No. 675,112. Patented May 28, 1901.

R. A. RUTHERFORD.

PNEUMATIC HOISTING APPARATUS.

(No Model.) (Application filed Aug. 9, 1900.)

Fig. 1

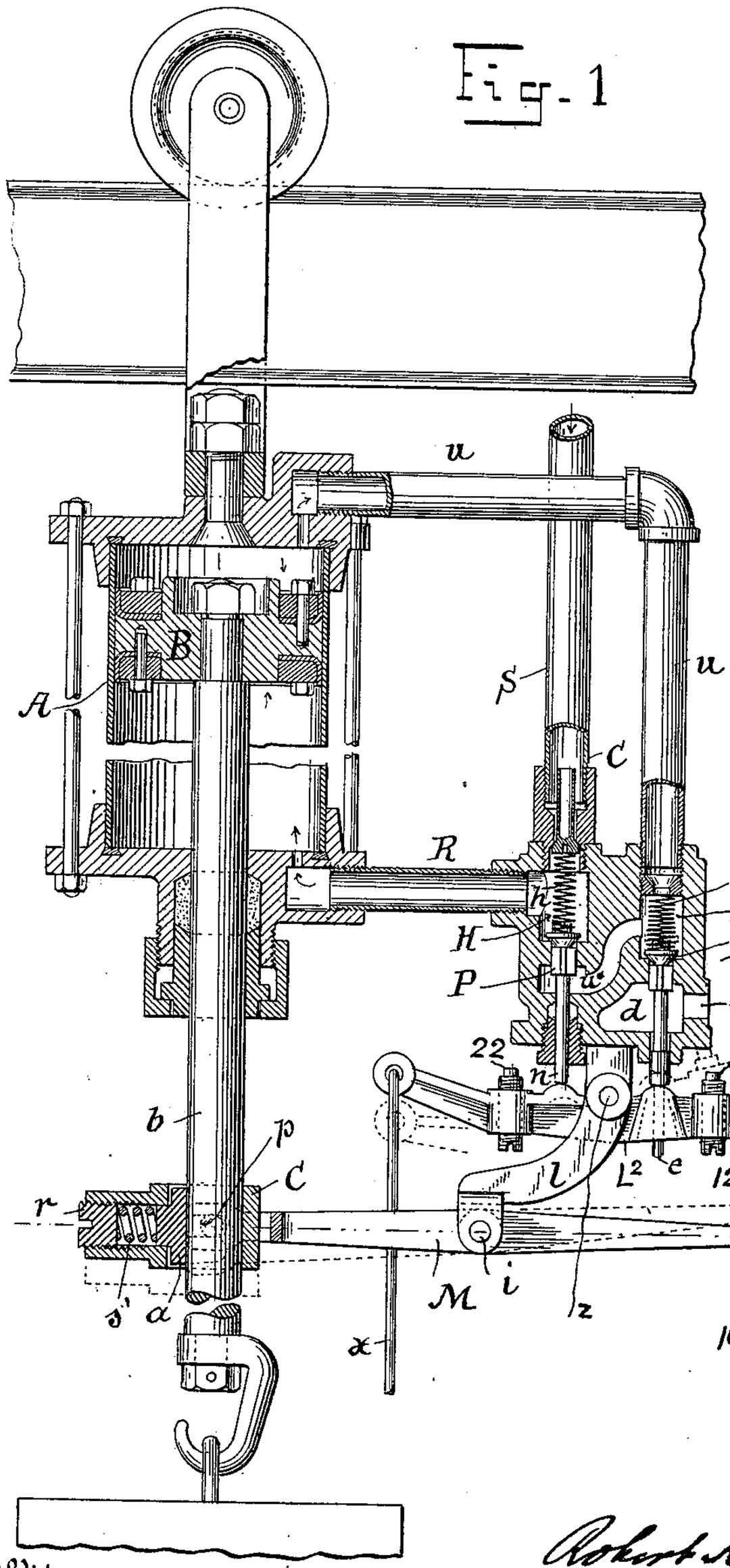
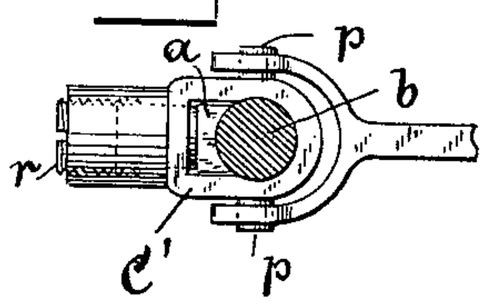


Fig. 2.



