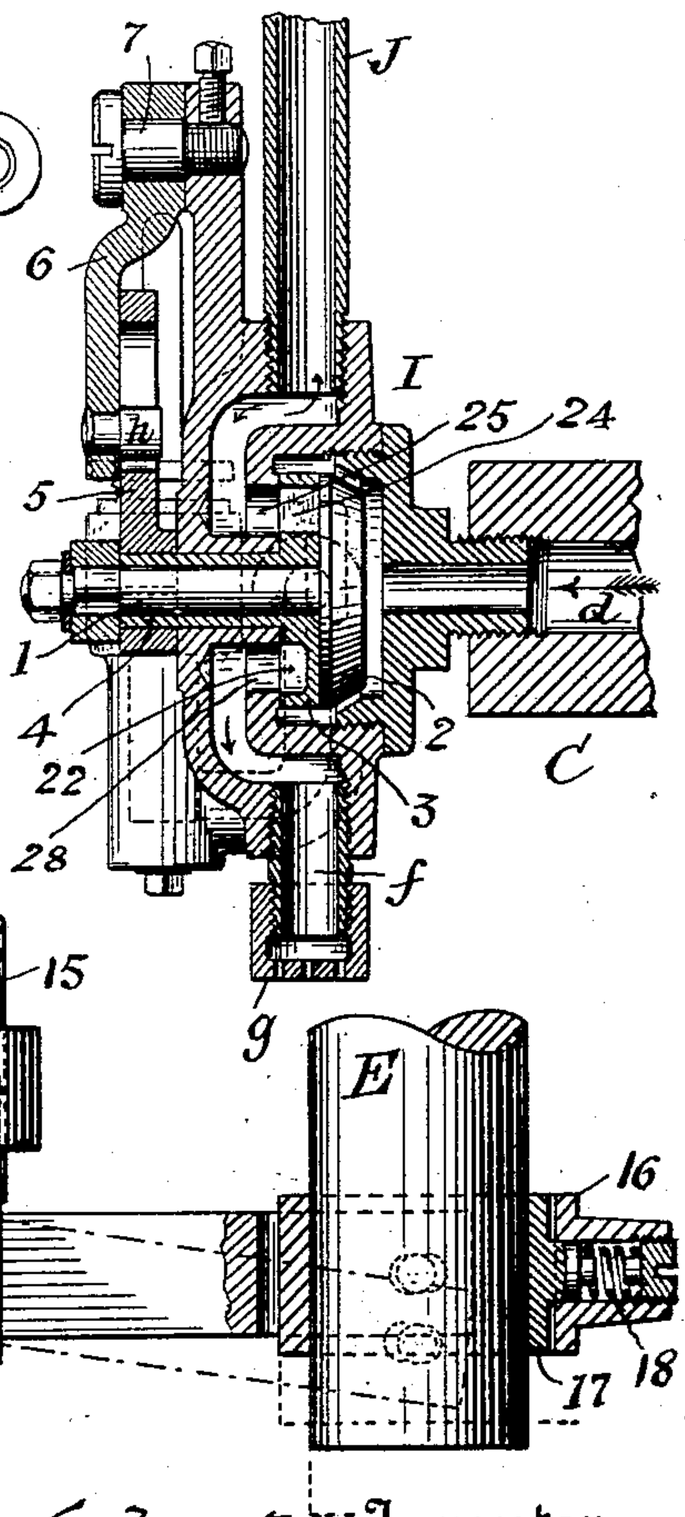


Fig. 4.



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Charles Hanimann.
Joseph A. Durkin

George E. Martin Inventor
By his Attorney Thos. H. Dorlon

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Fig. 6.

