No. 681,853. Patented Sept. 3, 1901

W. S. HALSEY.

PNEUMATIC HOIST.

(Application filed Apr. 5, 1901.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

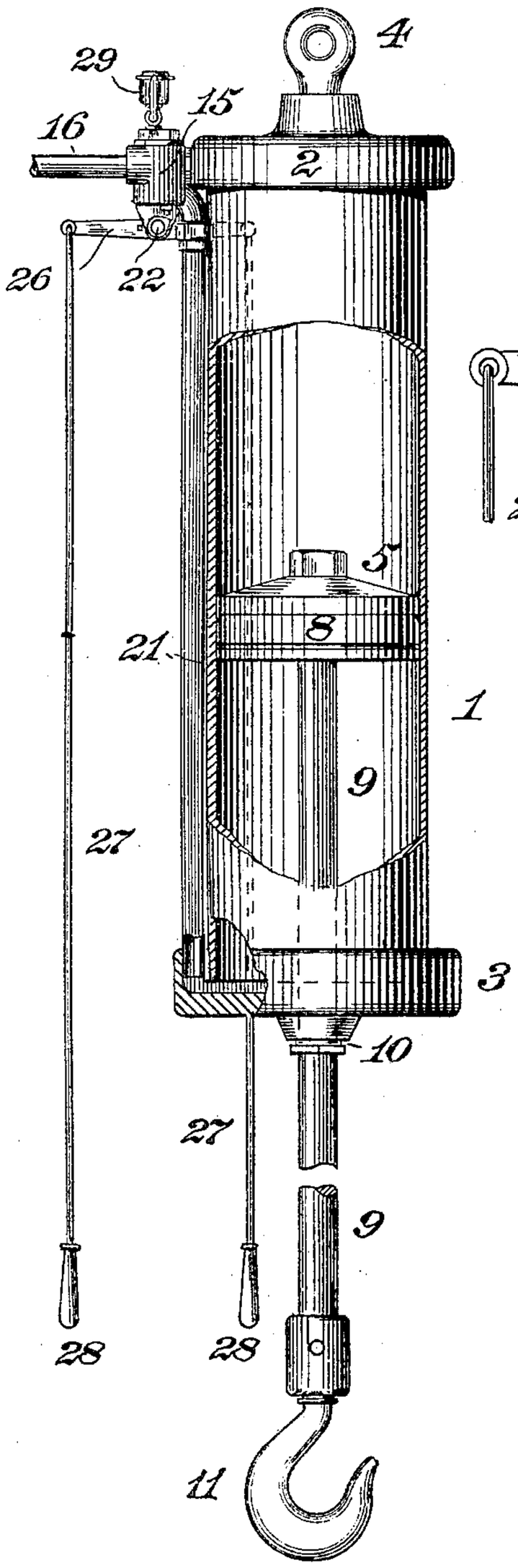

FIG. 3.