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PNEUMATIC HOISTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 675,112, dated May 28, 1901.

Application filed August 9, 1900. Serial No. 26,334. (No model.)

To all whom it may concern:

Be it known that I, ROBERT A. RUTHERFORD, 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 Hoisting Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improved valve arrangement and operating devices adapted to a pneumatic hoist of the type referred to in Letters Patent No. 646,458, dated April 3, 1900, wherein pressure is admitted to both ends of the cylinder and on the opposite sides of the piston and exhausted alternately from the upper end of the cylinder to the atmosphere and from the lower end of the cylinder to its upper end to operate the piston in either respective direction as desired and wherein communication with the atmosphere from the upper side of the piston is automatically controlled coincidently with any downward or settling movement of the piston when the load is suspended and whereby the load is restored to its normally suspended position.

The present invention consists in an improved valve arrangement and operative devices by which the method of operation referred to is better and more conveniently effected, and in order that others may understand the improvement I will first proceed to describe the same in detail, and subsequently will point out in the appended claims its novel characteristics, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view, partly broken away and partly in section, showing the hoist complete with all its essential details of construction and relative arrangement of the parts; and Fig. 2, a detached plan view of the collar which connects the valve devices with the piston-rod, all as hereinafter particularly described.

A represents the hoist-cylinder, B the piston, and *b* the piston-rod, to which the load is suspended.

o is the valve-casing, which communicates with the pressure-supply through the pipe *s*, with the cylinder below the piston through the pipe R, with the cylinder above the piston through the pipe *u*, and with the atmosphere through the port D^2. The valve-casing *o* is constructed with chambers H and K, in which the valves P and D are respectively arranged, each being normally held to its seat by the springs *h* and *m* and each provided with spindles or rods, which extend through and below the valve-casing and in contact with the rocking lever L^2, pivoted beneath the valve-casing, as shown at *z*. The stem *n* of the valve P is fitted with a stuffing-box, as shown, to prevent the escape of the working pressure of the fluid, while the stem of the valve D is provided with an extension *e*, that passes freely through and projects beneath the lever L^2, so that the valve may be opened independently, if desired.

A check-valve C is placed at the intersection of the motive-fluid-supply pipe *s* and chamber H, which opens inwardly and is held to its seat by the spring *h*, the tension of the latter being less than the pressure of the fluid-supply, thereby permitting a free passage of the latter to the cylinder. The object of this check-valve C is merely to prevent the escape of pressure from the cylinder in the event of a rupture in the source or passage of the fluid-supply.

The parts of the apparatus heretofore referred to comprise the main devices essential to the operation of the hoist, which I will first explain in order that the function of such parts may be understood previous to a description of the other attached devices shown, and whereby the object and operation of the latter will be more readily comprehended.

In elevating the piston B to the position shown in Fig. 1 the rocking lever L^2 is moved from its horizontal position (shown in full lines) to the position shown in dotted lines by means of the hand-rod *x*, which raises the valve D and opens communication between the cylinder above the piston and the atmosphere through the pipe U, chamber *d*, and escape-port D^2, which allows the fluid-supply pressure in the pipe *s*, chamber H, and pipe R to force the piston upward, the air-pressure and spring *h* in chamber H holding the valve P to its seat during this upward movement of the piston. When the piston is ele-

vated to the desired position, the lever L^2 is returned to its horizontal position, which permits the valve D to seat and which checks the further upward movement of the piston. When it is desired to lower the piston and its load, the lever L^2 is moved, by means of the hand-rod *r*, to a position opposite that indicated by the dotted lines and the valve P is opened or raised from its seat by the contact of the lever L^2 with its spindle *n*. This opens communication between the lower and the upper chambers of the cylinder through the passage *u'* and pipe *u*, thereby transferring the pressure to the upper and opposite side of the piston and which forces the piston downward, due to the equalized pressure acting upon the greater superficial area of its upper side, which in amount is equal to the area occupied by the piston-rod upon its lower side.

