(No Model.)

C. A. CHANDLER.

HYDRAULIC ELEVATOR.

No. 253,842. Patented Feb. 21, 1882.

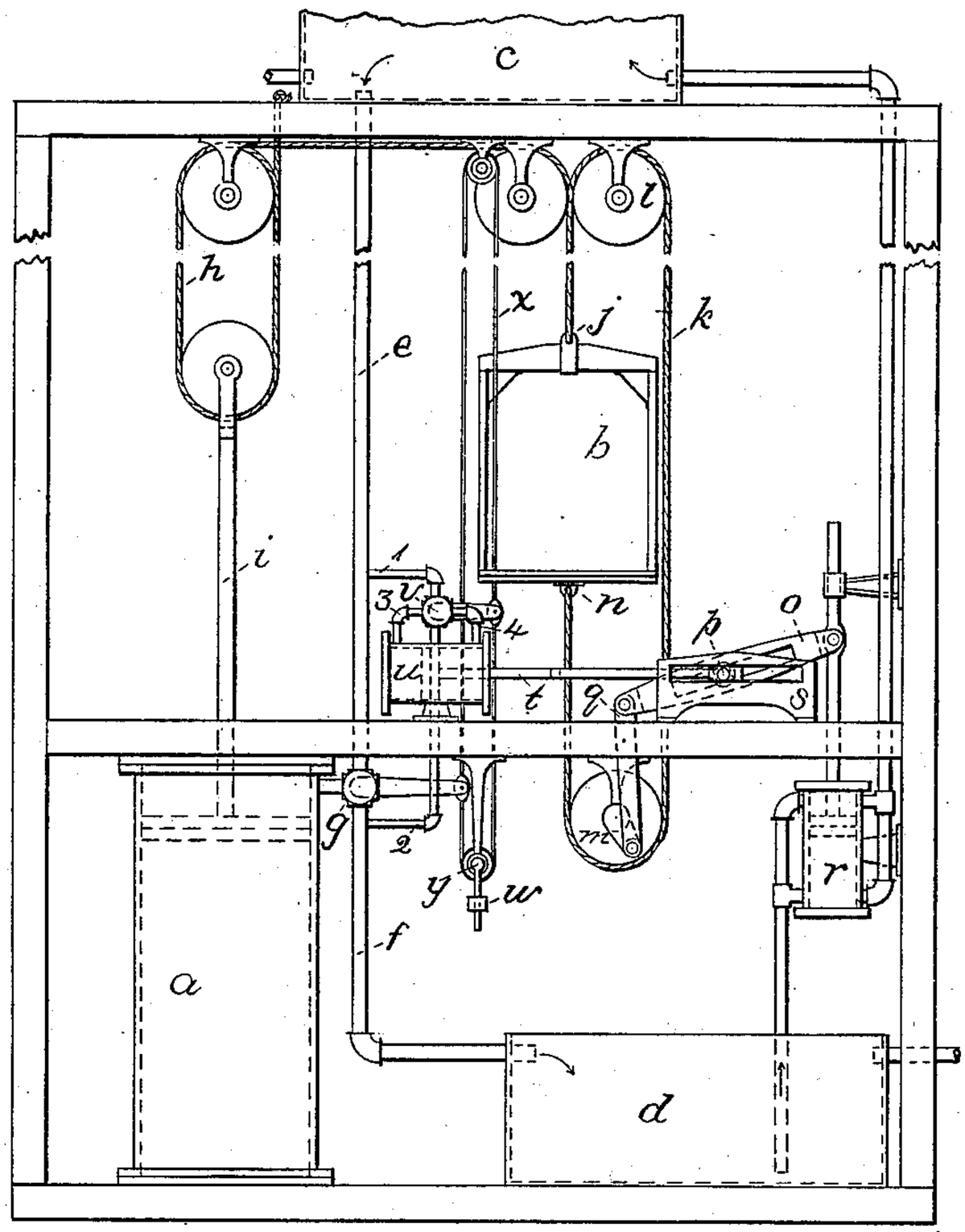

Fig. 1.

