No. 804,510. PATENTED NOV. 14, 1905.

H. H. VAUGHAN.

PNEUMATIC HOIST.

APPLICATION FILED NOV. 19, 1902.

2 SHEETS—SHEET 1.

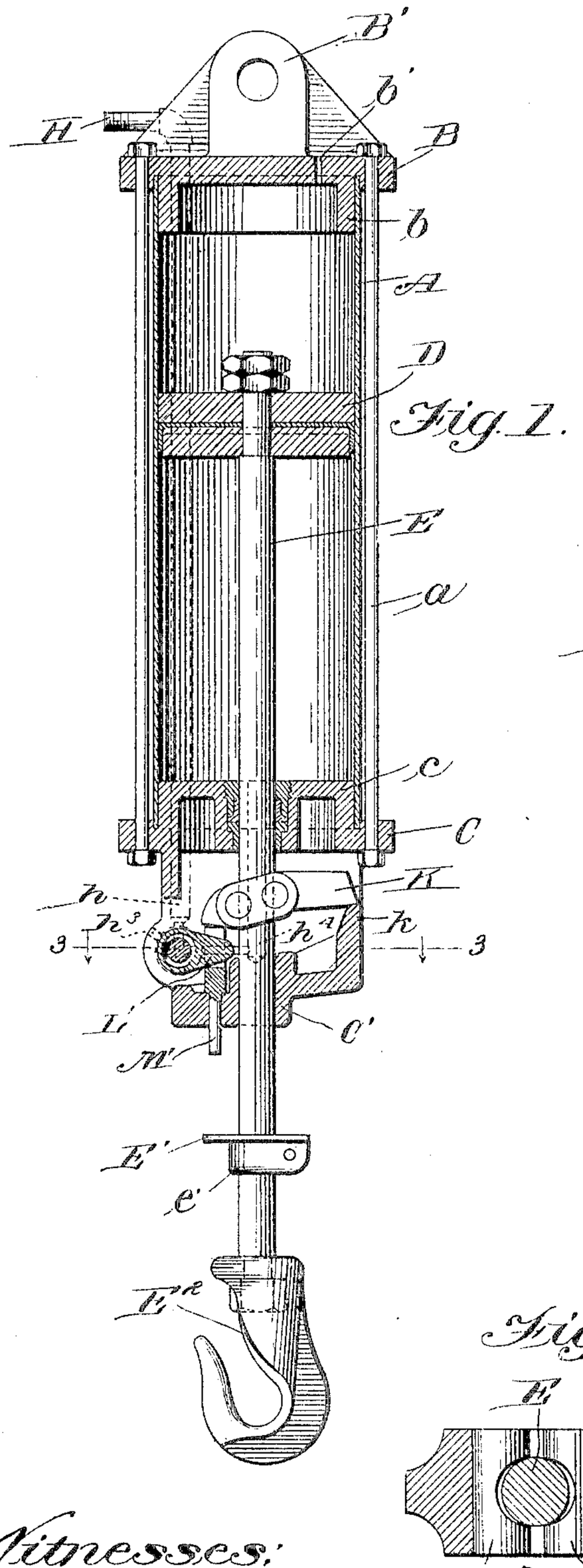

Fig. 1.

