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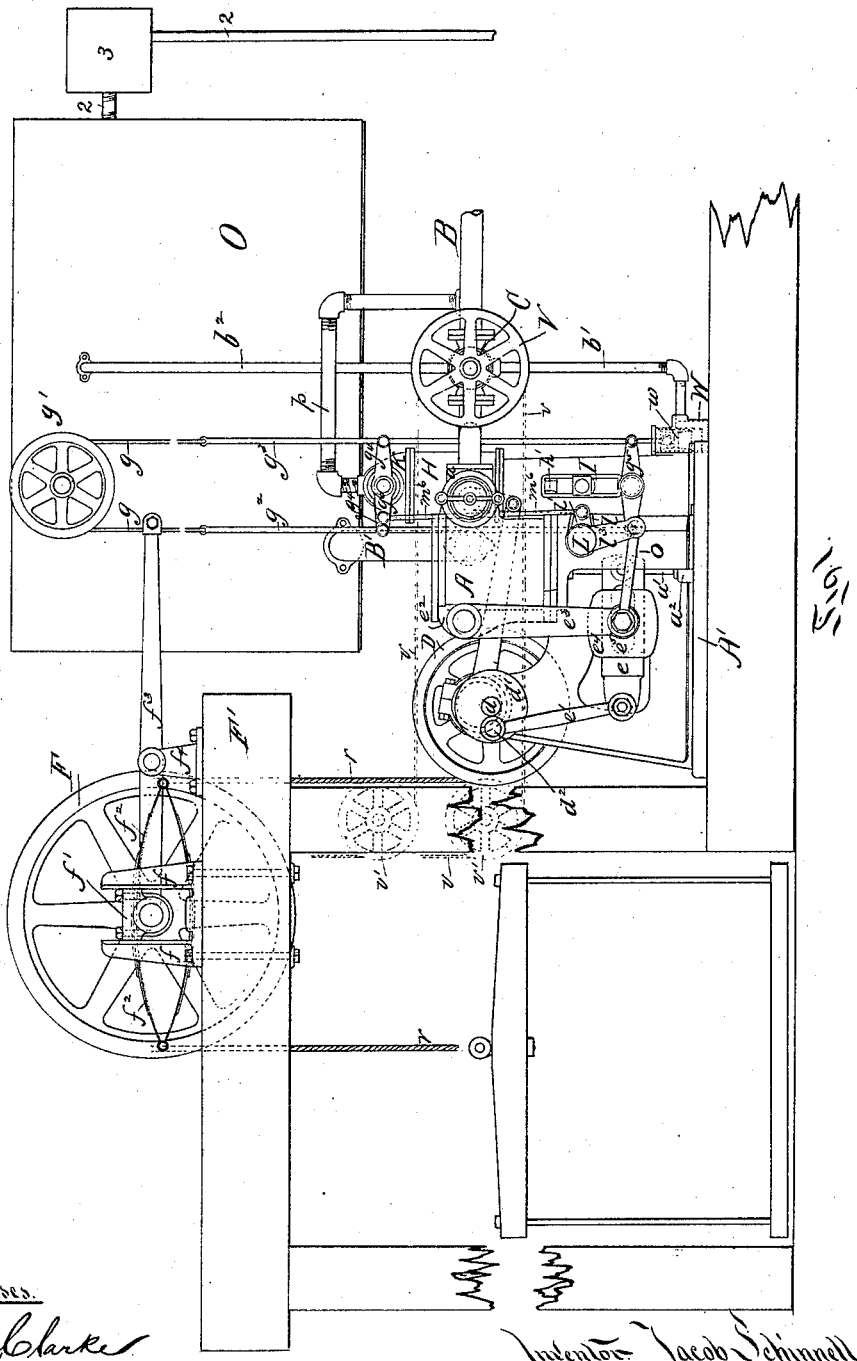
J. SCHINNELLER.

HYDRAULIC ELEVATOR.

No. 303,324. Patented Aug. 12, 1884.



Witnesses.
C. M. Clarke
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Inventor Jacob Schinneller
By Attorney George H. Christy

(No Model.) 5 Sheets—Sheet 2.

