

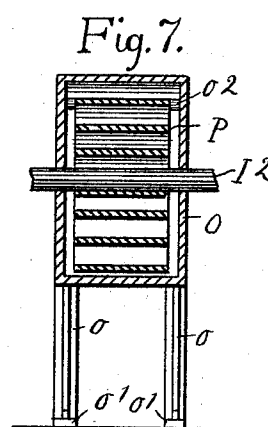
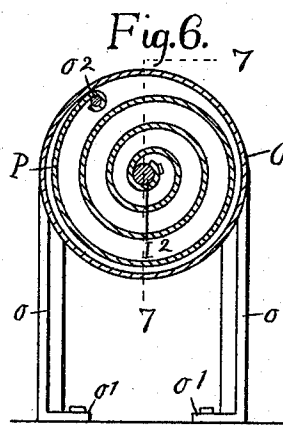
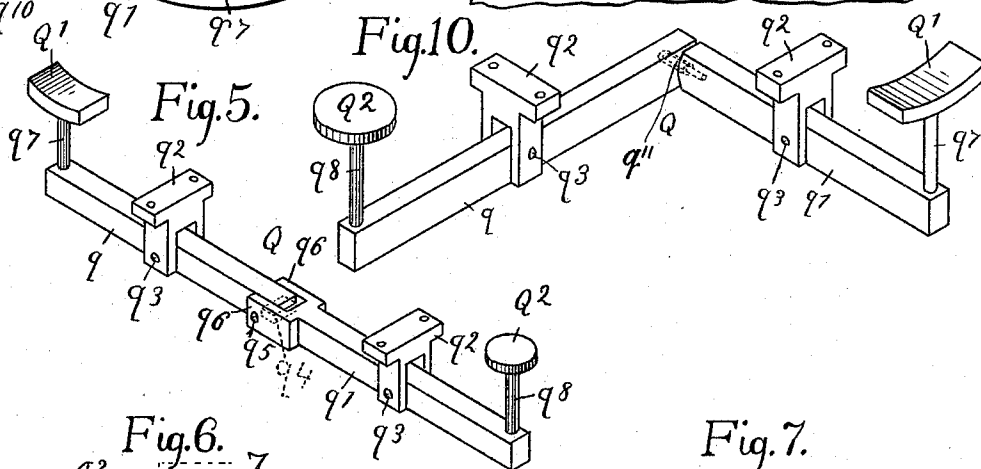
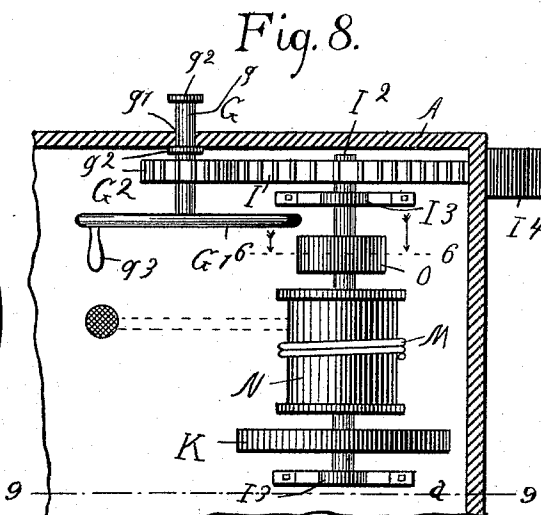
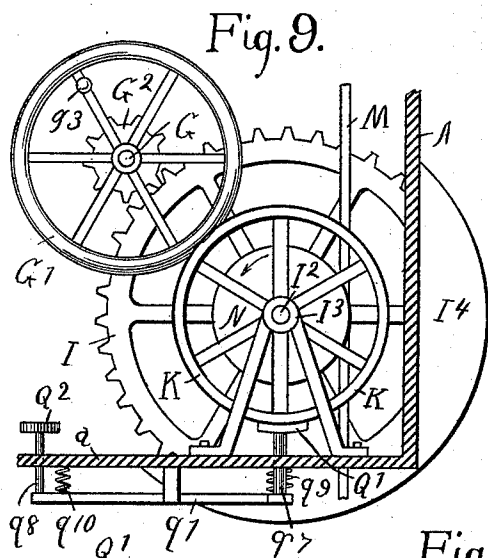
(No Model.)

