(No Model.) 2 Sheets—Sheet 1.

M. N. HUTCHINSON.

ELEVATOR.

No. 304,823. Patented Sept. 9, 1884.

Fig. 1.

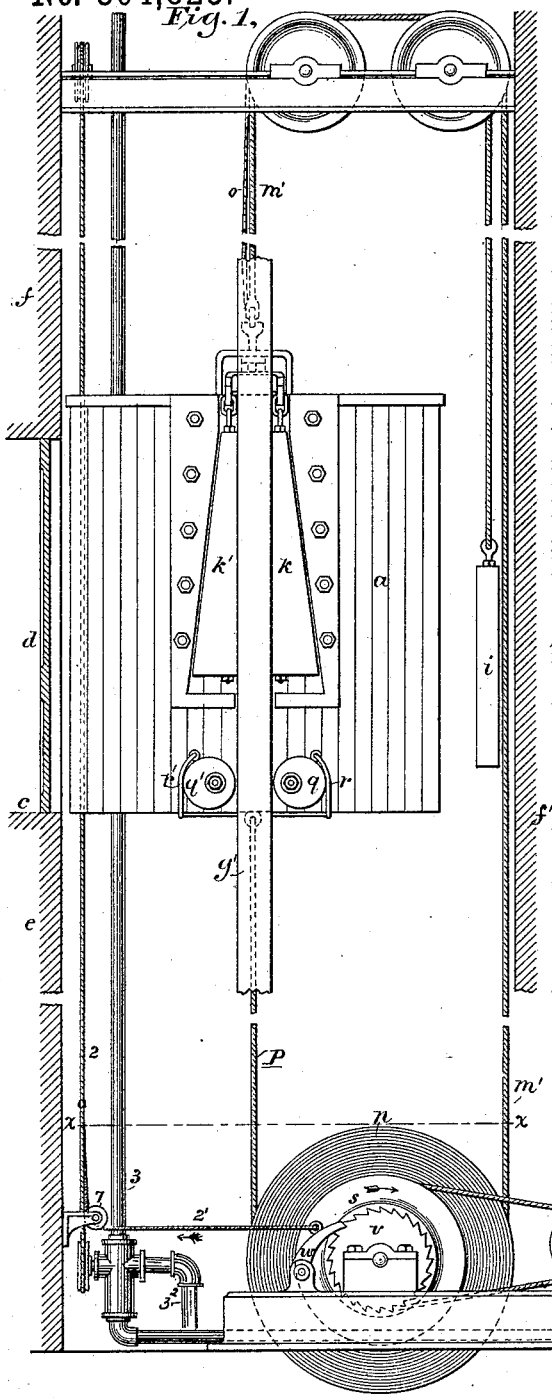
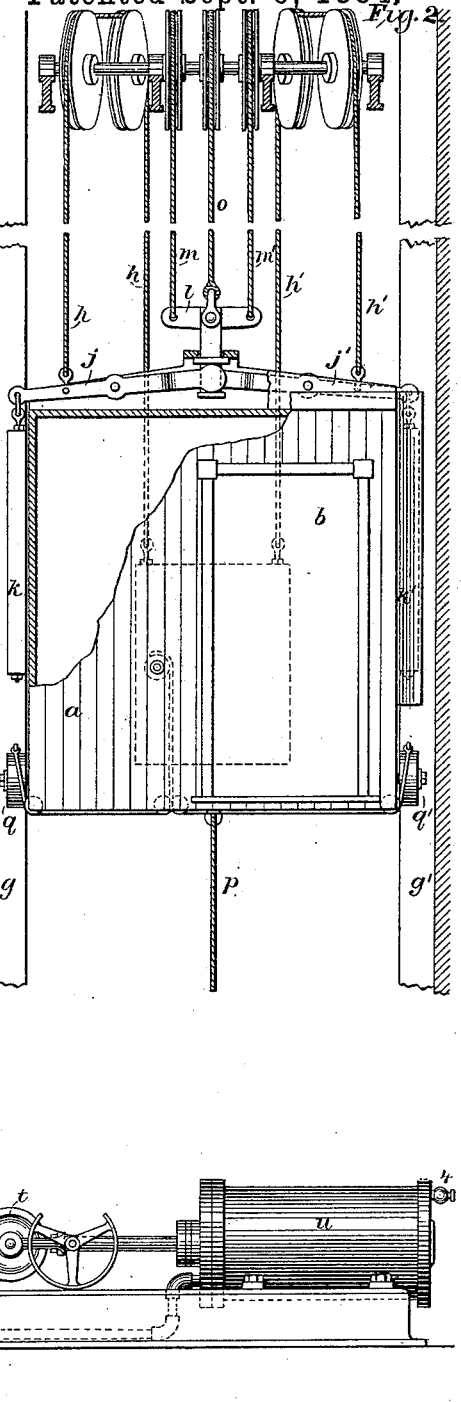