J. SCHINNELLER.

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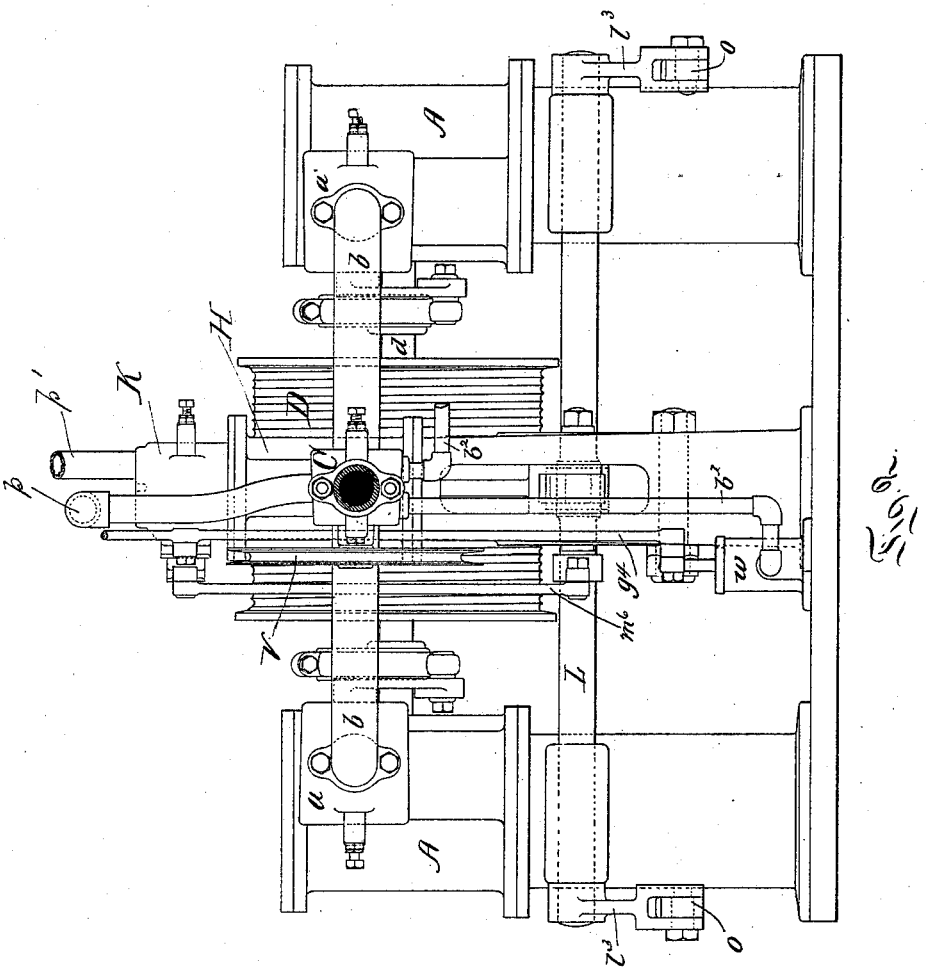

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(No Model.) 5 Sheets—Sheet 3.

J. SCHINNELLER.

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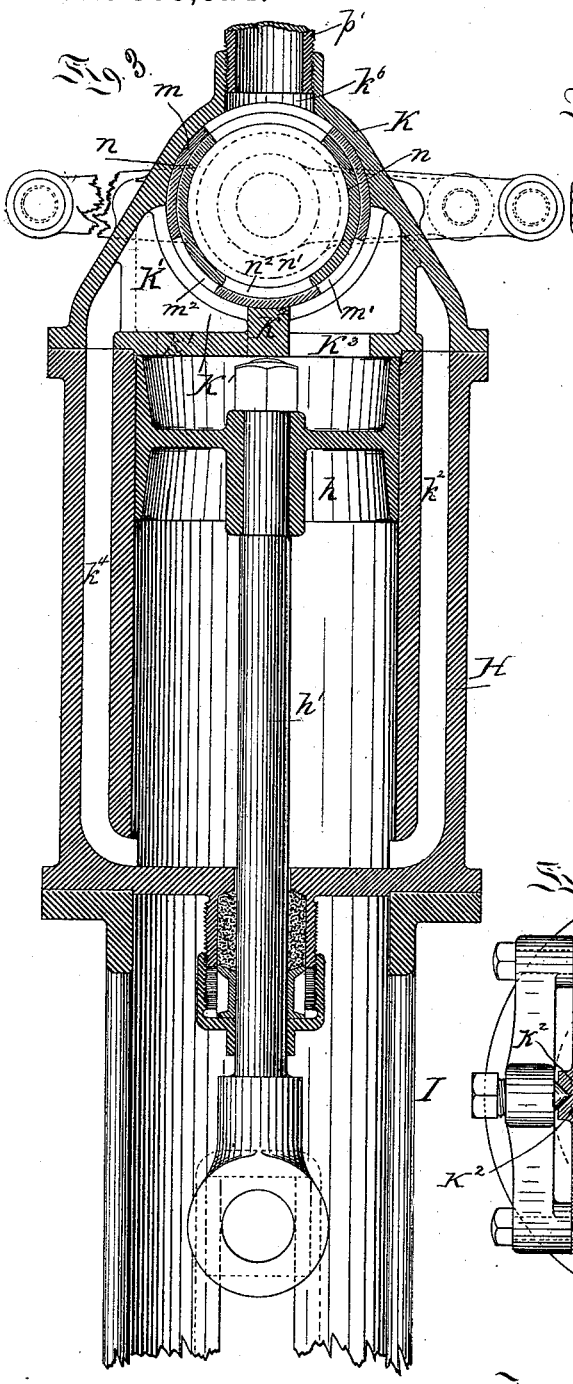

