

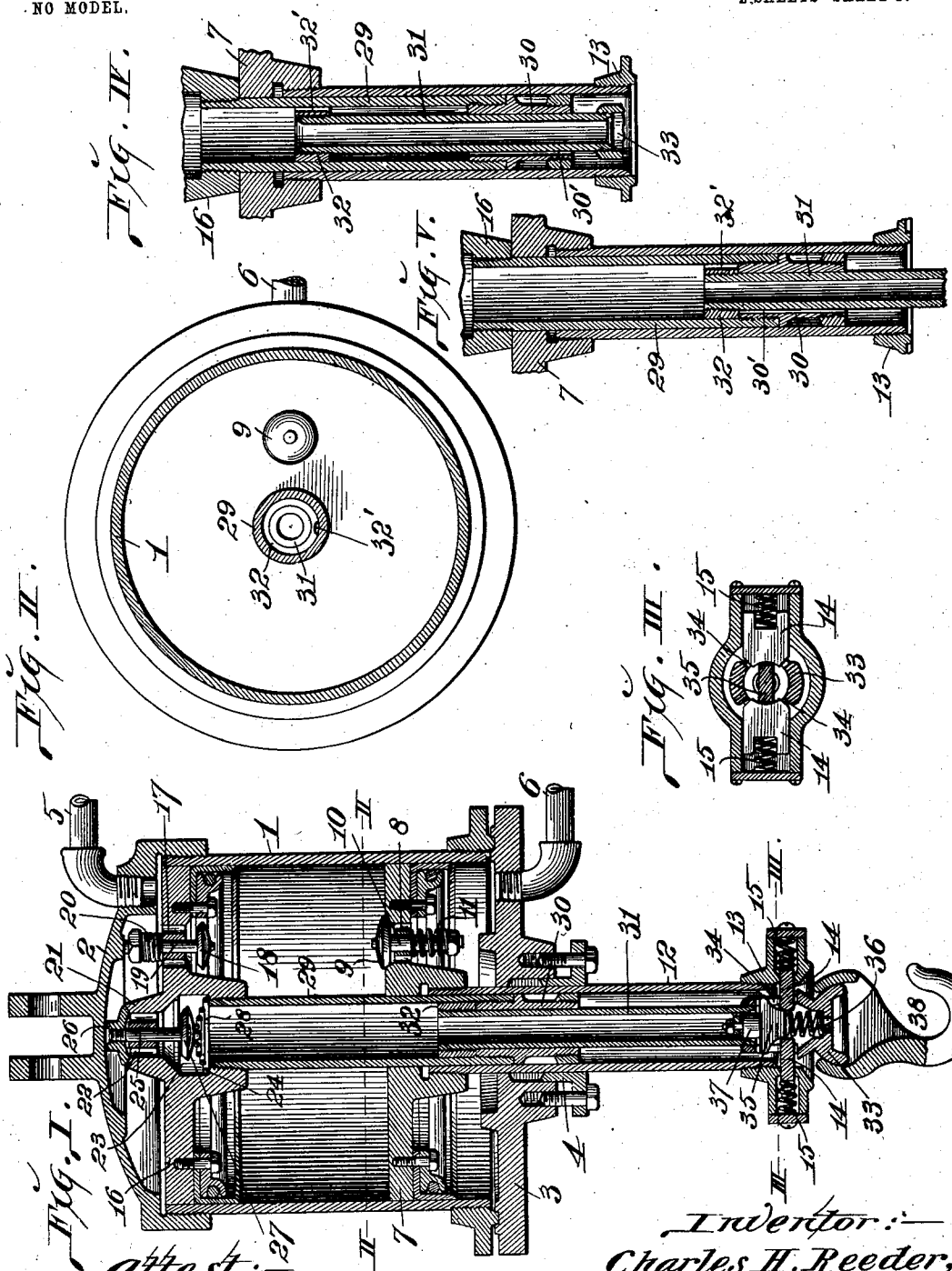
No. 744,611.

PATENTED NOV. 17, 1903.

C. H. REEDER.
PNEUMATIC HOIST.
APPLICATION FILED DEC. 8, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



attest:
W. Smith
S. Knight

Inventor:
Charles H. Reeder;
By Wright & Bro.
attys.