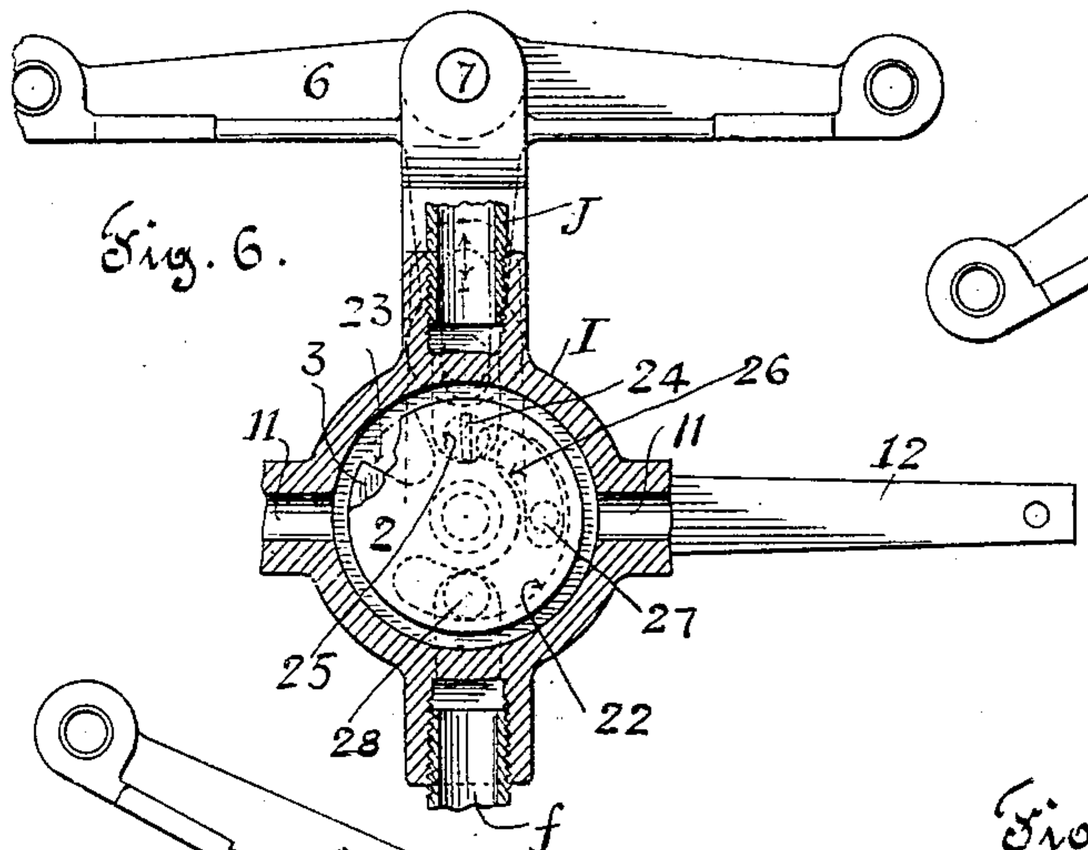


Fig. 7.

