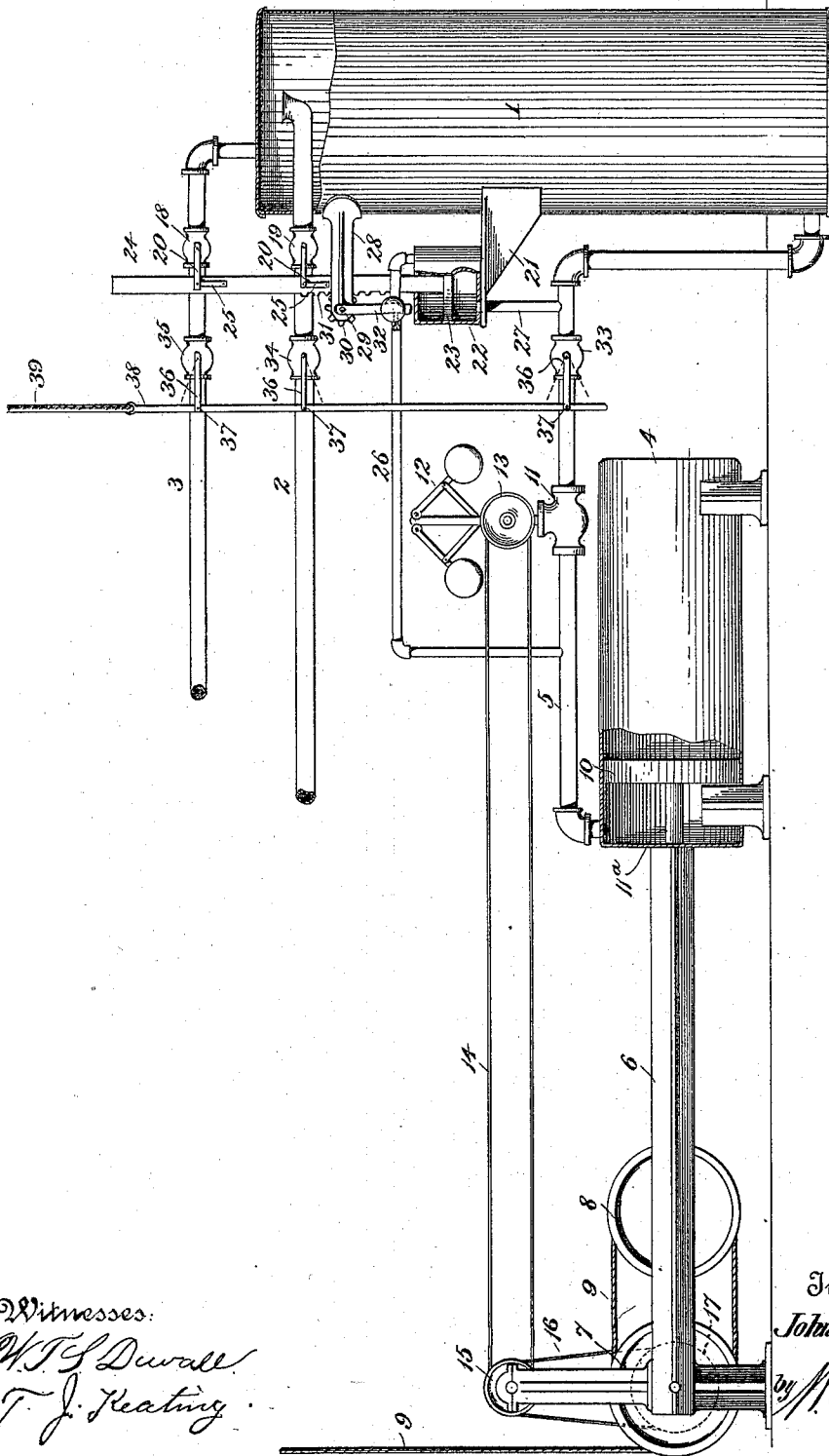


(No Model.)

J. T. WILKIN.
HYDRAULIC ELEVATOR MECHANISM.

No. 552,565.

Patented Jan. 7, 1896.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN T. WILKIN, OF CONNERSVILLE, INDIANA.

HYDRAULIC-ELEVATOR MECHANISM.

SPECIFICATION forming part of Letters Patent No. 552,565, dated January 7, 1896.