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2 SHEETS—SHEET 2.

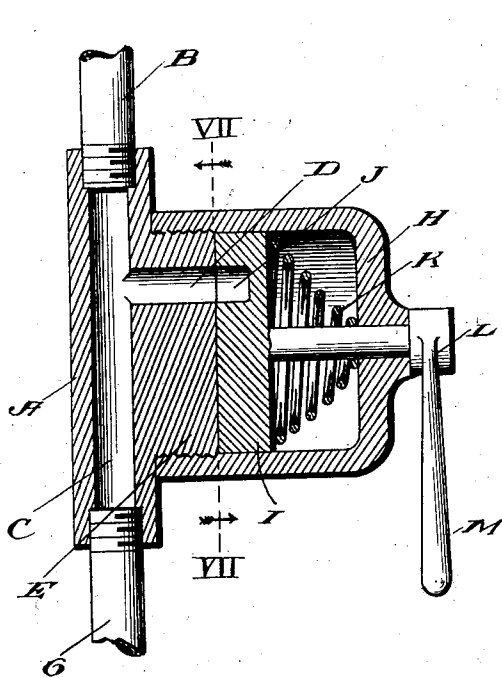


Fig. VI.

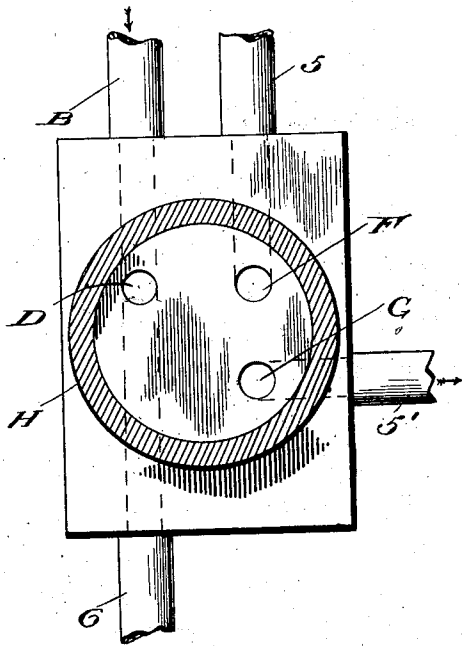


Fig. VII.

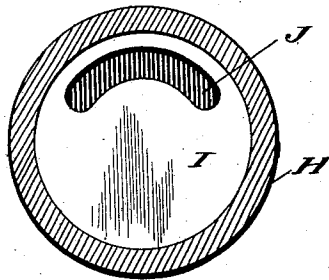


Fig. VIII.

Inventor

C. H. Reeder.

Witnesses

H. V. Simms

By

Knight Bros
Attorneys

UNITED STATES PATENT OFFICE.

CHARLES H. REEDER, OF ST. LOUIS, MISSOURI.

PNEUMATIC HOIST.

SPECIFICATION forming part of Letters Patent No. 744,611, dated November 17, 1903.

Application filed December 8, 1902. Serial No. 134,453. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. REEDER, a citizen of the United States, residing in the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Pneumatic Hoists, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to a hoisting apparatus operated by pressure medium, such as air; and, briefly stated, the invention consists of a cylinder, a pair of reciprocating pistons therein, and telescoping piston-rods connected to said pistons, thus providing a construction in the use of which a long lift is procurable through the travel of one of the pistons first and the other piston secondly; furthermore, a construction in which provision is made for the automatic engaging and disengaging of said piston-rods when the pistons reach the limit of their travel, thereby permitting elongation of the telescoping piston-rods and contraction of their combined telescoped length in the practical operation of the hoist.

The invention consists, further, in details hereinafter described and claimed.

Figure I is a vertical section of my hoist. Fig. II is a horizontal section taken on line II II, Fig. I. Fig. III is a horizontal section taken on line III III, Fig. I. Fig. IV is a vertical section illustrating the positions of the telescoping piston-rods when the pistons are at their upward limit of travel. Fig. V is a similar view to Fig. IV, showing the parts in the positions assumed when the pistons are at their lower limit of travel. Fig. VI is a longitudinal section of a valve suitable for use in controlling the flow of pressure medium to and from my hoist. Fig. VII is a section taken on line VII VII, Fig. VI, looking in the direction of the arrow at the top of said figure. Fig. VIII is a section taken on line VII VII, Fig. VI, looking in the direction of the arrow at the bottom of said figure.