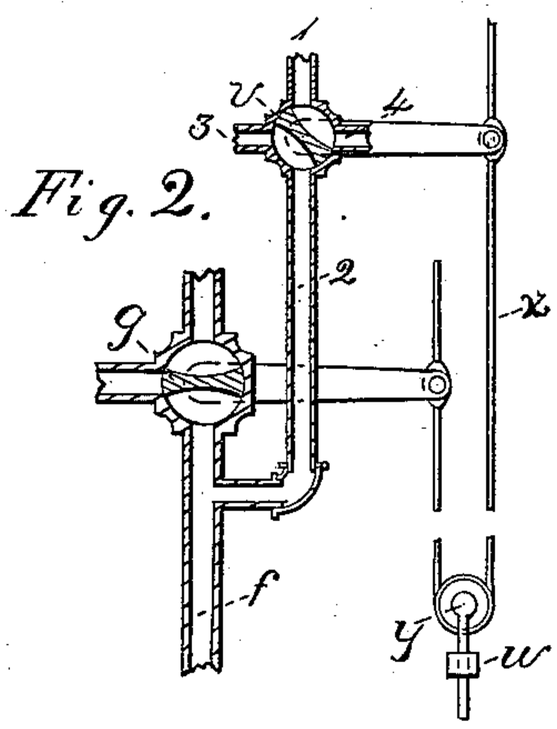

Fig. 2.

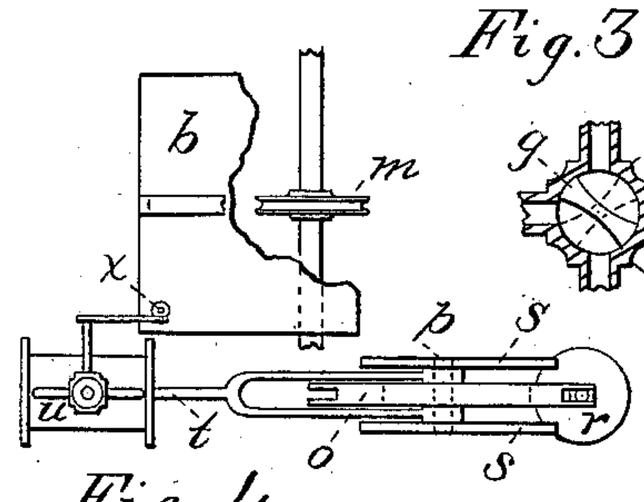

Fig. 4.

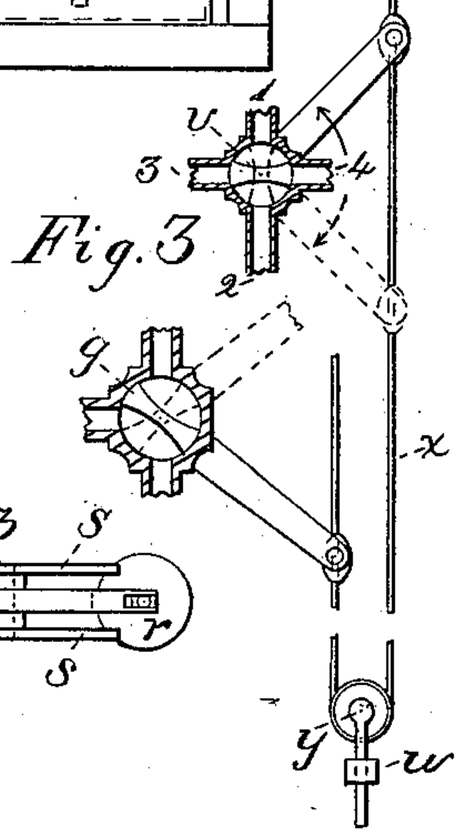

Fig. 3.

Witnesses:
F. M. Kingman
C. M. Kingman.

Inventor:
Clarence A. Chandler

UNITED STATES PATENT OFFICE.

CLARENCE A. CHANDLER, OF EAST BRIDGEWATER, MASSACHUSETTS.

HYDRAULIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 253,842, dated February 21, 1882.

Application filed September 15, 1881. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE A. CHANDLER, of East Bridgewater, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in Hydraulic Elevators, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

My invention is designed to be used in connection with that class of elevators described in Letters Patent of the United States No. 177,688, issued to me May 23, 1876.

The objects of my invention are, first, to move the fulcrum of the slotted lever described in said Letters Patent by means of water-pressure; second, to enable an operator to properly adjust it and control its movements when he is on the platform or within the carriage of the elevator; third, to unite the device for accomplishing the second with that ordinarily used to operate the main valve, when starting or stopping the elevator, in such a manner that but one rope need pass through the carriage; fourth, to cause the valve used in stopping and starting the elevator to automatically open to its fullest extent when nearly open and to entirely close when nearly closed; fifth, to cause the device by means of which the movements of the fulcrum are controlled to automatically operate to keep the fulcrum stationary in any position in its travel until readjusted by the operator. This I accomplish by means of a water-cylinder whose piston is attached to said fulcrum, and by providing it with a valve that can be made to so control the passage of the water to and from said cylinder that its piston may be forced toward either end or be made to remain rigid in any position in its travel. To this valve I attach a rope or rod, which passes through or near the carriage of the elevator in such a manner that by certain movements of said rope the valve will operate with the results above described. I also attach the main valve of the elevator to said rope in such a manner that certain movements of said rope will cause the elevator to start or stop. To the lower pulley or drum, around which the above-mentioned rope passes, I attach an arm provided with a weight or spring, so that the rope and consequently the valves connected with it are by the action of said weight brought to rest at certain fixed points.