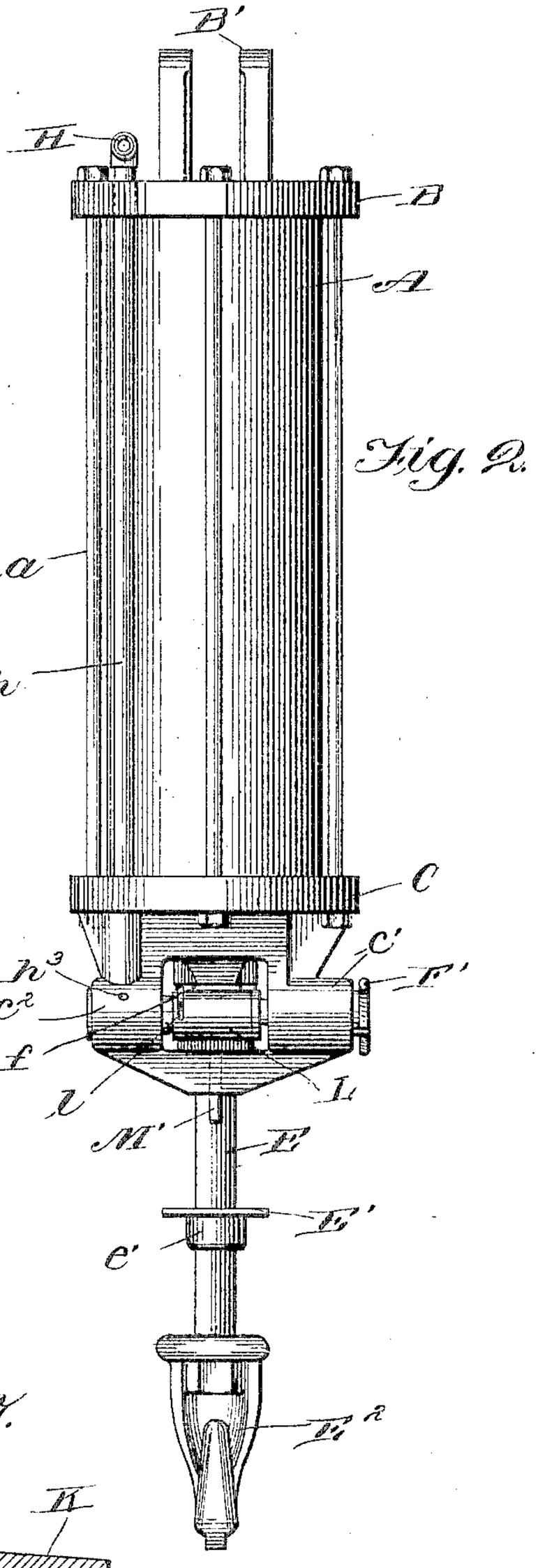

Fig. 2.

Fig. 7.

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2 SHEETS—SHEET 2.

Fig. 3.

