No. 693,517. Patented Feb. 18, 1902.

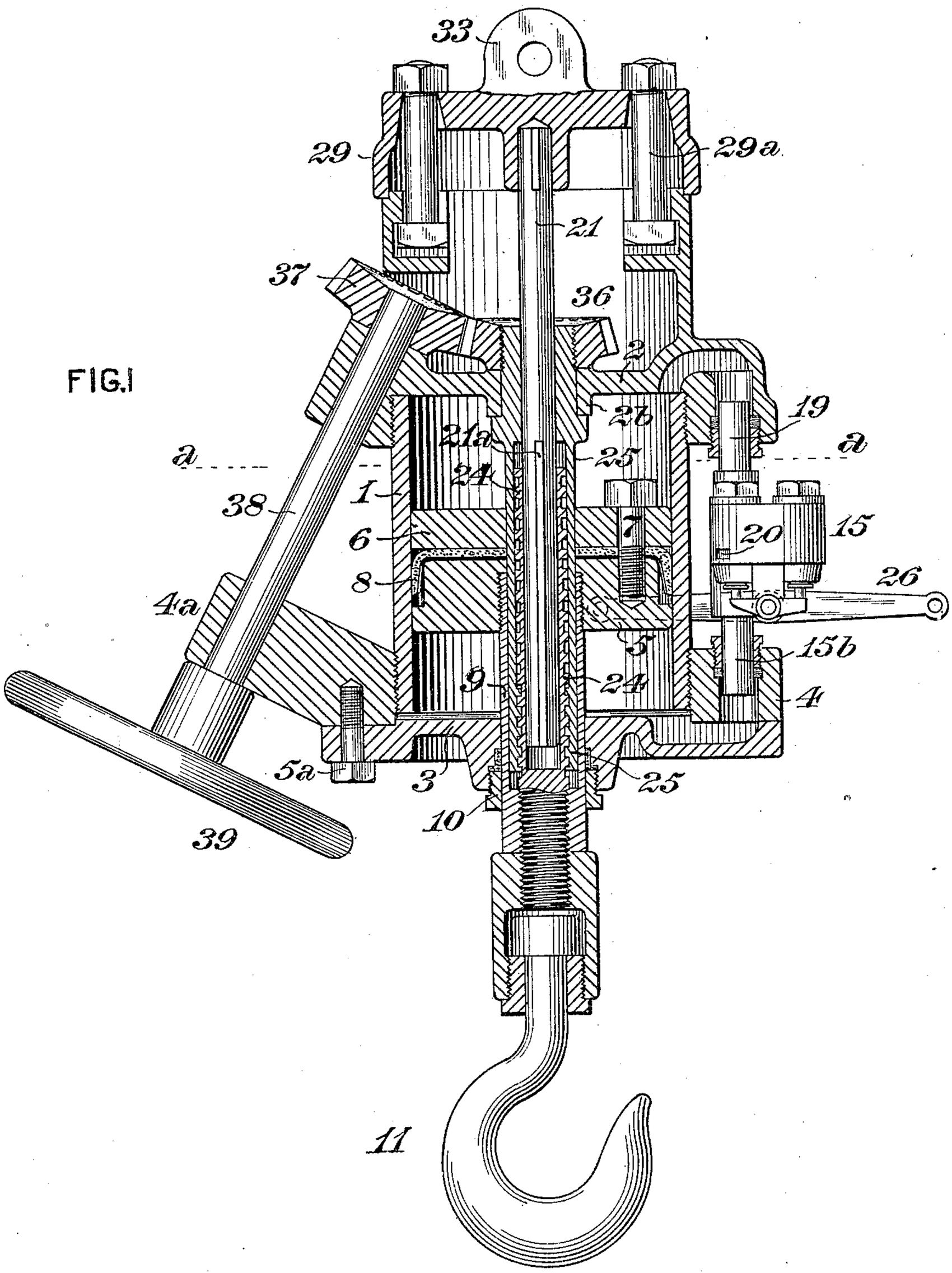
W. S. HALSEY.

