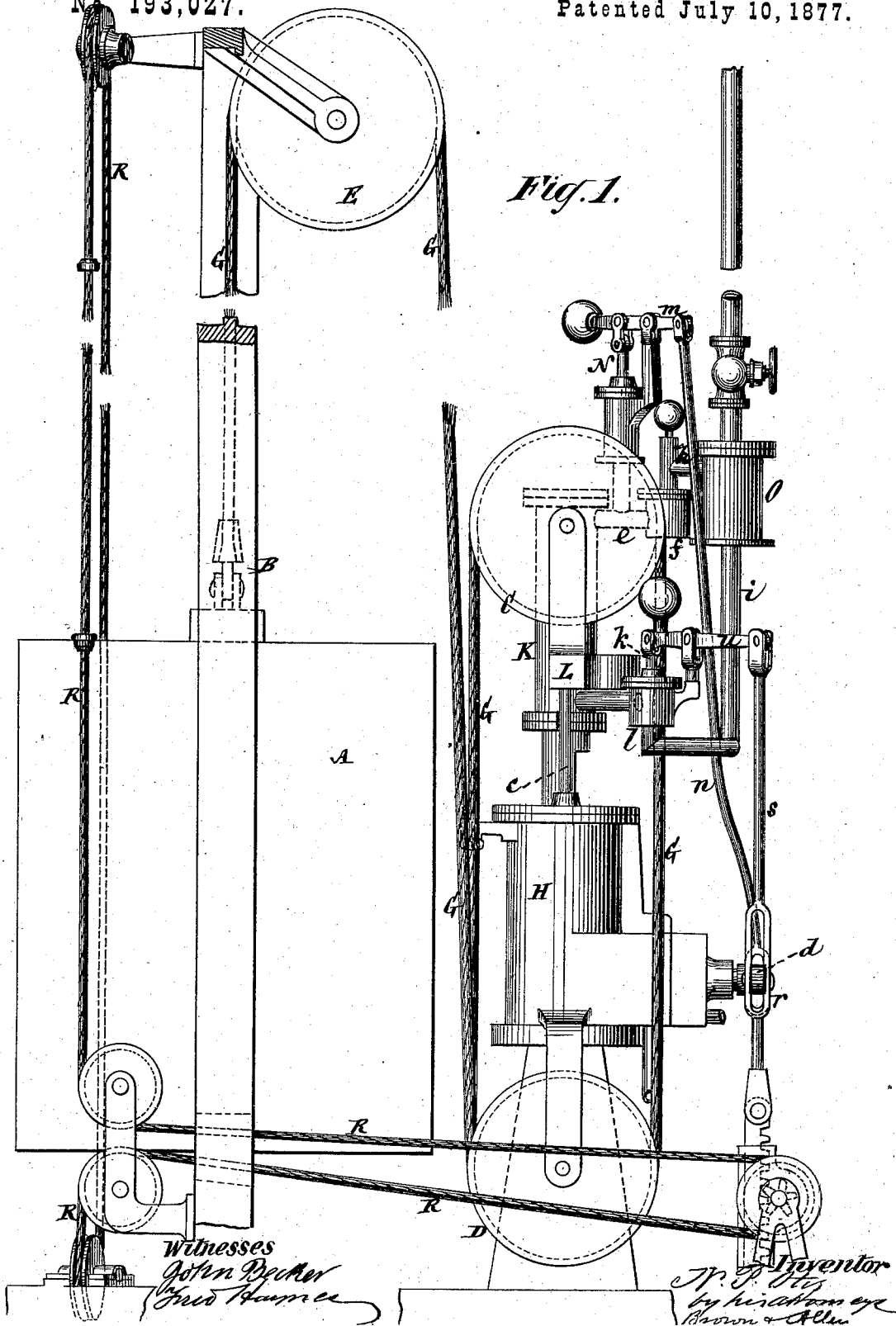


N. P. OTIS.
HOISTING-MACHINE.

No. 193,027.

Patented July 10, 1877.

