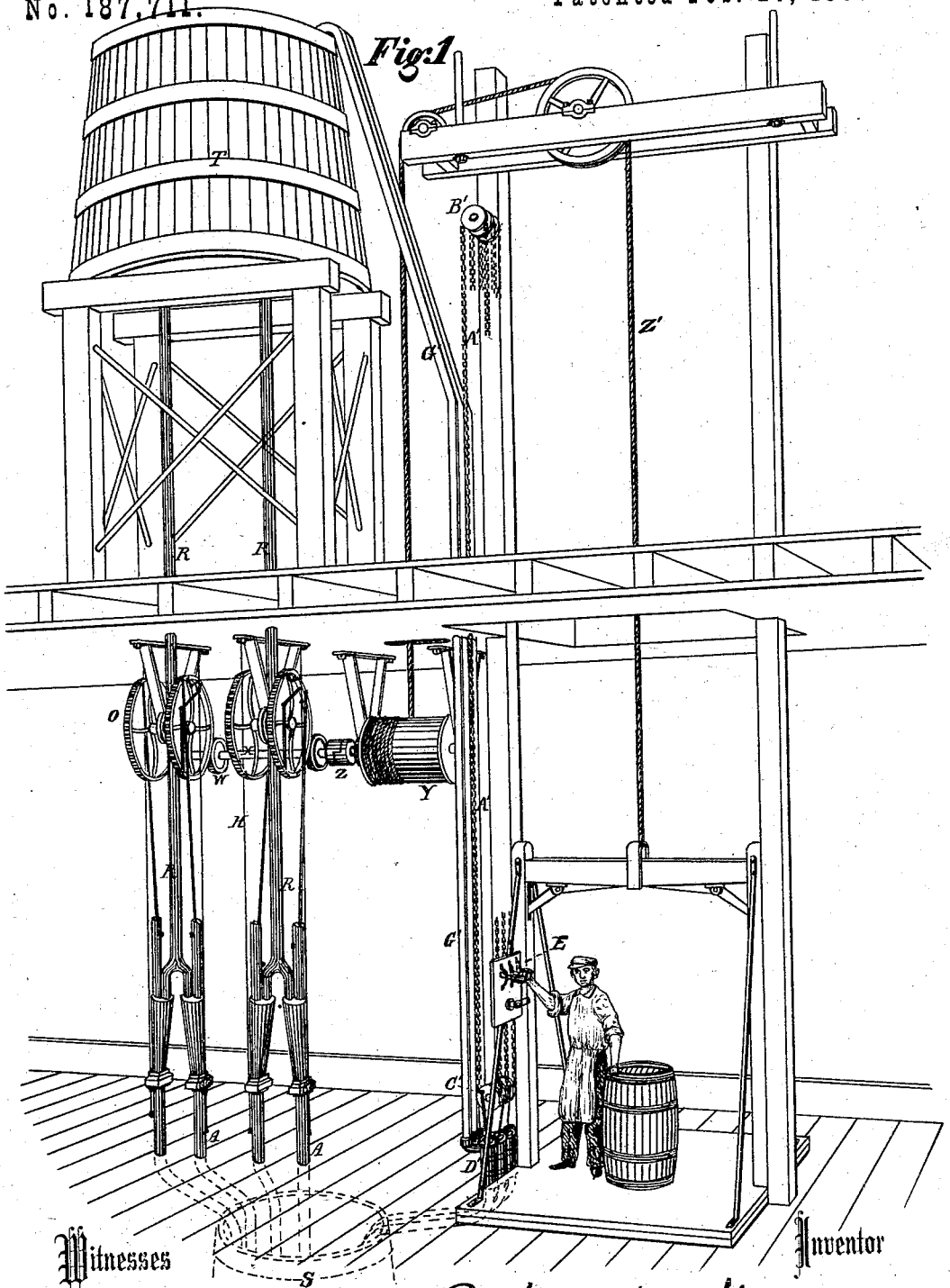
4 Sheets—Sheet 1.