Fig. 2.



WITNESSES

Wm A. Skinkle

Jos. S. Latimer

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By his Attorney Merrill N. Hutchinson

Livingston Gifford

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

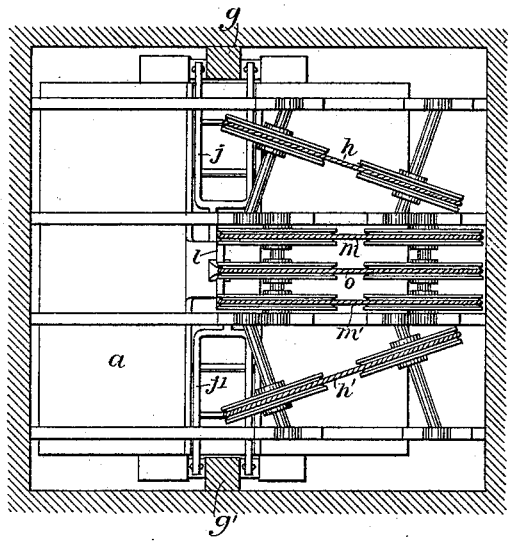


Fig. 5.

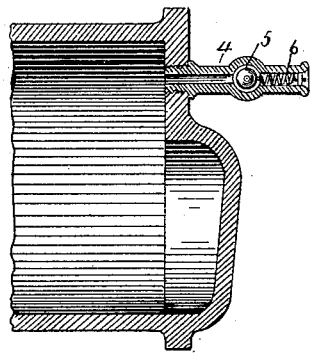
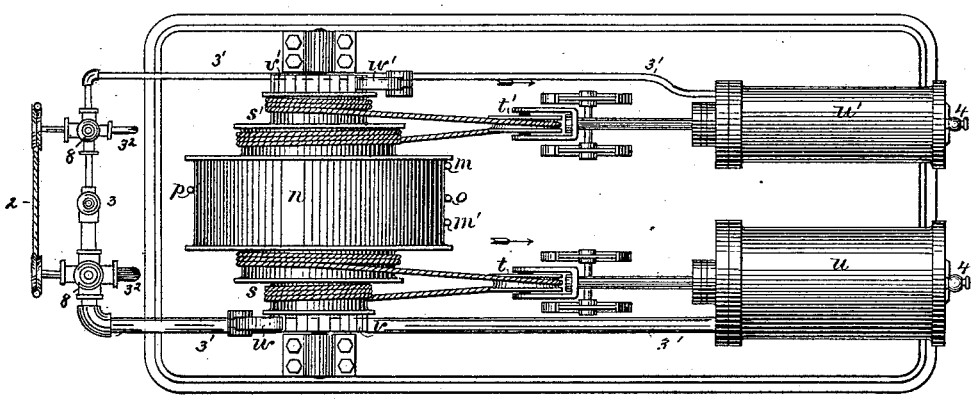


Fig. 3.



WITNESSES

Wm A. Skinkle

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UNITED STATES PATENT OFFICE.