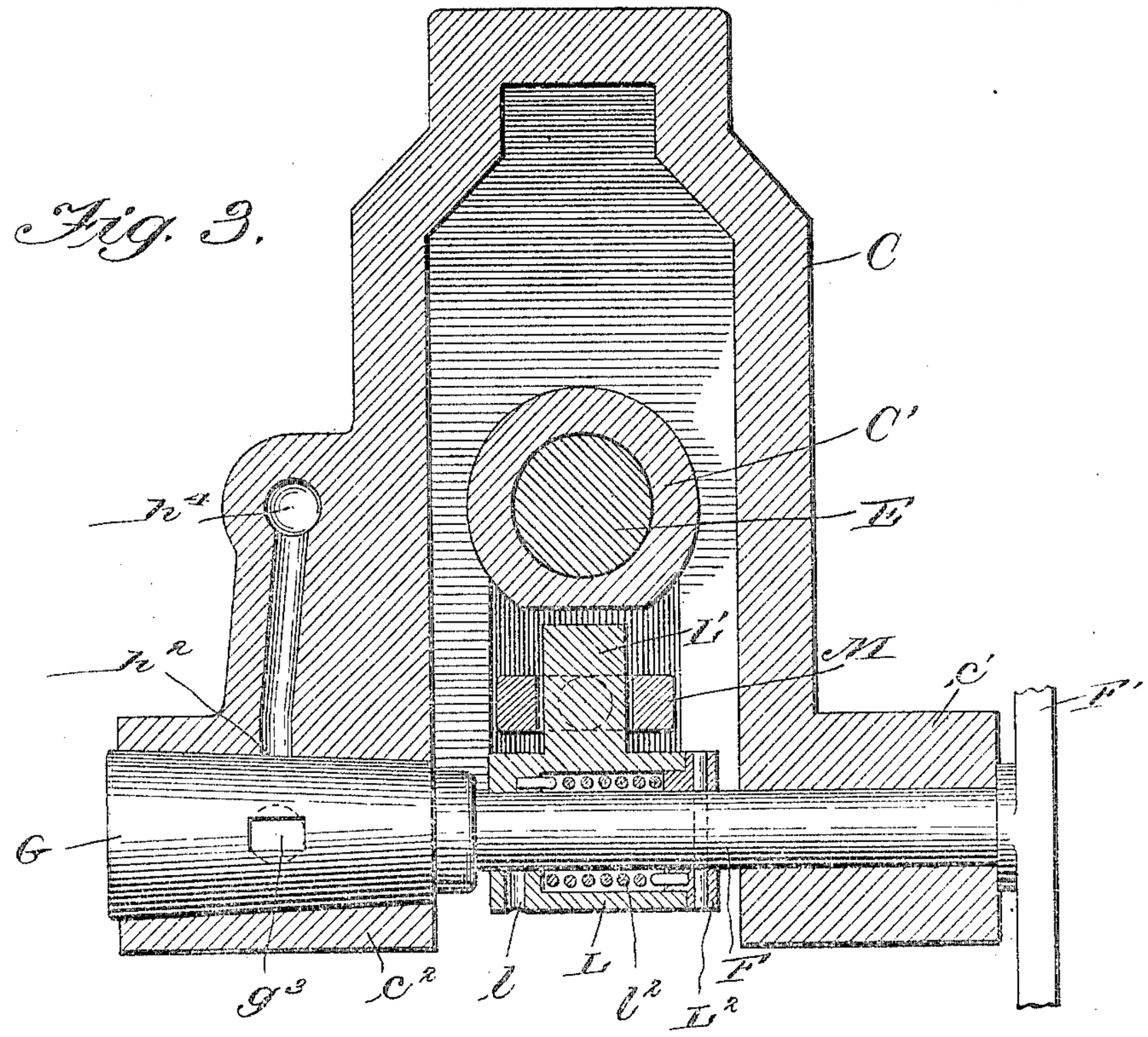


Fig. 4.

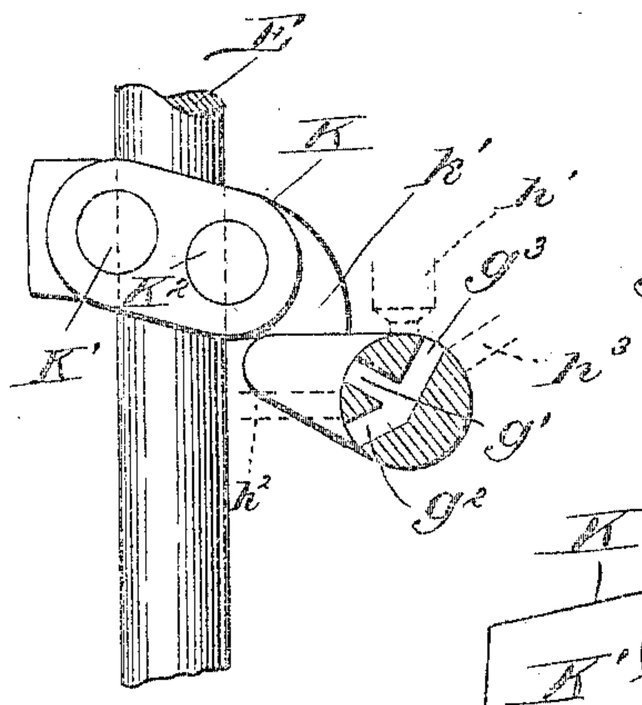


Fig. 5.