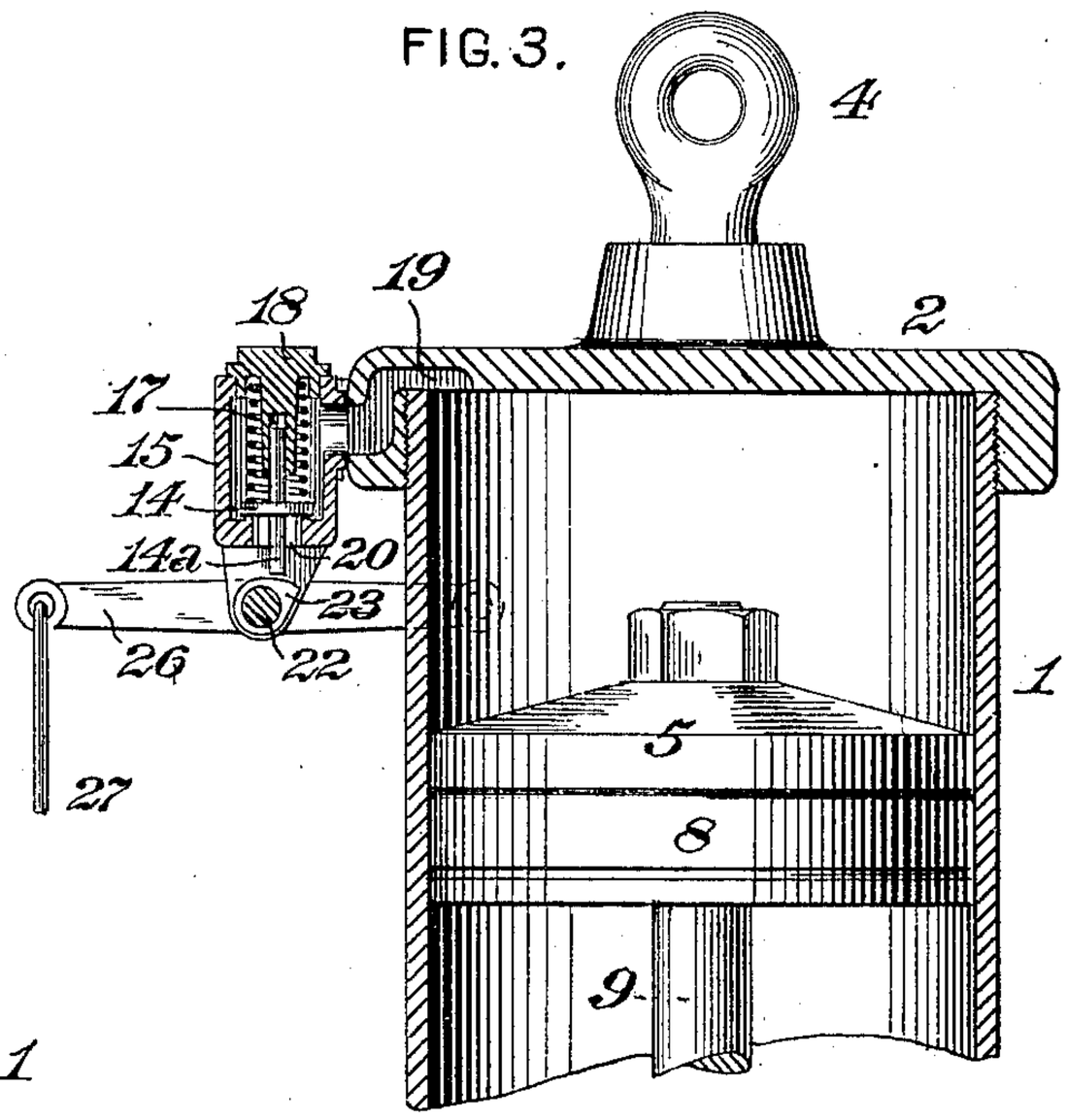

FIG. 2.

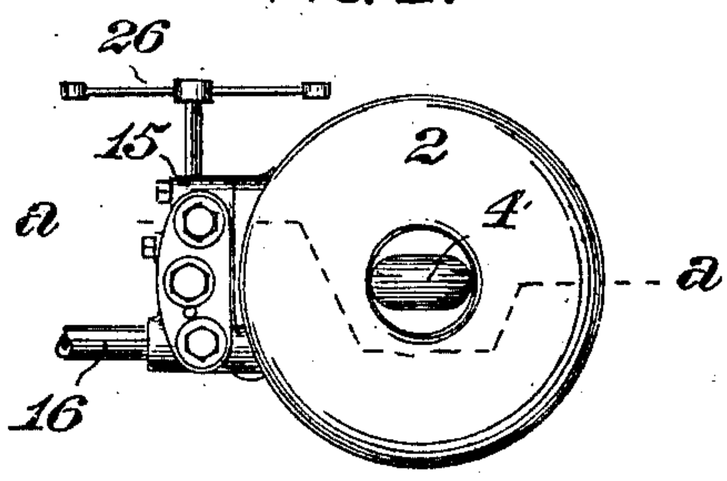

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FIG. 5.