MERRILL N. HUTCHINSON, OF NEW YORK, N. Y.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 304,823, dated September 9, 1884.

Application filed November 12, 1883. (No model.)

To all whom it may concern:

Be it known that I, MERRILL N. HUTCHINSON, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Elevators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention consists in the combination, in a hoisting apparatus, with the upwardly-hoisting rope or ropes, of a rope wound upon a drum with equal velocity but in an opposite direction to the hoisting-rope, in such a manner that the additional rope will haul the object being lifted or lowered downward, and enable a counter-weight greater than the weight of the object to be employed.

My invention also consists in a rope additional to the hoisting-rope, and attached to the car, and so controlled that in case the hoisting-rope slackens by breakage the said additional rope may become a substitute for the hoisting-rope.

My invention also consists in the combination and arrangement of various devices, hereinafter more fully described, whereby the safety of the elevator is increased.

In the accompanying drawings I have shown a form of apparatus embodying the various parts of my invention.

Figure 1 is a side view of the elevator-car, the sheaves above it, showing one hoisting-rope and other ropes for operating the same, the mechanism for operating the ropes, and the safety devices. Fig. 2 is a front view of the elevator-car and the sheaves above it, showing two hoisting-ropes, a safety-rope, and other safety devices and attachments of the same. Fig. 3 is a plan view of the devices below the line *x x*, Fig. 1. Fig. 4 is a plan view of the top of the elevator-car and the sheaves arranged above it. Fig. 5 is a central cross-section of a portion of one of the cylinders, showing the air-vent and valve in detail.

a is an elevator car or platform, having a door, *b*, Fig. 2.

c represents a landing or story of the building. *d* is a door opening on this landing, and *e* and *f* are respectively the walls of the elevator shaft or well between this landing and the landing below and above.

f' is the wall at the rear of the elevator-shaft.

g g' are the vertical guides at each side of the elevator-car.

h h' are the ropes connecting apparatus on the elevator-car with the counter-weight *i*. Each of these counter-weight ropes passes over two sheaves at the top of the elevator-shaft, which are arranged so as to bring the ends of the ropes attached to the counter-weight sufficiently near together for the width of the counter-weight, and at the same time to separate the other ends of the ropes sufficiently for attachment to the levers *j j'* near the sides of the elevator car or platform, for the operation of the safety devices or wedges *k k' k'' k'''*, as described in Letters Patent granted to me, numbered 259,019, and dated June 6, 1882. These levers *j j'*, as described in said Letters Patent, are attached to the wedges *k k' k'' k'''* at their outward extremities, and are pivoted to supports on the elevator car or platform at or near their centers, and meet at their inward extremities over the center of the elevator car or platform, where they are connected with the whiffletree *l* by the king-bolt, as shown.

m m' are ropes attached to the whiffletree *l*, each of which passes over two sheaves at the top of the elevator-shaft, and thence down the elevator-shaft behind the car or platform, and around the hoisting-drum *n*, their respective positions upon said drum being indicated in Fig. 3. These two ropes *m m'* are wound in unison upon the drum *n* when the same is revolved in the direction of the arrow of Fig. 1; and when a single rope, *m'*, is employed, as shown in Fig. 1, it should be attached to a hanger or eye rising from the center of the car, as shown in dotted lines in said figure, in which case the supplemental hoisting-rope *o* will also be attached to the same hanger, and, not being in use or under strain, will hang loosely, as shown in the same figure.

o is a rope attached also to the whiffletree *l* at the top of the elevator-car, and which passes over two sheaves at the top of the elevator-shaft, and thence down the elevator-shaft behind the car or platform, parallel with the ropes *m m'*, and around the drum *n*. This rope is wound and unwound upon the drum *n*

in unison with the ropes *m m'*, but in practice is made longer than said ropes, so as to be somewhat slack, and is never required to perform work unless in case of injury to the ropes *m m'*. This rope *o* may of course be omitted when desired.

