(No Model.) 3 Sheets—Sheet 1.

C. W. BALDWIN.

ELEVATOR.

No. 478,040. Patented June 28, 1892.

Fig. 1

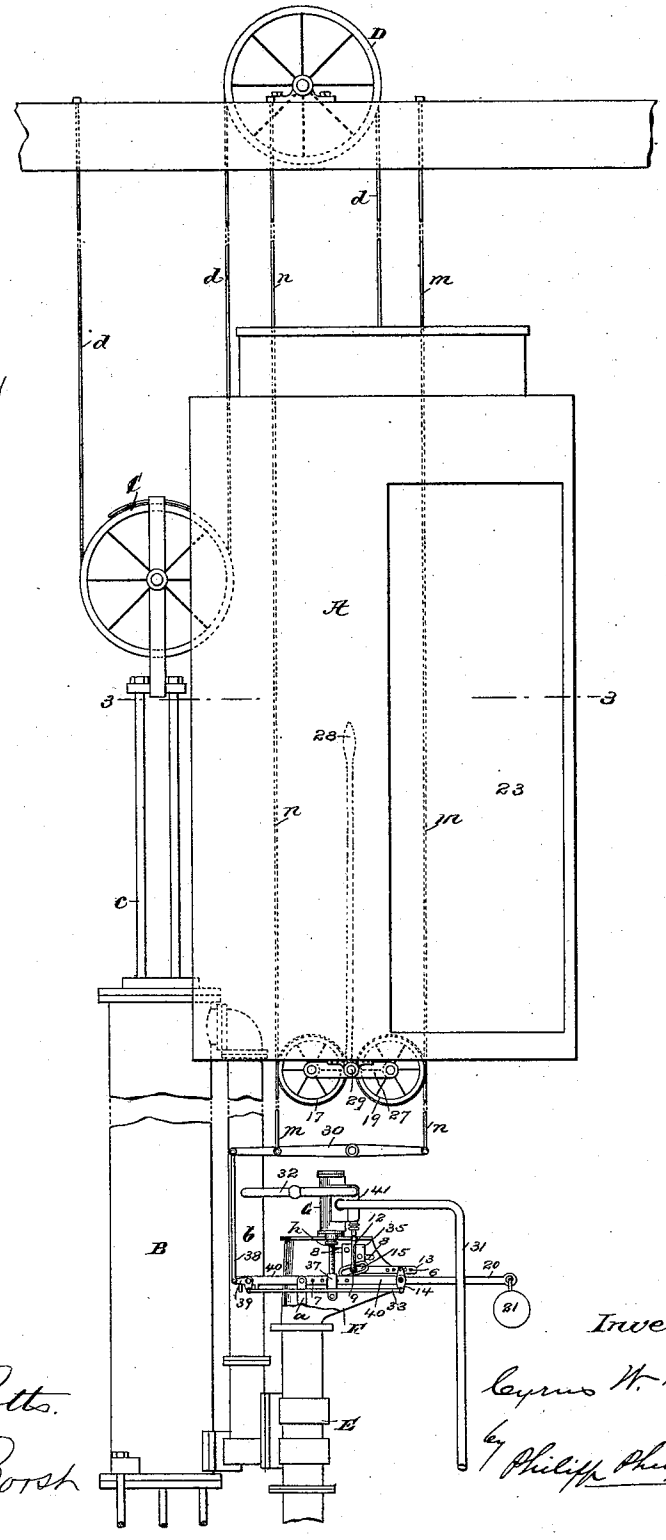

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Fig. 2.