3 Sheets—Sheet 2.

W. P. & H. D. HILL.
ELEVATOR.

No. 586,187.

Patented July 13, 1897.



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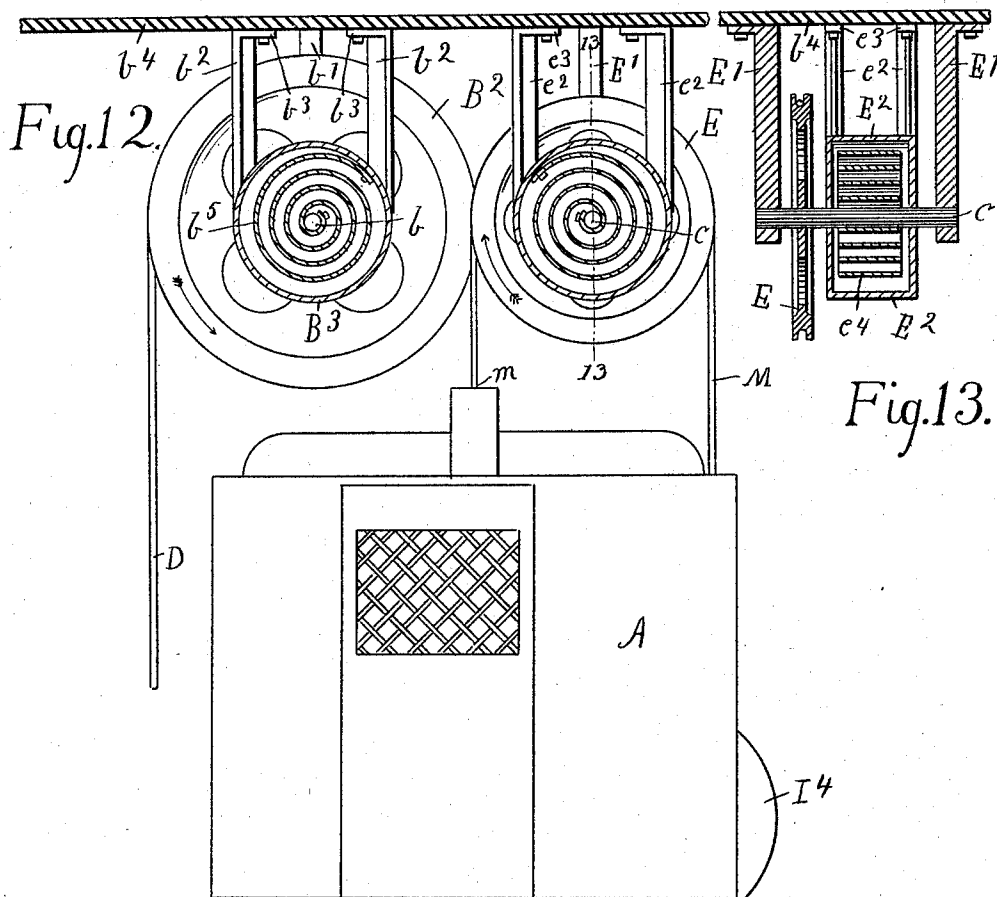
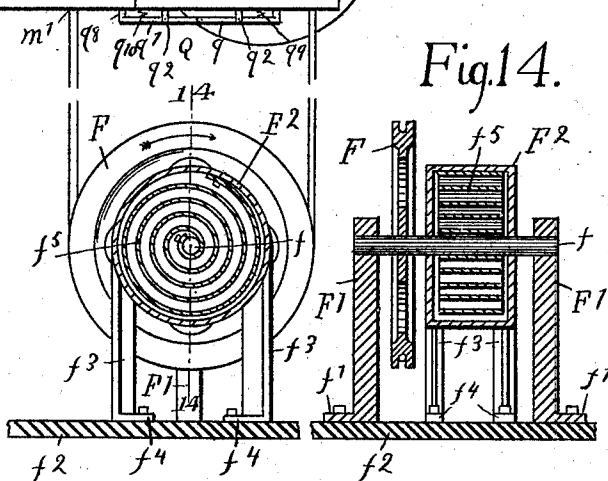
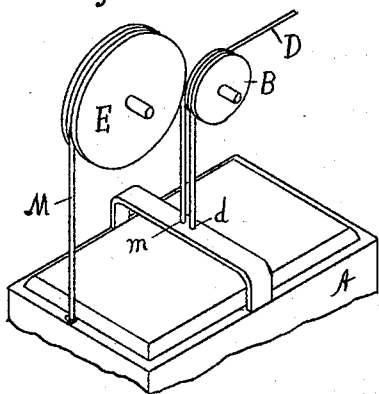