The valve connected with the cylinder whose piston is attached to the fulcrum, is an ordinary four-way valve consisting of a cylindrical chamber, on the cylindrical sides of which are four ports situated at equal distances apart. Within the chamber there is a piece of metal, which I shall designate as the "valve," which divides the chamber into two compartments. It is sufficiently thick to cover any of the ports, and is so arranged that it can be revolved on its axis within the chamber by means of an arm or lever from without. For convenience I have represented the valve which is connected with the main cylinder as being similar to what the above would be if it had but three ports.

In the drawings, Figure 1 represents an elevation of an elevator with my improvements attached, the parts being represented in that position which they occupy when the elevator is at rest. Fig. 2 is a cross vertical section, showing the valve by which the fulcrum of the lever for operating the force-pump is adjusted; also the valve which starts and stops the elevator, and the rope and mechanism by which both valves are operated. Fig. 3 represents the same as Fig. 2 with the valves in different positions. Fig. 4 represents a plan of the force-pump and its connecting parts.

In the drawings, *a* represents the main cylinder, into which water is admitted from the tank *c* through the pipe *e* and valve *g*.

i represents the piston-rod of the cylinder *a*, and is provided with pulleys, around which a rope, *h*, passes. One end of this rope is fastened to the frame of the elevator and the other to the car *b* at *j*, and is so arranged on pulleys that any motion of the piston in the cylinder *a* will cause the car to rise or fall. Another rope or band, *k*, which is also attached to the car at *j*, passes around the pulleys *l* and *m*, and is again attached to the car *b* at *n*.

o is a slotted lever with a movable fulcrum, *p*. This lever is connected at one end to the crank-shaft of the pulley *m* by means of a connecting-rod, *q*, and at the other end to the piston-rod of a common force-pump, *r*.

s s are guides for the fulcrum *p*.

t is the piston-rod of the cylinder *u*, and is rigidly connected with the fulcrum *p*.

v represents the valve which controls the passage of the water to and from the cylinder *u*.

x represents the rope, which is so hung upon pulleys that it can always be reached from within the car, and is the means by which the valves *v* and *g* are operated.

w represents a weighted arm rigidly attached to the pulley *y*, about which the rope *x* passes, so that the motion of the rope *x* causes the pulley and its weighted arm *w* to revolve about the center of the pulley. The object of thus attaching a weighted arm to the pulley *y* is to cause the rope *x* to remain in certain desired positions, and thus to hold the valves in such positions as will respectively cause the elevator to remain stationary, to ascend, or to descend.

f represents the exhaust-pipe of the cylinder *a*; *d*, a tank.

1 represents the supply-pipe of the cylinder *u*; 3, a pipe leading from the valve *v* to one end of said cylinder *u*, and 4 a pipe leading from the valve *v* to the other end. 2 represents its exhaust-pipe.