E. H. HUNT.

HYDRAULIC ELEVATOR.

No. 187,711. Patented Feb. 27, 1877.

Fig. 1



Witnesses

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Fig: 2

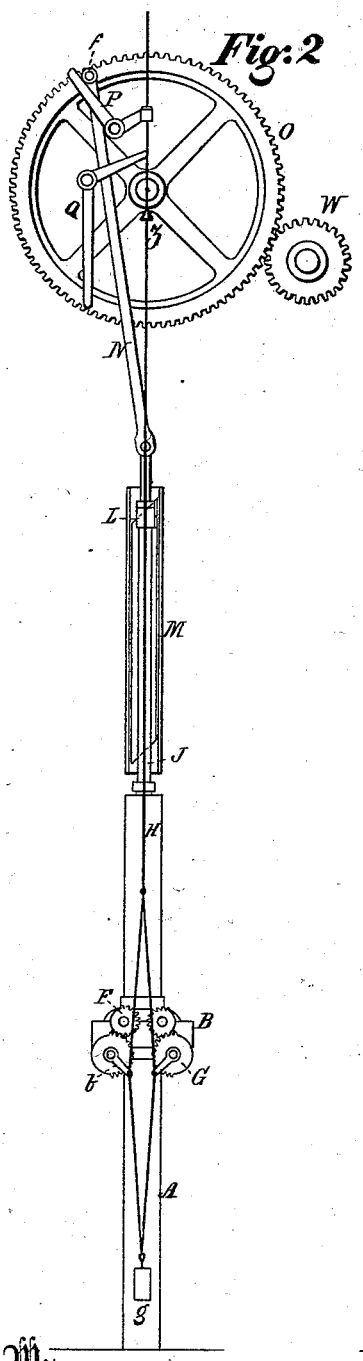
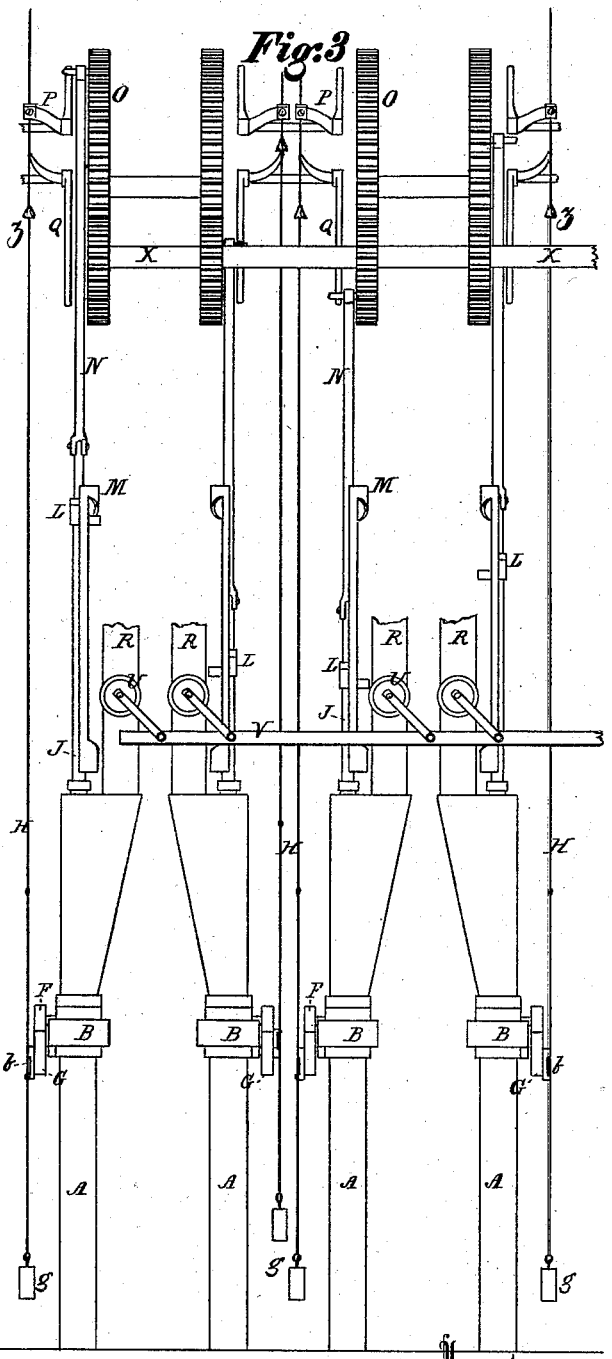


Fig: 3



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4 Sheets—Sheet 3.

