No. 696,181. Patented Mar. 25, 1902.

E. Y. MOORE.

HOISTING SYSTEM.

(Application filed Oct. 29, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1,

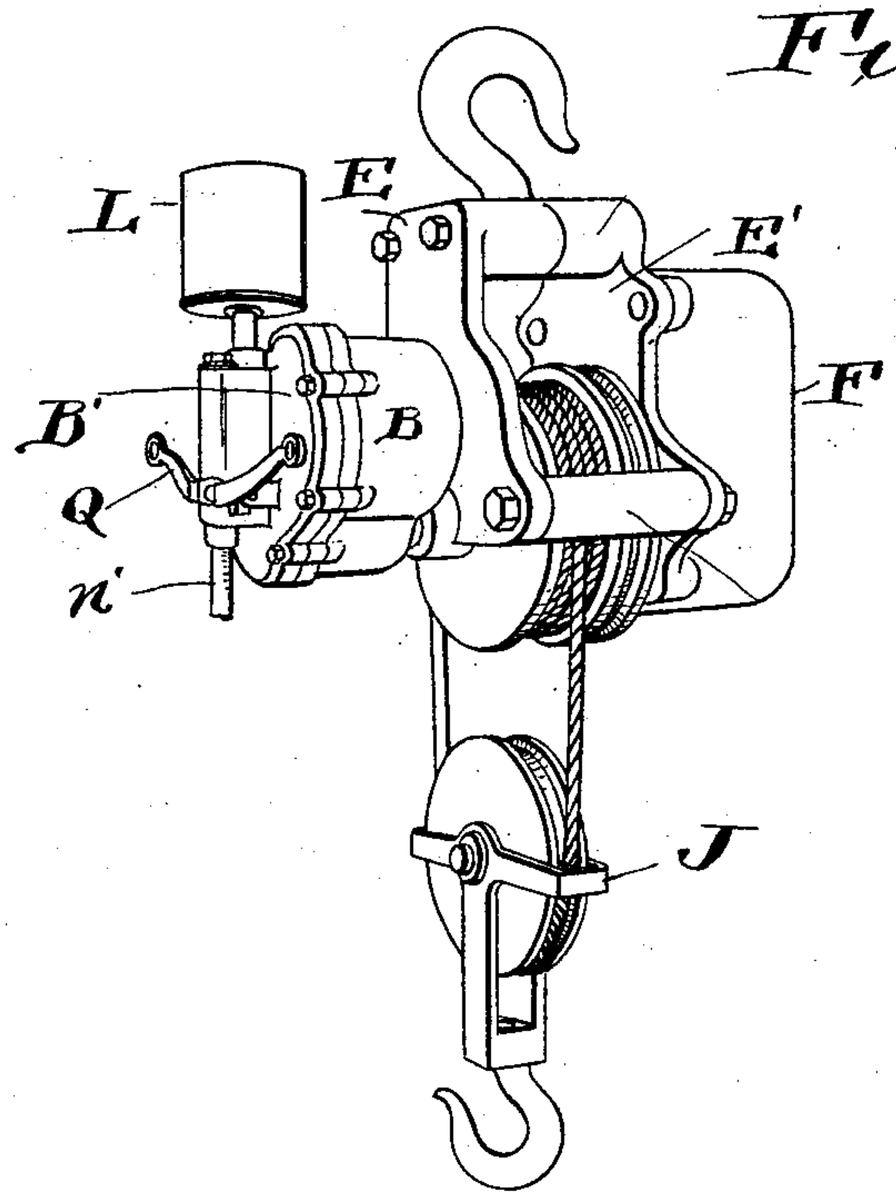
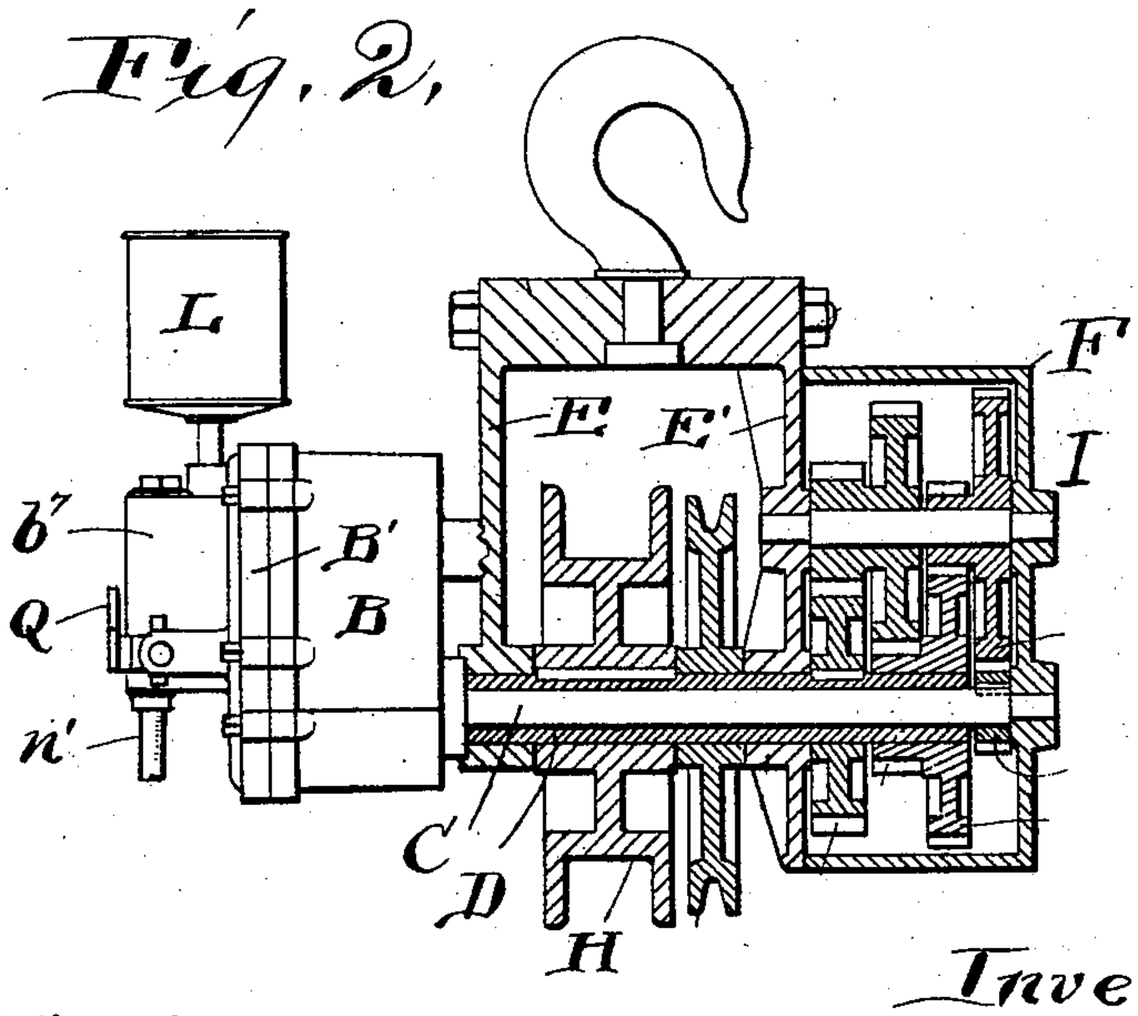