p is a rope attached to the bottom of the elevator car or platform at the center thereof, which passes downward through the elevator-shaft and around the drum *n* in the opposite direction to the ropes *m*, *m'*, and *o*, as indicated in Figs. 1 and 3. The length of the rope *p* is so adjusted that it is held taut by the drum *n* when the hoisting-ropes *m m'* are taut, the rope *p* being wound when the ropes *m m'* are unwound by the drum *n*, and vice versa. The rope *p* is attached to the drum *n* in such position that it occupies the same space which is occupied by the rope *o*—that is to say, the one when being wound occupies the same space which is vacated by the other as it is unwound—thus economizing in the extent of drum required.

q q' are eccentric safety devices similar to those shown in Letters Patent to me, No. 259,762, dated June 20, 1882, but operated by means of the ropes *r r'*, attached to the peripheries of the eccentrics *q q'*, and extending around suitable pulleys up into the interior of the elevator-car, where they are attached to a wheel or other suitable device convenient to the hand of the attendant, so that he may at any time slacken the ropes *r r'*, and thereby permit the eccentrics *q q'* to revolve in such manner as to bind against the guides *g g'* and prevent the farther upward travel of the car or platform; or, by tightening the ropes *r r'*, the attendant may cause the eccentrics to take effect in the opposite direction.

The rotation of the drum *n* is produced by the following mechanism: On each side of it, and upon the same shaft, is placed a differential windlass, *s* and *s'*. The ropes of these differential windlasses respectively pass around the movable pulleys *t t'*; but these ropes are arranged so that when the strain upon the movable pulley *t* is in the direction of the arrow, Fig. 3, its tendency will be, by winding the rope off of the large and onto the small drum of the differential windlass *s*, to move the drum *n* in the direction of the arrow, Fig. 1, whereas when the strain upon the pulley *t'* is in the direction of the arrow, Fig. 3, its tendency will be to move the drum *n* in the opposite direction. This effect is produced by arranging the respective ropes upon the differential windlasses *s* and *s'*, so as to be wound in opposite directions. Each pulley *t t'* is connected with a cylinder, *u* and *u'*, the cylinder *u*, to which the pulley *t* is attached, being made the larger by reason of the fact that its operation produces the upward pull upon the elevator car or platform through the ropes *m m'*, while the operation of the cylinder *u'* produces the downward pull upon the elevator car or platform through the rope *p*, the downward pull required upon the car or platform being generally less than the upward pull by reason of the load which the car or platform carries. The cylinders *u* and *u'* are so connected as to operate alternately by means of the pipes 3', branching off laterally from the main pipe 3, said pipes having two-way valves 8, the stems of which are provided with grooved pulleys, around which the hand-rope 2 passes. These valves are right and left, so as to operate alternately, the one to admit water from the upper tank into one cylinder, while the other exhausts the water from the other cylinder, through its exhaust-pipe 3^2, into the lower tank, and vice versa.

v v' are ratchets fixed upon the faces of the differential windlasses *s* and *s'*. Pawls *w w'* operate upon these ratchets in opposite directions. These pawls are connected with the hand-rope 2 of the elevator in such manner that when the hand-rope is moved downward to cause the ascent of the elevator (thereby causing the cylinder *u* to rotate the drum *n* in the direction of the arrow, Fig. 1,) the pawl *w* rests upon the ratchet-wheel *v*, and will prevent any backward movement of such ratchet. The same downward movement of the hand-rope raises the pawl *w'* out of gear with the ratchet *v'* and permits the ratchet to move free of such pawl. When the hand-rope is pulled upward for causing the descent of the elevator, the pawl *w* is pulled out of gear with the ratchet *v*, and the pawl *w'* is thrown into gear with the ratchet *v'*, so that the drum *n* is free to move in the proper direction for the descent of the elevator, but will be prevented from any retrograde movement by the action of the pawl *w'* upon the ratchet. I have shown a manner of connecting the pawl *w* with the hand-rope, but have not illustrated such connection with the pawl *w'*. Such illustration is not necessary, since the means of connection to produce the results described will readily suggest themselves to a mechanic, and their illustration would unnecessarily complicate the drawings. 3 is the pipe by which water or steam is supplied to the cylinders, and which has a valve of any suitable construction, having on its stem a pulley around which runs the endless hand-rope 2.