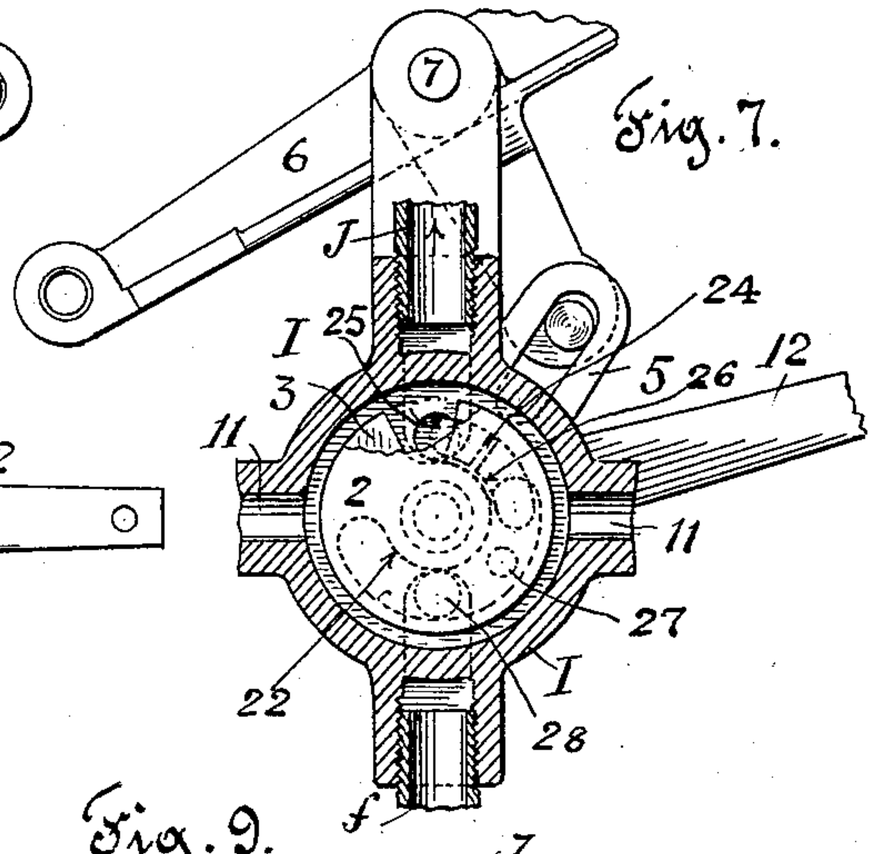


Fig. 8.

