

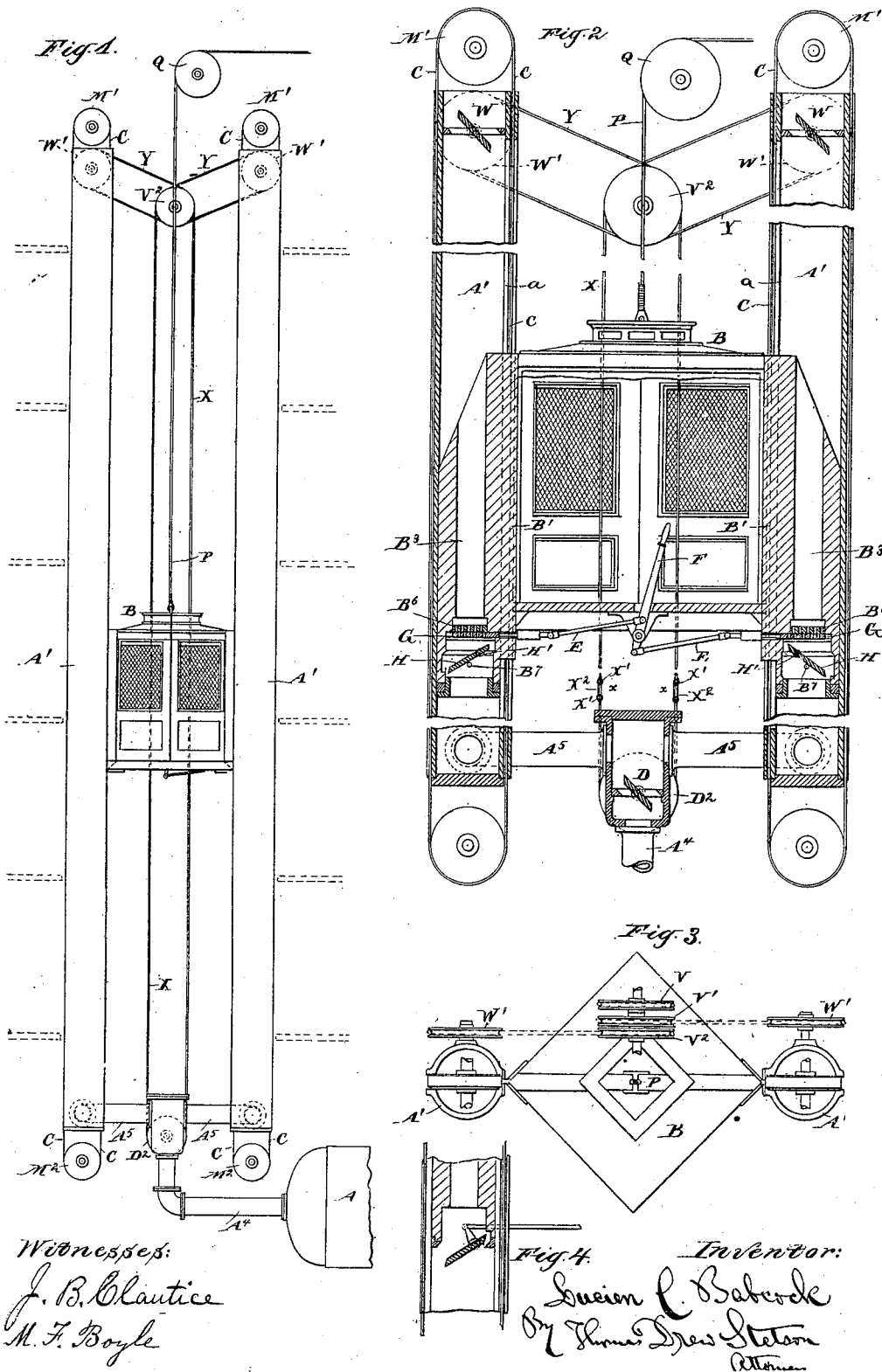
No. 651,095.

Patented June 5, 1900.

L. C. BABCOCK.  
PASSENGER ELEVATOR.

(Application filed Aug. 7, 1899.)

(No Model.)



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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## PASSENGER-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 651,095, dated June 5, 1900.

Application filed August 7, 1899. Serial No. 726,350. (No model.)

*To all whom it may concern:*

Be it known that I, LUCIEN C. BABCOCK, a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented a certain new and useful Improvement in Passenger-Elevators, of which the following is a specification.

The improvement is based on the invention set forth in the United States Patent to me for safety devices for elevators, dated March 21, 1899, No. 621,313. Substantially the same devices are operated in substantially the same way as safeguards against possible accident. I have devised important additions. I employ compressed air both to increase the safety effect of the previously-described parts, and thereby allow a smaller cross-sectional area of the tubes to serve efficiently, and also to constitute the means for operating the elevator. A number of elevators in the same building or different buildings, or in quite widely-separated points in an extended manufacturing establishment or in a city, may be all worked by a supply of compressed air from a single reservoir in which the pressure is maintained by operating with a single pump.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a general side elevation corresponding to Fig. 1 in the said previous patent. Fig. 2 represents certain portions on a larger scale, corresponding to Fig. 2 in the said previous patent. Fig. 3 is a plan view under the upper portion of Fig. 2. Fig. 4 is a vertical section of a portion, showing a modification.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

I shall, so far as practicable, designate the parts which appear in the previous patent by the same letters.