Fig. 2,



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H. M. Hisa.

Inventor:
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No. 696,181. Patented Mar. 25, 1902.

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HOISTING SYSTEM.

(Application filed Oct. 29, 1900.)

(No Model.) 3 Sheets—Sheet 2.

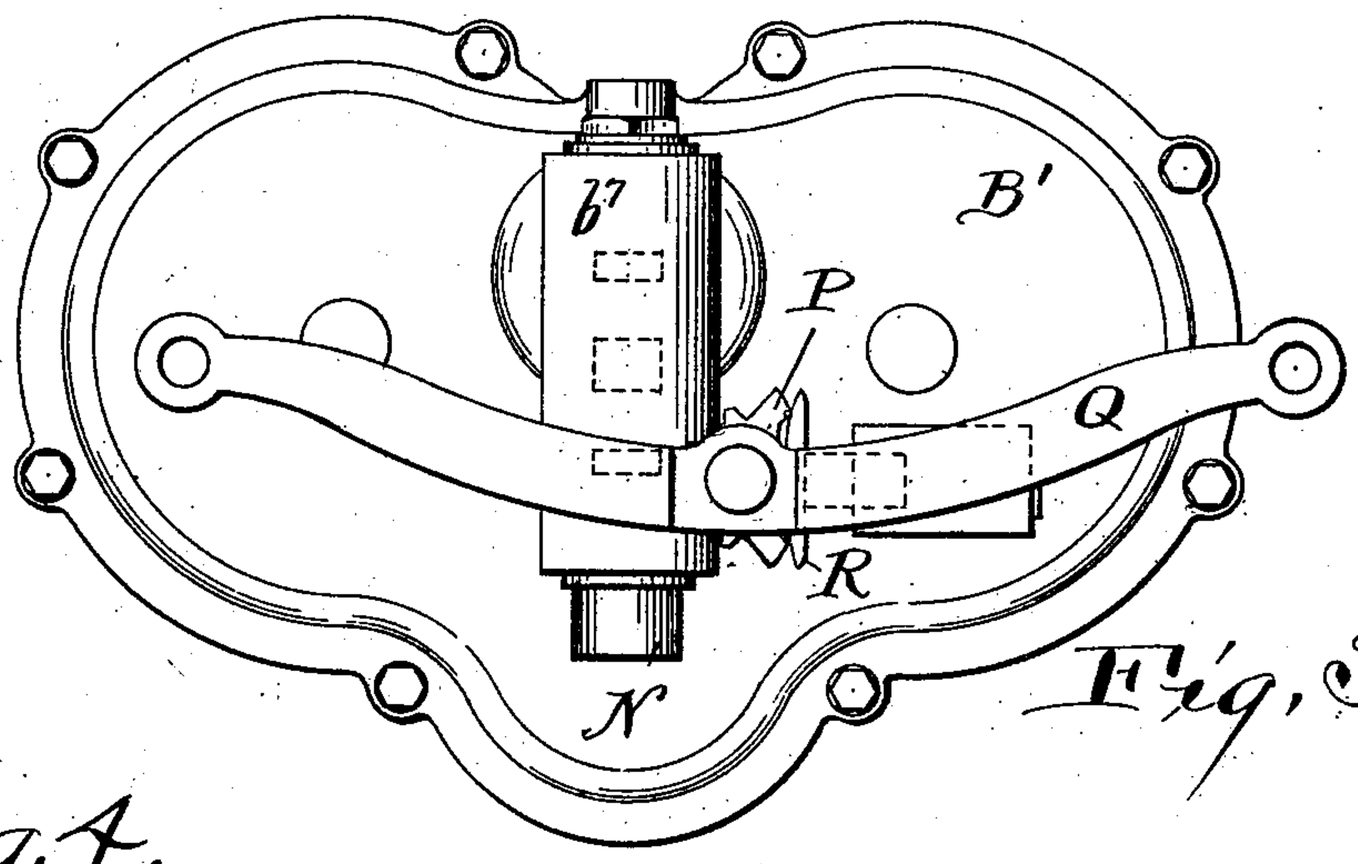


Fig. 3.