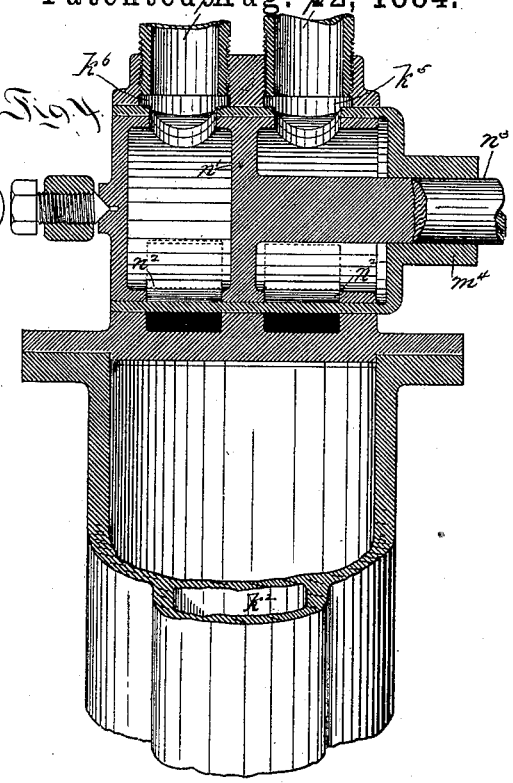

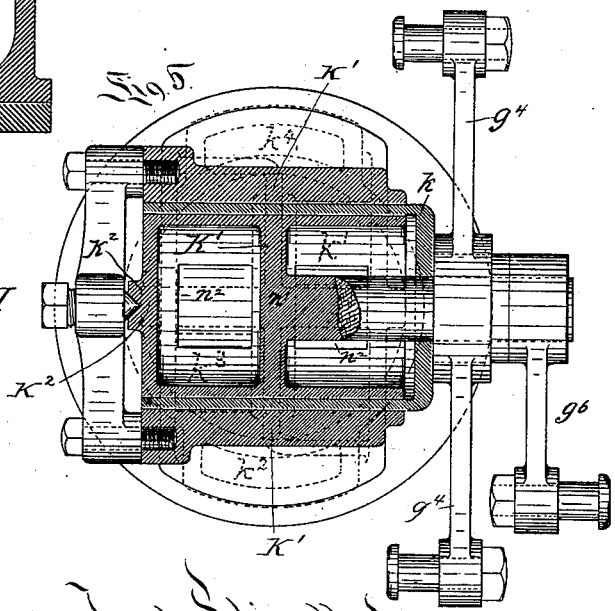

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(No Model.) 5 Sheets—Sheet 4.

J. SCHINNELLER.

HYDRAULIC ELEVATOR.

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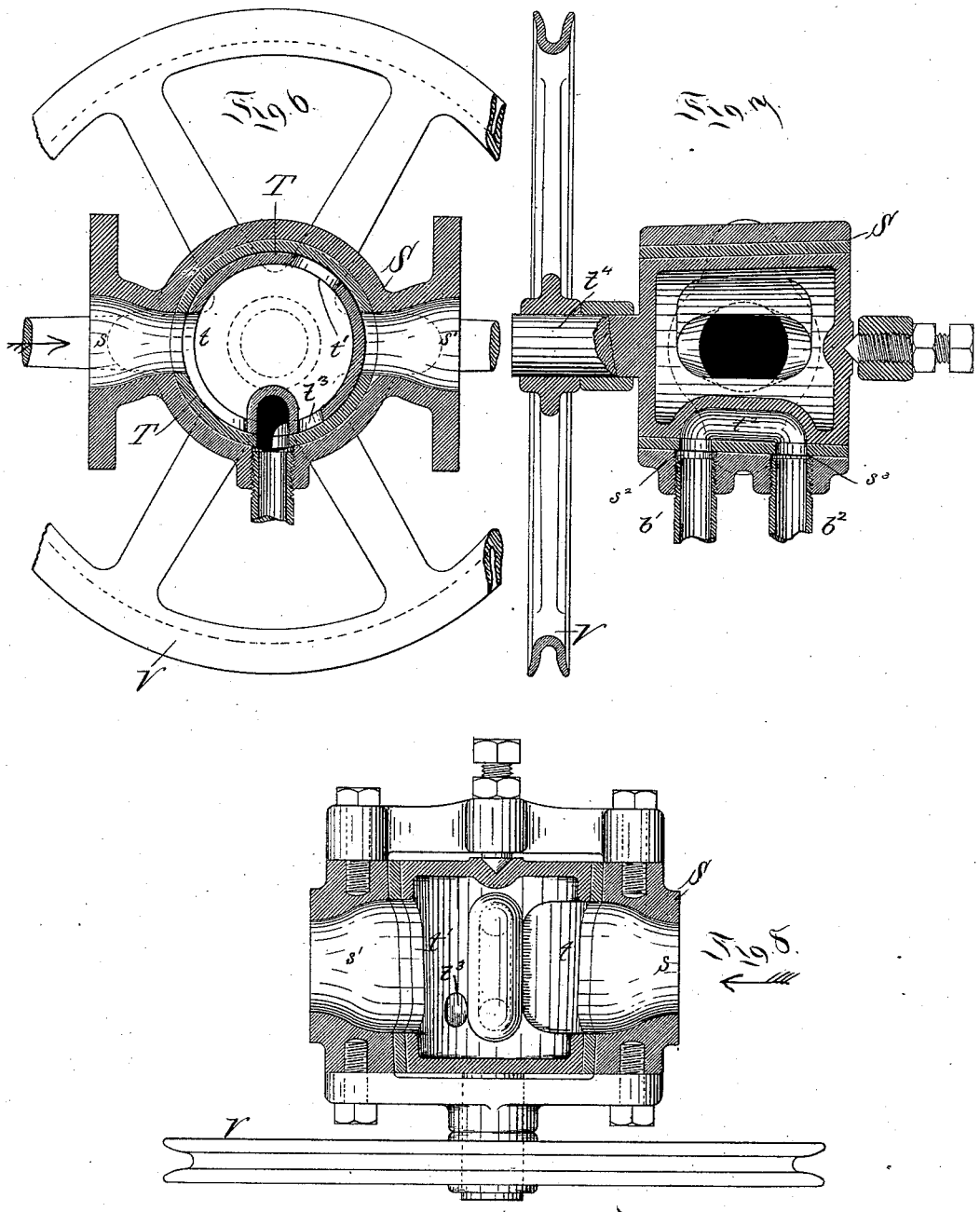