The operation of my invention is as follows: To cause the car to ascend (the car being stationary, the levers of the valves *v* and *g* occupying a horizontal position, as indicated in Figs. 1 and 2) the operator pulls down on the rope *x*, which action will cause the end of the lever of the valve *v* to descend, so as to occupy the position indicated by dotted lines in Fig. 3, and the end of the lever of the valve *g* to ascend, so as to occupy the position indicated by dotted lines in Fig. 3. At the same time the pulley *y* will make a complete revolution, carrying with it its weighted arm *w*, so that said weighted arm *w*, with pulley *y*, is again in its resting position, thus holding the rope *x* stationary until again moved by the operator. When thus placed the valve *g* allows the water to flow from the tank *c* through the pipe *e* into the cylinder *a*, and the valve *v* prevents water from entering or leaving the cylinder *u*, and thus causes its piston, and consequently the fulcrum *p*, to remain stationary in their positions farthest from the pump-rod. If the load on the car is sufficiently light, the pressure of the water in the cylinder *a* may cause its piston and piston-rod *i* to descend, which, acting through the ropes *h* and *k*, raises the car *b* and revolves the pulley *m* with its crank-shaft, which, acting through the connecting rod *q*, causes the lever *o* to oscillate and the pump *r* to work through the entire length of its stroke, and thus force water from the tank *d* into the tank *c*; but if the load on the car is so heavy that the pressure in the cylinder *a* cannot raise it and at the same time work the pump through the entire length of its stroke, the operator pulls the rope *x* still farther down, thereby revolving the valve *v* still farther in the direction of the dotted arrow, Fig. 3, (and causing the weight *w* to swing toward the horizontal—that is, out of its position of rest,) which, as will be readily understood, allows the water to flow from the supply-pipe 1 through the pipe 3 into the cylinder *u*, and at the same time allows water to escape from the cylinder *u* on the other side of its piston through the pipe 4 and exhaust-pipe 2. Thus the piston and fulcrum *p* are forced toward the pump-rod until the leverage becomes such that the power required to work the pump is sufficiently decreased to allow the pressure in the cylinder *a* to work said pump and at the same time raise the load in the car. This having been accomplished, the car immediately begins to rise. Then the operator loosens his hold on the rope *x*, and the weight *w*, resuming its position of rest, causes the lever of the valve *v* to close the valve, as shown by the dotted lines in Fig. 3, thus holding the fulcrum as above adjusted until the car is stopped.

To stop the ascent of the car the operator pulls up on the rope, thereby causing the weight *w* and pulley *y* to make a complete revolution backward on their common axis, and to restore the valves *g* and *v* to their normal position—viz., with *g* closed and *v* open—in such a manner that the fulcrum *p* is held in its position farthest from the pump-rod.

In order to lower the car the operator pulls up on the rope *x*, thus causing the weight *w* to make another backward revolution, and the valves *g* and *v* to occupy the positions shown by full lines in Fig. 3. It will be seen that with the valves in these positions the water can flow from the cylinder *a* through exhaust-pipe *f* into tank *d*, while the water in cylinder *u* is held by valve *v* in such a manner that the fulcrum *p* cannot move from its position farthest from the pump-rod. If there is sufficient load on the car, it immediately begins to descend, and, through mechanism already described, forces water from the cylinder *a* into the tank *d*, and causes the pulley *m*, with its crank-shaft, to revolve, and the lever *o* to oscillate, thereby working the piston of the pump *r* through the entire length of its stroke, thus forcing the water from the tank *d* into the tank *c* in the same manner as was done in the ascent of the car with a light load; but if the weight on the car is not sufficient to start it downward when the fulcrum *p* is in its position farthest from the pump-rod, the operator pulls the rope still farther up, and thus, while not materially affecting the valve *g*, causes the valve *v* to move still farther in the direction of the full-lined arrow, Fig. 3, which, as will be readily understood, allows the water to flow from the supply-pipes 1 and 3 into the cylinder *u*, and at the same time allows the water in the cylinder *u*, on the other side of its piston, to escape through the pipe 4 and exhaust-pipe 2. Thus the piston and fulcrum *p* are forced toward the pump-rod until the leverage becomes such that the load in the car is able to work the pump and the car descends. Then the operator loosens his hold on

the rope *x*, and the weight *w* immediately closes the valve *v*, as shown by full lines, Fig. 3, and the fulcrum remains stationary until the car is stopped.

To stop the descent of the car the operator pulls down on the rope *x* sufficiently to place the valves *g* and *v* in the positions represented in Fig. 2, thus preventing water from either entering or leaving the cylinder *a*, and causing the fulcrum to be forced to its position farthest from the pump-rod.

I claim—

1. In a hydraulic elevator, the combination of a cylinder, *u*, its piston, and the movable fulcrum *p* with the guides *s s*, oscillating lever *o*, and the piston and pump *r*, all operating substantially as described, and for the purpose specified.

2. The combination, in a hydraulic elevator, of a hand-rope, *x*, the weighted pulley *y w*, and the valve *v* with the cylinder *u*, with its injection and ejection pipes 1, 2, 3, and 4, connected and operating substantially as shown, and for the purpose set forth.

3. In a hydraulic elevator, the combination of the piston *i*, cylinder *a*, and the valve device *g* with the hand-rope *x* and weighted pulley *y w*, all arranged substantially in the manner shown, and for the purpose specified.

4. In a hydraulic elevator, the combination of the hand-rope *x* and the weighted pulley *y w* with the valve devices *v* and *g*, whereby both valves are controlled by a single hand-rope, substantially as described, and for the purpose specified.

CLARENCE A. CHANDLER.

Witnesses:
E. S. WHITMARSH,
F. M. KINGMAN.