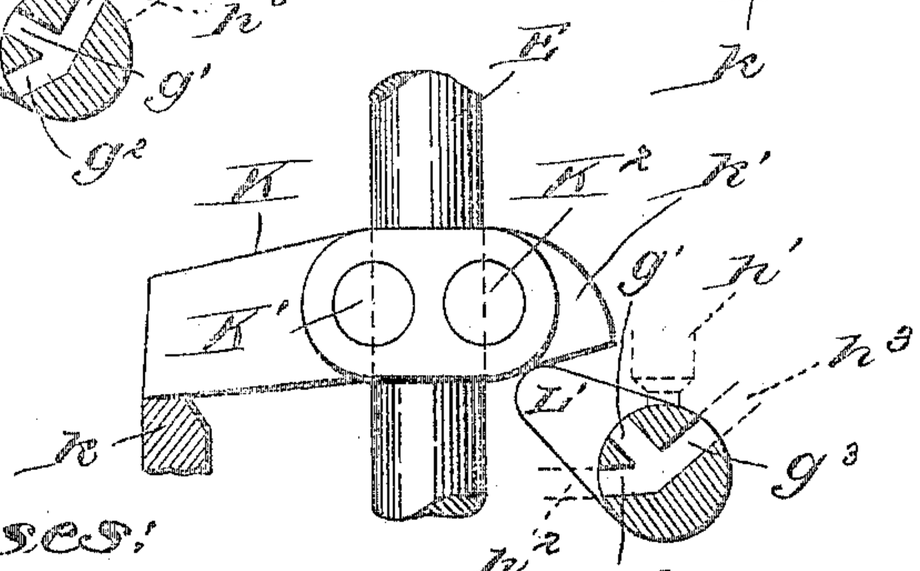
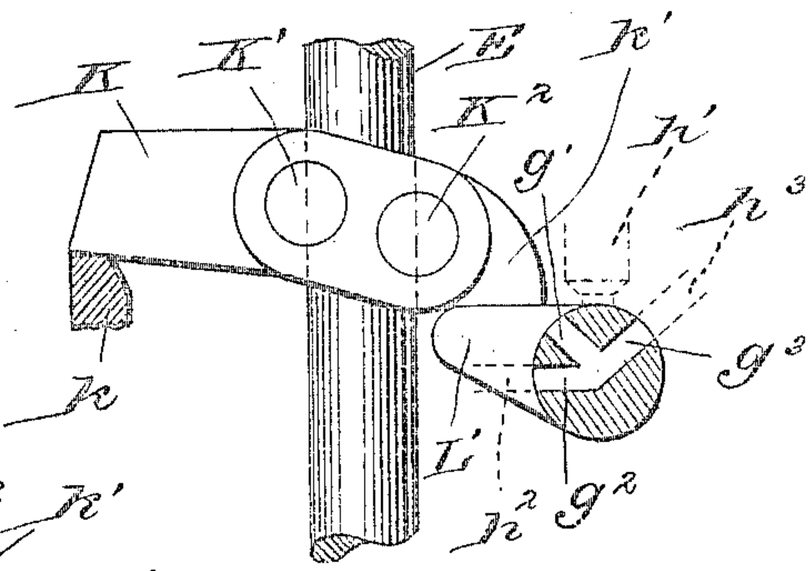


Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY H. VAUGHAN, OF CLEVELAND, OHIO, ASSIGNOR TO RIDGELY AND JOHNSON TOOL COMPANY, A CORPORATION OF ILLINOIS.

PNEUMATIC HOIST.

No. 804,510. Specification of Letters Patent. Patented Nov. 14, 1905.

Application filed November 19, 1902. Serial No. 131,947.

To all whom it may concern:

Be it known that I, HENRY H. VAUGHAN, a citizen of the United States, residing at Cleveland, county of Cuyahoga, State of Ohio, have invented a certain new and useful Improvement in Pneumatic Hoists; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates in general to fluid-pressure-operated lifting apparatus, and more particularly to pneumatic hoists.

In a fluid-pressure-operated mechanism in which a pull or a push is exerted by fluid-pressure medium it is desirable that the mechanism should be retained in position to maintain the push or pull after the fluid-pressure has been disconnected from the motor-cylinder, thereby preventing any release of the strain through condensation of steam or from leakage of compressed air. It is also desirable that the mechanism should be retained in position to maintain the push or pull until the load has either been removed or has been lifted by the readmission of fluid-pressure to the motor-cylinder.

The principal object of my invention is to provide a fluid-pressure-operated lifting apparatus in which the load is automatically sustained after the pressure medium has been disconnected, in which the movement of the lifting apparatus is automatically stopped when a predetermined limit has been reached, and in which the exhaust of the pressure medium only effects the return of the apparatus to its normal position when the strain has been previously relieved either by the removal of the load or the lifting thereof by the readmission of fluid-pressure.