WITNESSES:

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(No Model.) 5 Sheets—Sheet 5.

J. SCHINNELLER.

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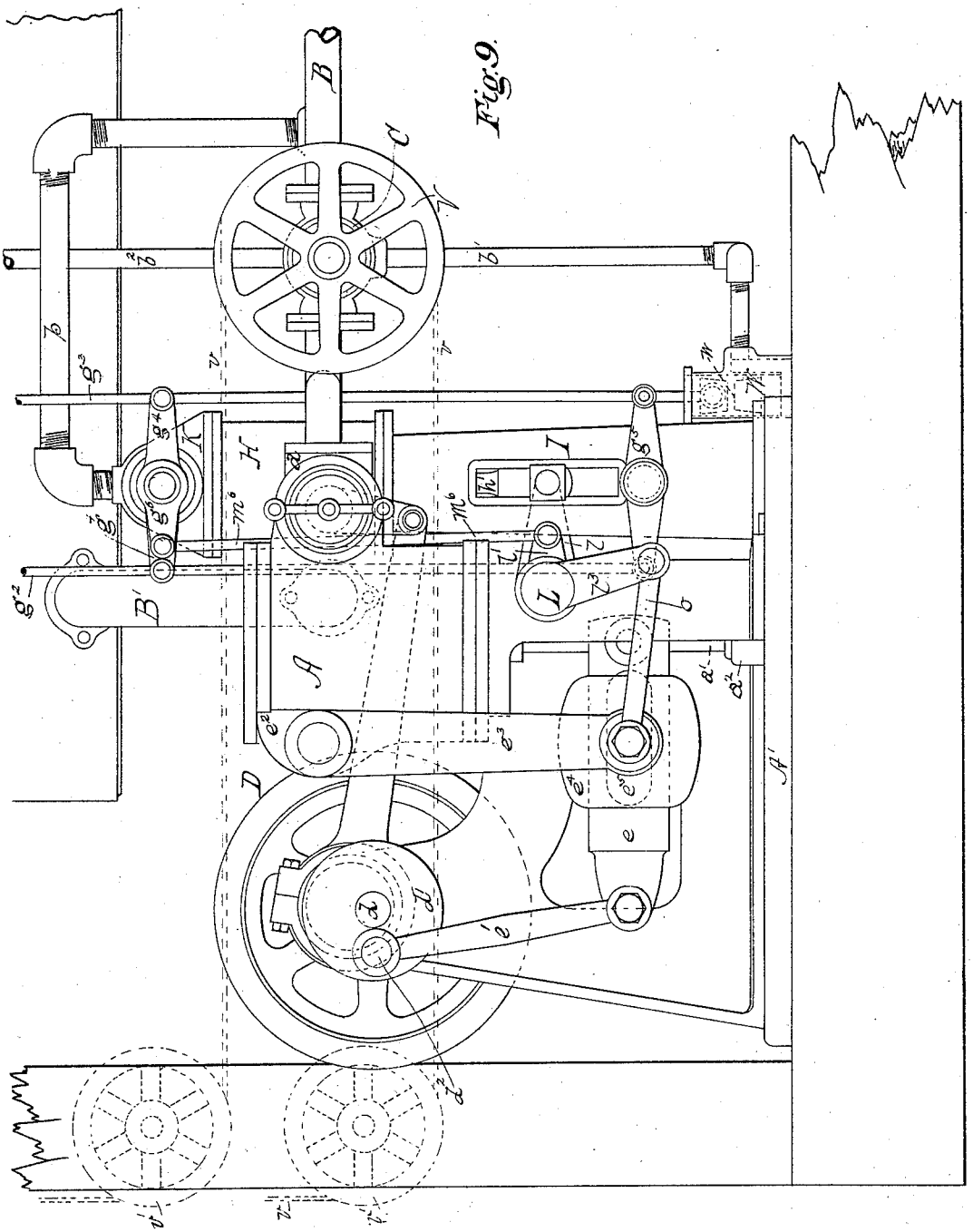
Fig. 9.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JACOB SCHINNELLER, OF PITTSBURG, PENNSYLVANIA.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 303,324, dated August 12, 1884.