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HYDRAULIC ELEVATOR.

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Fig: 4

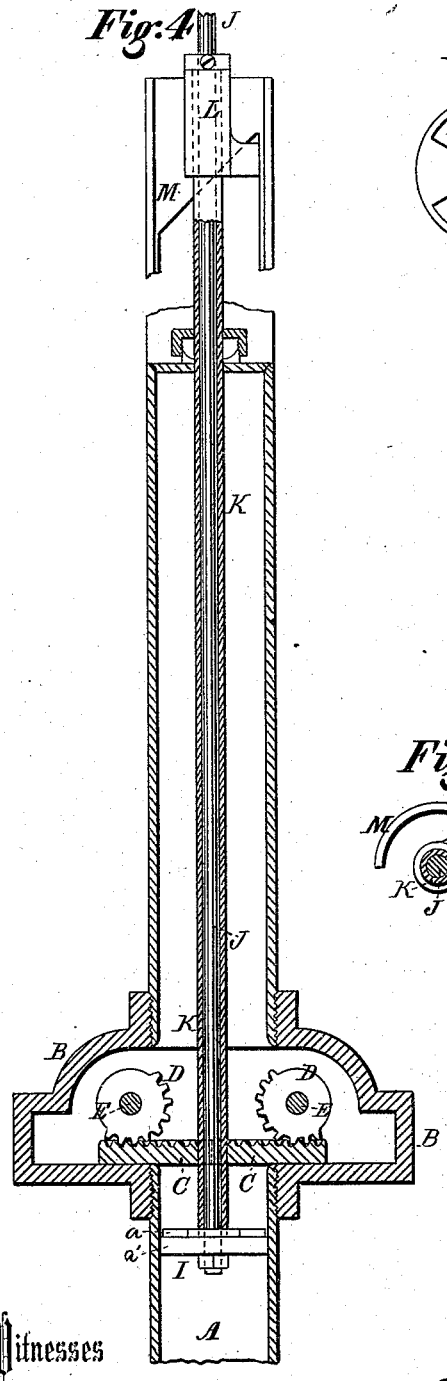


Fig: 7

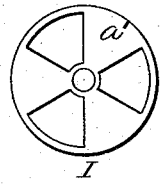


Fig: 8

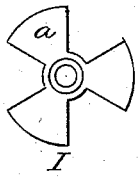


Fig: 5

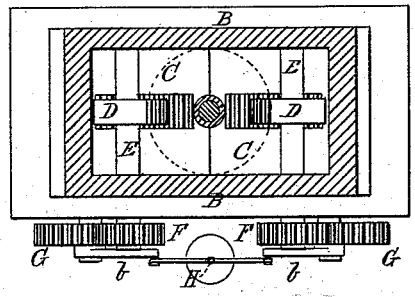
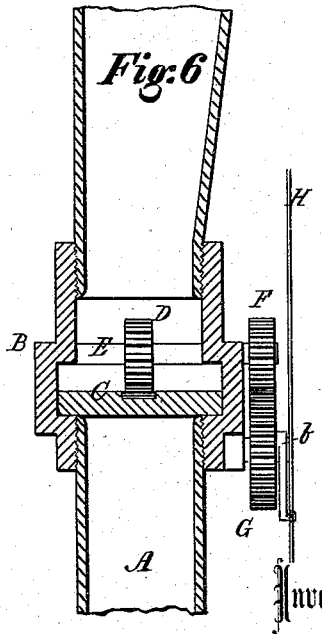