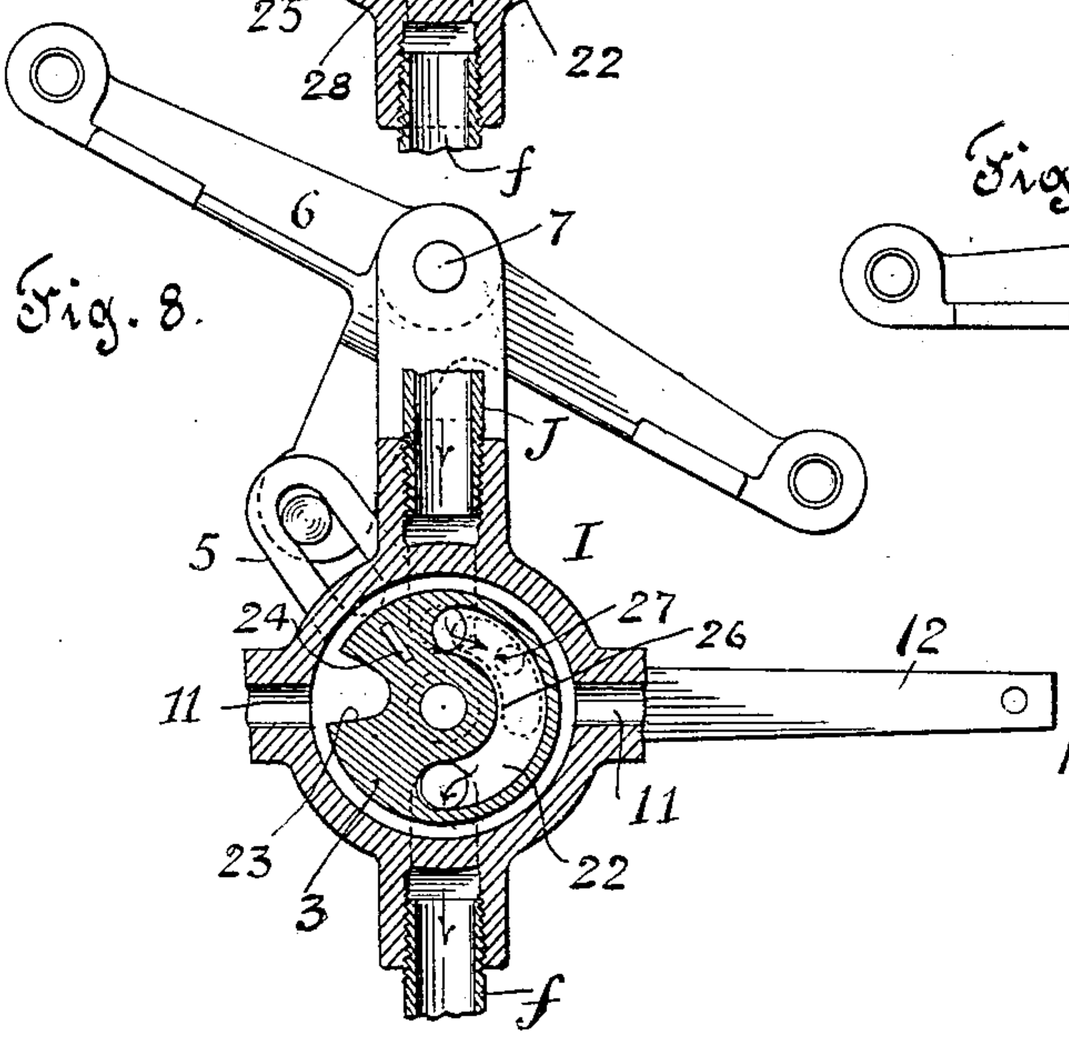


Fig. 9.

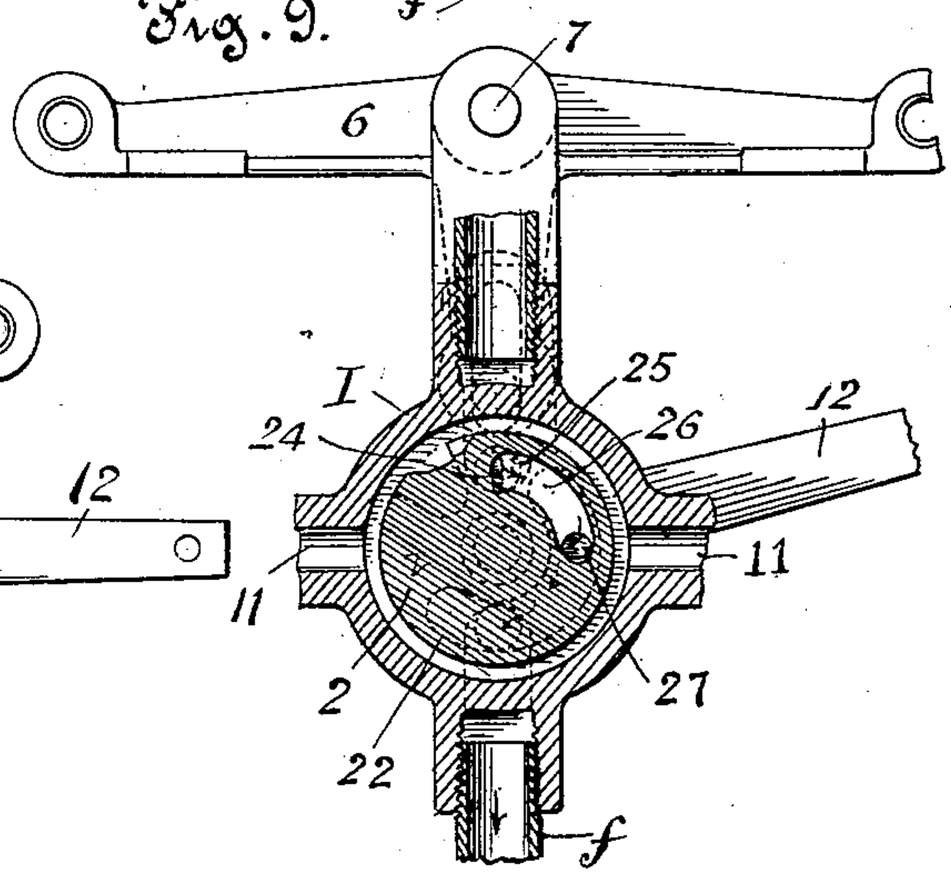


Fig. 10.

