(No Model.) 2 Sheets—Sheet 1.

J. A. DEAN.

ELEVATOR.

No. 511,726. Patented Dec. 26, 1893.

Fig. 1.

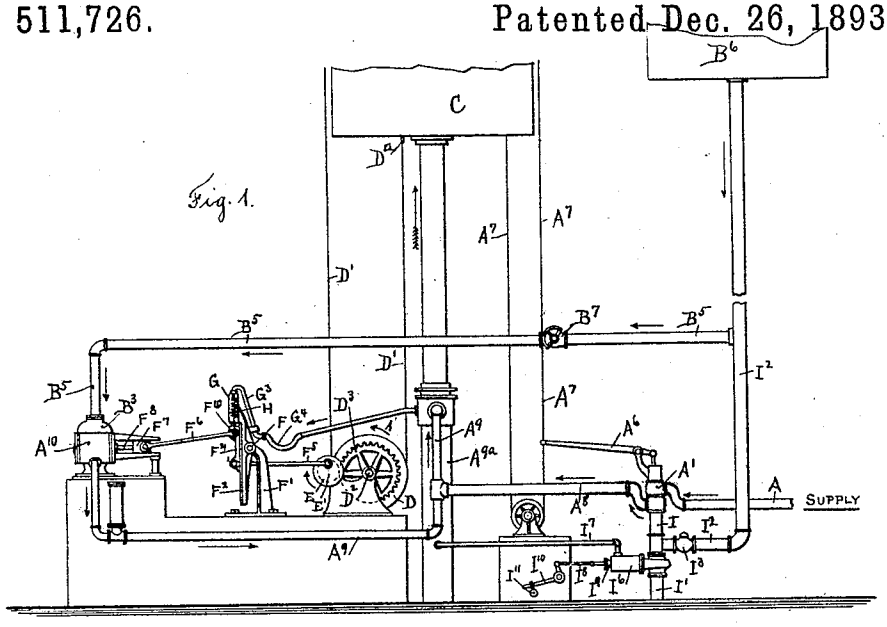
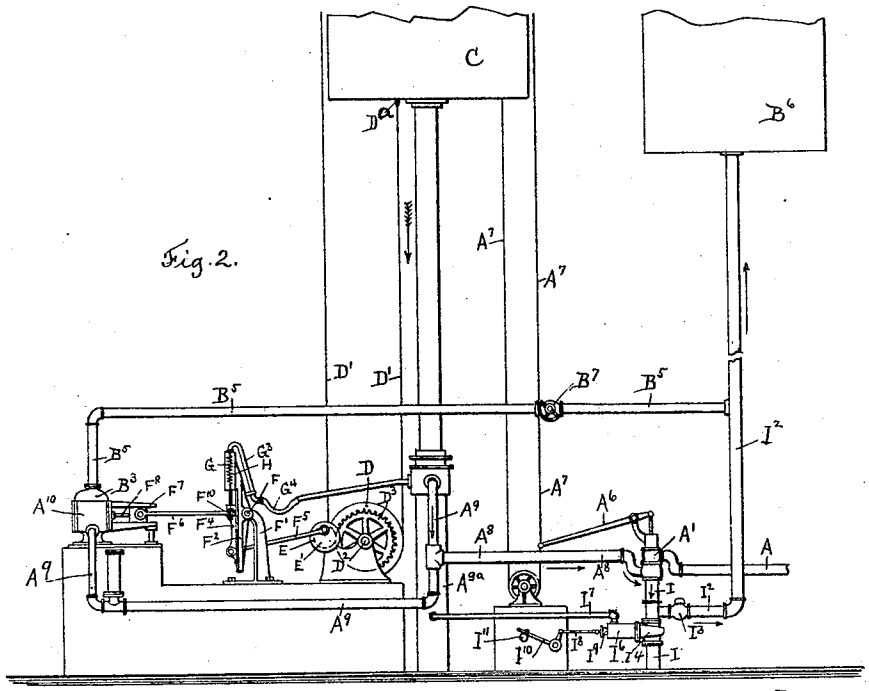


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

J. A. DEAN.

ELEVATOR.

No. 511,726. Patented Dec. 26, 1893.