PNEUMATIC HOIST.

(Application filed Nov. 13, 1901.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1



WITNESSES:

James C. Herron.
S. R. Bell.

INVENTOR,

William S. Halsey.
by Howson & Sell
Att'y.

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FIG. 2

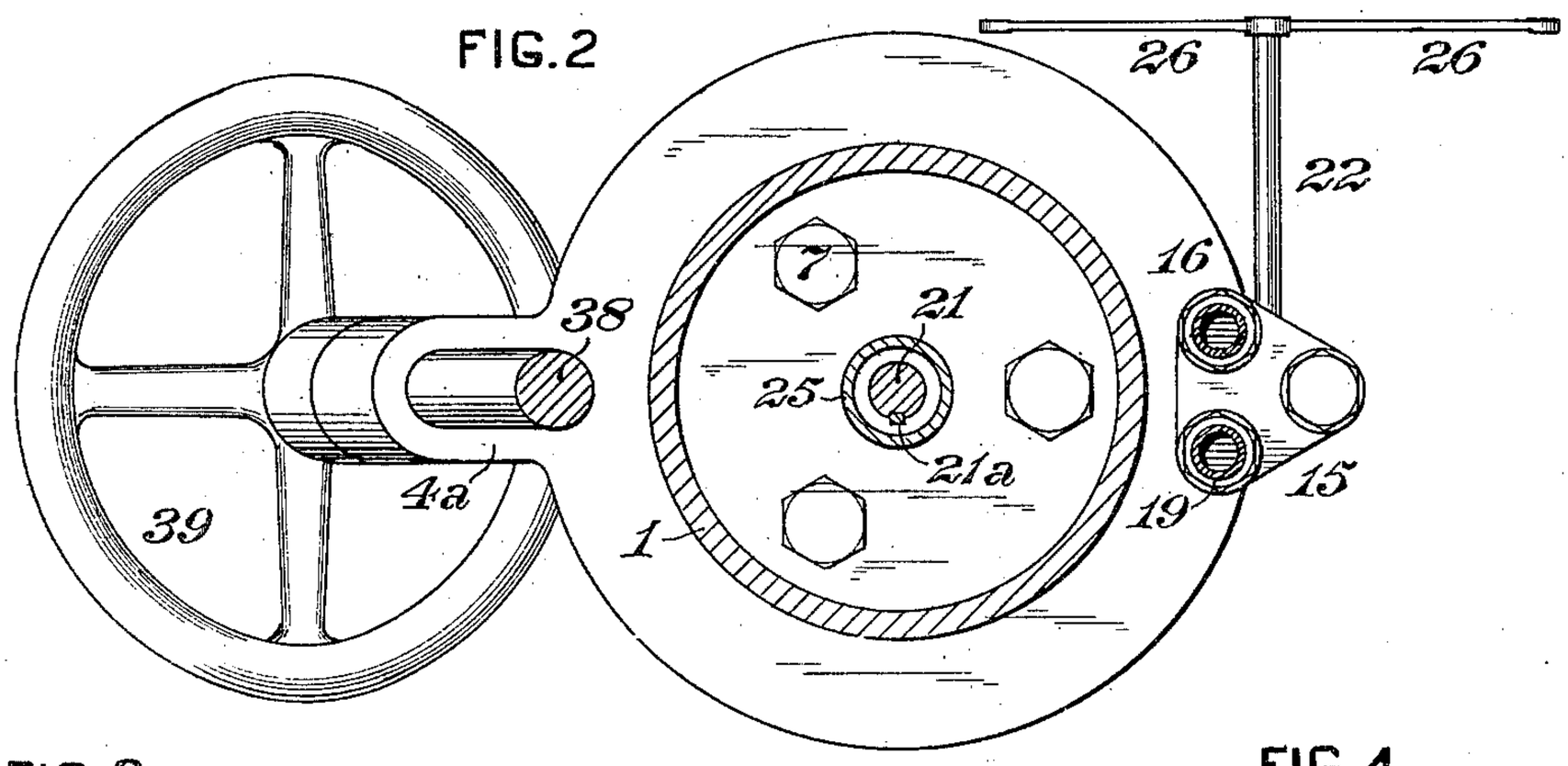


FIG. 3

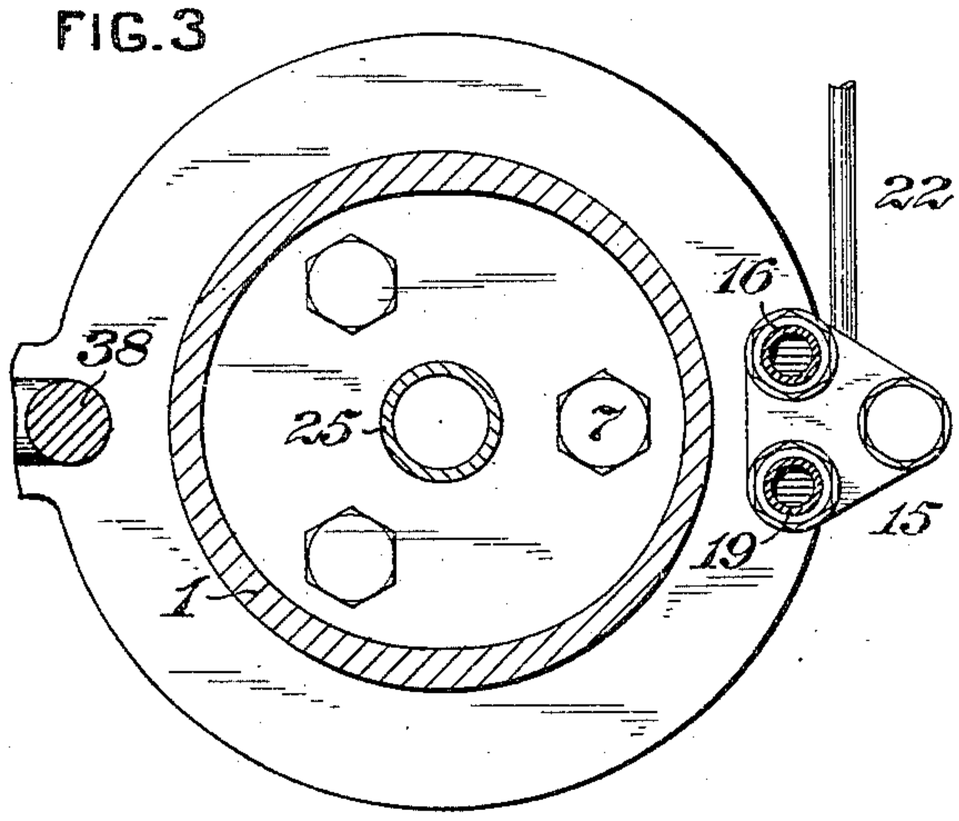


FIG. 4