Application filed March 7, 1895. Serial No. 540,892. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. WILKIN, a citizen of the United States, residing at Connerville, in the county of Fayette and State of Indiana, have invented certain new and useful Improvements in Hydraulic-Elevator Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in hydraulic mechanisms for operating elevators of that class wherein a body of water is operated upon by an expansive fluid; and the objects in view are to produce a simple mechanism of this class, the same being so constructed as to regulate the expenditure of expansive fluid in accordance with the load to be lifted, thereby effecting a saving of such fluid, the admission of which is automatically controlled by the aforesaid load; furthermore, in instances where a heavy load is brought down, either the entire or only a portion of the way, to preserve the pressure and utilize the same for starting the elevator up.

With these main objects in view, the invention consists in certain features of construction hereinafter specified, and particularly pointed out in the claims.

Referring to the drawing, which represents in side elevation my improved hydraulic-elevator mechanism, 1 represents the usual metal tank, which, when the elevator is down, is nearly full of water, and which is provided at its top with an inlet-pipe 2 and an exhaust-pipe 3, the former leading from any steam or air supply, as either steam or air or any other form of expansive fluid may be employed.

At a suitable distance from the tank 1 is the main cylinder 4, the same being properly supported and connected at its front end with the lower end of the tank 1 by means of a water-supply pipe 5. The cylinder 4 is arranged at one end of the usual cable mechanism or hoisting-frame 6, in which are arranged the pulleys 7 and 8, around which passes the cable 9 by which the elevator car or cage is suspended in the usual manner. The pulleys 7 and 8 are actuated by the movements of the piston-head 10 and its rod 11, as is usual.

A throttle-valve 11 is located in the water-supply pipe 5 and the same is controlled by an ordinary ball or centrifugal governor 12. The governor is actuated by a pulley 13, arranged upon the shaft for the purpose, as is usual in governors of this class, and the said pulley 13 receives its motion from an endless band 14, which also passes over a twin pulley 15, supported above the frame 6 and receiving motion from an endless band 16, which passes over a pulley 17 (see dotted lines) arranged upon the same shaft as and moving with the high-speed pulley 7.

The fluid-exhaust pipe 3 is provided with a valve 18 and below the same the fluid-inlet pipe 2 is provided with a similar valve 19, from the stem of which valves operating-levers 20 extend. Below the pipe 2, and in the present instance supported upon a bracket 21, is a small regulator-cylinder 22, in which vertically moves a piston or diaphragm 23, the stem 24 of which extends vertically beside the valves 18 and 19, and is loosely connected with the valve-operating levers 20 by links 25, whereby, as will be apparent, as the said piston or diaphragm moves up and down the valves 18 and 19 are opened and closed accordingly and in a manner to be described. A small pressure-pipe 26 extends from the upper end of the regulator-cylinder 22 and communicates with the water-supply pipe 5 between the throttle-valve 11 and the front end of the main cylinder 4. A similar pressure-pipe 27 communicates with the bottom of the regulator-cylinder 22 and the water-supply pipe 5 between the throttle-valve 11 and the tank 1. Thus it will be seen that any difference of pressure existing in the water-supply pipe at opposite sides of the throttle-valve 11 will influence the piston or diaphragm in the regulator-cylinder, causing it to ascend or descend.

An arm or bracket 28 extends in the present instance horizontally from the tank 1 over the regulator-cylinder, and upon a short shaft 29, arranged in the arm, there is supported a small pinion 30, the teeth of which intermesh or gear with the teeth 31, formed on the edge of the piston-rod 24 of the regulator-cylinder. The end of the shaft 29 receives a weighted arm 32, which, when the

piston 23 is in a middle position within the regulator-cylinder, hangs vertical or plumb. By adjusting the weight upon the arm greater or less pressure in the regulator-cylinder will
 5 be required to raise it from its vertical position, and in this manner the regulator may be adjusted to operate at a desired pressure against its piston.

The water-supply pipe 5 has a valve 33 located between the throttle-valve 11 and pressure-pipe 27. A similar valve 34 is located in the fluid-inlet pipe 2, in advance of the valve 19, and a similar valve 35 is located in the fluid-exhaust pipe 3, in advance of the
 15 valve 18. These three valves 33, 34 and 35 align vertically, and the stem of each is provided with a lever 36, the outer end of which is pivoted at 37 to a connecting-rod 38, at whose upper end is connected the lower end
 20 of the valve or operating-rope that passes up into the elevator cage or car, or they may be operated by an auxiliary piston.