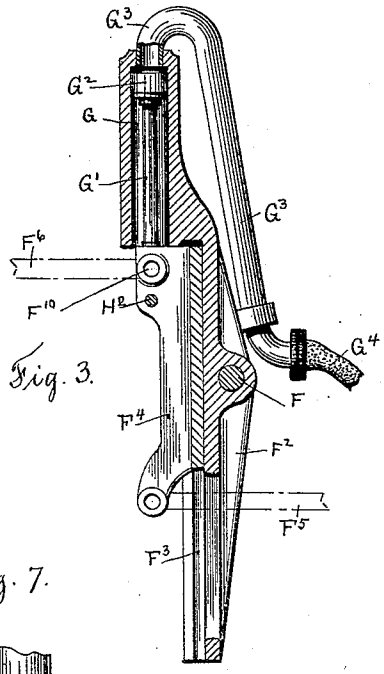


Fig. 3.

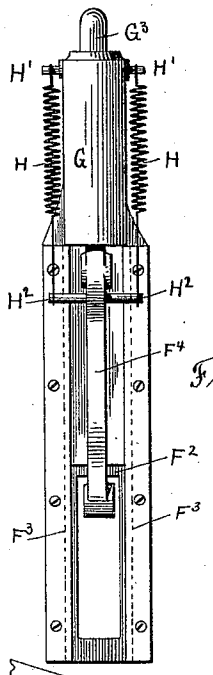
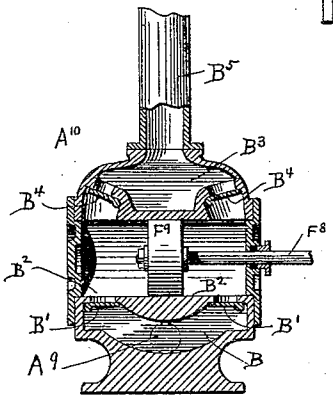


Fig. 4.

Fig. 7.



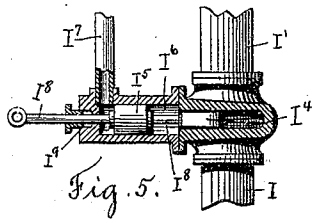


Fig. 5.

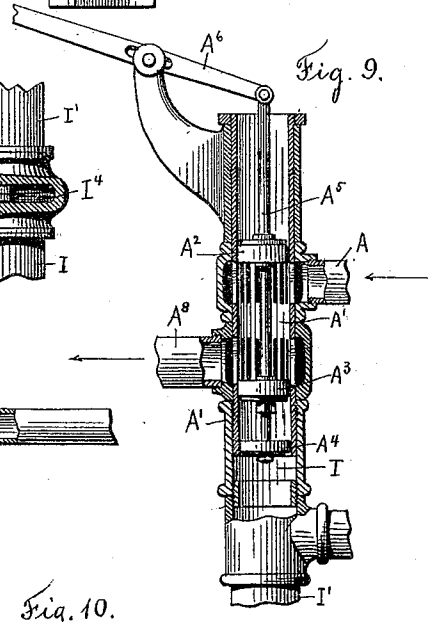


Fig. 9.

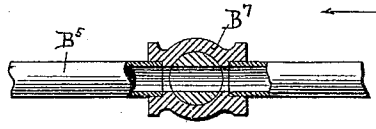


Fig. 6.

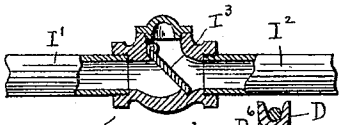


Fig. 8.

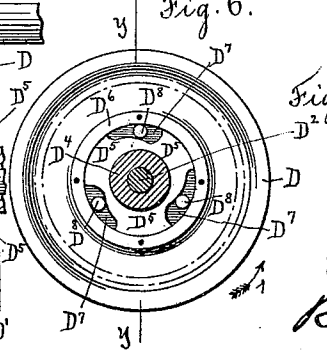


Fig. 10.

Fig. 11.

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UNITED STATES PATENT OFFICE.

JOHN A. DEAN, OF WORCESTER, MASSACHUSETTS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 511,726, dated December 26, 1893.

Application filed October 8, 1891. Serial No. 408,175. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. DEAN, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Elevators, of which the following is a specification, accompanied by drawings forming a part of the same and representing such portions of an elevator as embody my invention.

My invention relates to that class of elevators known as hydraulic elevators and it has for its object to regulate the water supply so that the amount of water received from the main shall vary in direct ratio to the amount of load to be lifted and it consists in the introduction into the pipe through which the water is emptied from the cylinder of a valve mechanism controlled by the water pressure in the cylinder so as to divert the water into an elevated tank, upon the descent of the loaded elevator car and further in connecting the elevator cylinder and an elevated tank with a pumping mechanism whose action is controlled by the water pressure in the cylinder as the elevator car is being raised.