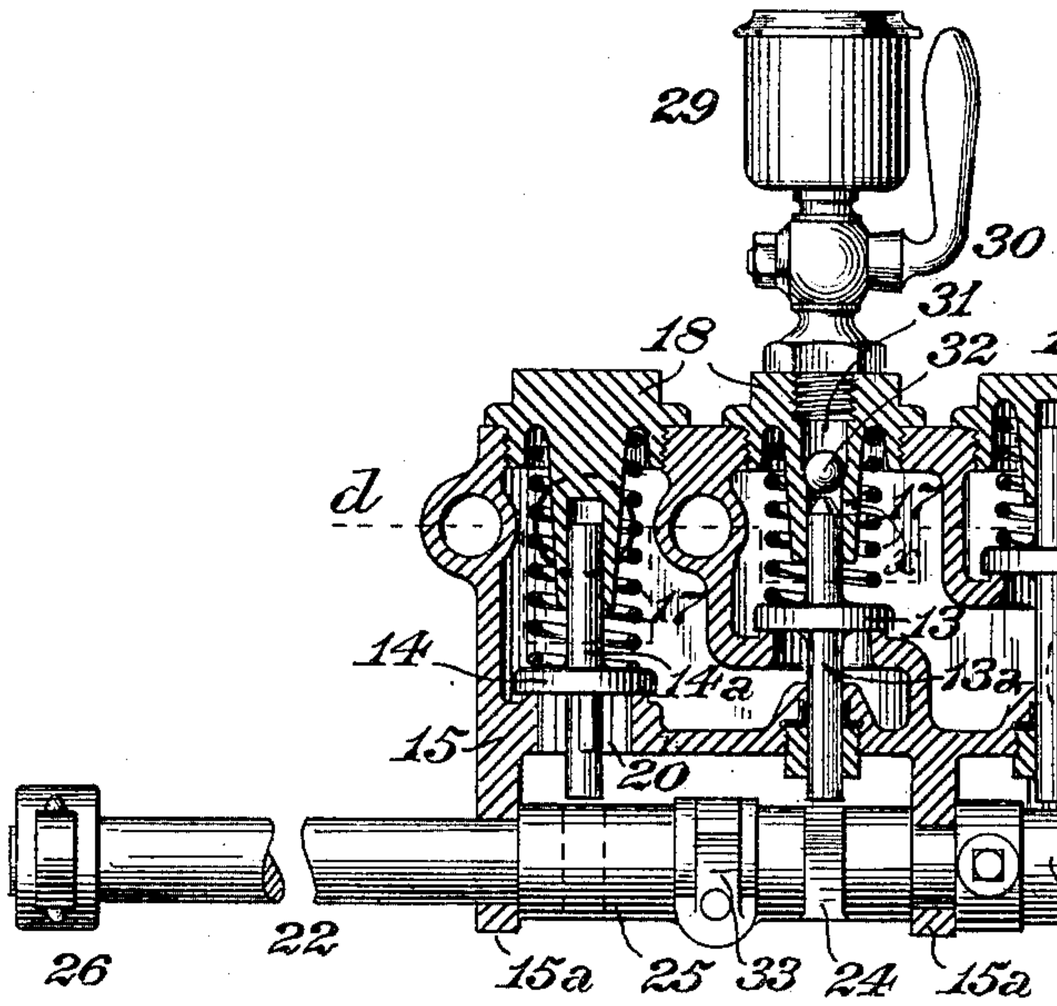


FIG. 6.