Fig.11.



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ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 586,187, dated July 13, 1897.

Application filed December 10, 1896. Serial No. 615,118. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM PRESTON HILL and HENRY D. HILL, citizens of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

Our invention relates chiefly but not solely to passenger and freight elevators operated in part by man-power; and the chief objects of our improvement are, first, to economize power; second, to gain an increase of speed; third, to provide mechanism for applying on elevator-cars the power for causing them to rise or descend, or both; fourth, to provide mechanism whereby elevator-cars may be chiefly or wholly elevated by means of one or more weights and caused to descend by means of power applied on said cars; fifth, to counteract the tendency of elevator-cars raised in whole or in part by weights to gather momentum to an undesirable extent as they rise; sixth, to so connect one or more springs to the operating mechanisms that power will be stored in such springs when the cars rise and be given forth and assist in lowering the cars when they are descending; seventh, to provide means for regulating the speed of elevator-cars; eighth, to provide compact and efficient mechanism to be carried by elevator-cars for raising or lowering them; ninth, to provide an improved brake, and, tenth, to provide means for causing elevators whose cars are raised entirely by one or more weights to operate substantially the same when rising, whether carrying a light or a full load of passengers or freight. We attain these objects by mechanism of which forms are illustrated in the accompanying drawings, in which—

Figure 1 is in part a vertical cross-section on line 1 1, Fig. 2, and in part a side elevation. Fig. 2 is a horizontal cross-section on line 2 2, Fig. 1. Fig. 3 is a vertical cross-section of a detail on line 3 3, Fig. 1. Fig. 4 is a horizontal cross-section of a detail on line 4 4, Fig. 1. Fig. 5 is a detailed isometric view of the brake mechanism preferably used with the preferred form of our device. Fig. 6 is a detailed vertical section, on an enlarged scale, on line 6 6, Figs. 2 and 8, looking in the direction indicated by arrows. Fig. 7 is a

vertical section of the same parts on line 7 7, Figs. 2 and 6. Fig. 8 is in part a horizontal cross-section on line 8 8, Fig. 1, with parts broken away, and in part a detailed plan view of a modification of mechanism carried by the elevator-car. Fig. 9 is in part a vertical section on line 9 9, Fig. 8, with parts broken away, and in part a detailed view, in side elevation, of the mechanism illustrated in Fig. 8. Fig. 10 is a detailed isometric view of the brake mechanism shown in Figs. 8 and 9. Fig. 11 is a detailed isometric view, on a reduced scale, with parts broken away, looking across the top of the elevator-car diagonally from above the corner marked X in Fig. 2. Fig. 12 is in part a side elevation and in part a vertical section of a form of our improvement in which each stationary sheave is supplied with a coiled spring which is wound up by the revolution of the sheave when the elevator-car is drawn upward. The outer sides of the spring-cases are removed, so as to enable the springs to be seen. Fig. 13 is a detailed view of a vertical section on line 13 13, Fig. 12; and Fig. 14 is a similar view on line 14 14, Fig. 12.