In the accompanying drawings: Figure 1, represents, in elevation, an elevator cylinder with its connected system of feed and exhaust pipes and comprising the valve and pump mechanisms by which the objects of my present invention are effected; the position of the operating parts being represented during the ascent of the elevator car carrying a light load. Fig. 2, represents the same view shown in Fig. 1, except that the positions of the operating parts are shown during the descent of the elevator car carrying a load. Fig. 3, is an enlarged view shown in vertical central section, of the vibrating or walking beam by which the pumping mechanism is operated. Fig. 4, is an elevation of the same, showing the side next the pumping mechanism. Fig. 5, is a sectional view of a portion of the exhaust pipe showing the valve controlled by the water pressure in the elevator cylinder by which the current of water is diverted to the elevated tank. Fig. 6, is a sectional view of the valve in the pipe leading from the elevated tank to the pump. Fig. 7, is a vertical central sectional view of the pump by which water is forced into the elevator cylinder during the ascent of the elevator car with a light load. Fig. 8, is a sectional view of the check valve placed in the pipe connecting the elevated tank with the exhaust pipe of the elevator cylinder. Fig. 9, is a sectional view showing the combined supply and exhaust valve by which the movement of the elevator car is controlled. Fig. 10, is a side view of the scored drum by which the ascending motion of the car is converted into rotary motion, the section being shown on line X, Fig. 11, and Fig. 11, is a central sectional view on line Y, Y, of the mechanism shown in Fig. 10.

Similar letters refer to similar parts in the different figures.

Referring to the drawings, A denotes the water supply pipe communicating with a water-main, or other water supply from which water is received under pressure. The pipe A communicates with the valve chamber A′ shown in sectional view in Fig. 9, and containing the valve pistons A^2, A^3 and A^4, carried by a piston rod A^5 pivoted to the vibrating lever A^6, which is operated by the elevator rope A^7 carried around sheaves at the top and bottom of the elevator well and passing through the elevator car in the usual manner.

When the pistons A^2, A^3 and A^4, are depressed as shown in Fig. 9, water from the pipe A passes through the valve chamber A′ and through the pipe A^8 to the pipe A^9 connecting the elevator cylinder A^{9a}, with the pump A^{10}. The pipe A^{10} is shown in vertical central sectional view in Fig. 7 and consists of a valve chamber B communicating with the pipe A^9 and having the valves B′, B′, allowing water to pass from the cylinder B^2 to the valve chamber B, but preventing its return. Above the cylinder B^2 is the valve chamber B^3 provided with valves B^4, B^4, admitting water from the valve chamber B^3 to the pump cylinder B^2, but preventing its return.

B^5 denotes a pipe connecting the valve chamber B^3 with a tank B^6 and having the valve B^7 shown in sectional view in Fig. 6 by which the pipe B^5 is opened and closed simultaneously with the opening and closing of the supply pipe A by means of a connection between the valve B^7 and the elevator cord A^7, so that whenever the pistons A^2, A^3 and A^4, are depressed as shown in Fig. 9, to allow the water from the supply pipe A to pass into the elevator cylinder A^{9a}, the valve B^7 will be opened to allow water to pass from the tank B^6 through the valve chamber B^3 and valves B^4, B^4 into the pump cylinder B^2. As

water under pressure, sufficient to raise the elevator car C with its load, is admitted through the supply pipe A to the elevator cylinder A^{9a} and also through the pipe A^9 to the valve chamber B the valves B′ will be closed by the water pressure and the elevator car C will be raised in the usual manner.

Journaled in a suitable supporting framework is a scored drum D around which is wound a wire cable D′ having the end D^a attached to the under side of the elevator car C. The wire cable is carried over a sheave at the top of the elevator well with its opposite end attached to the top of the car. Not shown in the drawings. The up and down motion of the elevator car C will produce a rotary motion of the drum D, in one direction, while the car is ascending and in the opposite direction as the car is descending.