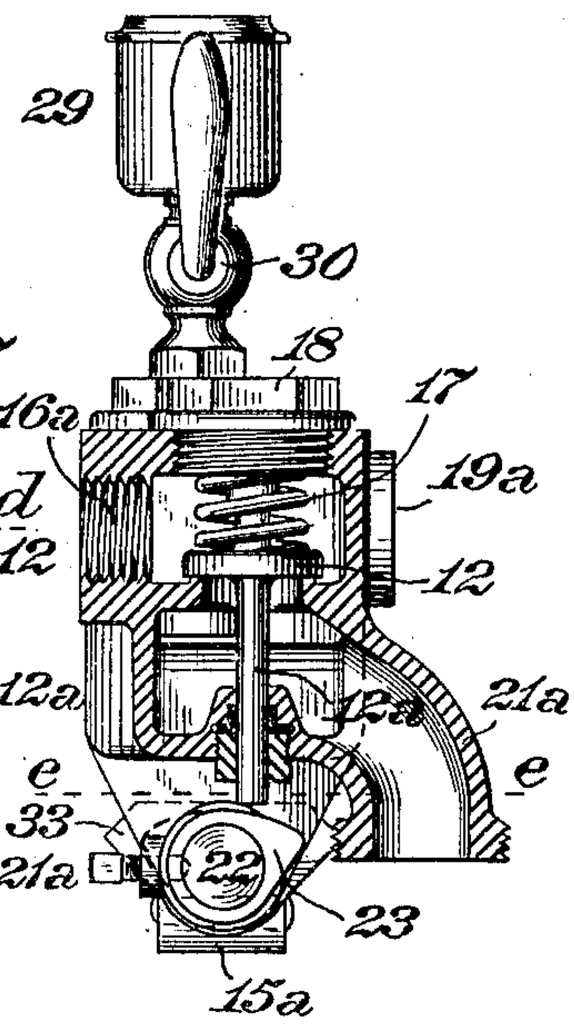


FIG. 7.

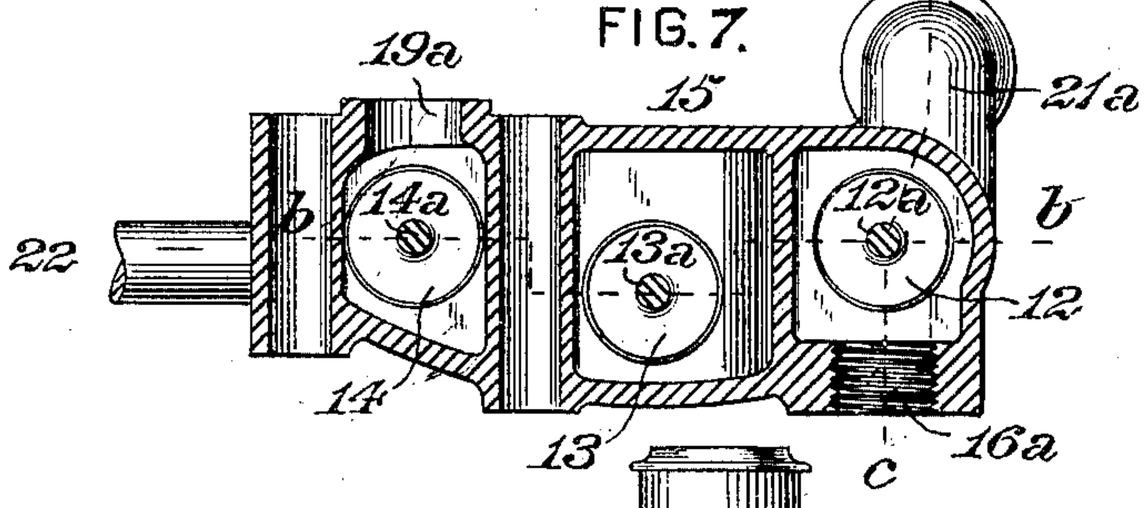


FIG. 4.