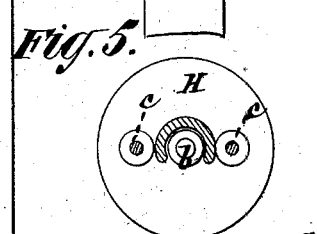
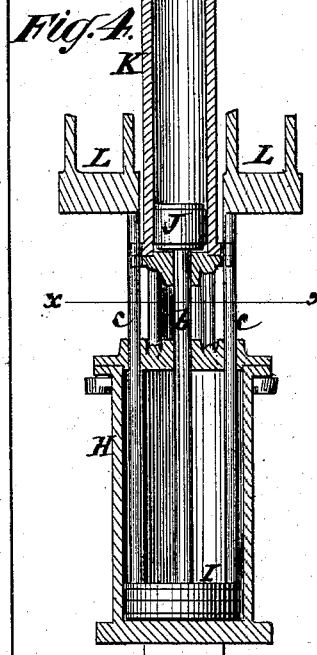
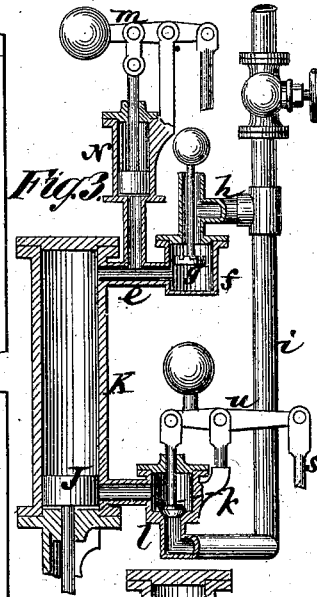
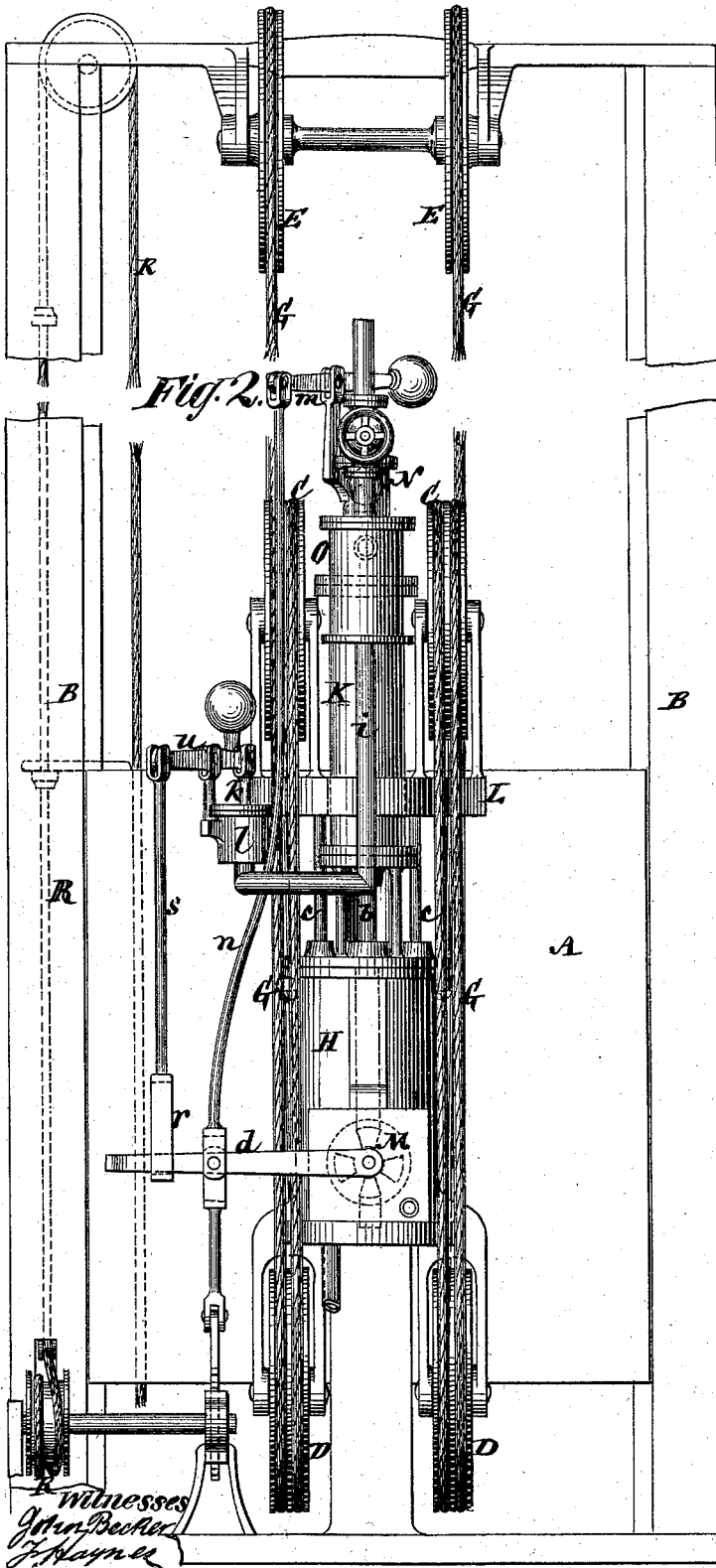


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2 Sheets—Sheet 2.