1 designates a cylinder, which is provided with an upper head 2 and a lower head 3, the latter of which bears a stuffing-box 4.

5 designates a pressure-medium pipe leading to the upper cylinder-head 2, designed to be connected to a suitable valve to control the pressure and exhaust to and from said

head. Said valve is intended to be in communication with the source of supply of pressure medium and permits exhaust at a certain period, as will hereinafter appear.

6 designates a pressure-medium pipe leading to the lower cylinder-head 3. This pipe is designed to be connected to a suitable source of supply, such as an air-compressor or pressure-tank, thus establishing constant communication to the lower end of the cylinder 1, this communication being preferably through a corresponding individual passage-way in the valve that controls pressure to the upper end of the cylinder 1.

7 designates a lower piston situated in the cylinder 1 and provided with ports 8, leading therethrough. The ports 8 are controlled by a valve 9, that is positioned above said piston and has a stem 10 extending downwardly through the piston. The valve 9 is normally held to its seat by a spring 11, that surrounds the stem 10.

12 is a tubular piston-rod connected at its upper end to the lower piston 7 and extending downwardly through the lower cylinder-head 3 and stuffing-box 4.

13 is a box connected to the lower end of the tubular piston-rod 12, and 14 are dogs or latches reciprocally positioned in said box and arranged transversely of the piston-rod 12. These dogs are normally held projected into the center of said box by springs 15, situated in chambers contained by said box.

16 designates an upper piston provided with ports 17, that are controlled by a valve 18, which is situated below the piston and is carried by a stem 19, which bears a spring 20, through the medium of which the valve is held to its seat during the travel of the piston 16.

21 is a neck extending upwardly from the center of the piston 16 and provided with ports 22, leading therethrough to a chamber 23 in the piston.

24 is a shoulder at the bottom of the chamber 23.

25 is a valve-stem centrally positioned in the neck 21. The valve-stem carries at its upper end a valve 26, adapted to seat on the neck 21, and at its lower end a valve 27, adapted to seat beneath said neck in the chamber 23. During the travel of the piston 16

the valve 27 is held to its seat by means of the spring 28, resting on the shoulder 24.

29 designates a tubular piston-rod connected to the upper piston 16 and telescopically seated in the lower or outer tubular piston-rod 12 to reciprocate therein.

30 is a sleeve or stuffing-box carried by the upper piston-rod 29 and arranged to operate therewith in the piston-rod 12. This sleeve is provided with a drain-groove 30', that allows leakage of pressure medium through the valve 26 to escape through the sleeve, so as not to disengage the dogs 14 when said dogs are in action.

31 is an auxiliary piston-rod carried by the piston-rod 29 and telescopically seated therein. This auxiliary piston-rod is arranged to operate through the sleeve 30 and the piston-rod 29 and carries at its upper end a collar 32, that is arranged to seat on the upper end of said sleeve at the limit of its individual downward travel. In the collar 32 is a drain-groove 32', offset from the drain-groove 30' in the sleeve 30.

33 designates a swivel carried by the auxiliary piston-rod at its lower end and provided with apertures 34, (see Figs. I and III,) through which the dogs 14 are adapted to pass to hold said swivel and auxiliary piston-rod from movement with respect to the piston-rod 12 of the lower piston.

35 is a wedge-shaped spreader situated in the swivel 33 and normally upheld by a spring 36. The spreader 35 is provided with a piston 37, located in the lower end of the auxiliary piston-rod 31.