Fig. 4.

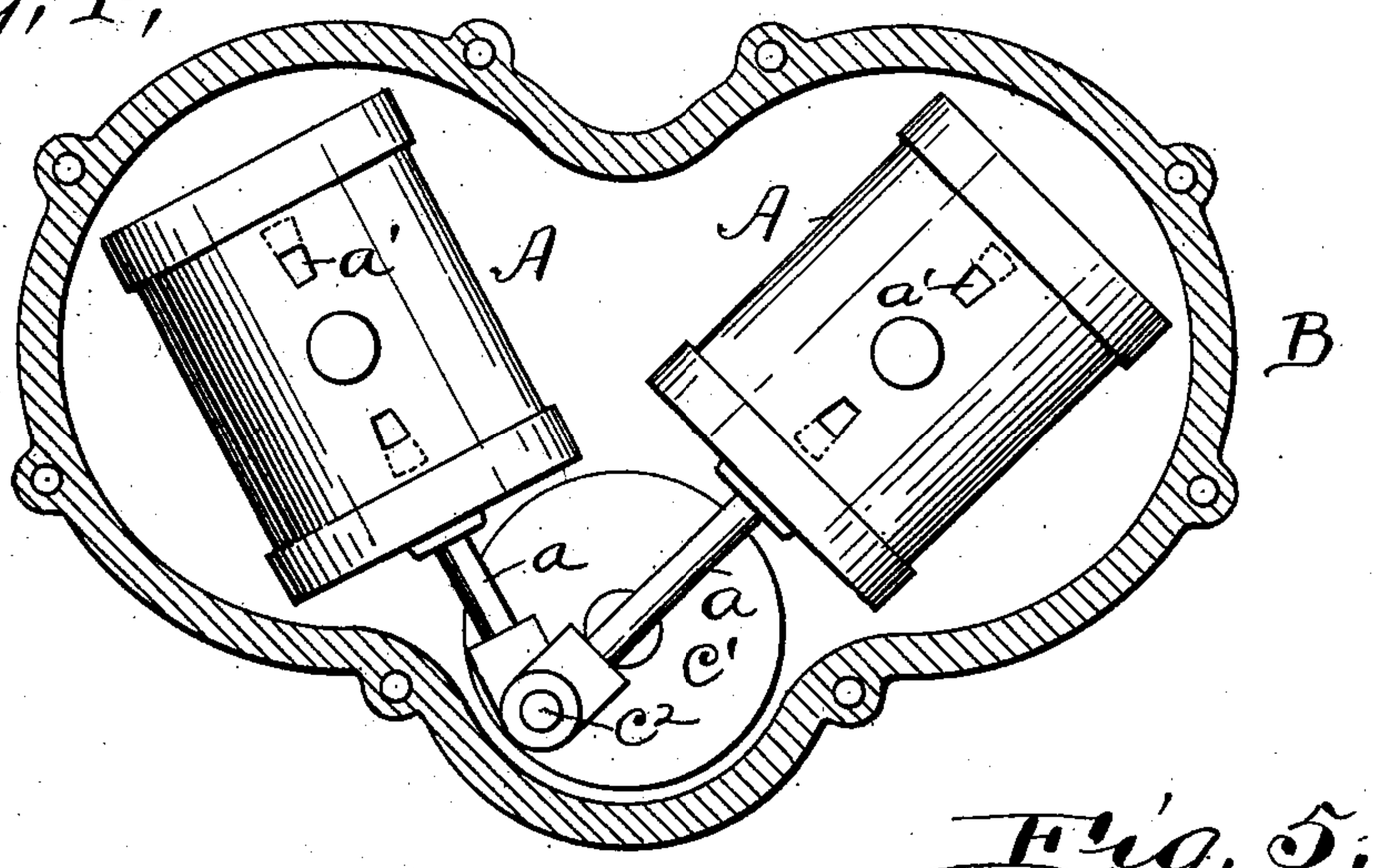