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NORTON P. OTIS, OF YONKERS, NEW YORK.

IMPROVEMENT IN HOISTING-MACHINES.

Specification forming part of Letters Patent No. **193,027**, dated July 10, 1877; application filed May 25, 1877.

To all whom it may concern:

Be it known that I, NORTON P. OTIS, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Hoisting-Machines, of which the following is a description, reference being had to the accompanying drawings, forming part of this specification.

This invention more especially relates to that class of hoisting-machines which are known as goods and passenger elevators, and in which the car or cage is actuated through a tackle-motion operated by an engine subject to the control of a fluid-retarder.

The invention consists in a novel and advantageous connection of the piston of the engine, the piston of the retarder, and the frame which carries the movable pulleys of the tackle-motion.

The invention also consists in a certain combination of a fluid-governor with a fluid-retarder, and a valve for controlling the motion of the engine, whereby the latter is automatically made to work expansively in accordance with the load.

The invention likewise consists in a certain combination, of a check-valve for controlling the descent of the load with a fluid-retarder, the hand-rope by which the motion of the engine is regulated, and means for actuating said check-valve by the same motion of the hand-rope that actuates the engine-valve, and in proper relation with the latter.

Further, the invention consists in a certain combination, with the fluid-retarder, of certain fluid-controlling check-valves, and a fluid-governor applied to the retarder, whereby a very efficient action is obtained.

In the accompanying drawing, Figure 1 represents a side elevation of a goods or passenger elevator having my invention applied, and Fig. 2 is a rear-end view or elevation of the same. Fig. 3 is a vertical section of a retarding water-cylinder with attached governor and valves, for regulating the flow of the water to and through the retarder. Fig. 4 represents a sectional elevation of the engine-cylinder and the retarder-cylinder, also showing the pistons which work in said cylinders, and the connections between said pistons, and be-

tween the engine-piston and the yoke or frame which carries the movable pulleys of the tackle-motion, by which movement is communicated to the cage or car of the hoisting apparatus. Fig. 5 is a transverse section on the line *x x*.

A is the cage or car, arranged to work up and down between uprights or guides B, by means of a tackle-motion controlled by the engine, and which is here represented by a set of movable pulleys, C, fixed pulleys D E, and ropes or chains G, but which tackle-motion may be indefinitely extended to give any desired increased movement to the cage or car over and above, or as compared with that of the movable pulleys. Such tackle-motion need not necessarily differ from other tackle-motions employed for a like purpose.

H is the cylinder of the hoisting-engine, and I its piston. K is the cylinder of the water-retarder, mounted on the engine-cylinder, or otherwise immovably supported above it, in the same axial line as the engine-cylinder, and J is the piston of said water-cylinder. A central rod, *b*, serves to connect the two pistons I and J, the up and down movements of which are here supposed to be simultaneously in the same direction as those of the car or cage A.

L is a yoke or frame which carries the movable pulleys C, and which is connected with the engine-piston I by opposite side rods *c*, arranged to pass out through the top of the engine-cylinder.

This system of connections between the piston of the retarder, the frame which carries the movable pulleys, and the engine-piston forms a stable and centering arrangement as regards said pistons and pulley-frame, which relieves them of lateral strain or tendency to cant or tip to either side.

M is a starting, stopping, and reversing valve for controlling the motion of the engine-piston. Said valve may be similar to those commonly in use for a like purpose, and be arranged so that when its operating-lever *d* occupies a horizontal or intermediate position, the motion of the engine is arrested, and, accordingly as said lever is thrown to opposite sides of said position, the engine is run in opposite directions.

Said valve, which is both an induction and eduction one, also operates as a cut-off to work the steam more or less expansively in the engine-cylinder, and it need not necessarily be constructed to admit steam to both sides of the engine-piston, inasmuch as the weight of the car may be sufficient to effect the descent of the latter.

The water-retarder, the object of which is to check or control the motion of the car or cage A, has its cylinder K connected at its upper end, by a pipe, *e*, with a cylinder or chamber, *f*, which contains an upper check-valve, *g*, that closes, or, rather, partially closes, upward. Above this valve the chamber *f* is connected, by a branch, *h*, with a water-reservoir, O, which may be connected above with the service-pipe of a building; or said chamber *f* may be connected directly with the service-pipe, as shown in Fig. 3. A pipe, *i*, extending downward, establishes a free water communication between the upper end of the retarder-cylinder or branch *h*, connected therewith, and the bottom of said cylinder, subject to the control of a lower check-valve, *k*, in a cylinder or chamber, *l*, which is arranged to connect with the bottom of the retarder-cylinder K.