Application filed November 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, JACOB SCHINNELLER, a citizen of the United States, residing at Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Hydraulic Elevators; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a side elevation of my improved hydraulic elevator. Fig. 2 is a rear view of the same. Fig. 3 is a sectional elevation of the auxiliary cylinder for regulating the stroke of the piston in the main cylinders; Fig. 4, a sectional elevation of the auxiliary cylinder, the section being at right angles to that shown in Fig. 3. Fig. 5 is a horizontal sectional view of the valve regulating the stroke of the piston in the auxiliary cylinder. Fig. 6 is a vertical section through the valve regulating the flow of water from the water-mains. Fig. 7 is a vertical section of the same valve, the section being at right angles to that of Fig. 6. Fig. 8 is a horizontal section of the same valve. Fig. 9 is an enlarged view of the operative mechanism of the elevator.

My invention relates to that class of elevators which are operated by double-acting engines driven by water stored under pressure either in the mains of a city or a storage-reservoir. In elevators of this class, when driven by water supplied from the water-mains of a city, a meter is usually attached either to the supply or exhaust pipes, to measure the amount of water used; and as the elevators now in use require as much water to drive the engine in lifting a light load as they do in raising a heavy one, and as the water, after performing its work, is allowed to escape either into the sewers or other waste-receptacle, the expense of running the elevator is considerable.

The object of my invention is to regulate the amount of water used in accordance with the weight of the load to be raised, and also to force part of the water used in raising the load back into the water-mains, the water in raising the load having been exhausted into a conveniently-located tank or reservoir. The meter is placed on the waste-pipe of the tank, and consequently will measure only the water which was not restored to the mains by the descent of the elevator.

My invention consists, in general terms, in the construction and combination of parts, all as more fully hereinafter described and claimed.

In the drawings, A A indicate the cylinders of double-acting hydraulic engines of the usual construction, placed side by side, but coupled to the winding-drum at right angles to each other, as is usual in all engines having two operating-cylinders. To these cylinders are attached the usual valve-chest, *a*, to which is connected the water-supply B by the branch pipes *b b* and the exhaust-pipe B′.

In the pipe B is arranged the valve mechanism C, for regulating the flow of water to the cylinders A. The construction and operation of this valve will be hereinafter described.

The piston-rods *a′* of these engines, in place of being directly attached to the shaft *d* of the winding-drum D, are pivotally connected to the levers *e*, the outer ends of these levers being connected to the disks *d′* of the shaft *d* by the connecting-rods *e′*, the connecting-rods *e′* being pivoted to the end of the lever, and also pivoted to the disk *d′*, by the pin d^2, eccentrically secured on the disk *d′*.

To support the piston-rod *a′* as against lateral strains, I provide guide-sockets a^2 in the bed-plate A′ of the engines.

On the side of cylinders A opposite the valve-chests *a* are formed ears or lugs e^2. To these lugs are pivoted the swinging arms e^3, and to the lower ends of these arms are pivotally attached the sleeves e^4, surrounding the levers *e*, and adapted to slide back and forth thereon. The lower ends of these arms e^3 are forked, so as to pass on opposite sides of the sleeve e^4, and the pins connecting the arms and sleeves pass through a slot, e^5, in the lever *e*. This sleeve e^4 and the swinging arm e^3 form the fulcrum of the lever *e*, and it is evident that as this sleeve is moved to and from the piston-rod *a′* the stroke of the piston will be shortened or lengthened, (the movement of the outer end of the lever being always the same,)

and consequently the amount of water used at each stroke will be correspondingly lessened or increased.

I will now describe the mechanism by which the stroke of the piston is varied according to the load in the car.

F indicates the sheave or pulley, over which passes the rope or flexible suspensory r, to one end of which the elevator-car is suspended, the other end of the rope being attached to the winding-drum D.

On a suitable beam or support, F′, are mounted the standards f, which serve as guides for the journal-boxes f' of the wheel F. These boxes f', in place of resting immovably in the standards f, are supported on the springs f^2. Consequently, as a load is placed upon the elevator-car, the springs are compressed and the pulley F and its journal-boxes are lowered. To one of the journal-boxes is attached the inner end of the lever f^3, pivoted on a standard, f^4, as clearly shown.