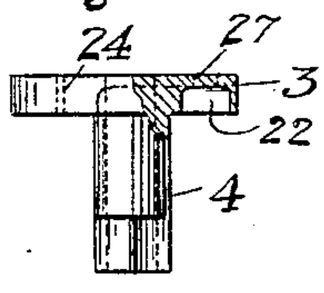
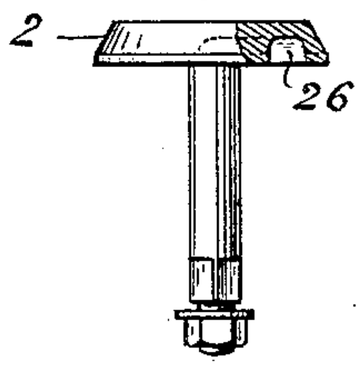


Fig. 11.



Witnesses
Charles Kanimann
Joseph A. Dunkin

George E. Martin Inventor
By his Attorney Chas. F. Burke

No. 702,979. Patented June 24, 1902.

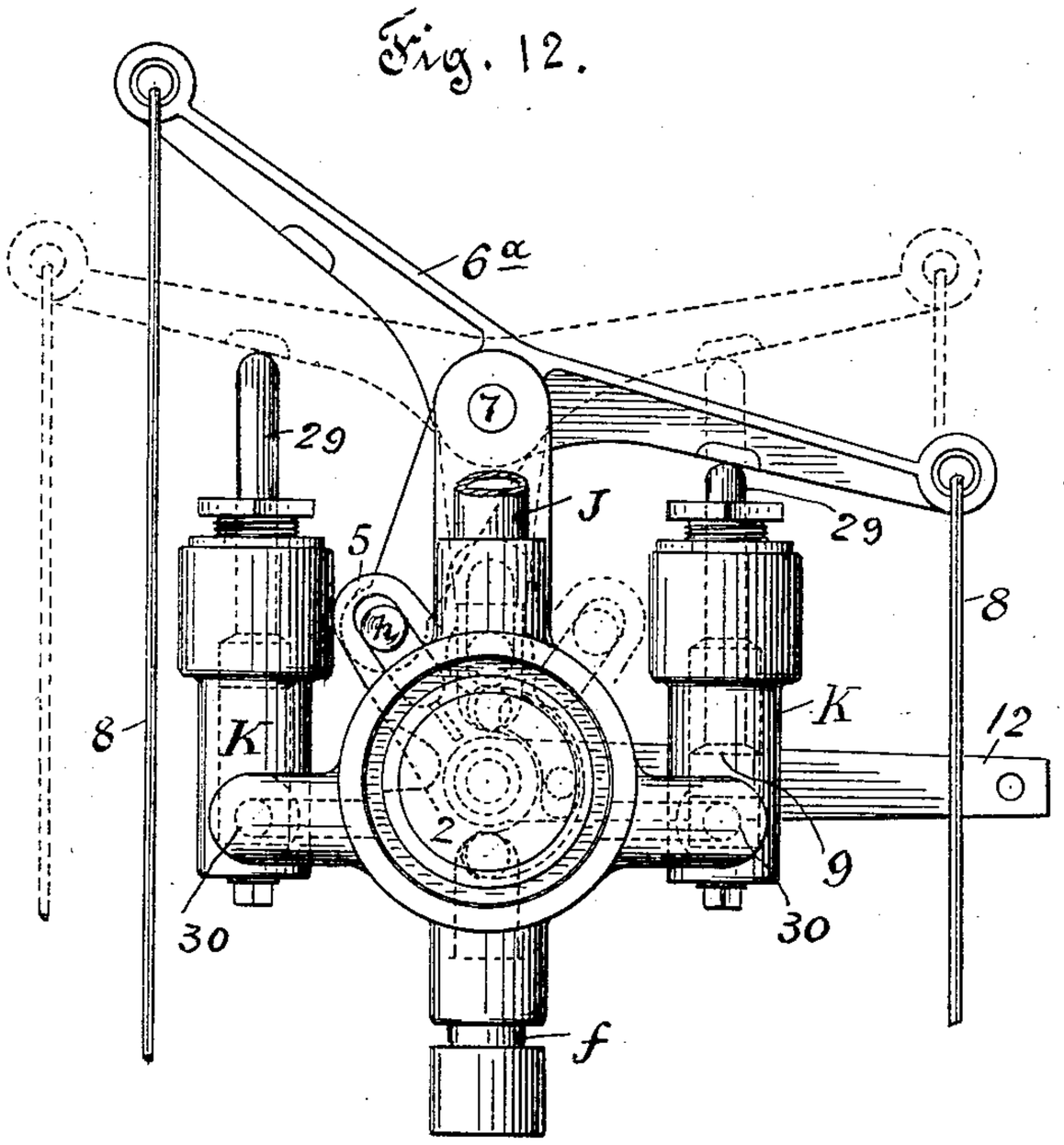
G. E. MARTIN.