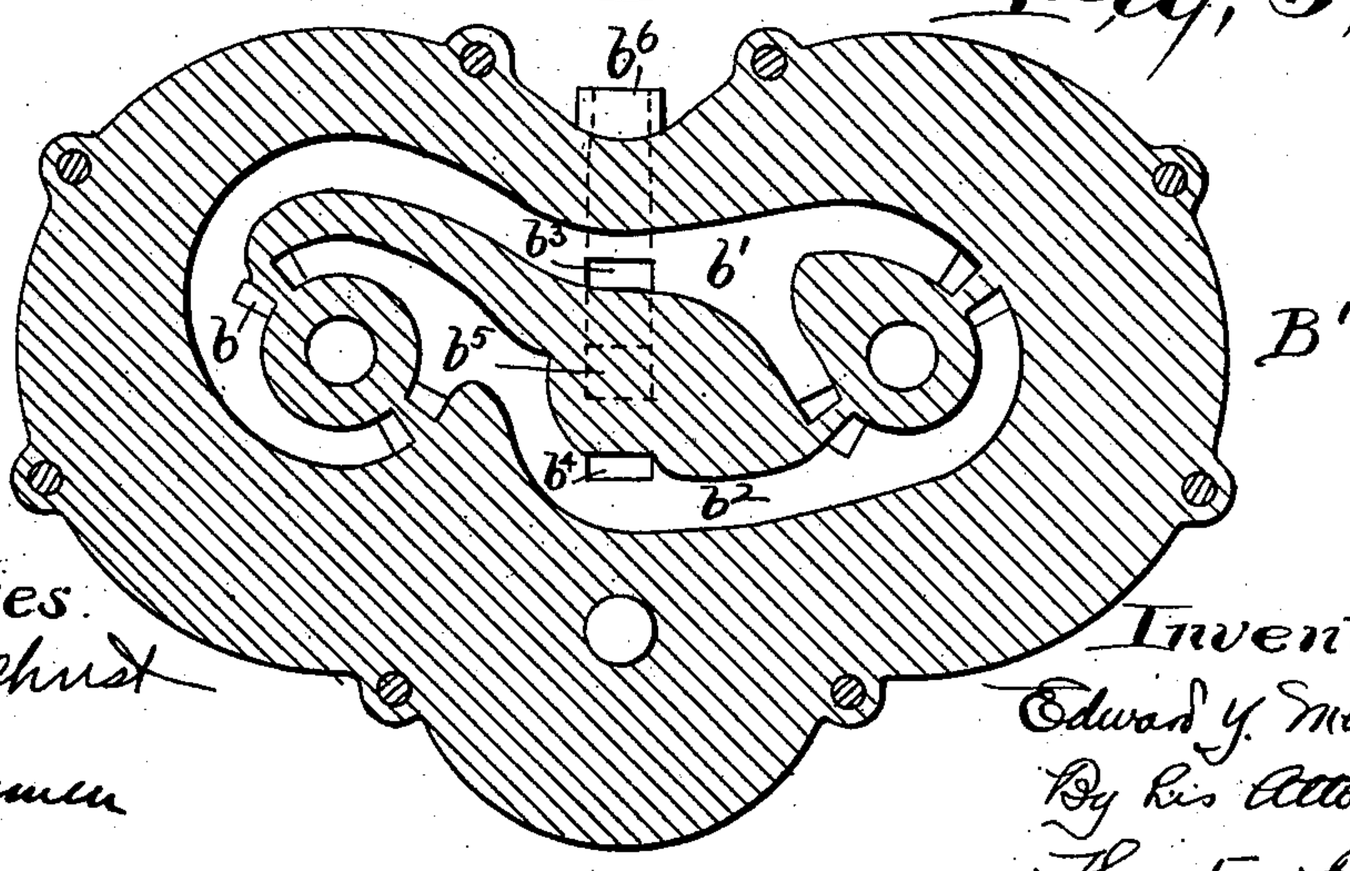