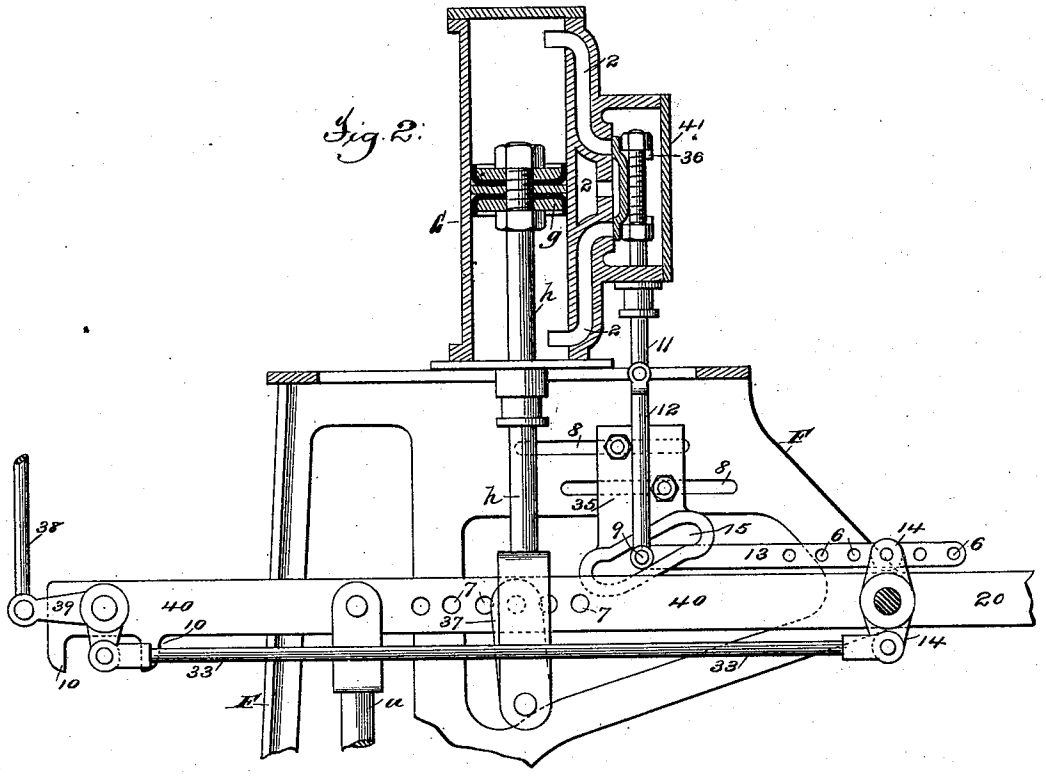
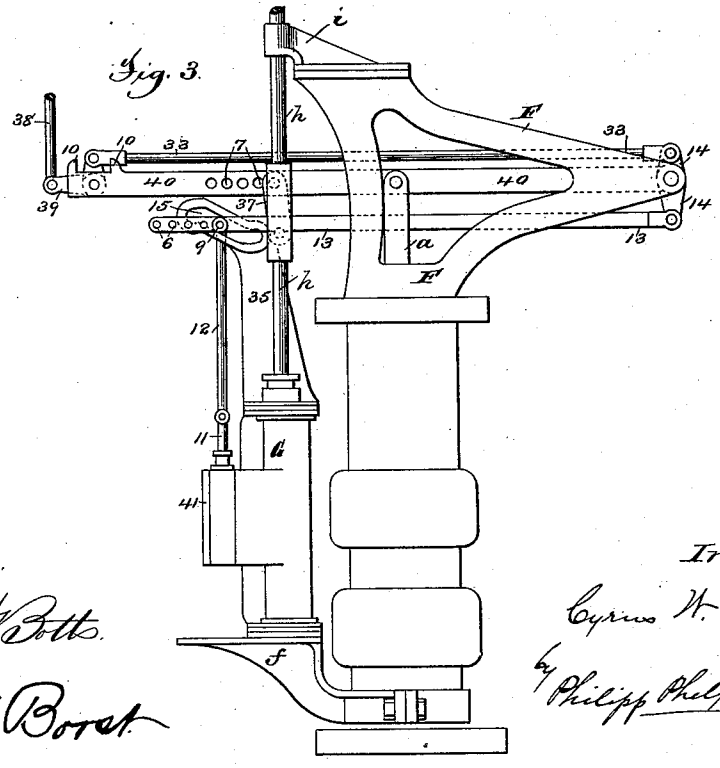


Fig. 3.