PNEUMATIC HOIST.

(Application filed Aug. 15, 1901.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 12.



Witnesses
Charles Hanmann
Joseph A. Durkin

George E. Martin Inventor
By his Attorney
Thos. H. Dodge

UNITED STATES PATENT OFFICE.

GEORGE E. MARTIN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE PEDRICK AND AYER COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

PNEUMATIC HOIST.

SPECIFICATION forming part of Letters Patent No. 702,979, dated June 24, 1902.

Application filed August 15, 1901. Serial No. 72,114. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. MARTIN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Pneumatic Hoists, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to pneumatic hoists wherein the operating fluid-pressure is constantly and freely admitted to one side of the hoist-piston and to the valve or valves controlling the admission, exhaust, and regulation of the fluid-pressure to and from the opposite side of the piston, whereby the movement of the hoist-piston is controlled and the position of the piston maintained.

The present invention embraces a valve formed of two parts, preferably of the oscillatory disk form, mounted together in the same casing and provided with coöperating ports or passages initially set for movement and moved by external means, such as by hand, but otherwise automatically moved and controlled by the air-pressure in the apparatus. By a movement of disk 3 in one direction the air-pressure is admitted to the greater area of the hoist-piston, forcing it in one direction and causing a lowering of the lifting portion of the apparatus, and a movement of the same disk in the opposite direction causing an elevation of the lifting devices. With the aid of the regulating-disk portion 2 of the valve the piston will remain substantially in the position to which it has been moved. By reversing the movement of the primary disk 3 the air from the larger area of the hoist-piston will exhaust to the atmosphere and the piston will raise under the pressure of the constant and freely-admitted pressure on its under side.

In the accompanying drawings, which illustrate a practical embodiment of the invention, Figure 1 is a side elevation of the pneumatic hoist somewhat foreshortened vertically for lack of space and two portions shown in vertical section. Fig. 2 is a vertical central sectional elevation of the same. Fig. 3 is an enlarged sectional elevation of the valve-levers, air-springs, and piston-rod connection. Fig. 4 is a vertical central section of the valve-casing, valves, and connected parts. Fig. 5 is a plan view of a portion of Fig. 3. Figs. 6 to 9, inclusive, are sectional views illustrating the valve in different moved positions. Figs. 10 and 11 are elevations, partly in section, of each of the valves. Fig. 12 is a modified form of the T-shaped lever and its adjacent parts.