Fig: 9

Fig: 6



Witnesses

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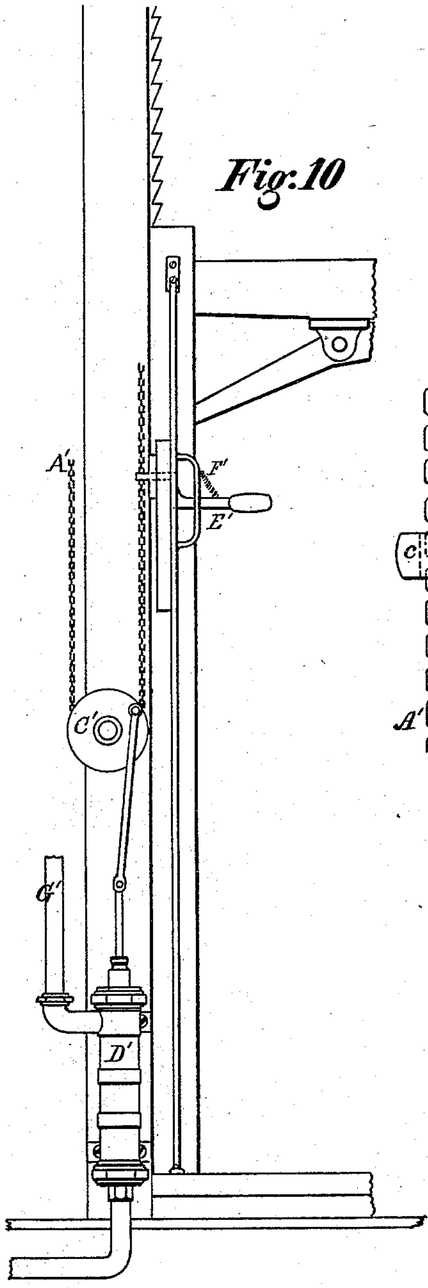