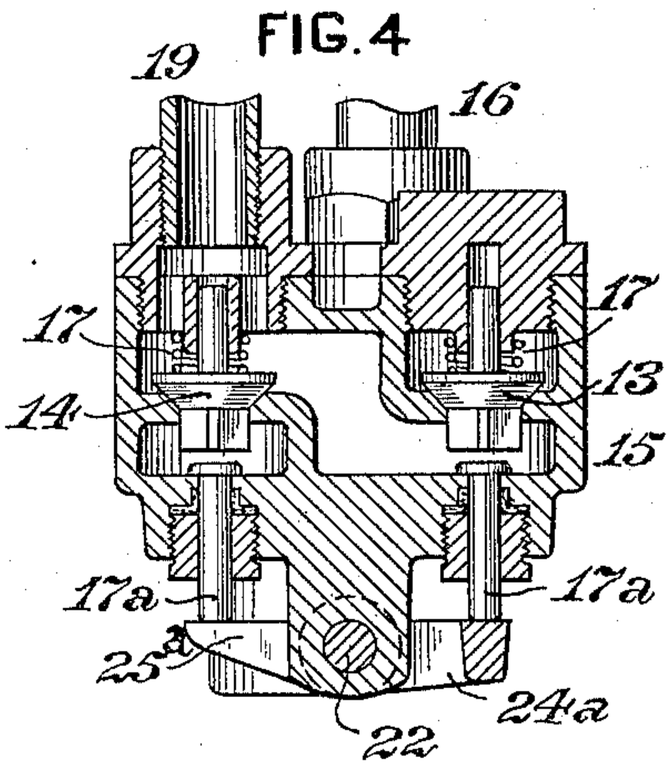


FIG. 5

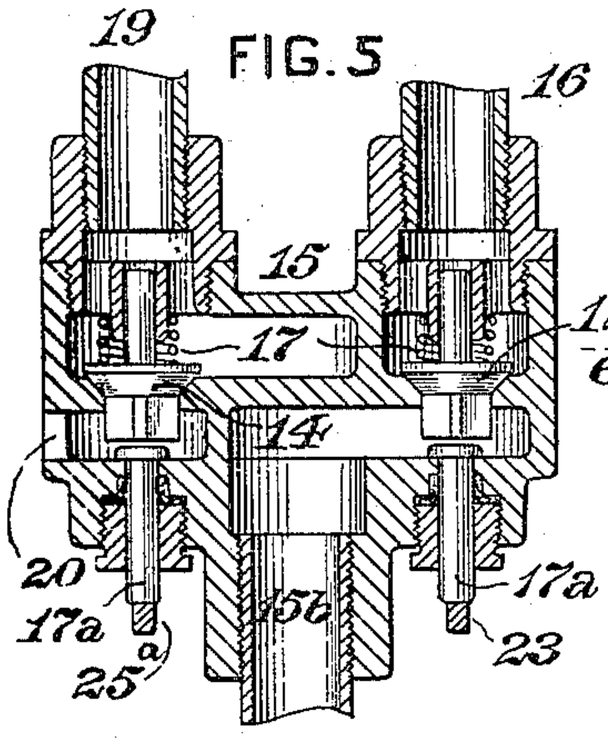


FIG. 6

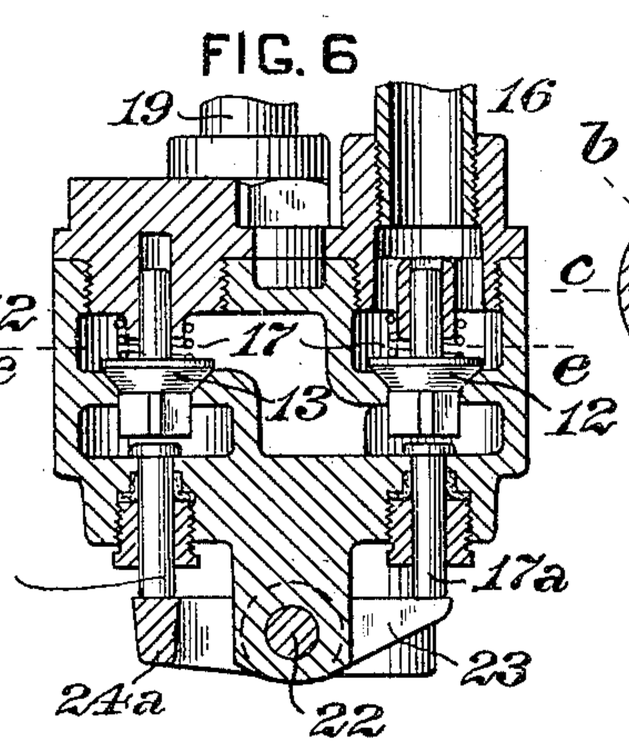
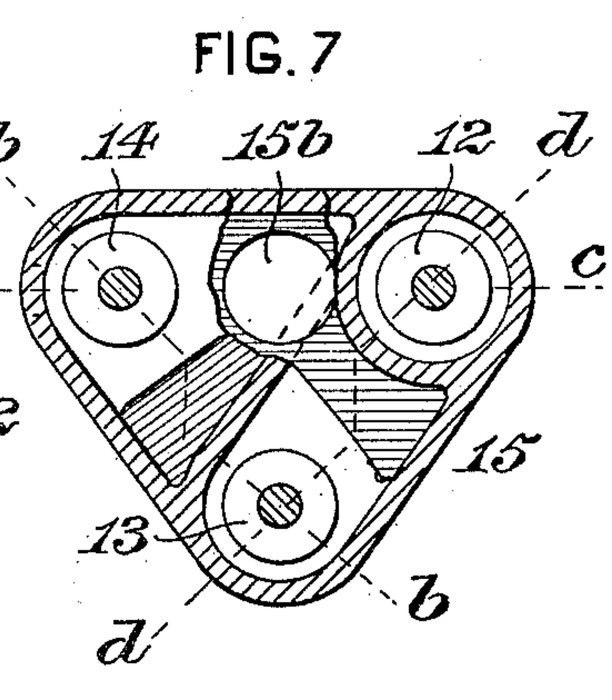