Attached to the pawl *w* and the rope 2 is a rope, 2', secured to said rope 2 at some distance above the pulley 7, and passing around said pulley on its way to the pawl *w*. The other pawl, *w'*, is connected to a similar rope (not shown) also secured to the rope 2, but on the other side, so that as the rope 2 is moved upward it operates the valve, and the rope 2' is moved in the direction of the arrow, thus pulling the pawl *w* out of gear with the ratchet-wheel *v*; but when the rope 2 is moved in the opposite direction the rope attached to the pawl *w'* is moved, and said pawl *w'* is then pulled out of gear with the ratchet-wheel *v*.

In proportioning the parts of my apparatus I propose to make the counter-weights in

practice somewhat heavier than the elevator-car, and sufficiently heavy to not only counterbalance the empty car or platform, but also to counterbalance or nearly counterbalance the ordinary load which it is required to carry. One of the principal advantages of this provision is that the amount of strain brought to bear upon the main hoisting apparatus and the amount of power required in the cylinder *u* are very much reduced, and, in fact, with ordinary loads substantially nothing, where the volume of the counter-weight is properly adjusted.

At 4 I have indicated an air-pipe to be used with hydraulic cylinders, which is connected with the cylinders *u* and *u'*, and which contains a valve, 5, (see Fig. 5,) controlled by a spring, 6, so as to be held open under ordinary conditions, but closed by the pressure of air whenever the speed of the piston is abnormally accelerated. This valve I have more fully described in another application, therefore make no broad claim to it in this case.