38 is a lift-hook carried by the swivel 33 and adapted to receive the object to be lifted by the hoist. When the lift-hook 38 is in lowered position to receive the load to be hoisted, the pistons 7 and 16 are both at their lower limit of travel, the upper piston resting on the lower one and the piston-rods being completely telescoped, as seen in Fig. V, at which time the auxiliary piston-rod 31 hangs mainly extended beneath the lower end of the lower piston-rod 12. When the parts are in the positions stated, the stem of the valve 9 rests against the lower cylinder-head 3 and holds said valve open against the action of the spring 11, thereby permitting the passage of pressure medium through the ports 8 in the lower piston. The pressure medium entering the cylinder through the conveying-pipe 6 is thus permitted to pass through the lower piston 7 and is exerted against the under side of the upper piston 16, the valve 18 of which is at such time closed and held by the spring 20. At this period of the operation of the hoist the pressure medium in the upper portion of the cylinder 1 is being exhausted through the pipe 5 to allow the pressure beneath the upper piston 16 to force said piston upwardly to the top cylinder-head 2, on the approach to which the valve 27 in the chamber 23 is unseated and the valve 26, carried by the same stem that carries the valve 27, is seated

to again close the ports 22 in the piston 16. Shortly after the valve 27 is unseated and a very short interval before the valve 26 becomes seated the valve-stem 19 strikes the upper cylinder-head 2 in the travel of the upper piston, and the pressure medium beneath said piston is permitted to escape through the ports 17 to pass into the pipe 5. The upper piston 16 in its upward travel carries with it the tubular piston-rod 29 and the auxiliary piston-rod 31, the latter of which is lifted by the former, owing to the bearing of the collar 32 against the upper end of the sleeve 30, carried by the piston-rod 29. Just previous to the completion of the upward stroke of the piston 16 the swivel 33 passes between the dogs 14, thereby forcing them outwardly, and after the spreader 35 has passed them they return beneath said spreader into the position seen in Figs. I and III, where they serve as retainers to uphold said auxiliary rod. Where it is desired to obtain increased lift over that acquired by the movement of the upper piston-rod in the manner explained, the lower piston is brought into action to furnish such increased lift as follows: As the upper piston completes its stroke the lower piston-rod 12 telescopes on the upper piston-rod and acts to lift the lower piston 7 a short distance through the engagement of the dogs 14, as explained, and the valve-stem 10 is carried away from the lower cylinder-head 3, thereby permitting the spring 11 to seat the valve 9. The entrance of pressure medium being continued through the conveying-pipe 6, it exerts pressure against the under side of the lower piston and lifts it in the cylinder 1, thereby raising the outer and lower piston-rod 12 and furnishing increased travel of the lift-hook 38 and swivel 33, the latter of which is maintained in engagement with said lower piston-rod through the medium of the dogs 14. To lower the load lifted, the pressure medium existing between the lower piston and the lower cylinder-head is permitted to be forced into and through the conveying-pipe 6 back to the source of supply through the corresponding individual passage-way in the valve that controls the flow of pressure medium from the source of supply. This return through the pipe 6 and valve is entirely independent of the pipe 5, leading to the top of the cylinder 1 and also connected to the controlling-valve referred to. At the same time the pressure medium passes through the pipe 5 into the upper end of the cylinder from the source of supply through a corresponding individual passage-way in the controlling-valve. The medium then passes through the ports 17 in the upper piston and acts against the lower piston to force it downwardly, together with its piston-rod 12, carrying the auxiliary piston-rod 31 therewith. When the lower piston is within a short distance of the bottom of the cylinder 1, the collar 32 of the auxiliary piston-rod seats on the sleeve 30, carried by the upper and inner piston-rod 29, there-

by furnishing initial downward movement of the upper piston 16. At this time the valve 26, controlling the ports 22 in the piston 16, is gradually carried away from its seat by the spring 28 in the chamber 23, and the valve 18 approaches its seat under the action of the spring 20. On the unseating of the valve 26 the pressure medium permitted to enter through the conveying-pipe 5 obtains ingress into the chamber 23 through the ports 22 and passes downwardly through the tubular piston-rod 29 and auxiliary piston-rod 31 to force the piston 37 in said auxiliary piston-rod downwardly. On the downward movement of said piston 37 the spreader 35 is forced between the dogs 14, thereby carrying them out of the apertures in the swivel 33 and permitting the descent of the auxiliary piston-rod 31, the movement of which is influenced by the load suspended from the lift-hook 38. Before the downward movement of said piston 37 takes place, however, the collar 32 at the upper end of the auxiliary piston-rod 31 comes to a seat on the sleeve 30, carried by the upper piston-rod 29, as seen in Fig. V, and closes the drain-groove 30', thereby preventing the passage of pressure medium therethrough to the detriment of action of pressure medium to actuate the dogs 14. As soon as the upper piston has moved a sufficient distance the valves 18 and 27 are carried to their seats under the action of the springs 20 and 28. Shortly after the valves 18 and 27 are seated the lower end of the valve-stem 10 strikes the lower cylinder-head 3, forcing the valve 9 from its seat against the action of the spring 11 to permit completion of the downward movement of the lower piston 7 and allowing the pressure medium in the cylinder 1 between the upper piston 16 and lower piston 7 to be forced through the ports 8 of said lower piston 7 and into the pressure-pipe 6 to return it to the source of supply. The pressure medium entering the upper end of the cylinder is then exerted against the upper piston 16 to force it downwardly in the cylinder 1, carrying its piston-rod 29 and the auxiliary piston-rod therewith and furnishing the extreme elongation of the telescoping piston-rods 12 and 29, said auxiliary piston-rod forming a part of the piston-rod 29, as stated.