FIG. 7



WITNESSES:

James C. Herron.

S. R. Bell.

INVENTOR,

William S. Halsey

by J. Howden Dell,

Att'y.

UNITED STATES PATENT OFFICE.

WILLIAM S. HALSEY, OF PITTSBURG, PENNSYLVANIA.

PNEUMATIC HOIST.

SPECIFICATION forming part of Letters Patent No. 693,517, dated February 18, 1902.

Application filed November 13, 1901. Serial No. 82,105. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. HALSEY, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Pneumatic Hoists, of which improvement the following is a specification.

My present invention relates generally to direct-acting hoists the pistons of which are actuated by fluid under pressure, and more particularly to those of the type which is exemplified in Letters Patent of the United States No. 679,421, granted and issued to me under date of July 30, 1901; and the object of my invention is to provide simple and effective means for manually controlling the speed of the regulating-screw, and consequently of the piston and attached load.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through a pneumatic hoist, illustrating an embodiment of my invention; Fig. 2, a horizontal section through the same on the line *a a* of Fig. 1; Fig. 3, a similar section illustrating a modification in the means for preventing rotation of the piston; Figs. 4, 5, and 6, vertical sections, on an enlarged scale, through the valve-chest on the lines *b b*, *c c*, and *d d*, respectively, of Fig. 7; and Fig. 7, a horizontal section through the same on the line *e e* of Fig. 6.

In the practice of my invention I provide, as in Letters Patent No. 679,421 aforesaid, a cylinder 1, which is closed by a top head 2 and a bottom head 3, the latter being shown as connected by bolts 5^a to a ring 4, which surrounds and is suitably secured to the lower end of the cylinder. The cylinder is fitted with a piston, which in this instance is shown as composed of a head 5 and a follower 6, which are connected by bolts 7, a suitable packing, as a cup-leather 8, being interposed between the head and follower. A tubular piston-rod 9, connected at its upper end to the piston-head 5, passes through the bottom head 3, leakage being prevented by a suitable stuffing-box 10 in said head, and carries on its lower end a hook 11 for the attachment of the load which is to be carried by the hoist.

A valve-chest 15 is suitably supported adjacent to the cylinder 1, in the instance shown by means of a pipe 19, through which it communicates at its top with the upper end of the cylinder, and by a pipe 15^b, through which it communicates at its bottom with the lower end of the cylinder. The valve-chest also communicates at its top, through a fluid-pressure-supply pipe 16, with a pump, reservoir, or other source of fluid-pressure supply. Communication between the supply-pipe 16 and the lower end of the cylinder is controlled by a supply-valve 12, which is normally held downwardly on its seat on a partition in the valve-chest by fluid-pressure in the supply-pipe. Communication between the upper and lower ends of the cylinder is controlled by an equilibrium-valve 13, seated on a partition in the valve-chest, and communication between the upper end of the cylinder and an atmospheric exhaust-port 20 in the valve-chest is controlled by an exhaust-valve 14, seated on a partition in the valve-chest.