A further object of my invention is to provide an apparatus of the character referred to which will be comparatively simple in construction, inexpensive in manufacture, and efficient in operation.

My invention, briefly described, consists in a motor-cylinder, a piston fitting within the cylinder, automatic means for retaining the piston in any position to which it may be moved by the fluid-pressure, and means for releasing the retaining means only when the load is no longer sustained thereby.

My invention will be more fully described hereinafter with reference to the accompanying drawings, in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is a vertical central section through my improved apparatus; Fig. 2, a front elevational view looking from the left of Fig. 1; Fig. 3, a central sectional view taken on line 3 3 of Fig. 1; Fig. 4, a fragmentary detail view showing the valve in cut-off position; Fig. 5, a view similar to Fig. 4, showing the valve in exhaust position with the retaining device lifted; Fig. 6, a view similar to Figs. 4 and 5, showing the valve in exhaust position and the retaining device in position to support the load; and Fig. 7, a sectional view of the catch-block or dog, which serves as a retaining device.

Similar reference characters are used in the several figures of the drawings to designate similar parts.

Reference-letter A designates a motor-cylinder provided with cylinder-heads B and C.

The top cylinder-head B is provided with a downward annular projection *b*, which fits within the upper end of the cylinder A. A perforation *b'* extends through the head B to permit the free passage of air into and out of the upper end of the cylinder. Perforated lugs B' project upwardly from the cylinder-head B and afford means for supporting the apparatus. A piston D, of any suitable construction, closely engages the interior surface of the cylinder. A piston-rod E is connected at one end to the piston D and extends through a stuffing-box formed through the lower cylinder-head C.

The lower cylinder-head C is provided with an upwardly-projecting portion *c*, which fits within the lower end of the cylinder. The upper and lower cylinder-heads are retained in engagement with the opposite ends of the cylinder by means of rods *a*, which pass through perforations in flanges formed on the cylinder-heads and which project laterally beyond the exterior of the cylinder.

The lower cylinder-head C is provided with a conical valve-seat c^2, within which fits a valve G. A valve-stem F is suitably united

to the valve and projects transversely with respect to the cylinder-head through a bearing c', formed therein. A controlling-lever F′ is connected to the end of the valve-stem F, which projects beyond the bearing c'.

The valve G may be of any suitable construction, but for convenience is shown as provided with three passages g', g^2, and g^3, which extend radially from the outer surface of the valve to a central point, where they unite. The valve-seat c^2 is provided with a series of ports h', h^2, and h^3, with which the passages in the valve are adapted to register. The port h' is formed as a continuation of a pipe h, which at its upper end is connected to a coupling H, which is united to a source of motive-fluid supply. The port h^2 is continued through the lower cylinder-head to a point indicated in Fig. 3, where it unites with a passage h^4, which extends vertically upward through the cylinder-head, so as to communicate with the lower interior end of the cylinder-head. The port h^3 is an exhaust-port.

Mounted within a chamber formed in the lower cylinder-head C is a dog or catch-block K, one end of which is fulcrumed at k upon a wall of the lower cylinder-head. The dog is provided with a vertical opening through which the piston-rod E passes. At each side of the piston-rod opening in the catch-block or dog is a transverse cylindrical opening, in which is journaled a cylindrical block provided with a circular recess which forms a continuation of the vertical opening through the dog surrounding the piston-rod.

Reference characters K′ and K² indicate the transverse cylindrical blocks journaled within openings through the dog K. The distance between the recesses in the blocks K′ and K² is sufficient to permit the reciprocation therethrough of the piston-rod when the dog is in horizontal position, as indicated in Fig. 5. When, however, the dog occupies an incline position with respect to the piston-rod, as indicated in Figs. 4 and 6, the blocks K′ and K² grip the opposite sides of the piston-rod and prevent the downward movement thereof.

Surrounding the valve-stem F between the valve-seat c^2 and the bearing c' is a sleeve L, within which is located a coil-spring l^2, encircling the valve-stem. One end of the spring l^2 is secured to the sleeve L, while the opposite end of the coil-spring is secured to a collar L², which surrounds and is rigidly secured to the valve-stem. The collar L² is provided with a reduced portion which extends within the sleeve L, as clearly shown in Fig. 3. The sleeve L is provided with a radial slot l, through which extends a pin f, rigidly secured to the valve-stem F. A short lever L′ is secured to and preferably formed integrally with the sleeve L and projects radially with respect thereto.