The object of the reservoir O or service-pipe connection with the branch *h* is not simply to supply the cylinder K with water, but to keep up any deficiency within said cylinder consequent upon leakage, and to compensate for the different capacities of such cylinder above and below its piston consequent on the space occupied by the rod *b* on one side of the piston J.

By constructing the valve *g* so that it does not close perfectly tight, or perforating it, which is the same thing in effect, a comparatively free passage is established for the water to the top of the cylinder K during the descent of the retarder-piston, or when said piston is at rest; but a much more closely-regulated or comparatively-restricted flow is obtained for said water in its passage out of the upper end of said cylinder to the bottom end thereof by the pipe *i* during the ascent of the retarder-piston and lifting of the load. This insures the proper action during the raising of the load of a weighted or otherwise regulated water-governor, N, which is controlled by the pressure of the water in the retarder-cylinder K, and may consist of a simple piston connected with a weighted lever, *m*, above, and arranged to work in a cylinder which is in free communication at its bottom with the upper portion of the retarder-cylinder K, between the latter and the upper check-valve *g*. This governor N serves to automatically control the main or steam valve M, to cause it to cut off sooner or later, or more or less, in the engine-stroke, according to the resistance of the load, and so to work the steam more or less expansively, thereby obviating the necessity of using a full boiler-

pressure when lifting light loads. This is effected by the varying pressure of the water in the retarder-cylinder on the piston of the governor, according to the load, and to this end the weighted lever *m* of the governor is connected, by a rod, *n*, with the lever *d* of the main valve.

The lower check-valve *k* is free to open to admit of the water passing from the upper to the lower end of the retarder-cylinder, when the piston J of the latter is making its ascent and the load is being raised; but said valve is closed by the pressure of the water above it on any attempt of the piston of the retarder to run back, thus holding the load at its lift, and preventing it from slipping or running back. To lower the load and run the retarder-piston down or back, said valve *k* requires to be opened, when the water will be free to pass said valve and upper check-valve *g* to the upper end of the retarder-cylinder. This lower check-valve *k* is opened or operated, to provide for the descent of the load, by the same movement of the hand-ropes R which controls the starting, stopping, or reversing of the engine from different heights or positions in the up-and-down travel of the car, as that which provides for the descent of the car by the movement of the valve-lever *d*; but such opening of the check-valve *k* is not effected till said valve-lever has been shifted to close the admission of steam to the engine-cylinder to further lift the load and to open the valve to the exhaust. This timely operation of the check-valve *k* relatively to the main or engine valve, by the hand-ropes R, may be effected either through the valve-lever *d*, or otherwise; but it will be found expedient to adopt a direct action of the valve-lever *d* for the purpose—such, for instance, as shown in the drawing, in which the valve-lever *d*, that may be operated by a rack and pinion through the hand-rope R, is free to play at its outer end up and down within a slotted portion, *r*, of a rod, *s*, attached to a lever, *u*, by which the check-valve *k* is opened. When, or immediately after, the main valve-lever *d* has been adjusted into position to shut off steam from that side of the engine-piston to which pressure is applied to lift the load, and the valve has been opened to exhaust the lifting body of steam, the same movement of said lever, which here is a downward one, causes the lever to bear down upon the closed lower end of the slotted portion *r* of the rod *s*, and thereby to open the check-valve *k*.

Although the engine, the movable pulley-frame operated by it, and the retarder are here shown and described as occupying an upright position, it will be more convenient in many or most cases to arrange them horizontally. Such change of position, however, in no wise changes the novel features and special or general operations of the invention.

I claim—

1. The combination, with the engine-cylin-

der and an outside retarder, of a central rod passing through the end of the engine-cylinder, and directly connecting the engine piston with the retarder-piston, the frame which carries the movable pulleys of the tackle device, and independent side rods directly connecting the engine-piston with said pulley-frame, substantially as specified.

2. The combination, in a hoisting apparatus, with the raising and lowering car or cage of said apparatus, a fluid-retarder for controlling the motion of said car or cage, and a main valve for controlling the motion of the hoisting-engine, of a fluid-governor controlled by said retarder, and serving to control the main or supply valve of the engine, essentially as herein described.

3. The combination, with a fluid-retarder, of a check-valve for arresting the return of the piston of the retarder against descent of the load, the hand-rope by which the lever of the main valve of the engine is controlled, and means for actuating said check-valve by said hand-rope in relation with the engine-valve, substantially as specified.

4. The combination, with the cylinder K of the fluid-retarder, of the perforated or partially-closing check-valve *g*, the governor N, the pipe *i*, and the close check-valve *k*, essentially as and for the purpose herein set forth.

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