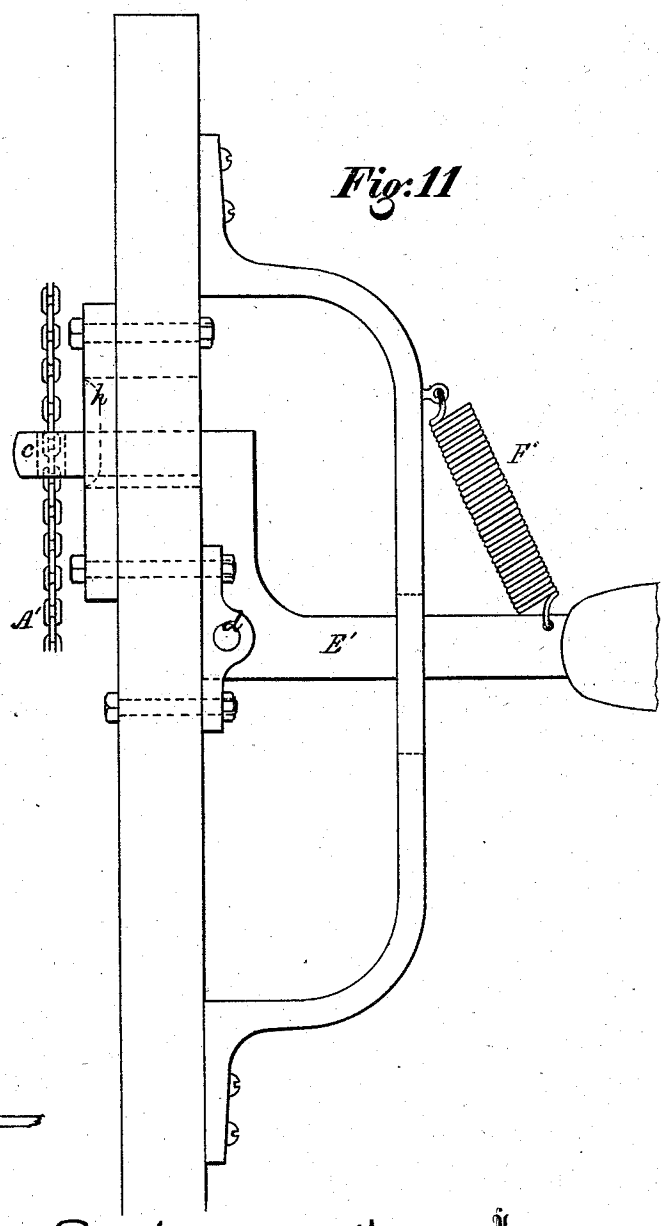

Witnesses

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UNITED STATES PATENT OFFICE.

E. HAMILTON HUNT, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN HYDRAULIC ELEVATORS.

Specification forming part of Letters Patent No. **187,711**, dated February 27, 1877; application filed June 16, 1876.

To all whom it may concern:

Be it known that I, E. HAMILTON HUNT, of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvement in Hydraulic Elevators, of which I hereby declare the following to a full, clear, and precise description, which will enable others skilled in the art to which my invention appertains to understand and employ it, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of my entire apparatus, showing the upper and lower floors of the building in which it is placed; Fig. 2, a side elevation of one of the cylinders and its connections; Fig. 3, a front elevation of a set of four of the same; Fig. 4, a vertical sectional elevation of the cylinder and case inclosing the gates; Fig. 5, a top-sectional plan of the gates, their attachments and connections, with the upper part of their cases removed; Fig. 6, a side sectional elevation of the gates and inclosing-case; Fig. 7, a top view of the perforated head-plate of the piston; Fig. 8, the valve-plate of the same; Fig. 9, a top view of the semi-cylindrical guiding-camway above the cylinder, and of the valve-controlling arm of the piston-rod; Fig. 10, a partial side elevation of platform of elevator, showing the pump and its controlling and operating connections; Fig. 11, an enlarged view of the spring governor-lever at the side of the platform, for operating the pumps.

Similar letters of reference indicate corresponding parts in all the drawings.

My invention relates to hydraulic elevators, having more especial reference to that class of the same which utilize the weight of a falling column of water as the motive power; and consists in the mechanism hereinafter set forth and claimed.

With reference to the drawings, the following is a detailed description of the mechanical construction of my device.

A is a cylinder of iron or other metal, of any desired diameter, running up from a tank, S, placed in the basement of the building, or in any other convenient position, as far as desired, either to the ground-floor, or to any other floor of the building. Affixed to the upper end of the cylinder A is a case, B, which incloses sliding gates C C, to admit into, and exclude from, the cylinder a column of water from a tank, T, above. The gates are opened and closed by means of two pinions, D D, within the case engaging with racks formed upon the gates. The shafts E E of the pinions extend through the case, and carry toothed wheels F F upon their outer ends. The toothed wheels F F engage with two larger toothed wheels, G G, pinned to the outside of the case below F F, which latter are connected, by lever-arms *b b*, to a wire rod or cord, H, whereof hereafter. Fitted within the cylinder A is a piston, I, formed in two parts, as shown in Figs. 7 and 8—*a'* the head-plate, *a* the valve-plate. The head-plate *a'* is fitted closely to the cylinder, and firmly attached to the piston-rod J. Both the head and valve plates of the piston are perforated in such a manner that, by changing the position of the valve-plate *a'*, the piston will either hold the water, or allow it to pass through it, as occasion requires. The piston-rod J is surrounded by a casing or pipe, K, the lower end of which casing is attached to the valve-plate *a* of the piston I, and the upper end of which has attached to it the lever-arm L, which arm moves up and down, through the camway M, at every stroke of the piston and its connections. The camway M is slotted to receive the arm L. The slot is, at its upper and lower extremities, curved or inclined in such a manner that the arm, passing up one side of the slot, on reaching the upper curve follows its inclination until it reaches the other side of the slot, thereby turning the casing K and valve-plate *a* of piston I through any given arc. The piston-rod continues a short distance above the casing K and arm L, where it is connected, by means of the connecting-rod N, to a driving cog-wheel, O, to the side of which are set trip-levers P and Q, the same being so pivoted that one end of each is free, and extends to the periphery of the cog-wheel in such position as to encounter the pivot-pin *f* of the wheel O at each rotation, and be deflected thereby, while the other end of the lever P is attached to the cord or rod H, which is preferably of iron, and that of the lever Q is in line with the cord, and adjusted at times to prop a detent, *z*, on