A pin M′ loosely fits within an opening through the bottom wall C′ of the lower cylinder-head C at a point vertically beneath the short lever L′. The upper end of the pin M′ is bifurcated to form prongs M, between which the lever L′ loosely fits.

A collar e' surrounds and is secured to the piston-rod E at a point below the lower cylinder-head. A flange E′ is formed integral with the collar e' and projects outwardly to a point vertically beneath the pin M′.

A hook E² or any other suitable means is secured to the lower end of the piston-rod to engage the load which is to be lifted.

The operation of my improved lifting apparatus, which will be readily understood from the foregoing description, is as follows: The hook E² is engaged with the article which is to be lifted, after which the lever F′ is rotated from a horizontal position to a slightly-inclined position, such as indicated in Fig. 2, thereby rotating the valve G through the valve-stem F interposed between the lever F′ and the valve into position to connect the source of fluid-pressure with the interior of the cylinder beneath the piston. The fluid-pressure passes from the coupling H through the pipe h to the port h' in the valve-seat c^2, through the passages g^3 and g' in the valve, thence through the port h^2 to the passage h^4, leading through the lower cylinder-head C′ into the cylinder A. The fluid-pressure is exerted upon the under surface of the piston D and forces the same upwardly within the cylinder, thereby elevating the object supported by the hook E². When the object has been elevated the desired distance, the lever F′ is oscillated to a horizontal position, thereby turning the valve to cut off the further flow of the pressure medium to the cylinder. The position of the valve is then such as indicated in Fig. 4—that is, the passages g' and g^3 have moved out of register with the ports h^2 and h', leading, respectively, to the interior of the cylinder and from the motive-fluid supply. If the valve is not turned to cut-off position by the operation of the lever F′ before the stroke of the piston has brought the flange E′ into engagement with the pin M′, the valve will be automatically turned by the contact of the said flange E′ with said pin to cut-off position through the elevation of the lever L′ by the pin M′. The collar e' may be located at any desired point on the piston-rod, thereby determining the maximum stroke of the piston. It will be noted by reference to Fig. 1 that the upper bifurcated end of the pin M′ engages the dog K, so that the elevation of the pin M′ by the flange E′ lifts the dog, thereby disengaging the same from the piston-rod prior to the rotation of the valve to cut-off position. Consequently when the valve is further turned by hand to exhaust position the piston is free to descend. Whenever the valve is turned to cut-off position

through the operation of the lever F′, the downward movement of the piston is prevented by the dog K through the cylindrical blocks K′ and K², journaled therein. The slightest downward movement of the piston-rod E causes the same to be gripped between the blocks through recesses in which the piston-rod passes, as shown in Fig. 7.

When it is desired to permit the fluid-pressure to exhaust from the cylinder and also to release the dog K from its engagement with the piston-rod E, the lever F′ is oscillated from its horizontal position, so as to turn the valve G to exhaust position, as indicated in Fig. 5, at which time the passage h^2, leading from the cylinder, registers with the port g^2 in the valve, while the exhaust-port h^3 registers with the passage g^3 in the valve.

The movement of the valve to release position swings the lever L′ upwardly into the position shown in Fig. 5, thereby elevating the dog K to a horizontal position, so that the piston-rod E may pass freely between the catch-block K′ and K². The tension of the spring l', which connects the sleeve L, and consequently the lever L′, to the valve-stem F, is such that the dog K will only be elevated when there is no strain thereon. It is consequently necessary to readmit pressure into the cylinder in order to relieve the strain on the dog K, and thereby permit the latter to be elevated to the position shown in Fig. 5 by means of the lever L′, the object of this construction being to avoid the release of the piston by the dog unless fluid-pressure has been admitted to the cylinder to sustain the load supported by the hook E² and prevent the load from falling and injuring the apparatus. In Fig. 6 the valve is shown as rotated to exhaust position without elevating the dog into position to release the piston-rod. The lever L′ is prevented from rising from the position indicated in Fig. 4 to that indicated in Fig. 5 owing to the loads sustained by the dog, while the valve is permitted to rotate to exhaust position owing to the yielding spring connection between the valve-stem and the sleeve L. When the valve moves without coincidently moving the lever L′, the pin f' moves within the slot l in the sleeve L from the position shown in Fig. 2 to a position in which the pin engages the lower end of the slot.