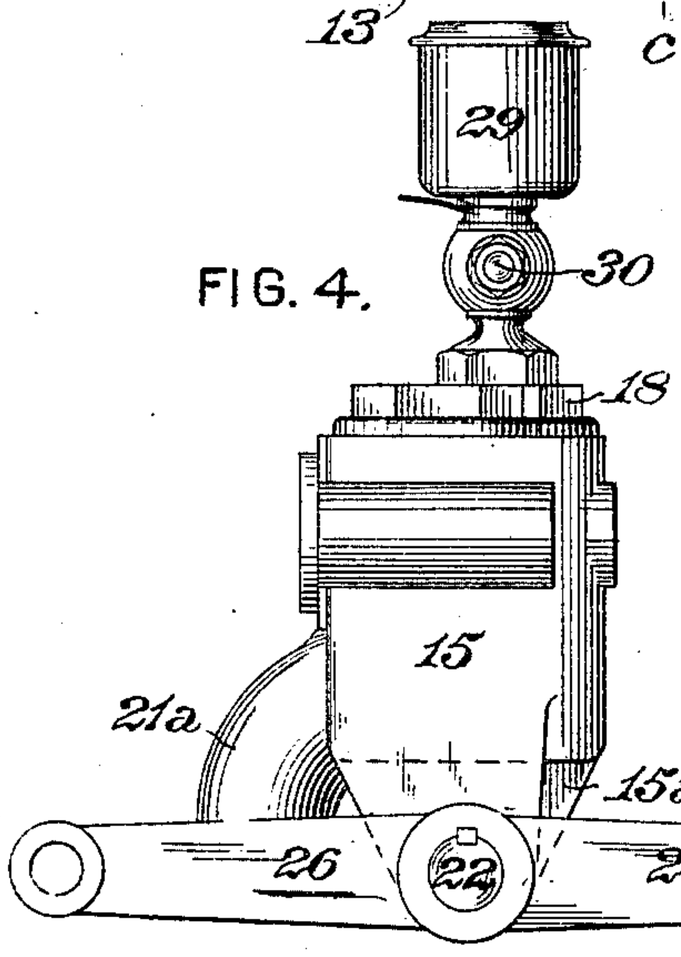
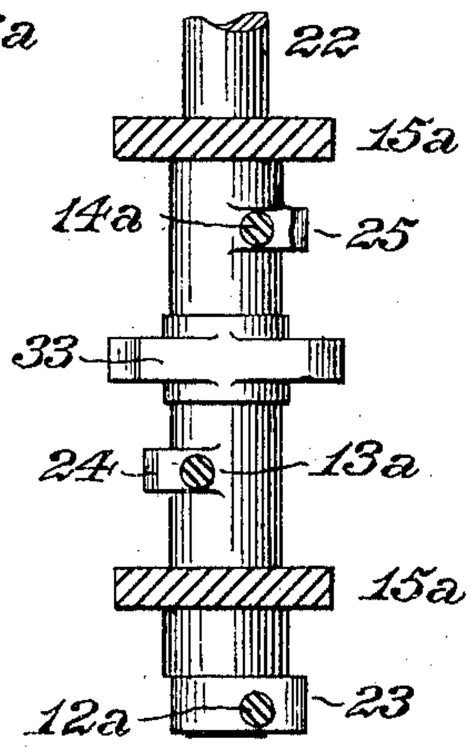


FIG. 8.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC HOIST.

SPECIFICATION forming part of Letters Patent No. 681,853, dated September 3, 1901.

Application filed April 5, 1901. Serial No. 54,512. (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 invention relates to hoists of the class or type in which the piston of the hoisting-cylinder is directly actuated by fluid under pressure; and its object is to provide a hoist of such type which shall be simple, substantial, and inexpensive in construction and shall embody effective and reliable means for economically utilizing motive fluid for preventing sudden and unsteady movements of the piston and for automatically effecting proper lubrication of the cylinder and piston without waste of lubricating material.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a view, partly in elevation and partly in vertical longitudinal central section, of a pneumatic hoist, illustrating an embodiment of my invention; Fig. 2, a plan or top view of the same; Fig. 3, a partial vertical section, on an enlarged scale, on the line *a a* of Fig. 2; Fig. 4, an end view in elevation and on a further enlarged scale of the valve-chest and its accessories; Fig. 5, a vertical longitudinal section through the same on the line *b b* of Fig. 7; Fig. 6, a vertical transverse section on the line *c c* of Fig. 7; Fig. 7, a horizontal section on the line *d d* of Fig. 5; and Fig. 8, a plan view of the valve-operating shaft and its cams, with the valve stems and bearings in horizontal section on the line *e e* of Fig. 6.