The governor 12 of the throttle-valve 11 is so set, it will be understood, that when the
 25 elevator reaches a normal speed the water passing from the tank 1 to the main cylinder 4 will be throttled. The valves 33, 34 and 35 are so constructed that the first-mentioned valve 33 will be open when its lever is either
 30 raised or lowered, as shown by dotted lines in the drawing, and the valve 34 will be open only when its lever is lowered, as shown by dotted lines, and is so arranged as to open slightly in advance of the valve 33, and the
 35 valve 35 is open only when its lever is raised to the position shown by dotted lines, and should open slightly before the valve 33. The valves 18 and 19 are both open when the regulator-piston 23 is at the center of its
 40 stroke. The valve 19 closes as the piston is raised and opens as it is lowered, and the valve 18 closes as the piston is lowered and opens as it is raised. Inasmuch as the weighted arm is vertical or plumb when the piston or dia-
 45 phragm 23 of the regulator-cylinder is at the middle of said cylinder or the middle of its stroke, it will be seen that any movement in either direction by said piston will cause said
 50 arm 32 to vibrate or swing from the vertical, and by means of this weighted arm a given difference of pressure can be maintained in the tank 1 and cylinder 4.

This being the construction the operation is as follows: In starting the elevator the
 55 connecting-rod 38 is moved downward by the operating-rope 39, which leads to the cage or car, thus opening the valves 33 and 34, and the fluid passing from the pipe 2 into the tank 1, between the upper end of the same and the
 60 body of water therein contained, exerts a pressure upon said body of water, thus forcing the latter through the water-supply pipe 5 into the front end of the tank 4 and against the piston-head 10, so that the latter is driven
 65 back into the main cylinder and operates the hoisting mechanism of the elevator in a man-

ner that is well known. As soon as the elevator reaches its maximum or normal speed, the governor operates the throttle-valve, partially closing the same so as to maintain or
 70 limit the speed of the elevator, which it is obvious it will do, by reason of the fact that the inflow of water under pressure to the cylinder is partially cut off. It will be obvious that
 75 when the water is throttled by the valve 11 there is at once a difference in the pressure in the regulator-cylinder 22, whereas before such throttling the pressure was equal, as it was throughout the pipe 5. The throttling of
 80 the water decreases the pressure between the throttle-valve 11 and the main cylinder 4, so that the greater pressure in the pipe 5 at the opposite side of the valve 11 will be directed against the under side of the piston or dia-
 85 phragm in the regulator-cylinder, causing said piston to move up, and its piston-rod being connected with the lever 20 of the valve 19, the latter is caused to gradually close, so that the fluid-pressure is reduced upon the
 90 body of water contained in the tank 1, and only sufficient fluid enters the tank 1 and operates upon the body of water therein contained to maintain a given difference of pressure in the regulator-cylinder. Thus it will be
 95 seen that the pressure in the upper part of the regulator-cylinder is always accurately determined by the load in the elevator-car, and the admission-valve 19 can be set to close at any given difference of pressure desired. In
 100 the descent of the elevator-car the opposite action occurs, and the air-pressure is throttled as it escapes through the fluid-exhaust pipe 3 from the tank 1. If a heavy load is brought either wholly or partially down, the pressure in the tank is preserved and can be
 105 subsequently utilized in promptly starting up a load. In case a heavy load is elevated only a portion of the travel of the elevator, the remaining load is carried up a part or the remainder of the distance as far as the expansion of the greater pressure will serve the purpose before any more fluid-pressure is admitted into the tank.

From the foregoing description, in connection with the accompanying drawing, it will be
 115 observed that I have produced a hydraulic mechanism for elevators wherein the expansive fluid is utilized and governed automatically by the load in exact proportion thereto, and therefore no waste can occur.

I do not limit my invention to the exact details of construction herein shown and described, but hold that I may vary the same to any degree and extent in the application of my principle without departing from the
 125 spirit of my invention or sacrificing any of its advantages.

In case a direct pressure of steam is employed in the tank 1, I prefer that the latter be lined with wood or other non-conductor, so
 130 as to absorb as little heat from the steam as possible, and I would in such case also use a

float of non-conducting material on top of the water. I may, however, employ a steam-cylinder arranged in direct line with the water-tank, but located a sufficient distance therefrom to obviate any radiation of heat therefrom to the tank, such cylinder acting similarly to a direct-acting steam-pump; but such detail changes are perfectly obvious and need hardly be mentioned with those familiar with this class of inventions.

Having described my invention, what I claim is—

1. In a hydraulic-elevator mechanism, the combination with a tank, its cylinder, and water-supply pipe leading from the lower end of the former to the latter in advance of its piston, of a governor-valve arranged on the water-supply pipe, a hoisting-gear connected to the piston, intermediate connections between the hoisting-gear and governor, whereby the movements of the latter are influenced by the gear, fluid-inlet and fluid-exhaust pipes leading to the tank, a regulator, valves arranged in the fluid-inlet and fluid-exhaust pipes and operated by the regulator, and suitable connections, whereby the regulator is influenced in accordance with the load on the elevator, substantially as specified.