To the outer end of the lever f^3 is attached a rope, g, which, passing over a pulley, g', is connected at its ends to the rods g^2 and g^3. The pulley g' is to be located at the top of the building in convenient proximity to the pulley F. The rods g^2 and g^3 are arranged parallel to each other, and are attached to opposite ends of the arms g^4 and g^5. The lower arm, g^5, is pivoted to a standard, I, and serves only to guide and steady the rods. The upper arm, g^4, is attached to the stem of a valve to be hereinafter described.

On a standard or frame, I, is mounted a hydraulic cylinder, H. Within this cylinder works the piston h, whose piston-rod h' is connected to an arm, l, of the shaft L.

On the top of the cylinder H is placed a valve-chamber, K, which is interiorly divided into four compartments by the partitions K′ and K². (See Figs. 3 and 5.) Into these compartments open the inlet-passages k' and k^2 and the exhaust-passages k^3 and k^4 of the cylinder H.

Within the valve-chamber K works the circular hollow valve m. This valve is provided with the inlet-ports m' and exhaust-ports m^2, which open into the same compartments of the valve-chamber as the inlet and exhaust passages of the cylinder. The stem m^4 of this valve m is secured to the arm g^4, above mentioned.

Within the valve m is placed the cut-off valve n, which has a diaphragm, n', dividing the valve into two parts, and on each side of the diaphragm is formed a port, n^2, adapted, when the valve is rotated, to register with the inlet and exhaust ports of the valve m.

To the diaphragm n' is attached the valve-stem n^3, which, passing through the hollow stem m^4 of the valve m, is attached to an arm, g^6, by which the cut-off valve is rotated. Each of the valves m and n is provided on the side opposite the ports above described with openings which register with the openings k^5 and k^6 in the valve-chamber K, into which openings are screwed the supply and exhaust pipes p p'. These openings in the valves are made sufficiently large to prevent any closing of the openings k^5 and k^6 when the valves are rotated. The arm g^6 is connected by a rod, m^6, with the arm l' of the shaft L, on the end of which is secured the crank-arm l^3, and the outer end of this crank-arm is connected to the sleeve e^4 by the connecting-rod o. The rod g^3, attached to one end of the valve-operating arm g^4, is extended below the guide-arm g^5, and is connected to the piston w of the auxiliary cylinder W, the operation of which will be hereinafter described.

In the main pipe B is placed the regulating-valve mechanism C, (see Figs. 6, 7, and 8,) which consists of a valve-chamber, S, having openings s s' at opposite sides thereof, and a hollow circular valve, T. This valve T is provided with the ports t and t', which regulate the flow of water into the valve, and from the valve into the branch pipes b, leading to the cylinders A.

In one of the sides of the valve-chamber, midway between the openings s s', are formed the openings s^2 s^3, one of which, s^2, is connected by the pipe b' with the auxiliary cylinder W, and the other opening, s^3, is connected by a pipe, b^2, with the tank O.

In the valve T is formed a passage, t^2, so constructed as to be capable of connecting the openings s^2 and s^3, which are connected with the pipes b' and b^2, respectively, as shown in Figs. 7 and 8, the pipe b' leading to the cylinder W, and the pipe b^2 leading to the tank O. This passage, however, does not communicate with the interior of the valve.

At one side of the passage t^2 is formed a port, t^3, adapted in a certain position of the valve T to register with the opening s, thereby allowing water to flow from the interior of the valve T to the cylinder W. The valve T is provided with a stem, t^4, on which is secured the grooved wheel V. Over this wheel V passes the rope v, which passes around guide-wheels v', located at the side of the elevator-well, and then passes up the side of the elevator-well and over a wheel at the top thereof, as is usual. The ports of the valve T are so arranged with reference to the ports of the valve-chamber that the passage t^2 and the port t^3 may be brought into register with the openings s^2 and s^3 without the port t' being brought into register with the opening s'. The port t is sufficiently large to allow a pressure of water within the valve at all the working positions of said valve. It will be noticed that the pipe p so connects the valve H with the water-main B that there is a constant pressure of water in said valve.

The operation of my device is as follows, and for convenience I will suppose that the elevator-car is at the lowest floor, ready to be loaded: As the load is placed on the car, it will, through its suspending rope or cable r,