A is a strong and capacious reservoir, into which air is compressed by the action of a pump (not shown) and held ready to be delivered with any required degree of promptness. A<sup>4</sup> is a pipe leading therefrom to a valve D, controlled by the operator, and through branch pipes A<sup>5</sup> into the base of two

upright smoothly-bored tubes A' A', each having a slot *a* extending the whole length on the side which is presented toward the car.

The car B is equipped with two hollow cylinders B<sup>3</sup>, connected with the car by webs B', which extend outward through the slots. This long slot *a* is closed by an endless ribbon C, which is attached to the car, as described in my said previous patent, being moved by its ascent and descent. Each ribbon C runs over a pulley M' near the upper end of its tube A' and under a corresponding pulley M<sup>2</sup> near the bottom of each. One or more ropes P, corresponding to the ropes P in my said previous patent, may be employed, extending upward from the car and running over a pulley Q, to be operated by ordinary or suitable machinery (not shown) as auxiliary to the air-pressure operation or ready to serve in case such should become temporarily out of order.

F is a lever conveniently placed to be operated by the attendant riding in the car. The connections E from this lever lead in opposite directions to two liberally-perforated slides G, arranged to be moved horizontally, each in its proper cylinder B<sup>3</sup>, against the under face of a horizontal disk B<sup>6</sup>, with exactly similar perforations, fixed in each such cylinder. When the lever is turned in one direction, it will operate the slides G to bring their perforations out of coincidence with the perforations in the corresponding disk B<sup>6</sup>. This movement makes the two devices, with the close-fitting cylinder B<sup>3</sup> on each side, serve together as a tight piston. When the lever F is turned fully in the opposite direction, it causes the apertures to coincide, and the air can move freely through what was previously a tight piston.

In each of the cylinders B<sup>3</sup>, below the slide-valve G, which is operated by hand, as described, is an automatically-operating valve comprising a disk H, hung out of the center and allowing its widest portion to depend from the shaft H'. A stop B<sup>7</sup> is provided to hold it in an inclined position ready to be promptly closed by the action of the air thereon if the car should commence to descend too rapidly.

The valve D and also the two valves W W, one of the latter at the top of each of the tubes

A', are operated by the attendant in the car by a single endless cord X, extending loosely through the car in the ordinary manner. The cord extends once around a pulley D<sup>2</sup> on the axis of the valve D at the bottom and is firmly secured at one point on such pulley. The two parts of the cord extend upward and once around a pulley V in a central position at the top. This pulley carries other pulleys V' V<sup>2</sup>, which are connected by cords Y Y to corresponding pulleys W' W', which control corresponding valves W in the top of each tube A'. When the operator, having first taken care to turn the lever F in the right position to close the slides G, and thus make the cylinders B<sup>3</sup> into tight pistons, pulls upward on one part of the cord X or downward on the other part of that cord, he turns both the pulleys D<sup>2</sup> and V and by acting directly and through the connecting-cords Y opens all these three valves D, W, and W'. Thus conditioned, the compressed air enters through the pipe A<sup>4</sup> and, passing the valve D at the bottom, flows through the branch pipes A<sup>5</sup> into the lower end of each of the tubes A' and presses upward on the pistons composed of the short cylinders B<sup>3</sup> and their contents with sufficient force to raise the car. The force with which the compressed air is allowed to act may be graduated at will by the attendant by operating the cord X to a greater or less extent, and thereby turning the valves into a more or less open position. Partially closing the valve D at the bottom, which admits the compressed air, and also the valves W and W' at the tops of the tubes, respectively, exerts a controlling influence. The effect of closing or partially closing the bottom valve is to restrain the reception of compressed air from the reservoir, and therefore to diminish the tension of the air under the piston. The effect of closing or partially closing the top valves W and W' is to restrain the escape of the ordinary air in the upper portion of the tubes and if the car continues to rise to exert a compression above the pistons. The two effects cooperate to stop the ascent at any desired point. Again, pulling the cord X in the proper direction will restore the conditions before obtaining, the air slightly compressed in the upper ends of the tubes being discharged through the now more-open valves W and W', and a fresh supply of compressed air being admitted through the pipes A<sup>4</sup> and A<sup>5</sup> from the reservoir A to again restore the proper conditions to continue the lifting. In preparing to descend the cord X and its connections should first be operated to close these valves D, W, and W'. Next the tight piston-like character of the parts B<sup>3</sup> and their inclosed valves must be dispensed with in whole or in part. The operator effects this by turning the lever F to such extent as will bring the apertures in the valves G partially into line with the apertures in the disks B<sup>3</sup>, thus allowing the compressed air below to flow freely into the space above. As the