the cord. The cord H is doubled at its lower part, and is then attached to the arms *b b* of the segmental cog-wheels G G, while at its upper extremity it is single, and firmly fastened to lever P, as before stated.

It will be readily comprehended that when the cord H is raised by means of lever P, as hereafter explained, it will cause the gates C C to open. X is a shaft, upon which is mounted a small gear-wheel, W, engaging with the driving-wheel O, and also the driving-drum, upon which is coiled the hoist-rope Z′. To secure uniform and regular motion to the shaft X, I employ a series of two or more cylinders and connections each driving-gear wheel O operating a smaller gear, W, all set on the shaft X, the cylinders being each so arranged that the point of connection of each of the connecting-rods N to their large gear-wheels O that only one pair of gates will be open at one time, and, consequently, only one cylinder in operation. R R are the supply-pipes to conduct the water from the upper tank T to the cylinders. U U are valves, placed in any convenient position in the supply-pipes, and governed by means of bar V or other suitable method. Z (shown in Fig. 1) is a clutch on the drum-shaft, operated by any suitable mechanism to throw the drum in and out of gear with the driving toothed wheels W W, preventing the unnecessary operation of the cylinders and attachments in the descent of the elevator. Running from the lower to the upper floors in the building, or as far as the elevator is intended to travel, are a series of endless chains, ropes, or other suitable connections, A′, passing over pulleys, sprocket or grooved wheels B′ and C′ secured to the guide-post on which the elevator runs. The lower set of wheels C′ are attached in the usual manner by means of crank-rods to a series of pumps, D′, as shown in Fig. 10, the number of pumps corresponding to the number of pulleys. The chains A′ run through slots *c* in one end of a corresponding series of hand-levers, E′, pivoted to the side of the elevator at a fulcrum, *d*, and provided with a spring, F′, to hold them ordinarily in the position shown in Fig. 11, so that the chain passes freely through the slot *c*. When, however, it is desired to grapple the chain A′ the lever is deflected, and the chain thereby drawn into a grooved recess, *h*, in the lever-frame, the handle being held in place by any convenient lock or notch.

Such being its mechanical construction the operation of my elevator is as follows: When the operator on the platform desires to rise, he will, by means of the bar V or other suitable connection, open the cocks U in the supply-pipes R, whereupon the entire weight of the water in the pipes R will descend upon the gates, one set of which, by reason of the trip-lever arrangements P and Q will be always open, in which pipe the water will fall upon the only piston, which by reason of the open gates, is ready to receive it. The weight of water forces such piston down, thereby, by means of the piston-rod J and connecting-rods N, revolving the large gear O, which in turn drives pinion W, shaft X, drum Y, and thence the platform.

The arm L, which reciprocates within the slotted portion of the semicircular plate M, and is, as before set forth, connected to the casing K inclosing the piston-rod, on reaching the camway at the lower end of the slot is deviated by following its inclination about a quadrant arc, and in turning turns the casing K and valve-plate *a* of the piston, thereby opening the same, and allowing the water to pass through the discharge-pipe A into the tank S below. At the same moment that the opening of the valve of the piston permits the water to pass through it, the crank-pin *f* will have come into contact with the lower end of the trip-lever Q, deflecting its upper end from under the detent *z*, and thereby releasing the cord H, which, by the action of the weight *g*, is drawn down, and the gates, in consequence, closed, as before set forth.