Fig. 5.



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HOISTING SYSTEM.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 6,

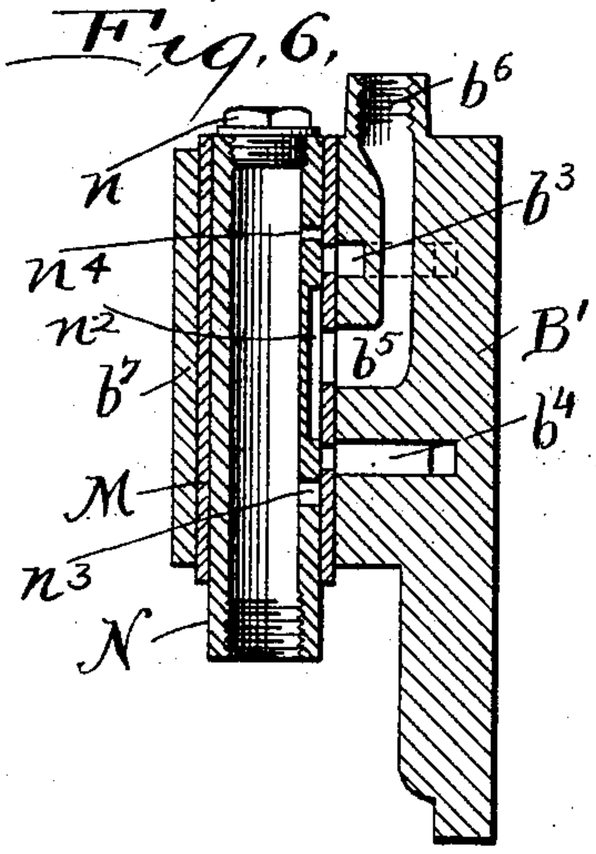


Fig. 7,

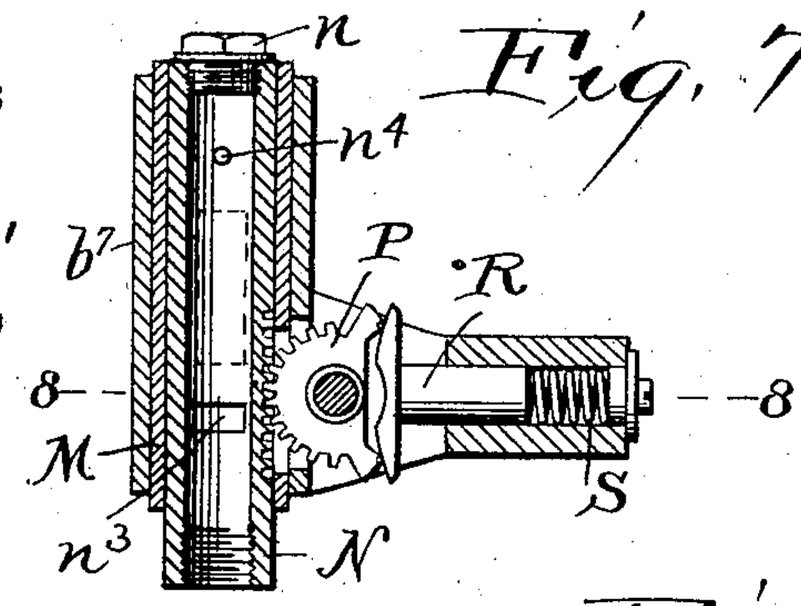


Fig. 8,

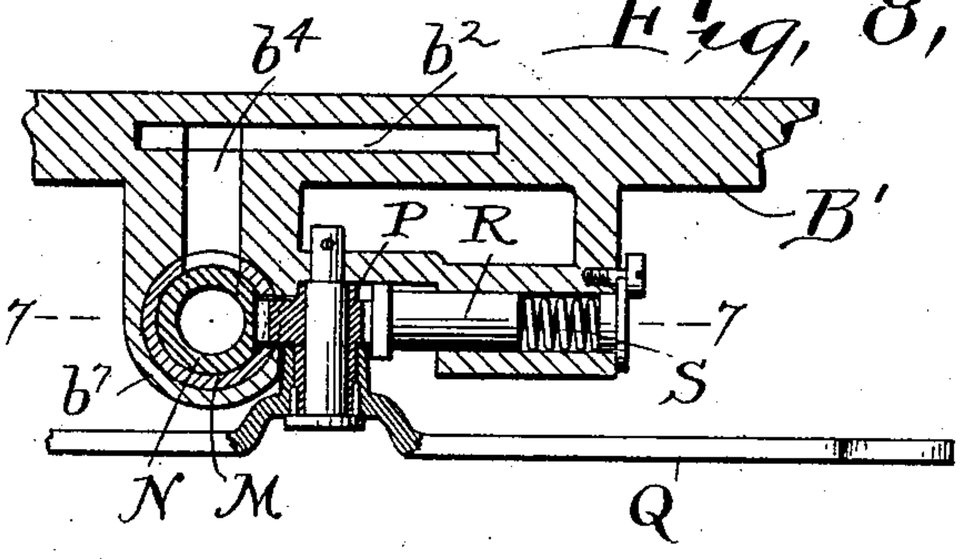


Fig. 9,

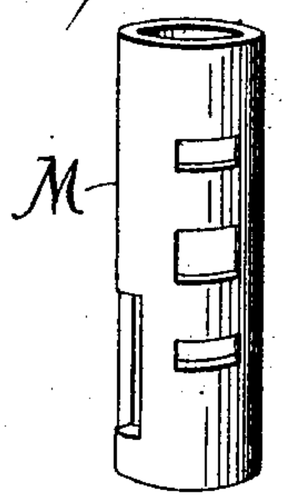


Fig. 10,

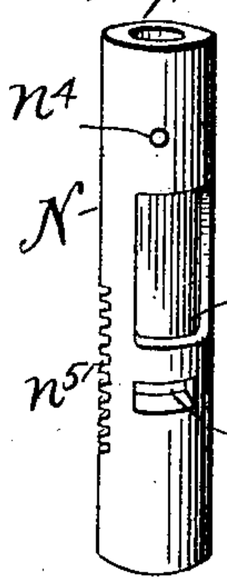


Fig. 12,

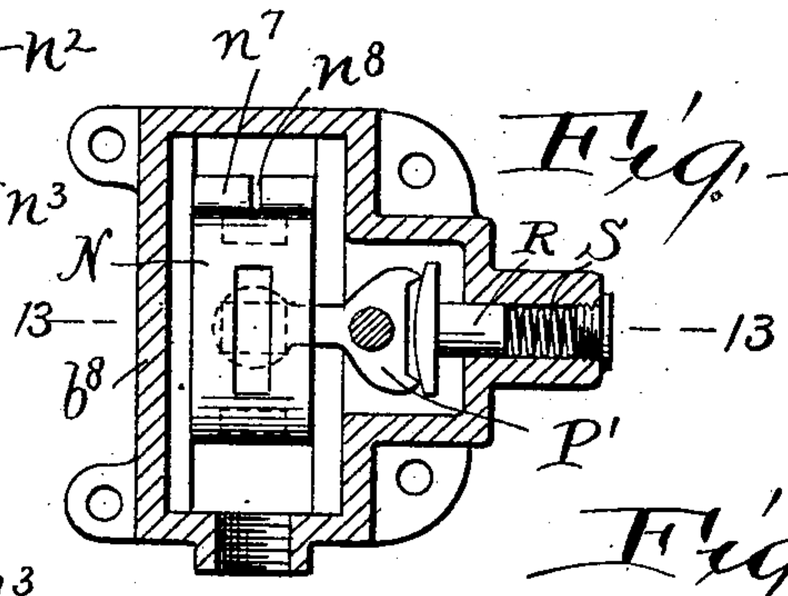


Fig. 11,

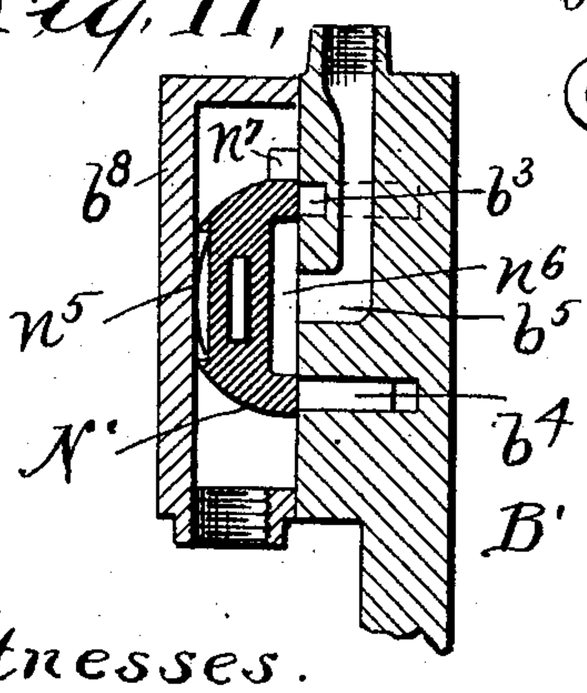
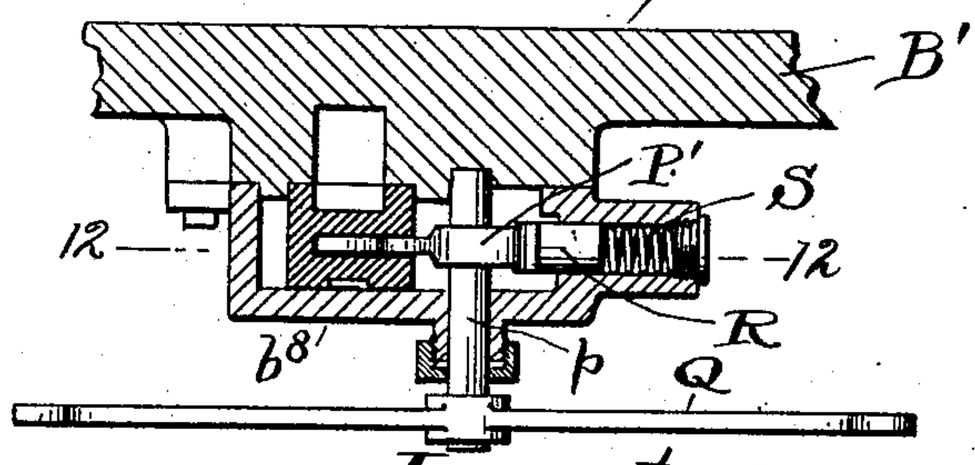


Fig. 13,



Witnesses.
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F. D. Ammen

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UNITED STATES PATENT OFFICE.

EDWARD Y. MOORE, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CHICAGO PNEUMATIC TOOL COMPANY, A CORPORATION OF NEW JERSEY.

HOISTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 696,181, dated March 25, 1902.

Application filed October 29, 1900. Serial No. 34,783. (No model.)

To all whom it may concern:

Be it known that I, EDWARD Y. MOORE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Hoisting Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates particularly to hoisting mechanism operated by pneumatic motors. In such system it is wasteful of air when lowering the load to drive the motor by the air under the same working pressure as when elevating it, because if the motor is properly released the weight of the load assisted by a slight air-pressure will cause the lowering.

The object of this invention is to provide very simple and efficient means for accomplishing this.