In Figs. VI to VIII, inclusive, I have shown a valve of a construction by which the flow of pressure medium may be controlled to the upper and lower end of my hoist-cylinder. This valve consists of a box A, to which an admission or supply pipe B is connected. Extending longitudinally through the box A is a duct C, that leads to the lower cylinder-head pipe 6, to provide constant communication between the admission-pipe and said pipe 6 in the manner hereinbefore referred to. Extending from the duct C is a branch duct D, that leads through a boss E on the valve-box. F is a duct leading through the boss E and the main body of the box to the upper cylinder-head pipe 5. G is a duct leading through the boss and main body of the valve-box to an exhaust-pipe 5'. H is a cap fitted to the valve-box boss and in which is seated a valve-disk I, that bears against the face of said boss and is provided with a channel J at its side which faces said boss. The valve-disk is held to its seat against the boss by a spring K, and it is operated through the medium of a stem L and handle M. By the use of the described valve the pressure medium may flow freely to the lower cylinder-head and into the cylinder from the admission-pipe to and through the valve-duct C and pipe 6, and when the pressure medium is being forced out of the lower part of the cylinder its flow will be reversely through the parts mentioned. When flow to the upper end of the cylinder is to be established, the valve-disk I is moved to provide communication from the duct C and branch duct D through the channel J in said disk and to the duct F, that leads to the pipe 5. When the pressure medium is to be exhausted from the upper end of the cylinder, the valve-disk is moved to provide communication between the ducts F and G, thereby permitting the pressure medium to flow from the pipe B through said ducts and the valve-channel to the exhaust-pipe 5'. When this is done, communication between the duct C and pipe 5 is discontinued.

I claim as my invention—

1. In a hoist of the character described, the combination of a cylinder, upper and lower load-lifting pistons arranged to operate in said cylinder, a piston-rod carried by said lower piston and a piston-rod carried by said upper piston arranged to operate telescopically in the piston-rod of said lower piston, substantially as set forth.
2. In a hoist of the character described, the combination of a cylinder, a pair of load-lifting pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to telescope one within the other, and means for engaging said piston-rods; substantially as set forth.
3. In a hoist of the character described, the combination of a cylinder, a pair of load-lifting pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to telescope one within the other, and means whereby said piston-rods are engaged and disengaged, substantially as set forth.
4. In a hoist of the character described, the combination of a cylinder, a pair of load-lifting pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to telescope one within the other, retaining means carried by one of said piston-rods, and means carried by the other piston-rod arranged to be engaged by said retaining means, substantially as set forth.
5. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, piston-

I claim as my invention—

1. In a hoist of the character described, the combination of a cylinder, upper and lower load-lifting pistons arranged to operate in said cylinder, a piston-rod carried by said lower piston and a piston-rod carried by said upper piston arranged to operate telescopically in the piston-rod of said lower piston, substantially as set forth.

2. In a hoist of the character described, the combination of a cylinder, a pair of load-lifting pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to telescope one within the other, and means for engaging said piston-rods; substantially as set forth.

3. In a hoist of the character described, the combination of a cylinder, a pair of load-lifting pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to telescope one within the other, and means whereby said piston-rods are engaged and disengaged, substantially as set forth.

4. In a hoist of the character described, the combination of a cylinder, a pair of load-lifting pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to telescope one within the other, retaining means carried by one of said piston-rods, and means carried by the other piston-rod arranged to be engaged by said retaining means, substantially as set forth.

5. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, piston-

rods connected to said pistons and arranged to operate one within the other, retaining means carried by one of said piston-rods, an auxiliary piston-rod carried by the other piston-rod, and means carried by said auxiliary piston-rod arranged to be engaged by said retaining means, substantially as set forth.

6. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to operate one within the other, dogs carried by one of said piston-rods, and means carried by the other piston-rod adapted to be engaged by said dogs to connect the piston-rods, substantially as set forth.

7. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to operate one within the other, an auxiliary piston-rod arranged to operate in the inner one of said piston-rods, dogs carried by the outer piston-rod and arranged for engagement with said auxiliary piston-rod, and a spreader carried by said auxiliary piston-rod and arranged to move said dogs out of engagement with said auxiliary piston-rod, substantially as set forth.

8. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to operate one within the other, an auxiliary piston-rod arranged to operate in the inner one of said piston-rods, dogs carried by the outer piston-rod and arranged for engagement with said auxiliary piston-rod, and a spring-actuated spreader carried by said auxiliary piston-rod and arranged to move said dogs out of engagement with said auxiliary piston-rod, substantially as set forth.

9. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to operate one within the other, an auxiliary piston-rod arranged to operate in the inner one of said piston-rods, spring-actuated dogs carried by the outer piston-rod and arranged for engagement with said auxiliary piston-rod, and a spreader carried by said auxiliary piston-rod and arranged to move said dogs out of engagement with said auxiliary piston-rod, substantially as set forth.

10. In a hoist of the character described, the combination of a cylinder, upper and lower pistons arranged to operate in said cylinder, telescoping piston-rods connected to said pistons, valves arranged to control ports in said pistons and adapted to be unseated at the ends of said cylinder, and means for conveying pressure medium to the ends of said cylinder, substantially as set forth.

11. In a hoist of the character described, the combination of a cylinder, upper and lower pistons arranged to operate in said cyl-

inder, piston-rods connected to said pistons, valves arranged to control ports in said pistons and adapted to be unseated at the ends of said cylinder, and means for conveying pressure medium to the ends of said cylinder, substantially as set forth.

12. In a hoist of the character described, the combination of a cylinder, a lower piston in said cylinder, a tubular piston-rod connected to said lower piston, an upper piston, a tubular piston-rod connected to said upper piston and arranged to telescope in said lower piston-rod, a valve controlling a port leading through said upper piston to the piston-rod carried thereby, means by which said piston-rods are engaged, and means whereby said piston-rod-engaging means is actuated to disengage the piston-rods through pressure medium passed through said upper piston, substantially as set forth.

13. In a hoist of the character described, the combination of a cylinder, a lower piston in said cylinder, a tubular piston-rod connected to said lower piston, an upper piston, a tubular piston-rod connected to said upper piston and arranged to telescope in said lower piston-rod, an upper valve and a lower valve controlling a port leading through said upper piston to the piston-rod carried thereby, means by which said piston-rods are engaged, and means whereby said piston-rod-engaging means is actuated to disengage the piston-rods through pressure medium passed through said upper piston, substantially as set forth.

14. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, piston-rods connected to said pistons and arranged to operate one within the other, retaining means carried by one of said piston-rods, a sleeve carried by the inner one of said piston-rods and provided with a drain-groove, an auxiliary piston-rod arranged to operate in and seat upon said sleeve when in lowered position, and means carried by said auxiliary piston-rod arranged to be engaged by said retaining means, substantially as set forth.

15. In a hoist of the character described, the combination of a cylinder, a pair of pistons arranged to operate in said cylinder, a pair of piston-rods connected to said pistons and arranged to operate one within the other, retaining means carried by one of said piston-rods, a sleeve provided with a drain-groove and connected to the inner one of said piston-rods, an auxiliary piston-rod arranged to operate in said sleeve, a collar provided with a drain-groove and carried by the upper end of said auxiliary piston-rod and adapted to seat on said sleeve, and means carried by said auxiliary piston-rod arranged to be engaged by said retaining means, substantially as set forth.

CHARLES H. REEDER.

In presence of—
E. S. KNIGHT,
M. P. SMITH.