The several valves are preferably held normally to their seats by springs 17, in addition to the pressure of fluid on their upper sides, and are seated and unseated in the sequence and relation required in the operation of the hoist by means of an operating-shaft 22, which is journaled in a bearing depending from the lower side of the valve-chest and carries oppositely-projecting lever-arms 26, to which are coupled suitable downwardly-extending operating connections or pendants. Stems or lifter-rods 17^a are fitted to move vertically in guides in the bottom of the valve-chest 15, in line axially with the valves 12, 13, and 14, said lifter-rods passing through suitable stuffing-boxes in the valve-chest, each serving when raised to unseat the valve in line with which it is located. A cam or lifting-toe 23 is fixed upon the operating-shaft 22 and projects therefrom below the lifter-rod of the supply-valve 12, in position to raise said rod and unseat the supply-valve when the shaft is turned in its bearing by a downward pull upon the lever-arm 26, which projects to the right in Fig. 1. A similar cam 25^a is secured to and projects from the shaft 22 in position to simultaneously raise the lifter-rod of the exhaust-valve 14 and unseat said valve in and by the movement of the shaft 22, which

unseats the supply-valve. A cam 24ª projects in opposite direction from the shaft 22, in position to raise the lifter-rod of the equilibrium-valve 13 when the shaft 22 is turned in its bearing in opposite direction to that above specified—that is to say, by a downward pull upon the lever-arm 26, which projects to the left in Fig. 1. Under the above construction, consequently, the supply and exhaust valves are coincidently unseated while the equilibrium-valve remains seated, and vice versa.

A tubular nut 25 of coarse pitch fits freely in the tubular piston-rod 9 and passes through the piston-head and follower and is journaled to rotate in a bearing 2ᵇ in the upper cylinder-head 2. A bevel-pinion 36, fixed upon the upper end of the nut 25, engages a corresponding pinion 37 on an inclined shaft 38, which is journaled in bearings 2ᶜ and 4ª on the upper cylinder-head and the lower ring 4 of the cylinder, respectively, and carries on its lower end a hand-wheel 39, through which the speed of rotation of the nut 25 may be controlled through the pinions 37 and 36. A regulating-screw 24, which is secured at its lower end to the tubular piston-rod 9, fits within and engages the thread of the nut 25. A removable cap 29, which is provided with a suitable eye 33, through which a connection may be passed for suspending the hoist in operative location, is secured to the top 2 of the cylinder by bolts 29ª.

It will be seen that as the regulating-screw is connected to the piston-rod and piston it is essential that the latter should be prevented from rotating in the cylinder. To this end a rod 21 may be secured to the cap 29 of the top cylinder-head, said rod extending downwardly through the tubular nut 25 and into the regulating-screw 24 and being provided with a longitudinal key or feather 21ª, which engages a corresponding keyway or groove in the regulating-screw. The same end may be attained by boring out the cylinder elliptically and providing a correspondingly-formed piston, as shown in Fig. 3. Either or both of the above means for preventing rotation of the piston may be adopted, in the discretion of those skilled in the art to which my invention relates.