Referring to said drawings, Figs. 1 and 2, the cylinder A is provided with upper and lower heads B C, a piston D, having a rod E, passing through a stuffing-box in the lower head, and in this instance having a lifting-hook F, representing a means for attachment to the load to be lifted. The two cylinder-heads and the cylinders are held together by vertical bolts G, an air-pressure-supply pipe H, leading from any suitable source of supply, communicating with the interior of the cylinder A below the piston through a channel *c* in the lower head. The lower head also has a channel *d*, providing a constant free opening from the cylinder to a valve-casing I, from which leads a pipe or conduit J, communicating with the upper end of the cylinder above the piston through a channel *e* in the upper head. The valve-casing also has an exhaust port or passage *f*, headed by a perforated cap *g*. The valve-casing I supports a valve formed of two disks 2 and 3, controlling ports admitting the air-pressure through the pipe J to the upper end of the cylinder and allowing it to exhaust therefrom through the pipe J, port 25, slot 24 in disk 3, port 26 in disk 2, through opening 27 into port 22 to the exhaust *f*. In the position shown in Fig. 4 and corresponding position shown in Fig. 6 the exhaust-passage is closed by the disk 2. The sleeved spindle 4 of the disk 3 is connected to a slotted lever 5, the slot of which is engaged by a pin *h*, carried by one end of a T-shaped lever 6, that is pivotally mounted on a stud 7, fast to a bracket extending from the valve-casing I. The outer ends of said lever are provided with depending connections 8 for hand manipulation.

The horizontally-extending portions of the T-shaped lever 6 are each borne upon by an air-cushion K, tending to hold and return the lever to its normal position, consisting of independent pistons 9, working in cylinders

10 and constantly in communication on one side of the pistons with the air-pressure passing from the hoist-cylinder through the by-passes 11 in the valve-casing. (Shown in Figs. 6, 7, 8, and 9. (After the T-shaped lever, with its connected disk 3, has been rocked in either direction against the pressure of one of the air-cushions by releasing the lever the parts will return to their normal position.

The spindle 1 of the disk 2 within the sleeved spindle 4 is attached to a lever 12, that is connected to one end of a connecting-rod 13, the other end of said rod being connected to a lever 14, that is pivoted to a post 15, depending from the lower cylinder-head *c*. This lever 14 carries a collar 16, having a spring 18 pressing a shoe 17 in frictional contact with the surface of the piston-rod E. (Shown enlarged in Fig. 3.) The connection between the collar 16 and the lever 14 is made by pins 19, projecting from the collar 16 and entering slots in the lever to provide free motion between the collar and lever during the rocking of the latter.

The depending post 15 carries a guide 20, having stop-screws 21 for limiting and governing the extent of rocking of the lever 14 through the movement of the piston-rod, the continued movement of said piston-rod sliding through the collar 16 and passing the shoe 17.

The disk 3 has a cavity 22 made concentric with its axis of oscillation for establishing pressure communication in one position, Fig. 8, between the pipe J and exhaust *f* when it is desired to raise the hoist-piston. It also has a notch or recess 23, which when registered with the port 25 in the valve-casing, leading to the pipe J, will allow the fluid-pressure to pass to the upper end of the cylinder, as shown in Fig. 7, to cause the downward movement of the hoist-piston. It furthermore has a narrow slot-opening 24, (shown in Figs. 4, 6, 8, and 9,) arranged so that when the disk 2 has been moved by the movement of the piston-rod to register with the port 25 and recess 26 in said disk 2, and also in turn registers with a port 27 in the disk 3, the recess 22 is opened to the exhaust to admit small quantities of the fluid-pressure from the upper end of the cylinder for holding or regulating the position of the piston and its load, as shown in Fig. 9.