During the suspension of the load the tendency of the piston is to lower or settle downwardly, due principally to leakage from beneath the piston. To obviate this, I provide a lever M, centrally pivoted at *i* to an arm *l* on the valve-casing, and connect one end with the lever L^2 and the opposite end with the piston-rod *b*, the latter by means of a friction-collar C'. (Shown in vertical section in Fig. 1 and in plan in detached view, Fig. 2.) This collar is connected to a forked end of the lever M by means of projecting pins *p*, that engage elongated slots in the forked ends and is fitted with a loose bearing-block *a*, whereby the contact with the piston-rod is made to conform to its upward and downward movements, the degree of friction of the bearing-block upon the piston-rod being regulated by the spring *s'* and adjusting-screw *r*, so that the collar will move with the piston-rod and automatically operate the lever L^2 until the latter is arrested in its movement, the collar C' then being forced to slide idly upon the piston-rod. The rocking movement of the lever L^2 is limited by means of the adjusting-screws 22, which contact with the valve-casing, as shown in the representation of the lever in dotted lines in the drawings. This attachment is designed to automatically open the valve D as the piston settles from its normally suspended position and release sufficient pressure from the upper side of the piston to permit the ascendant pressure on its lower side to elevate the piston to its proper place. The connection of the lever M with the rocking lever L^2 is made by means of a pivoted rod *w*, depending from the lever L^2. This rod *w* is provided with a sliding flanged collar *t*, that engages the end of the lever M, and upon said rod, on opposite sides of the sliding collar, springs 20 21 are placed, which are compressed by the nuts 10 12 to a degree of tension to maintain an elastic medium through the whole movement of the lever in operating the valve D. In the settling movement of the piston the spring 20 is further compressed by the movement of the friction-collar and lever M until the resistance of the pressure and the spring *m* above the valve D is overcome. The release of this pressure allows the increased tension given to the spring 20 by the movement of the lever M to open the valve D suddenly and wider, thus quickly relieving the pressure above the piston and lessening the period of its settling movement. In the return movement of the parts coincident with the seating of the valve D the normal compression of the spring 21 acts to cushion the movement and effect a smoother action.

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

1. In a pneumatic hoist wherein pressure is admitted to both ends of the hoist-cylinder and on opposite sides of the piston, and exhausted alternately from the upper end of the cylinder to the atmosphere, and from the lower end of the cylinder to the upper end to operate the piston in either respective direction, a valve device consisting in a casing constructed with a chamber having free communication with the fluid-supply and the hoist-cylinder beneath the piston; a chamber having free communication with the hoist-cylinder above the piston, and a chamber having free communication with the atmosphere, said chambers communicating successively one with another through ports or passages provided with interposed valves operated by suitable hand devices to admit and hold the fluid-supply within the cylinder above the piston, and cut off and release the same at the will of the operator, as set forth.

2. In a pneumatic hoist, substantially as described, the valve device comprising the casing *o*, chambers H, K, containing the puppet-valves P and D which control, respectively, the communication between the opposite ends or chambers of the hoist-cylinder and its upper chamber and the atmosphere, in combination with the rocking lever L^2, whereby said valves are opened alternately to admit and release the pressure to and from the upper end of the cylinder, as set forth.

3. The pivoted lever M connected with the piston-rod by a friction-collar C' and with the valve-operating lever L^2, by a compression device which maintains an elastic action between the parts, and when the pressure is released produces a quick movement of the lever L^2 and valve D, and whereby the period of the settling movement of the piston is lessened, as set forth.

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

ROBERT A. RUTHERFORD.

Witnesses:

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