In operation, when it is desired to lift a load the operator unseats the supply-valve 12, thereby admitting fluid under pressure from a compressor, accumulator, or other source of supply, through the supply-pipe 16, the valve-chest 15, and the port controlled by the supply-valve 12, to the cylinder-space below the piston, said fluid by its pressure upon the piston elevating the latter and the load attached to the hook 11. The exhaust-valve 14 being, as above described, coincidently unseated there will be only atmospheric pressure above the piston, the cylinder-space above the piston being put into communication with the exhaust-port 20 through the pipe 19 and the port controlled by the valve 12. The operator at the same time takes hold of the hand-wheel 39 for the purpose of controlling the speed of rotation of the nut 25 of the regulating-screw through the gears 36 and 37 and the shaft 38. The piston being, as before described, prevented from rotating, its upward movement will, through the connected and coincidently upward-moving regulating-screw 24, impart rotation to the nut 25, the speed of which will be controlled by the operator through the hand-wheel 39 and intermediate members. When a load is to be lowered, the operator unseats the equilibrium-valve 13 and coincidently seats the supply and exhaust valves, whereupon fluid passes from the lower to the upper side of the piston through the port controlled by the equilibrium-valve and the pipe 19. Equilibrium of fluid-pressure per square inch on opposite sides of the piston will thereby be established, and the piston and attached load will be caused to descend by gravity, as well as by the preponderance of fluid-pressure acting on the upper side of the piston throughout an area equal to the sectional area of the piston-rod. The speed of the piston and load is controlled by the operator, who rotates the hand-wheel 39 at the rate desired, and the lowering of the load is effected steadily and without jerks through his control of the rotation of the nut and the induced longitudinal traverse of the regulating-screw. In lowering, as in raising, the load may be held suspended at any desired point.

I claim as my invention and desire to secure by Letters Patent—

1. In a pneumatic hoist, the combination of a fluid-pressure cylinder, a piston fitting therein, a rod fixed to said piston and adapted to be connected to a load, means for admitting and releasing fluid to and from the cylinder, a regulating-screw fixed to, and movable longitudinally with, the piston, a nut engaging the regulating-screw and rotatable by the traverse thereof, means for preventing rotation of the piston, and means for controlling the speed of rotation of the nut.

2. In a pneumatic hoist, the combination of a fluid-pressure cylinder, a piston fitting therein, a tubular piston-rod fixed to said piston and projecting through a packed opening in one end of the cylinder, means for admitting and releasing fluid to and from the cylinder, a regulating-screw fixed to the piston-rod, a tubular nut fitting freely in the piston-rod, and surrounding and engaging the thread of the regulating-screw, means for preventing rotation of the piston, and means for controlling the speed of rotation of the nut.

3. In a pneumatic hoist, the combination of a fluid-pressure cylinder, a piston fitting therein, a rod fixed to said piston and adapted to be connected to a load, means for admitting and releasing fluid to and from the cylinder, a regulating-screw fixed to, and movable longitudinally with, the piston, a nut engaging the regulating-screw and rotatable by the traverse thereof, means for preventing rota-

tion of the piston, a manually-operable shaft journaled on the cylinder, and gearing connecting said shaft with the regulating-screw.

4. In a pneumatic hoist, the combination of a fluid-pressure cylinder, a piston fitting therein, a rod fixed to said piston and projecting through a packed opening in one end of the cylinder, means for admitting and releasing fluid to and from the cylinder, a head closing the end of the cylinder opposite that through which the piston-rod passes, a nut journaled in said head and passing freely through the piston, a regulating-screw fixed to the piston and engaging said nut, a shaft journaled laterally on the cylinder, gearing connecting said shaft with the nut, means for manually operating and controlling said shaft, and means for preventing rotation of the piston.

5. In a pneumatic hoist, the combination of a fluid-pressure cylinder, a piston fitting therein, a tubular piston-rod fixed to said piston and projecting through a packed opening in one end of the cylinder, means for admitting and releasing fluid to and from the cylinder, a tubular regulating-screw fixed to the piston-rod, a rod fixed to the cylinder and extending into the bore of the regulating-screw, a key in said rod engaging a keyway in the regulating-screw, a tubular nut fitting freely in the piston-rod, and surrounding and engaging the thread of the regulating-screw, and means for controlling the speed of rotation of said nut.

WILLIAM S. HALSEY.

Witnesses:
J. SNOWDEN BELL,
CLARENCE A. WILLIAMS.