From the foregoing description it will be observed that I have invented an improved fluid-pressure-operated lifting apparatus in which the load is automatically supported after the fluid-pressure source has been disconnected from the cylinder, in which the load continues to be sustained until the strain on the retaining-dog has been relieved, and in which the admission of fluid-pressure to the cylinder is automatically discontinued when the load has been elevated a predetermined distance.

While I have described, more or less precisely, the details of construction, I do not wish to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit of my invention.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a fluid-pressure lifting apparatus, the combination with a cylinder, of a piston therein, a piston-rod adapted to support a load, automatic mechanism for directly engaging and retaining the piston-rod in any position to which it may be moved by the fluid-pressure.

2. In a fluid-pressure lifting apparatus, the combination with a cylinder, of a piston therein, a piston-rod adapted to support a load, a valve controlling the admission and exhaust of fluid-pressure, mechanical means for engaging and directly retaining the piston-rod against retrograde movement, and operative connections between said means and said valve.

3. In a fluid-pressure lifting apparatus, the combination with a cylinder, of a piston therein, a piston-rod adapted to support a load, a valve controlling the admission and exhaust of fluid-pressure, a dog adapted to engage the piston-rod and thereby support the load, a connection between said dog and valve whereby when the valve is in position to exhaust fluid-pressure from the cylinder the dog is disengaged from the piston-rod and when the valve is in cut-off position the dog locks the piston-rod against retrograde movement.

4. In a fluid-pressure lifting apparatus, the combination with a cylinder, of a piston therein, a piston-rod adapted to support a load, a valve controlling the admission and exhaust of fluid-pressure, a dog adapted to engage the piston-rod and thereby support the load, a yielding connection between said dog and valve whereby when the valve is moved to release position the dog will be disengaged from the piston-rod only when the load is sustained by fluid-pressure said connection yielding when the load is supported by the dog thereby permitting the valve to move to release position without disengaging the dog from the piston-rod.

5. In a fluid-pressure lifting apparatus, the combination with a cylinder, of a piston therein, a piston-rod adapted to support a load, a valve controlling the admission and exhaust of fluid-pressure, a valve-stem secured to said valve having a radial projection thereon, a movable yoke supported adjacent to but disconnected from said radial projection, a tripping device rigidly secured to the piston-rod and carried therewith into engagement with said yoke to move said yoke into contact with

said projection, thereby moving the valve to cut-off position through rotation of the valve-stem.

6. In a fluid-pressure lifting apparatus, the combination with a cylinder, of a piston therein, a piston-rod adapted to support a load, a valve controlling the admission and exhaust of fluid-pressure, a dog adapted to engage the piston-rod and thereby support the load, a valve-stem secured to said valve, a lever yieldingly connected to said stem and adapted when the valve is moved to cut-off position to lift said dog and disengage the same from the piston-rod only when the load is supported by fluid-pressure.

7. In a fluid-pressure lifting apparatus, the combination with a cylinder, of a piston therein, a piston-rod adapted to support a load, a valve controlling the admission and exhaust of fluid-pressure, a dog adapted to engage the piston-rod and thereby support the load, a valve-stem secured to said valve, a lever yieldingly connected to said stem and adapted when the valve is moved to cut-off position to lift said dog and disengage the same from the piston-rod only when the load is supported by fluid-pressure, a movable yoke supported adjacent to said lever, a tripping device secured to the piston-rod and adapted to move the yoke into contact with said lever thereby moving the valve to cut-off position through the rotation of the valve-stem.

In testimony whereof I sign this specification in the presence of two witnesses.

HENRY H. VAUGHAN.

Witnesses:

PAUL C. CADY,

ERNEST C. BOWER.