In the practice of my invention I provide a cylinder 1, which is closed at its ends by suitably-connected top and bottom heads 2 3 and is fitted with a piston 5, having packing 8 of any preferred type. A piston-rod 9, connected at its upper end to the piston 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 lifted or lowered by the hoist. An eyebolt 4, through which a connection may be passed for suspending the hoist in operative location, is secured to the top cylinder-head 3.

The supply and exhaust of actuating fluid to and from the opposite sides of the piston 5 is controlled by a valve mechanism which is mounted in and on a valve-chest 15, secured to the cylinder 1 adjacent to its upper end. The valve-chest communicates by lateral ports or passages 16^a, 19^a, 21^a, and 20 with a source of fluid-pressure supply, with the upper end of the cylinder 1, with the lower end of said cylinder, and with the atmosphere, respectively. The port 16^a is connected to a fluid-pressure-supply pipe 16, the port 19^a with a port 19 in the top cylinder-head 2, which leads into the upper end of the cylinder, the port 21^a with a pipe 21, which leads into the lower end of the cylinder, and the exhaust-port 20 may either open directly to the atmosphere, as shown, or be connected with an exhaust-pipe leading to a desired point of discharge. Valves 12, 13, and 14, which are preferably, as shown, of the lift or puppet type, secured upon stems 12^a, 13^a, and 14^a, respectively, which project outwardly through the lower wall of the valve-chest 15, are fitted to seat on proper faces in the valve-chest, the seats of the valves 12 and 13 being on partitions therein and that of the valve 14 being on the lower wall of the chest. The valve 12 controls communication between the fluid-pressure-supply port 16^a and the port 21^a, leading to the lower end of the cylinder. The valve 13 controls communication between the upper and lower cylinder-ports 19^a and 21^a, and the valve 14 controls communication between the upper cylinder-port 19^a and the exhaust-port 20. The valve-stems are guided, so as to insure the true seating of the valves, by sockets on the inner sides of screw-caps 18, which close the openings in the valve-chest through which the valves are introduced, and the valves are brought to and normally held on their seats by the pressure acting upon their upper faces, the action of such pressure being preferably supplemented, as shown, by springs 17, which abut against their upper sides and against the caps. The valves 12, 13, and 14 are unseated in the sequence and relation required in the operation of the hoist by means of an operating-shaft 22, which is journaled in bearings 15^a, depending from the lower side of the valve-chest, and carries oppositely-pro-

jecting lever-arms 26, to which are coupled operating connections or pendants 27, having handles 28 on their lower ends. The valve-stem 13^a is set on one side of the vertical axial plane of the operating-shaft 22, and the valve-stems 12^a and 14^a are set on the opposite side of said vertical plane. A cam or lifting-toe 24 is fixed upon the shaft 22 and projects therefrom below the valve-stem 13^a in position to raise said stem and the connected valve 13 when the shaft 22 is turned in its bearings by a downward pull upon the right-hand pendant 27 toward the right of Fig. 6. Similar cams or lifting-toes 23 25 are secured upon the shaft 22 and project therefrom in opposite directions to the cam 24 below the valve-stems 12^a and 14^a, respectively, in position to simultaneously raise said stems and the connected valves 12 and 14 when the shaft 22 is turned in its bearings by a downward pull upon the left-hand pendant 27 toward the left of Fig. 6. A cam 33, having arms which project in opposite directions from the shaft 22, is secured thereto, one or the other of said arms being adapted to abut against the bottom of the valve-chest when the shaft has been turned sufficiently far in either direction, the cam 33 acting as a stop to prevent movement of the operating-shaft to an undue or excessive degree.