Rotating about the shaft D^2 of the drum D, is a gear wheel D^3 having a hub D^4 provided with the three arms D^5 inclosed within the annular flange D^6 upon the side of the drum D forming chambers D^7 inclosing the rolls D^8 which are held in position by an annular cap plate D^9. The radial dimension of the chamber D^7 is gradually reduced from one end to the other so that the rotary movement of the drum D in direction of the arrow 1, will cause the rolls D^8 to be wedged between the annular flange D^6 and the arms D^5, causing the rotary motion of the drum D to be communicated to the gear wheel D^3. The gear wheel D^3 engages a pinion represented by the broken line E by which the connected crank plate E′ is rotated.

Pivoted upon the shaft F held in the post F′ is a walking beam F^2 provided with ways F^3 along which slides a carriage F^4 to which is pivoted a pitman rod F^5 through which a rocking motion is imparted to the walking beam F^2 by means of the crank E′.

To the opposite end of the carriage F^2 is pivoted a pitman rod F^5 connected with a cross head F^7 carrying the piston rod F^8 by which a reciprocating motion is imparted to the piston F^9 within the pump cylinder B^2.

Upon the upper end of the walking beam F^2 is formed a cylinder G against the lower end of which the carriage F^4 is held by means of the spiral springs H, H, attached to the studs H′, projecting from the sides of the walking beam, and a pin H^2 passing through the carriage F^4. Attached to the carriage F^4 and in axial alignment with the cylinder G, is a piston rod G′ carrying a piston G^2.

The upper end of the cylinder G is connected by the pipe G^3, and a flexible pipe G^4 with the elevator cylinder A^{9a} so that in case the pressure of water in the elevator cylinder is greater than the tension of the springs H, H, the piston G^2 will be forced along the cylinder G, moving the carriage F^4 downward and bringing the pivotal pin F^{10} by which the pitman rod F^6 is hinged to the carriage F^4 downward into the plane of the pivot F so that the rocking motion of the walking beam F^2 will fail to produce a reciprocating motion of the pump piston F^9. This movement of the piston G^2 and carriage F^4 will of course take place, whenever the elevator car C is loaded so as to produce a water pressure in the elevator cylinder A^{9a} greater than the tension of the springs H, H.

When the elevator car C is carrying a light load as represented in Fig. 1, the springs H, H will hold the carriage F^4 against the lower end of the cylinder G causing the rocking motion of the walking beam F^2 to impart the maximum stroke to the pump piston F^9 and forcing the water which is fed to the pump cylinder from the tank B^6, through the pipe A^9 into the elevator cylinder A^{9a} and utilizing the water in the tank B^6 in raising the elevator car. When the load upon the elevator car increases the water pressure in the elevator cylinder A^{9a} beyond the tension of the springs H, H, the downward movement of the carriage F^4 occurs, as already described, thereby stopping the action of the pump and allowing the elevator car to be raised by the water received from the water-main through the supply pipe A.

When the elevator car is to be lowered the valve B^7 is closed and the lever A^6 depressed by the action of the elevator cord A^7, as shown in Fig. 2, raising the pistons A^2, A^3 and A^4, so as to cut off the supply A from the valve chamber A′ and open the pipe A^8 to the pipe I, and from the pipe I a pipe I^2 leads to the tank B^3.

The pipe I^2 is provided with a check valve I^3 permitting the passage of the water from the pipe I, to the tank B^6, but preventing its return. The pipe I is opened and closed by a sliding gate valve I^4 connected with a piston I^5 having a sliding motion in the closed cylinder I^6 to which the water is admitted by a pipe I^7 communicating with the elevator cylinder A^{9a}. As the elevator car C descends the water is forced from the elevator cylinder A^{9a} through the pipe A^8 to the pipe I and in case the valve I^4 is open through the pipe I′ to the sewer, but in case the gate I^4 is closed the exhaust water is forced past the check valve I^3 through the pipe I^2 to the tank B^6.

The piston rod I^8 connecting the gate valve I^4 and piston I^5 is extended through the stuffing box I^9 and connected with the weighted bell-crank lever I^{10} carrying a weight I^{11} adjustable along its longer arm by which the sliding gate valve I^4 is withdrawn from the pipe I opening the passage for the exhaust water to flow to the sewer. In case, however, the pressure imparted to the exhaust water by the load upon the elevator car is sufficient to slide the piston I^5 against the weighted bell-crank lever the gate I^4 will be closed and the exhaust water diverted through the pipe I^2 to the tank B^6. It will thus be seen that the water in the tank B^6 will be utilized in raising the elevator car, whenever the pressure required to lift the load is less than the tension exerted, by the springs H, H, and when the elevator car descends the water will

be carried back into the tank B^6, whenever the pressure produced by the descending load, as applied to the piston I^5, is sufficient to counteract the weight I^{11} on the arm of the bell-crank I^{10}.