I have heretofore devised a vent-valve for releasing the motors. This, though requiring extra parts, operates well for heavy loads; but light loads will not start down quickly enough, owing to the internal friction of the raising mechanism. I have discovered that the desired result may be attained by simply admitting a very much reduced quantity of compressed air to the cylinders when lowering and at the same time releasing their opposite ends by fully opening the exhaust from them, and my invention includes a mechanism so arranged and more particularly a combination wherein the main valve alone governs such operation.

In the drawings, Figure 1 is a perspective view of a complete hoisting system illustrating and embodying my invention. Fig. 2 is a side elevation thereof, partly in central section. Figs. 3, 4, and 5 are side elevations of the pneumatic motor employed in such embodiment, Fig. 3 being a face view, Fig. 4 an inside view with the cover removed, and Fig. 5 a vertical section through the cover-plate parallel with its outer face and looking toward such face. The remaining views illustrate the valve. Fig. 6 is a vertical central section of one form thereof through the cover-plate, Fig. 7 is a vertical central section parallel with the cover-plate, and Fig. 8 is a horizontal section on the line 8 8 of Fig. 7. Figs. 9 and 10 are perspective views of the bushing for the valve and the valve itself, respectively. Figs. 11, 12, and 13 are views corresponding to Figs. 6, 7, and 8, respectively, but with a D-valve instead of a piston-valve.

I have shown and described herein a suspensible hoist to which my improved valve is applied; but this is to be taken as illustrative of any hoisting mechanism wherein the load may tend to run down, driving the engine backward. The arrangement of the gearing and of the engine coöperating therewith apart from the valve is not a portion of the present invention, being shown, described, and claimed in my application, Serial No. 60,322, filed May 15, 1901.