pressures above and below commence to approach each other the car descends. Whenever the attendant wishes to arrest its descent, he turns the lever F to close the valve G and again restore the piston-like condition of the cylinders B<sup>3</sup>. If it is desired to remain a considerable time at any landing, the operator may set the valves G tightly closed, finding, by trial or otherwise, some position of adjustment of the cord X which will give a just-sufficient surplus of pressure below the piston to hold the car stationary. It will now be seen that the car may be started upward from the bottom or from any intermediate position by simply closing the valves G and operating the cord X so as to open the valves D, W, and W', and that it may be lowered from the top or from any position by operating the cord X to close those valves and then operating the lever F to sufficiently open the valves G. It will also be seen that, if from any cause, such as a failure of the rope P, the rapid descending movement of the cylinders B<sup>3</sup> will cause the automatic valves H to close, making them, with the pistons B<sup>3</sup>, serve as practically air-tight pistons. If under those circumstances the attendant closes the valves D, W, and W', the lowermost valve D will compel the air to be retained and cushioned in the lower part of the tube A', and thus by its resilient action under the piston will retard the descent, so as to either prevent it altogether or compel it to descend but slowly; and if the attendant for any reason is unable to effect the closing movement of these valves the air in the reservoir A flowing upward against the valve H will attain the same end—the retardation or complete arrest of the descent.

I attach importance to the valves W W' at the top of the tubes A', with means for operating them simultaneously with the valve D, because they not only allow the air to be compressed in the upper ends of the tubes to arrest a too-rapid upward movement in the rare cases where such occurs and tend to make a partial vacuum in the upper portion of the tubes when the car tends to descend too rapidly, but also, because in the frequently-recurring cases in practice when the car is to be raised and lowered by small increments rapidly repeated to adjust its position level with any floor, their presence prevents the complete escape of the air, which is discharged upward past the valves G and by exerting a pressure above attains the condition which allows the car to sink, while there is still so much tension of compressed air below the piston as prevents the descent of the car except for this pressure above. It thus economizes the compressed air in the lower portion of the tube and reduces the requirement for drawing further compressed air from the reservoir to make the next lifting action on the car.

I provide for adjusting the length of the two parts of the endless cord X at will, each

part independently. Referring to Fig. 2,  $x$  is an opening where a portion of the cord X is omitted. An eye  $X'$  is secured one to each of the ends adjacent, and  $X^2$  is a smaller cord or wire rove through such eyes and holding the eyes strongly and adjustably together. When through stretching or other cause both parts of X require to be taken up, this can be readily done by tightening the cords X. If the two parts shall stretch or wear unequally, this may be compensated by shortening one part and leaving the other alone or even letting out the other. The shaft carrying the pulleys  $V V' V^2$  may be raised to slacken the cords Y Y and lowered to tighten those cords, the angle being such as to make this mode of adjustment effective, any disturbance of the tension of the long cord X being easily remedied by adjusting the cords  $X^2$ , as just described.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. The forms of the valves G may be modified. I prefer the slide form; but turning valves hung out of the center and properly connected with the rods E, so as to be operated by the lever F, the same as shown in my previous patent, may be used, if preferred. I have shown such a construction in the present drawings in the modification Fig. 4.

Parts of the invention can be used without the whole. I can make the two valves G and H in one. I can dispense with the automatic valve H when the main valve G is made as last described, the valve rapidly closing itself by the quick action of the air and moving the lever F automatically in the required position when the attendant fails to do so in the case of a too-rapid descent of the car.

I claim as my invention—

1. In an elevator, the tubes A', A', each having a longitudinal slot  $a$ , the car B having webs B', extending through such slots and

carrying pistons in such tubes, and the ribbon C moving with the car adapted to close the slots, in combination with the pipe A<sup>4</sup> leading from a reservoir of compressed air, and means X and connections, for controlling its induction to the bases of the tubes at will, arranged to serve substantially as herein specified.

2. In an elevator, the tubes A, A' each having a longitudinal slot  $a$ , the car B having webs B' extending through such slots and carrying pistons in such tubes, and the ribbon C moving with the car adapted to close the slots, in combination with the pipe A<sup>4</sup> leading from a reservoir of compressed air, and means X and connections for controlling its induction to the bases of the tubes at will, a valve D at the bottom, and a valve W at the top of each of such tubes, said valves being all connected with said means X so that they may all be controlled by a single operation, substantially as herein specified.

3. In an elevator, the tubes A', A', each having a longitudinal slot  $a$ , the car B having webs B', extending through such slots and carrying pistons in such tubes, and the ribbon C moving with the car adapted to close the slots, in combination with the pipe A<sup>4</sup> leading from a reservoir of compressed air and means X and connections for controlling its induction to the bases of the tubes at will, the hand-operated devices X and the valves D, W and W, for controlling the flow of air both at will and automatically, so as to serve both for operating and for safety, all substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

LUCIEN C. BABCOCK.

Witnesses:

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THOS. H. WILLIAMS.