The hoist is provided with means for enabling the automatic lubrication of the cylinder and piston to be effected during the periods, and only during the periods, in which the upper and lower ends of the cylinder are connected, so that the lubricant may be supplied intermittently to the cylinder and when fluid under pressure is not being admitted thereto, thus preventing wasteful use of lubricant or the blowing out of the same by coincidently entering pressure. To this end the socket of the cap 18 of the valve 13 is extended entirely through the cap and somewhat enlarged at and adjacent to its upper end to form an oil-receptacle 31. An oil-cup 29 of any suitable construction, having its delivery-passage controlled by a cock 30, is connected to the upper end of the oil-receptacle 31, and the lower end of said receptacle is controlled by a valve 32, which is adapted to be unseated by the upper end of the stem 13^a of the valve 13 when said valve is unseated by the operating-shaft 22 and cam 24. When the valve 32 is unseated, oil from the receptacle 31 passes through a side port x in the socket or a longitudinal groove therein, if preferred, into the valve-chest, and is thence carried, by the fluid passing from the lower to the upper end of the cylinder, into the upper end thereof and upon the upper surface of the piston, in the downward traverse of which it effectually lubricates the wall of the cylinder.

In operation, it being desired to lift a load, the left-hand pendant 27 is pulled down by the operator, and the operating-shaft 22 is thereby rocked in its bearings, so as to unseat the valves 14 and 12, which, respectively, open the upper end of the cylinder 1 to the atmosphere and admit fluid under pressure to the lower end of the cylinder. This pressure, acting on the lower side of the piston 5, will elevate it and the load attached to the connected hook 11, the power applied for the purpose being proportionate to the degree of opening imparted to the valves. When the load has been raised to the desired height, the operator releases the pendant, and the valves will thereupon be seated by the pressure acting on their upper faces, supplemented by the action of their springs, and the load will be held suspended during the period that they remain closed. It will be seen that this construction attains the novel and important result of enabling the operator to arrest the movement of the load at any desired point without giving any attention to the position of the valves or to their adjustment, as is required in devices of prior construction, inasmuch as the valves are instantaneously and automatically seated by the release of the pendant by the operator, and there being consequently no exit for the fluid under pressure from the cylinder the load will remain in the position it occupies when the valves are thus automatically seated. When a load is to be lowered, the operator pulls down the right-hand pendant, thereby rocking the operating-shaft 22 in its bearings, so as to unseat the valve 13. Fluid under pressure will then pass from the lower to the upper side of the piston 5 through the pipe 21, port 21^a, chamber above the valve 13, port controlled by the valve 13, chamber above the valve 14, and port 19^a, and an equilibrium of the pressure per square inch of the fluid in the cylinder-spaces on the opposite sides of the piston 5 will be established. The load will then be lowered by the unbalanced pressure acting on the upper side of the piston throughout an area equal to that of the transverse section of the piston-rod. The lowering of the load is effected without waste of air and without jar or sudden movement of the piston by reason of the cylinder-spaces on each side of it being filled with fluid under pressure. The unseating of the valve 13 for lowering a load coincidently unseats the valve 32 and lubricant from the receptacle 31 passes into the valve-chest and is carried by the flow of fluid under pressure through the chest to the upper side of the piston, lubricating the cylinder-wall as the piston descends. It will be seen that the cylinder and piston are thereby automatically lubricated in each and every downward movement of the piston, and that no substantial portion of the lubricant can be driven out of the cylinder by the pressure of motive fluid therein. The durability of the cylinder is thereby materially increased. No attention is required on the part of the operator for lubricating these parts and there is no waste of lubricating material.

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, a fluid-pressure-supply pipe, a fluid-pressure-supply valve controlling communication between the fluid-pressure-supply pipe and one end of the cylinder, an exhaust-valve controlling communication between the other end of the cylinder and an exhaust-passage, an equilibrium-valve controlling communication between the opposite ends of the cylinder, each of said valves being movable toward and from its seat, and being subject to pressure tending to seat it, and means for manually unseating the fluid-pressure-supply valve and exhaust-valve, independently of the equilibrium-valve, and vice versa.