The hoist shown in the drawings comprehends a bifurcated frame E E′, adapted to be supported by a hook or eye, a drum H between the sides of the frame on a sleeve D, journaled therein, a shaft C within such sleeve, and a pneumatic motor within a casing B on one side of the hoist for driving the shaft, and suitable reduction-gearing I within a box F on the other side of the hoist connecting the shaft with the sleeve. A tackle-block, as J, is shown as elevated by a cable running from the drum.

The particular form of the pneumatic motor preferably employed and which is shown herein is not in itself a portion of the present invention, being shown, described, and claimed in my prior patent, No. 669,587, issued March 12, 1901. The motor consists, as shown, of a pair of oscillating cylinders A, contained within a casing consisting of the box B with the cover-plate B′, the pistons a of the cylinders taking onto a single crank-pin c^2 on the crank c, which is rigidly secured to the main shaft C. The cylinders have port-openings a', which coöperate with suitable openings in the cover-plate to form individual valves. These openings in the cover-plate are designated b. They are connected in two groups by the passage-ways b' b^2, into which lead the ports b^3 and b^4 from the valve-box b^7 or b^8. Intermediate of these ports is the exhaust-port b^5, shown as discharging through the opening b^6 into a suitable muffler L.

My method of causing the diminished air-

supply when lowering is by contracting the proper passage, preferably by means of the reversing-valve itself. Figs. 6 to 13 illustrate this, wherein two styles of valve are shown within suitable valve-boxes b^7 or b^8. This valve, as heretofore stated, governs the motors to raise the load and at the same time is adapted to cause their release and let the load run down without wasting air. This I accomplish by providing the valve with ports such that when the valve is shifted to the position to elevate the load the full supply of air is admitted through the admission-opening and the other passage may be fully open to the exhaust, while when the valve is shifted in the other direction the passage which was connected with the admission becomes in full and open communication with the exhaust; and the other passage has a reduced communication with the air under pressure, the opening being small enough so that the air admitted expands to more or less nearly atmospheric pressure in the passages—that is, to give just pressure enough to start the load and drive it down, assisted by the weight of the load. This obviates, on the one hand, the waste of air resulting from running the engine the same in one direction as in the other and, on the other hand, an additional vent-valve (with its attendant disadvantages) to release the air inside the engines, allowing the load to run down. For convenience in description I call the passage to the cylinder, which conveys operating fluid under pressure for raising the load, the "raising-passage," though of course this passage becomes the exhaust-passage when the load is being lowered. Similarly the passage which conveys the fluid to drive the load downward I call the "lowering-passage," though it acts as the exhaust-passage when the load is being elevated. This feature of a reduced admission-opening with full exhaust is adaptable to various forms of valves. In Figs. 6 to 10 it is shown applied to the balanced piston-valve, which is the invention of Thomas Barrow, and shown, described, and claimed in his Patent No. 673,573, issued May 7, 1901. In Figs. 11 to 13 it is shown applied to a D-valve. Each of these valves is shown with a centering mechanism which is also the invention of Thomas Barrow and shown, described, and claimed in his said patent.

The ports in the valve-seat, which are the entrances to the passages, I will call "seat-ports," and I will use the term "valve-port" as applying to the coöperating openings presented by the valve to the seat-port, whether these openings be by holes through the wall of the valve, as in the case of the tubular valve shown in Figs. 6 to 10, or be the space beyond the end of the valve, as is the case at one end of the D-valve shown in Figs. 6 to 13.

Referring now, first, to Figs. 6 to 10, the seat-ports b^3 b^4 b^5 terminate in a cylindrical recess within the valve-box b^7, and within this recess is placed a bushing M, having openings corresponding to these ports, and within the bushing is a tubular valve N. This valve is plugged at its upper end by a screw-plug n, and screwing into it at the lower end is a flexible hose n'. On the outer side of the valve is a recess n^2 of sufficient size to couple the exhaust-port b^5 with either of the ports b^3 or b^4, which latter are of substantially the same size. Extending through the valve is the admission-opening or valve-port n^3, adapted to coöperate with the port b^4 and of substantially its size. Coöperating with the full-sized port b^3, however, is a valve-port n^4 of very-much reduced size, which operates, as stated, to allow air enough to the lowering-passage to the engines so that they will easily drive down, the port b^4 being simultaneously coupled in full with the exhaust from the raising-passage. This valve N is balanced by having the air on its inner side and is a very satisfactory arrangement. It is shown as operated by the gear-segment P, which has teeth meshing with the teeth n^5, cut in the valve, and is oscillated by the lever Q, rigid with the segment. The valve is given a normal tendency to come to its center by the plunger R, suitably guided and having a T-head bearing against toes projecting from the segmental gear on opposite sides of its pivot, the plunger being pressed in that direction by a spring S.