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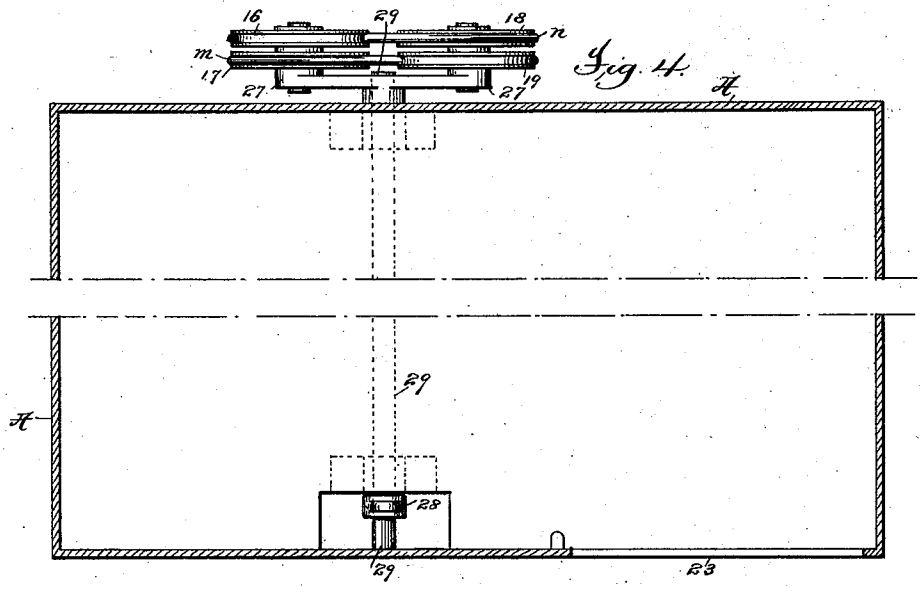

Fig. 4.

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UNITED STATES PATENT OFFICE.

CYRUS W. BALDWIN, OF YONKERS, NEW YORK, ASSIGNOR TO THE NATIONAL COMPANY, OF CHICAGO, ILLINOIS.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 478,040, dated June 28, 1892.

Application filed June 21, 1887. Serial No. 242,061. (No model.)

To all whom it may concern:

Be it known that I, CYRUS W. BALDWIN, a citizen of the United States, residing at Yonkers, county of Westchester, and State of New York, have invented certain new and useful Improvements in Elevators, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates particularly to improvements in the means for operating the main valve of an elevator, the object of the invention being to relieve the conductor from a large portion of the labor caused by operating the valve directly without at the same time placing the valve beyond the direct and positive control of the conductor.

In the class of elevators which are in most general use at the present time the valve for controlling the movements of the elevator is operated by the conductor in the car through a hand-rope or other direct connection with the valve. This valve is necessarily of considerable size and weight and has so much friction that considerable power is required to operate it, and this, when the connections are direct, involves a large amount of labor. So great is the labor involved in operating the valve directly in this manner that many efforts have been made to devise means by which the valve can be operated in such manner as to relieve the conductor of this labor. One of the ways in which it has been proposed to accomplish this was through an auxiliary cylinder having a piston which was connected to and operated the main valve of the elevator, the valve of the auxiliary cylinder being operated by the conductor in the car through an ordinary hand-rope or other connection. This arrangement accomplished the desired result of relieving the conductor of the labor of operating the main valve directly; but it has not proved wholly satisfactory in practice, because it removed the main valve from the direct and positive control of the conductor, and thus any slight imperfection in the operation of either the main or auxiliary valves of the auxiliary piston might prevent the proper stopping or starting of the car, and thus occasion annoyance.

The present invention aims to secure substantially the benefit of the auxiliary cylinder and piston as a means for operating the main valve, so as to relieve the conductor of the principal part of that labor, while at the same time the main valve remains under the direct and positive control of the conductor, so as to be operated by him directly independently of the auxiliary cylinder and piston in case the latter fails to act properly or in case of an emergency.

As a full understanding of the invention can be best given by an illustration and a detailed description of a valve-operating apparatus for an elevator embodying the same, all further preliminary description will be omitted and a full description given, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic elevation of a hydraulic elevator, showing the present invention applied thereto. Fig. 2 is an enlarged sectional elevation of the auxiliary cylinder and piston, showing the connections for operating the valves of both the main and auxiliary cylinders. Fig. 3 is an elevation illustrating a modified arrangement of the parts. Fig. 4 is an enlarged horizontal section of the elevator-car, taken on the line 3 3 of Fig. 1.