In order to secure the greatest economy in the use of the water I consider it preferable to utilize the descending weight in the elevator car in forcing the exhaust water into an elevated tank where its weight can be employed in assisting to raise the elevator car, but it will be obvious that the water tank B^6 can, if desired, be placed on a level with the exhaust pipe from the elevator cylinder.

In the accompanying drawings the pumping mechanism is actuated through a flexible connection with the elevator car as a convenient method of transmitting the reciprocating motion of the car to the pump. I do not, however, confine myself to the specific method herein described by which the pump is operatively connected to the elevator car, as any known and obvious construction of operating mechanism can be employed by which the motion of any reciprocating portion of the elevator, such for example, as the plunger itself, can be operatively connected with the pump. In hydraulic elevators having a horizontal cylinder and in which the elevator car is raised by a rope or cord the reciprocating plunger, or piston rod, or the intermediate rope or cord between the piston rod and car can be connected with and made to actuate the pump.

While I am aware that a pump has been employed for the purpose of forcing water into an elevator cylinder, I believe it to be new to actuate such a pump by connecting the same with a reciprocating part of the elevator, so as to employ the surplus water pressure, when the elevator car is being raised with a light road, for the purpose of actuating the pump and I also believe it to be new to apply a governing or controlling mechanism to the pump by which its action shall be determined by the water pressure in the elevator cylinder. I do not therefore wish to be herein understood as confining myself to the specific form and arrangement shown, of either the pump actuating mechanism, or the mechanism for controlling the same by means of the water pressure in the elevator cylinder.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a hydraulic elevator, the combination of an elevator cylinder, in which a water pressure is applied to raise the load, a supply pipe through which water under pressure is received into said cylinder, an auxiliary supply pipe and a pump operatively connected with the moving parts of the elevator by which water is forced through said auxiliary supply pipe into the elevator cylinder, substantially as described.

2. In a hydraulic elevator the combination with an elevator cylinder in which a water pressure is applied to raise the load, a supply pipe through which water under pressure is admitted to said elevator cylinder, a tank receiving the exhaust water and a pump connected with said tank and the elevator cylinder, said pump being operatively connected with the moving parts of the elevator, substantially as described.

3. In a hydraulic elevator the combination of an elevator cylinder in which pressure is applied to raise the load, a supply pipe through which water under pressure is received into said cylinder, an auxiliary supply pipe, a pump operatively connected with the moving parts of the elevator by which water is forced through said auxiliary supply pipe into said cylinder and a pump controlling mechanism operated by the pressure of the water in the elevator cylinder, whereby the action of the pump is varied, substantially as described.

4. In a hydraulic elevator, the combination of an elevator cylinder, a supply pipe through which water under pressure is received into said cylinder, an auxiliary supply pipe, a pump operatively connected with the moving parts of the elevator, by which water is forced into the elevator cylinder through said auxiliary supply pipe, a pressure cylinder communicating with the elevator cylinder, a reciprocating piston in said pressure cylinder moved in one direction by the water pressure, springs applied to reverse the motion of said piston, said piston being operatively connected with the pump actuating mechanism, whereby the action of the pump is varied in accordance with the pressure in the elevator cylinder, substantially as described.

5. In a hydraulic elevator the combination with an elevator cylinder, of a supply pipe through which water under pressure is received into said cylinder, an auxiliary supply pipe, a pump operatively connected with the moving parts of the elevator by which water is forced into the elevator cylinder through said auxiliary supply pipe so that the excess of water pressure above the resistance of the elevator load shall serve to actuate the pump, a pressure cylinder communicating with the elevator cylinder, a piston moved in one direction in said pressure cylinder by the water pressure, springs applied to reverse the motion of said piston, a sliding carriage connected with said piston and moving in ways upon a walking-beam, a walking-beam, a reciprocating pump rod connected with said sliding carriage, a rotating crank operatively connected with the moving parts of the elevator and a pitman rod connecting said rotating crank with said sliding carriage, substantially as described.

Dated at Worcester, in the county of Worcester and State of Massachusetts, the 28th day of September, 1891.

JOHN A. DEAN.

Witnesses:
RUFUS B. FOWLER,
EMMA KESTER.