Figs. 11, 12, and 13 show my improved valve embodied in a D-valve construction. There the valve-box b^8 is preferably made separable from the plate B' and is bolted to it. Within this box is suitably guided the D-valve N', which is shown as pressed toward its seat by a spring n^5. The valve has the full-sized exhaust-recess n^6 and is adapted to close the two ports b^3 and b^4, as shown in Fig. 11. Extending from one end of the valve is the lap n^7, adapted to cover over the port b^3 of the lowering-passage, except as to the small valve-port n^8 through this lap. Thus the effect of this valve on the seat-ports is the same as that of the piston-valve described. When in one position, the port b^3 from the lowering-passage is coupled in full with the exhaust and the port b^4 from the raising-passage in full with the compressed air in the box by reason of the valve having its port unconstricted at this end, while in the other position the port b^4 is coupled in full with the exhaust and the port b^3 receives a very much reduced quantity of compressed air through the small opening n^8. This valve N' is shown as operated by a pivoted arm P', which takes into a recess in the valve and is rigid with an operating-lever Q, both being secured to the same shaft p. The valve is centered by the plunger R, the head of which bears against toes on the arm P', being pressed toward the same by the spring S, which is contained within a recess, which in this case is an extension of the valve-box b^8. The centering devices maintain the valve normally closed, while the pull on the operating-lever in one direction causes

the load to be elevated as desired, the admission-opening to one side of the engine-cylinders and the exhaust from the other being simultaneously open. A pull on the lever in the other direction opens the exhaust in full to allow the load to pass down and supplies to the other side of the cylinders just enough air for this purpose. Thus a very simple and economical operation is obtained.

I claim—

1. The combination of hoisting mechanism, a pneumatic engine adapted to drive the same in either direction, and mechanism for admitting to the engine compressed air in relatively large quantities for raising the load and in relatively small quantities for lowering, and concurrently with each of said admission operations opening the exhaust to a relatively large amount.

2. The combination of hoisting mechanism, a pneumatic engine for driving the same in either direction including a reversing-valve mechanism for controlling said engine, and a raising-passage and a lowering-passage leading from said valve mechanism to the cylinder of the engine, and means for constricting the lowering-passage without constricting the raising-passage.

3. The combination of hoisting mechanism, a pneumatic engine for driving the same in either direction, and mechanism for governing the passages of said engine adapted to present two different sizes of inlets according to the direction of rotation of the engine, and one size of outlet for both directions, the outlet corresponding in size with the larger inlet.

4. The combination of hoisting mechanism, a pneumatic engine for driving the same in either direction, a valve mechanism consisting of a body and coöperating seat, there being raising and lowering passages from the seat to the engine-cylinder, and an outlet-passage from the seat, the valve mechanism having two sizes of inlet-ports, the smaller port coöperating with the lowering-passage and the larger port with the raising-passage, the valve-body carrying an exhaust-port adapted to couple either the raising or lowering seat-port with the seat exhaust-port.

5. The combination of hoisting mechanism and a pneumatic engine adapted to drive the same in either direction, said engine including a reversing-valve for governing the direction of operation thereof, which reversing-valve with its seat have two admission-ports of unequal size and an exhaust-port common to both of said seat-ports, whereby said valve is adapted to allow the admission of compressed air in relatively large quantity for raising the load and in relatively small quantity for lowering and concurrently with each of said admission operations to open the exhaust to a relatively large quantity of air.

6. The combination of hoisting mechanism, a pneumatic engine for driving the same in either direction, including a reversing-valve for controlling said engine, which valve has an exhaust-recess and on opposite sides thereof admission-ports and the seat for said valve has a pair of ports leading to the engine-cylinder and a common exhaust-port between them, the admission-ports presented by the valve and seat being of unequal size and the exhaust-port corresponding in size with the larger admission-port, whereby said valve is adapted in one extreme operative position to fully open to the compressed air the admission-port for raising the load and concurrently couple the other port with the exhaust in full, and in the other extreme operative position to choke the admission-port for lowering the load while coupling the other port with the exhaust in full.

7. The combination of hoisting mechanism and a pneumatic engine for driving the same, said engine including a valve-seat and a reversing-valve occupying the same, there being a pair of full-sized admission-ports in the valve-seat one for raising and one for lowering, and a full-sized exhaust-port in said seat, and admission and exhaust passages leading therefrom, said valve having a recess adapted to connect either admission-port openly with the exhaust-port and being provided with a wall partly covering the lowering admission-port when the raising admission-port is fully coupled with the exhaust, substantially as described.

8. The combination of hoisting mechanism, a pneumatic engine adapted to drive the same including an automatic valve operated by the engine and in turn governing it to cause continuous consecutive operations thereof, a reversing-valve, there being a pair of admission-passages between said valves, and an exhaust-passage leading from the reversing-valve, said reversing-valve being adapted in one extreme operative position to fully uncover one admission-opening to the operating fluid and simultaneously fully connect the other with the exhaust, but having a wall which in the other extreme operative position materially covers one admission-opening though allowing a slight access thereto while coupling the other opening fully with the exhaust, and means for shifting said reversing-valve in each direction from an off position intermediate of the two positions mentioned.

9. The combination of hoisting mechanism, a casing carried thereby, an operating-shaft extending from within the casing and connected to drive said hoisting mechanism, pneumatic engines within the casing operating to drive said shaft and having automatic individual valves for allowing continuous operation, a valve-seat, there being valve-passages through said casing leading from said valve-seat to said automatic valves, said passages terminating at the seat in full-sized ports, an exhaust-passage also having a full-sized port at said seat, and a reversing-valve coöperating with said seat and having a recess adapted in either extreme operative position to

couple an admission-passage openly with the exhaust, said valve having a wall partly covering the lowering admission-port when the raising-port is fully connected with the exhaust, the raising admission-port being adapted to be fully open when the lowering-port is fully connected with the exhaust.

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

EDWARD Y. MOORE.

Witnesses:
ALBERT H. BATES,
H. M. WISE.