In operation to lower the hoist-piston the lever 6 is rocked by hand from the normal closed positions of the disks or valves (shown in Fig. 6) to the position shown in Fig. 7, thereby rocking the disk 3 and allowing the passage of fluid-pressure from the pressure-supply to the upper end of the cylinder above the piston. In this position of the disk 3 the port 23 registers with the opening 25 in the casing into pipe J, which permits the air to pass to and act upon the upper side of the piston to force it downward. Immediately upon the movement of the disk 3 to the position shown in Fig. 7 the governing-disk 2 is also moved in an opposite direction by means of the friction-collar 16 upon the piston-rod E through the interposed lever 14, connecting-rod 13, and valve-arm 12. The adjustable guide 20 limits the movement of the lever 14, and consequently the valve movement, and the piston-rod in its continued movement is permitted to slide through the friction-collar 16.

In the operation of this hoist the piston and its connected load are automatically maintained at the desired elevation through the instrumentality of the disk 2 regardless of any leakage of air, that would cause the piston to settle. This result is effected through the devices connecting the disk with the friction-collar 16 on the piston-rod, whereby when the disk is brought into the position shown in Fig. 7 a slight amount of air is permitted to escape from the upper side of the piston through pipe J, slot 24 in disk 3, channel 26 in disk 2, opening 27 and channel 22 in disk 3, and through the passage *f* to the atmosphere. This slight relief causes the piston to rise to its normal elevation. To move the piston, with its load, upwardly, the lever 6 is rocked in the opposite direction, as in Fig. 8, placing the recess 22 of the disk 3 in register with the pipe J and exhaust *f* to allow the exhaust of the fluid-pressure from the upper end of the cylinder and above the piston to the atmosphere. When the lever 6 is released, it automatically returns to its normal position, as shown in Fig. 6, moving the disk 3 to shut off further exhaust of fluid-pressure and in closing admission thereof to the upper end of the cylinder. When the piston-rod E moves in excess of the needed movement of the lever 14, to move the disk 2, one or the other—the limiting stop-screws 21—will hold the lever in position while the rod slides idly past the friction-shoe 17.

In the modification, Fig. 12, the parts are arranged to operate substantially the same as described. The T-shaped lever 6^a in this instance is shaped with its outwardly-extending arms directed slightly upward, so as to use a shorter rod and to obtain a more direct thrust by the lever on the rods of the air-pistons, and thereby relieving the same of undue binding.

What I claim is—

1. In a fluid-pressure hoist comprising a cylinder, piston and piston-rod a constant fluid-pressure communication to one side of the piston, a communication between both sides of the piston and a double valve device mounted in a single casing for controlling the admission of fluid-pressure to one side of the piston, its exhaust therefrom and automatically regulating the escape of pressure to hold the piston in its moved position, as described.

2. In a fluid-pressure hoist comprising a cylinder, piston and piston-rod, a constant fluid-pressure to one side of the piston, a communication between both sides of the piston and a pair of disk valves mounted in a single casing and provided with coöperating ports con-

trolling admission of the fluid-pressure to the piston, its exhaust therefrom and automatically regulating its escape to maintain the piston in its elevated position, by an independent movement of one of said disks as described.

3. In a fluid-pressure hoist comprising a cylinder, piston and piston-rod, a constant fluid-pressure supply to one side of the piston, a communication between both sides of the piston, a double valve device mounted in a single casing with suitable coöperating ports controlling the admission of the fluid-pressure to one side of the piston, and its exhaust therefrom, a double-armed lever to actuate the valve and fluid-pressure and means for returning the lever to its normal position, as described.

4. In a fluid-pressure hoist comprising a cylinder, piston and piston-rod, a fluid-pressure supply to one side of the piston, valved communication between both sides of the piston for controlling admission of the fluid-pressure to one side of the piston, its exhaust therefrom and automatically regulating its escape to hold the piston in its moved position, a lever frictionally connected to the piston-rod and connected to the valve and a guide for said lever having adjustable stops for limiting the movement of the lever as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE E. MARTIN.

Witnesses:
THOMAS HEWETT,
J. W. RITTER.