The operation of the apparatus which I have just described is as follows: Supposing the elevator car or platform to be starting from the lower end of the elevator well or shaft with an ordinary load, the attendant pulls the hand-rope 2 downwardly. By this motion the valve is opened, admitting the water or steam into the cylinder *u*, and the hoisting-drum *n* is caused to revolve in the direction of the arrow, Fig. 1. At the same time the pawl *w* is thrown into gear with the ratchet *v* and the pawl *w'* out of gear with the ratchet *v'*. This rotation of the drum *n* winds the hoisting-ropes *m m'* and the slack rope *o*, which in turn lift upon the whiffletree *l* and the inner arms of the levers *j j'*, thereby holding the outer arms of said levers in a depressed position, so that the inclined sides of the wedges *k k'* are held out of contact with their bearing-surfaces. The connections of the levers *j j'* with the elevator car or platform communicate to it the lifting-power of the ropes *m m'*, which causes it to ascend. If during the ascent the weight of the elevator-car and its load is equal to the counter-weight, the work performed by the cylinders *u* and *u'* will be substantially nothing, the cylinder *u* merely overcoming the inertia of the bodies moved; and in case of the breakage of any part excepting the counter-weight ropes the elevator-car will tend neither to fall nor ascend, the balance between it and the counter-weight being perfect. In case the weight of the car and its load is greater than the counter-weight, the strain will be brought upon the hoisting-ropes *m m'* and the cylinder *u*, and under this condition of affairs, if those ropes should break, there will be the following provision for safety: The inward ends of the levers *j j'* being dropped for the instant, the outward arms of those levers will be raised by the counter-weight ropes *h h'*, and with them the wedges *k k'*, so that any downward motion of the car is arrested by those wedges, either finally or until the drum *n* has taken up the slack of the rope *o*, and the ascent of the elevator is renewed by that rope hauling upward upon the inward arms of the levers *j j'* and operating as did the main ropes *m m'* before the breakage of the same. Since the wear upon the rope *o* in practice will be very slight, its strength need not be made as great as that of the ropes *m m'* when new, though it should be sufficient to take their place as a hoisting in the event of their breaking. In case, when the elevator is ascending, the weight of the car and its load is less than the counter-weight, the upward lift will all be caused by the counter-weight, and the cylinder *u* will not be called upon to perform any work. The cylinder *u'*, however, acting through the rope *p*, will operate as a brake to prevent the too rapid ascent. Under this condition of affairs, should any breakage occur in the rope *p* or its connections, so as to permit the car to ascend too rapidly, its rapidity of ascent may be arrested by the attendant on the car, who may slacken the ropes *r r'*, and thereby permit the eccentrics *q q'* to revolve, so as to grip the guides *g g'* and arrest the ascent. If need be, a second rope, like *p*, may be added, but slack in ordinary use, so as to be brought into use on the bottom of the car only in case of the breakage of the main rope, as is the rope *o* on the top thereof. When the elevator car or platform has completed its ascent, the attendant pulls the hand-rope upward, and thereby reverses the action of both cylinders *u* and *u'*, and at the same time reverses the action of the pawls *w w'*, throwing the pawl *w* out of gear and the pawl *w'* into gear. During its descent, in case the weight of the car and its load is equal to the counter-weight, the only work to be performed by either cylinder will be the overcoming of the inertia of the moving bodies by the cylinder *u'*, and in the event of the breakage of any part, the balance being complete, no danger will result. During the descent, in case the weight of the car or platform and its load is greater than the counter-weight, the strain will be upon the ropes *m m'*, and in the event of their breaking the same operation will occur that was described in reference to the ascent under like circumstances. During the descent, in case the weight of the car or platform and its load is less than the counter-weight, the strain will be upon the rope *p*, actuated by the cylinder *u'*, and in case of its breaking the motion of the elevator may be arrested from the interior of the car by the ropes *r r'*, as before described. During the descent, where the direct strain is not on the ropes *m m'*, they nevertheless prevent the wedges *k k'* being brought into action by the lifting of the outward arms of the levers *j j'*; but to provide against the stretching of the ropes *m m'* and *p*, so that they are not simultaneously taut, I propose to bring only a portion of the pull of the counter-weight to bear upon the levers *j j'*—that

is, I propose to connect the counter-weight ropes both with the levers *j j'* and directly with the car (as through the intervention of a pulley) in such manner that the strain upon the levers is always less than the weight of the car. Thus it will be impossible for the safety devices *k k'* to be thrown into operation under any circumstances, excepting upon the breaking of the ropes *m m'*; or the same effect might be produced by dividing the counter-weight and having separate ropes for each division, one being connected with the levers and the other with the car. The same effect of the downwardly-hauling rope *p* may be accomplished, although, as I believe, with less beneficial results, by having it pass over a sheave at the top of the elevator-well, and thence downward, and attached to the counter-weight, in lieu of attaching it to the bottom of the car, as shown, so that, instead of being a downwardly-hauling rope upon the bottom of the elevator car or platform, it becomes an upwardly-hauling rope upon the counter-weight, thereby producing the effect of causing the descent of the elevator when overbalanced by the counter-weight, though in a less direct manner than is shown in the drawings.

Obviously the wedges *k k'* could be used in lieu of the eccentrics *q q'*, and vice versa, and the safety devices *q q'* might be connected with automatic mechanism to throw them into action upon the breaking of the rope *p*; or, in lieu of the variety of safety devices shown, other forms might be employed in connection with the other apparatus shown.

I do not limit myself to the form of safety devices unless where specifically pointed out in the claims.

I have shown the safety devices for arresting the ascent of the elevator in combination with a counter-weight of greater gravity than the car or platform and with the rope *p*; but the same safety devices might be employed with great utility for the purpose of arresting the ascent of the car when produced by any cause, and especially in steam-elevators when the car is liable to be hauled too high.

In lieu of the two cylinders *u u'*, as described, a single double-acting cylinder may be employed to give motion to the drum *n* in both directions, the water, steam, or other motive power being alternately introduced at opposite ends.