depress the pulley F, which movement will also lower the journal-boxes, which are supported on the springs f^2, and by lowering the journal-boxes the inner end of the lever f^3, connected with the journal-boxes, will be also lowered and its outer end correspondingly raised, and as the rope g is securely attached to the outer end of this lever, the upward movement of this end of the lever will raise the rod g^2 and lower the rod g^3. As these rods are attached to the ends of the valve-arm g^4, the valve m will be turned to the right, as shown in Fig. 3, thereby bringing its port m^2 in line with the port n^2 of the cut-off valve n, thereby allowing the water under the piston to flow out through the passage k^4, the ports m^2 n^2, which are thus brought into register, and out through the exhaust-pipe p' to the tank. At the same time the inlet-port m' on the opposite or inlet side of the diaphragm n' is brought into register with the correspondingly-located port n^2 of the cut-off valve n, thereby allowing water to flow from the supply-pipe p, through these registering ports, and through the inlet-opening k' (shown by dotted lines at the left of Fig. 3) into the cylinder K above the piston, thereby driving down the piston. As the piston descends it forces down the arm l, thereby turning the shaft L, and with it the arm l^3, to the left, and as the arm l^3 is connected to the sleeve e^4, said sleeve is also forced to the left on the lever e, thereby throwing the fulcrum of this lever away from the piston-rod a', thus permitting of an increased stroke of the piston in the cylinder A; but as the shaft L turns, the arm l' is turned down, pulling down with it the rod m^6 and the arm g^6 of the cut-off valve n, thereby turning said valve to the right, and consequently closing the exhaust and inlet ports opened by the movement of the valve m, and stopping any further downward movement of the piston of the cylinder H. These alternate and intermitting movements—by which I mean the movement of the piston first in one and then in the opposite direction, and the stopping and starting of the piston—continue as long as a load is being placed on the elevator-car, and the parts are so adjusted as to effect such an adjustment of the fulcrum of the lever e that the stroke of the piston, and consequently the amount of water used, will correspond to the load to be raised. During the loading of the car and the consequent adjustment of the parts of the engine the valve T is so adjusted as to bring the passage t^2 into register with the openings s^2 s^3, so that any water that may be in the cylinder W can flow out, and thus allow a free movement of the piston w and the parts connected thereto, for if water were held in the cylinder W it would prevent the movement of its piston w in one direction or the other, and consequently prevent the movement of the arm g^4, which is rigidly attached thereto, and which should be free to move under the action of the lever f^3 when the car is being loaded. After the car has been loaded and the parts have adjusted themselves as above described, the elevator attendant pulls the rope v, thereby turning the valve T so as to bring its ports t and t' in register with the openings s s', which connect with the supply-pipe on each side of the valve, and water will thus be admitted to the cylinders A and the engine started. After the car has been stopped at the desired floor, the load is removed from the car, and during the unloading the springs f^2 will expand, thereby raising the pulley F and its journal-boxes, and consequently depressing the outer end of the lever f^3, and thereby lower the rod g^2 and raise the rod g^3. This movement of these rods will turn the valve m so as to allow the water to exhaust from above the piston k and flow in below the same, thereby raising the piston, and with it the arm l. This movement of the arm l will turn the shaft L, and with it the arm l^3, to the right in Fig. 1, thereby drawing the sleeve e^4 to the piston end of the lever e, and therefore shorten the stroke of said piston and throw the balance of power to the outer end of the lever e. Now, if the attendant so turns the valve T as to open communication between the cylinders A and the supply-pipe B, it will be found that the weight of the car is sufficient to reverse the engines, and thereby in its descent cause the engines to pump water from the tank O back into the pipe B, which then becomes the exhaust-pipe, so to speak, of the cylinders. It will be observed, however, that as the stroke of the piston is not as great during its reverse movements as when raising the car, only part of the water used in raising the load will be restored to the mains. It may, however, happen that the weight of the car is not sufficient to reverse the engine. In that case, before the ports t' and s' are brought into register, the attendant pulls the starting-rope so as to turn the valve T until its port t^3 is caused to register with the opening s^2, in which is screwed the pipe b', leading to the cylinder W, and thereby admit water into the cylinder W and raise its piston, thereby raising the rod g^3 and turning the valve m to the left in Fig. 3, and consequently causing the piston K to rise. This movement will, as before described, move the sleeve e^4 closer to the piston end of the lever e. This adjustment is continued until the sleeve or fulcrum of the lever e has reached such a point on the lever that the weight of the car is sufficient to overcome the pressure of the water in the engine. This device is especially needed when loads are to be carried down, for as the load is placed on the car the sleeve e^4 will be moved away from the piston, as before described; but this movement renders the water-pressure in the cylinders more effective. It is therefore necessary that the sleeve should be so adjusted that the weight of the car will overcome the water-pressure, in order to allow the car to descend.

In place of having the rod g^3 connected with

the piston of the cylinder W, I may connect the cylinder with the rod g^2, and in that case the water would be exhausted from said cylinder, in order to effect the adjustment above described for causing the car to descend.

Whenever the elevator is employed for raising heavy loads and descends with a light load or empty, more water will be used in raising the load than can be returned to the mains by the reversal of the engines, as above described, and if this use is long continued the storage-tank will be filled. I therefore connect the storage-tank O, near its top, with an overflow-pipe, 2, leading to the sewer, and in this pipe 2 I place a water-meter, 3, which will measure the amount of overflow, which will represent the amount of water actually withdrawn from the mains or supply, and which cannot in the usual operation of the elevator be returned, and must therefore be paid for.