The particular form of elevator-motor shown in the present case is that in which the power is derived from a cylinder having a moving piston, upon one side of which the water is admitted to cause the car to ascend, the water then passing through a circulating-pipe to the opposite side of the piston to permit the car to descend, and then escaping from the cylinder as the car again ascends. This form of elevator has been selected merely for the purpose of illustration, as the improvements constituting the present invention are equally applicable to other forms of elevators.

Referring to the drawings, it is to be understood that A represents the car of the elevator; B, the main cylinder; C, the traveling pulley connected to the piston-rod *c* of the cylinder B; D, the stationary pulley at the top of the elevator-shaft, and *d* the hoisting-cable. The cylinder B is provided with a

circulating-pipe *b* and with a valve E for controlling the circulation of the water from the upper to the lower end and its final escape from the lower end of the cylinder. All of these parts are of the ordinary form, and are organized in the manner common in this class of elevators.

The valve-rod *a* of the valve E is connected to a lever 40, which is pivoted at one end upon a frame-work F, rising from the top of the casing of the valve E, and carries at its opposite end a bell-crank lever 39, which is pivoted on the side of the lever 40. One arm of the bell-crank lever 39 is provided with a stud, which is arranged to move between stops 10, formed on the lever 40 in such manner as to limit the movement of the lever 39. The other arm of the lever 39 is connected to a rod 38, to which motion is imparted from the car through an ordinary hand-rope or other suitable operating connection.

Located upon the frame-work F above the lever 40 (see Figs. 1 and 2) is a small auxiliary cylinder G, having a piston *g*, the rod *h* of which is connected by a link 37 with the lever 40. The cylinder G is provided with the usual induction and exhaust ports 2, which are controlled by a valve 36, the rod 11 of which is connected by a link 12 with a rod 13, which in turn is pivoted to one end of a lever 14, which is fulcrumed on the fulcrum-pivot of the lever 40. The opposite end of the lever 14 is connected by a rod 33 with the bell-crank lever 39. The pivot-bolt 9, which connects the link 12 and rod 13, passes through an inclined slot 15, formed in a plate 35, which is bolted to the frame-work F. The slot 15 of the plate 35 is set at such an inclination that as the pivot-bolt 9 is moved in either direction from the central position (shown in Fig. 2) the valve 36 will be moved up or down, as the case may be, so as to open the ports 2 for the admission of water to one end of the cylinder G and permit the escape of the water from the opposite end. The valve-chest 41 of the cylinder G receives its supply of water from the circulating-pipe *b* or any other suitable source through a pipe 32, and the water after performing its work in the cylinder G escapes through a waste-pipe 31.

The operation of the apparatus as thus far described is as follows: As shown in the drawings, the various parts of the apparatus are on center, which will be their position when the car is at rest. Assuming that the conductor desires that the car should ascend, he will, through the ordinary hand-rope or other similar apparatus with which the elevator is provided, impart an upward movement to the rod 38. This will rock the bell-crank lever 39 until the stud on the lever comes into contact with the outer stop 10. This movement of the lever 39 will impart a corresponding movement to the rod 33, lever 14, and rod 13 and move the bolt 9 upward along the slot 15, so as to move the valve 36 upward and open the ports 2 to allow the water to enter the lower end of the cylinder G and escape from the upper end. As soon as this takes place the water entering the cylinder G will exert an upward pressure upon the piston *g*, which will tend to raise the lever 40 and the main valve. The parts may be so proportioned that the pressure upon the piston *g* will be sufficient to perform the entire work of raising the main valve, but it will be preferable to so proportion the parts that the pressure upon the piston *g* will be nearly but not quite sufficient to move the main valve, leaving a small amount of the work to be done by the conductor. This will give the conductor a more absolute and perfect control over the movements of the main valve without adding but a trifle to his labor. After the lever 39 has been rocked as just described, so as to carry the stud upon its lower arm against the stop 10 and shift the valve 36, the further movement of the operating device in the car will act directly upon the lever 40 and the main valve, and the conductor, with the aid afforded by the piston *g*, can then by a very slight effort raise the lever 40 and the main valve, so as to allow the water to escape from the lower end of the cylinder B and cause the car to move upward.