In lieu of the two differential windlasses, a single one may be employed, the ropes for operating the same from the cylinder or cylinders being wound in opposite directions.

The preferred motive power which I use is water; but I do not limit myself to any particular motive power.

I do not intend to limit myself to the exact arrangement or forms of devices shown, since I am aware that they may be varied without departing from the principle of my invention.

I claim—

1. In combination with the elevator car or platform and its hoisting-rope, the supplemental hoisting-rope *o*, substantially as and for the purpose set forth.

2. In combination with the elevator car or platform, its hoisting-rope and hoisting-drum, and an overweighted counter-balance, constructed to hoist said car or platform by its own gravity, the downwardly-hauling rope *p*, attached to said hoisting-drum in such manner as to be wound thereon as the said hoisting-rope is unwound, and vice versa, substantially as set forth.

3. In combination, the elevator car or platform, the hoisting-rope thereof, the supplementary rope *o*, the rope *p*, and mechanism, substantially as described, for operating the same, substantially as described.

4. In combination with the elevator car or platform and a lever supporting the same, and carrying the safety devices connected therewith, a counterpoise overbalancing the car or platform and exerting a positive force on said safety devices, whereby the same are instantly applied in case of accident, substantially as described.

5. In combination, the elevator car or platform, the safety devices connected therewith, and the supplemental hoisting-rope *o*, attached thereto to prevent said safety devices impeding the free movement of the car upon the breakage of the main hoisting-rope, substantially as described.

6. In combination, the elevator car or platform provided with an overweighted counter-balance, and safety devices connected therewith, whereby the said car or platform may be prevented from ascending upon the breakage of the rope, *p*, substantially as described.

7. In combination, the elevator car or platform, the counter-weight of equal or greater gravity than the said car or platform, and pneumatic and friction safety mechanism connected therewith, substantially as shown and described.

8. In combination with the car or elevator platform provided with an overweighted counter-balance, a hoisting-drum, an upwardly-hoisting rope, as *m'*, and a downwardly-hauling rope, as *p*, and apparatus, substantially as described, whereby rotation is communicated to said hoisting-drum in both directions.

9. In combination with the hoisting-drum, an upwardly-hoisting rope, as *m'*, a downwardly-hauling rope, as *p*, and one or more differential windlasses having ropes attached, substantially as described, whereby power is communicated to the hoisting-drum alternately in reverse directions, as set forth.

10. In combination with the elevator car or platform, the hand-rope thereof, the hoisting-drum *n*, an upwardly-hoisting rope, as *m'*, a downwardly-hauling rope, as *p*, the ratchets *v v'*, and the pawls *w w'*, acting thereon in opposite directions, substantially as described.

11. In combination with the elevator car or

platform, the hand-rope thereof, the hoisting-drum n, an upwardly-hoisting rope, as m', a downwardly-hauling rope, as p, the ratchet v', and the pawl w', acting thereon, substantially as described.

12. In combination with the elevator car or platform and its hoisting-rope, as m', a counter-weight of greater gravity than the car or platform, and adapted to hoist said car or platform, by its own gravity, and a rope, p, whereby the too rapid upward movement of the car or platform by the counter-weight is prevented and the descent of the car or platform caused, substantially as described.

13. In combination, the downwardly-hauling rope p, the cylinder u', and intermediate mechanism, substantially as described, whereby the same is actuated, and the air pipe or passage 4, containing a valve, whereby said pipe is closed by any undue speed of the piston, substantially as described.

14. In combination, the hoisting-rope, as m', the downwardly-hauling rope, as p, the cylinders u and u', and intermediate mechanism, substantially as described, whereby said ropes are actuated, and an air pipe or passage, 4, connected with each cylinder, each pipe or passage containing a valve, whereby the same is closed by any undue speed of the piston, substantially as described.

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

MERRILL N. HUTCHINSON.

Witnesses:

W. F. HAPGOOD,

D. H. DRISCOLL.