2. 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, a fluid-pressure-supply pipe, a fluid-pressure-supply valve controlling communication between the fluid-pressure-supply pipe and one end of the cylinder, an exhaust-valve controlling communication between the other end of the cylinder and an exhaust-passage, an equilibrium-valve controlling communication between the opposite ends of the cylinder, means for automatically seating said valves, an operating-shaft journaled in bearings transversely to the stems of said valves, cams or lifting-toes projecting from said shaft, in position to abut against and lift the stems of the fluid-pressure-supply and exhaust valves, by movement of the shaft in one direction, and a cam or lifting-toe projecting oppositely from said shaft in position to abut against and lift the stem of the equilibrium-valve, by movement of the shaft in the opposite direction.

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, a fluid-pressure-supply pipe, a fluid-pressure-supply valve controlling communication between the fluid-pressure-supply pipe and one end of the cylinder, an exhaust-valve controlling communication between the other end of the cylinder and an exhaust-passage, an equilibrium-valve controlling communication between the opposite ends of the cylinder, an operating-shaft journaled in bearings transversely to the stems of said valves, cams or lifting-toes projecting from said shaft, in position to abut against and lift the stems of the fluid-pressure-supply and exhaust valves, by movement of the shaft in one direction, a cam or lifting-toe projecting oppositely from said shaft in position to abut against and lift the stem of the equilibrium-valve, by movement of the shaft in the opposite direction, and a stop-cam having arms projecting oppositely from said shaft in position to contact with fixed stops at the limits of circumferential movement of the shaft.

4. 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, a valve controlling the passage of fluid under pressure into one end of the cylinder, an oil-receptacle communicating with the casing of said valve, and a valve governing communication between the oil-receptacle and said casing and adapted to be unseated by said controlling-valve when the latter is unseated.

5. 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, a fluid-pressure-supply pipe, a fluid-pressure-supply valve controlling communication between the fluid-pressure-supply pipe and one end of the cylinder, an exhaust-valve controlling communication between the other end of the cylinder and an exhaust-passage, an equilibrium-valve controlling communication between the opposite ends of the cylinder, means for unseating the fluid-pressure-supply valve and exhaust-valve, independently of the equilibrium-valve, and vice versa, an oil-receptacle, and a valve controlling the flow of lubricant from said receptacle to the cylinder and adapted to be unseated by the equilibrium-valve when the latter is unseated.

6. 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, a fluid-pressure-supply pipe, a fluid-pressure-supply valve controlling communication between the fluid-pressure-supply pipe and one end of the cylinder, an exhaust-valve controlling communication between the other end of the cylinder and an exhaust-passage, an equilibrium-valve controlling communication between the opposite ends of the cylinder, means for unseating the fluid-pressure-supply valve and exhaust-valve, independently of the equilibrium-valve, and vice versa, a tubular cap connected to the casing of the equilibrium-valve and forming an oil-receptacle and a guide for the stem of said valve, and a valve controlling communication between the oil-receptacle and the casing of the equilibrium-valve, and located in position to be unseated by the stem of the equilibrium-valve when said equilibrium-valve is unseated.

7. 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, a fluid-pressure-supply pipe, a fluid-pressure-supply valve controlling communication between the fluid-pressure-supply pipe and one end of the cylinder, an exhaust-valve controlling communication between the other end of the cylinder and an exhaust-passage, an equilibrium-valve controlling communication between the opposite ends of the cylinder, means for automatically

seating said valves, an operating-shaft journaled in bearings transversely to the stems of said valves, cams or lifting-toes projecting from said shaft, in position to abut against and lift the stems of the fluid-pressure-supply and exhaust valves, by movement of the shaft in one direction, a cam or lifting-toe projecting oppositely from said shaft, in position to abut against and lift the stem of the equilibrium-valve, by movement of the shaft in the opposite direction, arms fixed to and projecting oppositely from the shaft, and pendants connected to said arms for effecting the movement of the shaft in either direction from a lower level.

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