To stop the car or allow it to descend, the conductor will move the bell-crank lever 39 in the opposite direction until the stud on its lower arm abuts against the inner stop 10. This will reverse the valve 36 and admit the water to the upper end of the cylinder G and allow it to escape from the lower end, so that the piston *g* will exert a downward pressure upon the lever 40, and with the aid thus afforded the conductor can with very little effort move the lever 40 and the main valve downward until it is on center to stop the car or past the center to allow the car to descend. If the parts are so proportioned that the pressure upon the auxiliary piston is sufficient to move the main valve without any aid from the conductor, then as soon as the car stops at any landing the conductor will move the lever 39 and the auxiliary valve 36 to the central position shown in Fig. 2, so as to arrest and hold the auxiliary piston at its central position. From this it will be seen that substantially the whole labor of moving the main valve E is accomplished by the auxiliary cylinder and piston G and *g*, the only labor performed by the conductor being that of shifting the small auxiliary valve 36 and giving a small amount of aid to the auxiliary piston, and if the parts are properly adjusted this will be very little. The main valve is, however, at all times under the direct and positive control of the conductor, so that if at any time through any slight derangement of the mechanism or for any other cause the auxiliary piston should fail to act so as to aid in operating the main valve the conductor can by continuing the movement of the rod 38 after the bell-crank lever 39 has rocked so as to bring the stud upon its arm against

one of the stops 10 operate the main valve wholly directly from the car, and thus have perfect control of the elevator.

By varying the point of connection of the link 37 to the lever 40 the power exerted by the auxiliary piston upon the main valve can be readily varied, so that the auxiliary piston can be made to perform the entire work of shifting the main valve or any part of the work that may be desired.

In order to enable the parts to be readily adjusted to suit main valves of different sizes and weights and also to operate under different water-pressures, the auxiliary cylinder and the parts connected thereto are made adjustable upon the frame-work F. For this purpose the top of the frame-work is slotted, so as to admit of the cylinder being placed in different positions upon the frame-work, and the frame-work is also provided with slots 8, through which the bolts for securing the plate 35 pass, so as to permit that plate to be adjusted to different positions to correspond with the position of the cylinder, and the rod 13 and lever 40 are provided with a number of holes 6 7 to permit the lever 14 and link 37 to be connected at different points. The valve 36, as herein shown, is a slide-valve of the ordinary D-pattern, but it may of course be of any other suitable form. In some cases it may be preferable to employ a piston-valve and such a valve can readily be substituted for the form shown.

When the parts are organized, as shown in Figs. 1 and 2, the weight of the parts will assist in moving the main valve downward and will resist the upward movement of the valve. This, if not compensated for, would tend to make the power required to move the valve in one direction greater than that required to move it in the other direction, and this might be objectionable. This can, however, be nearly or quite overcome by providing a counterpoise-weight to balance the weight of the parts. One convenient way of arranging such a counterpoise is illustrated in Figs. 1 and 2, in which the lever 40 is provided with an extension 20, projecting beyond its fulcrum and carrying a weight 21 of sufficient size to properly balance the parts.

Another way of effecting the same result is shown in Fig. 3, in which the auxiliary cylinder G is located below the lever 40 and at the side of the main valve E. The auxiliary cylinder is adjustable upon its support *f*, the same as upon the frame-work F in the organization shown in Figs. 1 and 2 and for the same purpose. The plate 35, in which the slot 15 is formed, is in this case connected to and moves with the cylinder G, and the piston-rod *h* extends above the lever 40 and passes through a guide *i*, which is adjustable upon the frame-work F. By reason of this arrangement of the parts the pressure of the water upon the side of the piston *g*, to which the rod *h* is connected, is exerted to move the parts downward, in which direction the least power is required, while the pressure of the water upon the opposite side of the piston *g*, which is greater by reason of the absence of the rod *h*, is exerted to move the parts upward, in which direction the most power is required. This difference in the power developed by the piston *g* upon its up-and-down strokes can by properly proportioning the parts be made to practically or exactly balance the apparatus.