As the gates of the first cylinder close the crank-pin of the next driving-gear will have arrived at the point shown in Fig. 2, and strikes the trip-lever P, thereby raising the cord H until the detent *z* has caught upon the upper end of the lever Q, in which position the gates of such cylinder will be open. This continuous operation of successively opening and shutting continues through the whole series of cylinders, the crank-pin and levers being so adjusted that only one cylinder is in operation at a given time.

When the arm L arrives at the upper camway of the semicircular plate M, it is again deviated in the opposite direction, whereby the piston is closed, and in condition to receive the column of water upon the reopening of the gates.

When the operator desires to stop, he shuts the cocks in the supply-pipes, and by the use of any suitable brake can lock the platform at the desired point. To lower, the brake is released, whereupon the weight of the platform causes it to descend. By means of levers E′ at side of platform, its weight, in descending, can be utilized to operate any desired number of pumps, D′, in the following manner: By deflecting the lever E′ the chain A′ is jammed in the slot or groove *h*, (shown in dotted lines in Fig. 11,) and so becomes for the time fixed rigidly to the platform. As a result the chain is operated by the platform, so as to actuate the sprocket-pulleys B′ and C′. The lower pulleys C′ operate by means of cranks, as hereinbefore described, the pumps D′, which force the water from the lower tank to the upper, through the pipes G′. In ascending with a light load, as well as in descending, the surplus power is thus utilized to return a portion of the water to the tank above, thereby saving excessive waste. In descending, to avoid the unnecessary friction of the driving mechanism, the clutch Z is uncoupled,

so as to permit the free unwinding of the drum Y.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In combination with a cylinder, A, a piston, I, piston-rod J, connecting-rod N, and driving-gear O, the whole adapted to rotate the driving-gear by the weight of a column of water admitted within the cylinder upon the piston, substantially as described.

2. In combination with the inclosing-case B located above the cylinder, one or more sliding gates, C C, within the casing, adapted to be opened or shut by toothed segmental pinions D engaging with racks upon the gates, the whole arranged to admit or exclude water from the cylinder, essentially as described.

3. In combination with a cord or rod, H, provided with a weight, *g*, one or more segmental cog-wheels, G, connected to the rope by means of one or more arms, *b*, and one or more segmental toothed wheels, F, gearing with G, and set upon the shaft E of the internal wheels D, the whole arranged to open or shut one or more sliding gates, C, when the cord is lifted or allowed to fall, substantially as described.

4. In combination with the trip-lever Q, the detent *z* upon the cord H, to retain the cord when raised, substantially as described.

5. In combination with the trip-lever Q and detent *z*, the pivot-pin *f* upon the driving-gear O, to release the detent and allow the cord to drop, essentially as described.

6. In combination with the piston I, the piston-rod J, crank N, and driving-gear O, to drive the pinion W, substantially as described.

7. In combination with the piston-rod J and piston head-plate *a'*, the valve-plate *a*, casing K, and arm L, the whole forming a device for retaining water in the cylinder, while the piston is descending and letting water out of the cylinder when the piston has descended, substantially as decribed.

8. In combination with the valve-plate *a*, casting K, and arm L, the slotted camway M to rotate the valve-plate through the arc of a circle, substantially as described.

9. In combination with mechanism for driving the pinion W, to wit, driving-gear O, connecting-rod N, piston-rod J, piston I, and cylinder A, the shaft X, clutch Z, and driving-drum Y, for transmitting power from the cylinder to the platform of the elevator, to raise the same, substantially as described.

10. In combination with the platform of the elevator, the spring hand-lever E', constructed as described, to clutch an endless chain, A', for the purpose specified.

11. In combination with the hand-lever E' upon the platform, the endless chain A', passing over the sprocket-pulley B', and sprocket-driving pulley C', to operate the force-pump D', and thereby return water through the pipe G' from the tank S, into the tank T, when the entire device is operated by the descending weight of the elevator, substantially as described.

In testimony whereof I have hereunto set my hand and seal.

E. HAMILTON HUNT. [L. S.]

In the presence of—
CHAS. TALLMAN,
JNO. B. WILLARD.