2. In a hydraulic-elevator mechanism, the combination with a tank, its cylinder, and water-supply pipe leading from the lower end of the former to the latter in advance of its piston, of a governor-valve arranged on the supply-pipe, a hoisting-gear connected to the piston, intermediate connections between the hoisting-gear and governor, whereby the movements of the latter are influenced by the gear fluid-inlet and fluid-exhaust pipes leading to the tank, a regulator, valves arranged in the fluid-inlet and fluid-exhaust pipes and operated by the regulator, and suitable connections, whereby the regulator is influenced by the load on the elevator, valves located in the water-supply pipe, the fluid-inlet and fluid-exhaust pipes, means for operating the valves, and an operating rope leading from such means to the car, substantially as specified.

3. In a hydraulic-mechanism for elevators, the combination with a tank, a main-cylinder, a supply-pipe leading from the tank to the cylinder, a throttle-valve arranged in the supply-pipe, a hoisting-gear connected with the piston of the main-cylinder, means for controlling the throttle-valve in accordance with the speed of the gear, valved inlet and exhaust-pipes leading to the tank, a regulator, connections whereby it is automatically influenced by the load on the elevator, and connecting-devices between the said valves, substantially as specified.

4. In a hydraulic-mechanism for elevators, the combination with a tank, a cylinder, a supply-pipe between the tank and cylinder, a throttling-valve arranged on the supply-pipe, means for automatically governing the same,

a hoisting-mechanism connected with the piston of the cylinder, fluid-inlet and outlet-pipes having oppositely opening valves, a regulator connected with the valves, means for adjusting the regulator to operate at various pressures, and automatic means for operating said regulator by the load on the elevator, substantially as specified.

5. In a hydraulic-mechanism for elevators, the combination with a tank, a main-cylinder, and a pipe leading from the tank to the cylinder, a throttling-valve provided with a centrifugal governor arranged upon the pipe, a hoisting-gear connected with the piston of the cylinder, a pulley above the same geared with one of the pulleys of the hoisting-gear, a belt connecting said pulley with the centrifugal governor, of fluid-inlet and fluid-exhaust pipes provided with oppositely opening valves, a regulator cylinder adjacent thereto, a pressure-pipe connecting the top of the cylinder with the supply-pipe between the throttle-valve and main-cylinder, a similar pressure-pipe connecting the lower end of the regulator-cylinder with the supply-pipe between the tank and throttle-valve, a piston or diaphragm arranged in the regulator-cylinder, and connections between the same and valves of the fluid-inlet and fluid-exhaust pipes, substantially as specified.

6. In a hydraulic-mechanism for elevators, the combination with a tank, the cylinder, the water-supply pipe leading from the tank to the cylinder, the hoisting-mechanism operated by the piston in said main-cylinder, a throttle-valve located on the water-supply pipe, fluid-inlet and exhaust-pipes leading to and from the tank, oppositely opening valves arranged in said pipes, a regulator-cylinder, a piston arranged therein and having its stem connected with the valves and provided with teeth, of a support, a shaft journaled therein, a toothed pinion arranged upon the shaft and engaging with the teeth of the stem, a weighted arm depending from the shaft, pressure-pipes connecting the upper and lower ends of the regulator-cylinder with the water-supply pipe between the cylinder and throttle-valve and between the latter and tank, substantially as specified.

7. In a hydraulic-mechanism for elevators, the combination with a tank, a cylinder, the hoisting-mechanism connected with the latter, the pipe 5 leading from the tank to the cylinder, the throttle-valve therein, the governor for operating the throttle-valve, means for controlling the speed of the governor by the hoisting mechanism, of the inlet-pipe 2, and the valves 34 and 19, provided with the levers 36 and 20, respectively, the exhaust-pipe 3, having the valves 35 and 18, provided with the levers 36 and 20, respectively, the two-way valve 33 in the pipe 5, and the lever 36, the rod 38, pivoted, as at 37, to the levers 36, and connected to the rope 39, the regulator-cylinder 22, having the piston 23, pro-

vided with teeth 31, the loose-connecting links
25 connecting the piston and levers 20 of the
valves 18 and 19, the arm 28, the shaft 29, the
pinion 30 upon the shaft and engaging the
5 teeth 31, the weighted-arm 32 suspended from
the shaft, and the pressure-pipes 26 and 27
leading from the top and bottom of the regu-
lator-cylinder and connected to the pipe 5 at

opposite sides of the throttle-valve 11, sub-
stantially as specified. 10

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

JOHN T. WILKIN.

Witnesses:

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HYATT L. FROST.