What I claim as my invention is—

1. In a hydraulic elevator having in combination a car, a flexible suspensory, a winding-drum, and a connecting-lever from the piston of the hydraulic engine for operating said drum, a movable fulcrum point or bearing for said connecting-lever, having a range of motion relative to the other pivotal points of the lever such that when shifted in one direction the force exerted by the water-pressure from the mains or head shall be in excess of the load, and when shifted in the opposite direction such force shall be less than the load, whereby in the latter case, on the opening of the valve leading to the mains or head, the load shall reverse the engine and pump back into the mains or head some or all of the surplus water previously stored up, substantially as set forth.

2. In a hydraulic elevator, the combination of a car, a flexible suspensory, a winding-drum, a hydraulic engine, and an automatic mechanism, substantially as described, for regulating the length of the piston-stroke of said engine by and according to the load to be raised in the car, substantially as set forth.

3. In a hydraulic elevator, the combination of an operating-cylinder, a winding-drum, a suitable connecting-lever for transmitting the reciprocating motion of the piston of said cylinder to the winding-drum, and an adjustable fulcrum or bearing for said lever, substantially as set forth.

4. In a hydraulic elevator, the combination of an operating-cylinder, a winding-drum, a suitable connecting-lever for transmitting the reciprocating motion of the piston of said cylinder to the winding-drum, an adjustable fulcrum or bearing for said lever, and a fluid-pressure mechanism for automatically varying the position of said fulcrum in its relation to the pivotal points of said lever by and in accordance with the load to be raised, substantially as set forth.

5. In combination with a movable fulcrum or bearing of the operating-lever of a hydraulic elevator, a fluid-pressure mechanism for automatically varying the position of said fulcrum in its relation to the pivotal points of the lever by and in accordance with the load to be raised, substantially as set forth.

6. In a hydraulic elevator, the combination of an operating-cylinder, a suitable connecting-lever for transmitting the reciprocating motion of the piston of said cylinder to the winding-drum, an adjustable fulcrum for said lever, a fluid-pressure mechanism for varying the position of said fulcrum in its relation to the pivotal points of the lever, and an auxiliary hydraulic cylinder W, for reversing the valves of said fluid-pressure mechanism, whereby the bearing or fulcrum point of the lever is shifted and the weight to be lowered may overcome the force of the water-pressure in the operating-cylinder, substantially as set forth.

7. In a hydraulic elevator having a car, a flexible suspensory, a pulley mounted in yielding bearings over which said flexible suspensory passes, a winding-drum, a main operating hydraulic cylinder and piston, a connecting-lever interposed between the piston-stem thereof and the rotating devices of the winding-drum, the movable fulcrum or bearing-point of said lever, and in combination therewith a fluid-pressure cylinder, H, and suitable interposed connections for shifting such movable fulcrum, and mechanism for transmitting motion from the movable bearings of the pulley to the valve-gear of said cylinder H, substantially as set forth.

8. A hydraulic elevator having, in combination with the pulley F and the yielding bearings thereof, and with a hydraulic cylinder, H, for regulating the piston-stroke of the main operating-cylinder, a mechanism for transmitting the motion of the yielding bearings of the pulley to the valve-gear of the hydraulic cylinder H, substantially as set forth.

9. The cylinder H, provided with valves and piston, in combination with the auxiliary cylinder W, having a piston to the valves of cylinder H, for imparting a reverse movement to said valves, and the movable fulcrum e^4, connected to the piston of the cylinder H, substantially as set forth.

10. In a hydraulic elevator, a main operating-cylinder, a winding-drum, a suitable connecting-lever for transmitting motion from said cylinder to the winding-drum, an adjustable fulcrum for said lever, in combination with a double-acting hydraulic cylinder, H, having suitable main and cut-off valves, and mechanism for transmitting motion from said cylinder to the adjustable fulcrum, substantially as set forth.

11. The combination of the cylinder A of the operating-engine, the hydraulic cylinder W, the main water-pipe B, having suitable pipe-connections with said cylinders, and the valve C, provided with ports t, t', and t^3, so ar-

ranged as to admit water to the cylinder W in advance of the cylinder A, whereby the stroke of the operating engine is adjusted before the cylinder A is connected with the water-main B, substantially as set forth.

12. The combination of the operating cylinder A and its piston, the lever *e*, the adjustable sleeve e^4, and a swinging arm, e^3, pivoted to the cylinder, and the winding-drum, substantially as set forth.

13. A hydraulic elevator having in combination a car, a flexible suspensory, a winding-drum, an operating-engine, and a storage-tank, the piston of said engine being adjustably connected to the winding-drum, whereby the stroke of the piston and the amount of water exhausted into the storage-tank in raising a load or car shall be proportional to said load, and whereby when the car or load is descending the car or load shall be, on the opening of the valve leading to the mains or head, in excess of the pressure from the mains, and shall reverse said engine, thereby causing said engine to act as a pump and restore part of the water previously exhausted into the storage-tank, substantially as set forth.

14. In a hydraulic elevator, the combination of an operative engine, a storage-tank connected to said engine by an exhaust-pipe, and provided with an overflow-pipe, and a water-meter arranged in the overflow-pipe, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JACOB SCHINNELLER.

Witnesses:

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