It has been stated that the apparatus for operating the main valve, which is herein shown, can be used in connection with an ordinary hand-rope or any of the other well-known forms of connection for controlling the movements of the car. One form of connection well suited for the purpose is, however, illustrated in the present case. This connection consists of a double lever 30, which is fulcrumed at the bottom of the elevator-shaft and connected at one end to the rod 38. This lever is also connected upon opposite sides of its fulcrum-pivot with two ropes *m n*, which are suspended from the top of the shaft.

Supported upon the bottom of the car is a rock-shaft 29, one end of which is provided with a vertical lever 28, which projects upward through the bottom of the car, while its other end is provided with a horizontal cross-bar 27, located just outside the edge of the car. This cross-bar carries at each end two pulleys 16 17 18 19, mounted side by side. The rope *m* passes from the top of the well downward under the pulley 19, upward between the pulleys 19 and 17, and downward over the pulley 17 to the lever 30, while the rope *n* passes from the top of the well downward under the pulley 16, upward between pulleys 16 18, and downward over pulley 18 to the lever 30 at the opposite side of its fulcrum. The parts are so adjusted that when the cross-bar 27 is in a horizontal position and the levers 30 40 in the same position, the valves 36 and E and the piston *g* will be on center, and the car will consequently be at rest. By moving the lever 28 in either direction, however, it will readily be seen that one of the ropes (the one toward which the lever is moved) will be taken up at its lower end where it is connected to the lever 30, while the other one will be correspondingly paid out at its lower end, thus rocking the lever 30, so as to first rock the bell-crank 39 to open the valve 36, and then by the continued movement of the lever 28, operating the main valve, to start the car either up or down. By moving the lever 28 in the opposite direction the taking up and paying out of the ropes will be reversed and the main valve moved, so as to start the car in the opposite direction.

What I claim is—

1. The combination, with the car, motor, and main valve of an elevator, of an auxiliary cylinder having a piston connected to said main valve to operate or assist in operating the same, a valve for controlling the movements of said auxiliary piston, operating de

vices for the auxiliary valve arranged to be controlled from the car, and actuating connections between the main valve and said operating devices, constructed to communicate the movement of the operating devices directly to the main valve after the auxiliary valve has been operated, substantially as described.

2. The combination, with the car, motor, and main valve of an elevator, of an auxiliary cylinder having a piston connected to said main valve to operate or assist in operating the same, a valve for controlling the movements of said auxiliary piston, an operating-rope connected to said auxiliary valve and arranged to be controlled from the car, and connections between said rope and the main valve, whereby the continued movement of the rope after operating the auxiliary valve is communicated directly to the main valve, substantially as described.

3. The combination, with the car, motor, and main valve of an elevator, of an auxiliary cylinder having a piston connected to said main valve to operate or assist in operating the same, a valve for controlling the movements of the auxiliary piston, an operating-rope arranged to be controlled from the car and connected to both the main and auxiliary valves, and means for permitting an amount of lost motion between said rope and the main valve, substantially as described.

4. The combination, with the car, motor, and main valve of an elevator and a lever for operating the same, of an auxiliary cylinder having a piston connected to said lever to operate or assist in operating the valve, a valve for controlling the movements of the auxiliary piston, an operating-rope arranged to be controlled from the car and connected to the auxiliary valve, and connections between said rope and the lever of the main valve, whereby the continued movement of the rope after operating the auxiliary valve operates the main valve, substantially as described.

5. The combination, with the car, motor, and main valve of an elevator and the lever 40 for operating the same, of the auxiliary cylinder G, having the piston g connected to said lever, the lever 39, pivoted to the lever 40 and arranged to vibrate between stops on the latter, an operating-rope connected to the lever 39 and arranged to be controlled from the car, and connections between the lever 39 and the valve of the auxiliary cylinder G, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CYRUS W. BALDWIN.

Witnesses:
J. J. KENNEDY,
G. M. BORST.