Similar letters refer to similar parts throughout the several views.

A, Figs. 1, 2, 8, 9, and 12, is an elevator-car of ordinary construction running in guides A' of common form.

B and B', Fig. 1, are stationary overhead sheaves.

C, Figs. 1, 3, and 4, is a weight, shown guided by vertical rods *c c*.

D, Figs. 1, 3, and 4, is a rope which in the preferred form is shown passing over the sheaves B and B' and having one end attached to the car A and the other to the weight C.

E, Figs. 1, 11, and 12, is a stationary overhead sheave preferably arranged on the side opposite the sheaves B and B'.

F, Fig. 1, is a stationary sheave below the elevator, attached to the shaft *f*, which is journaled in bearings in the standards F', secured to the floor of the elevator-shaft, as shown in Fig. 14.

G, Figs. 1, 2, 8, and 9, is a shaft whose journal *g* turns in the bearing *g'*, within which it is free to move longitudinally between limits fixed by the collars *g² g²*, which act as stops.

G' is a fly-wheel attached to the inner end of the shaft G. g^3 is a handle attached to said wheel for turning it, and G^2 is a pinion attached to said shaft G. The pinion G^2 preferably meshes in with a larger gear-wheel I, attached to a shaft I², Figs. 1, 2, 6, 7, 8, and 9, turning in bearings I³ I³, preferably secured to the floor of the elevator-car. For the purpose of economizing space I preferably cause said gear I to project through openings in the side and bottom of the car, as shown in the drawings, and preferably protect the projecting parts by means of a casing I⁴.

K, Figs. 1, 2, 8, and 9, is a fly-wheel attached to the shaft I².

L, Figs. 1 and 2, is a double-faced sheave attached to the shaft I², and L' is a sheave, preferably single faced and of smaller diameter than the sheave L, arranged opposite the sheave L, but it is not material that its axis should be on a level with that of the larger sheave. The sheave L' is preferably secured to a shaft l, which turns in journal-bearings l' l', preferably secured to the floor a of the car A.

M, Figs. 1, 2, 8, and 9, is a rope having one end shown secured to the top of the elevator-car at m and its other end to the bottom of said car at m'. In the preferred form of our apparatus it first passes up from the car to and over the sheave E, then down through the top of the elevator-car on the outside of one face e of said sheave L and under said sheave, then up and over the sheave L' and back from beneath it and up over the top of the sheave L and down over its face e², then through an opening in the floor of the car to the sheave F and under said sheave from the outside, and finally up from the sheave F to the point m', where it is secured to the bottom of the car A.

In the form of winding mechanism represented in Figs. 8 and 9 the rope M instead of passing over sheaves L and L' passes around a winding-drum N, attached to the shaft I², and from it passes direct to the sheave F. It is preferably passed around the drum N twice or more to prevent slipping. This form of winding mechanism though it can be used to advantage in low buildings is not so compact as the preferred form of our device and is not so well adapted for use where the elevator-car has to be lifted to a great height, as said preferred form, and therefore though it is a winding mechanism within the meaning of our generic claims it is not the full equivalent of said preferred form of winding device.

O, Figs. 2, 6, 7, and 8, is a case for a coiled spring hereinafter described. It is shown provided with legs o o, through whose feet o' it is preferably secured to the floor a of the car. o² is a bar extending across the interior of said case.

P, Figs. 6 and 7, is a coiled spring which encircles the shaft I² within the case O. Its in-

ner end is secured to said shaft, and its outer end to the cross-bar o² of the case. It is wound up when the shaft I² is turned in a direction opposite the one indicated by arrows in Fig. 9 and tends when wound up to turn the shaft and parts thereto attached in the direction in which said arrows point.

In the modification shown in Fig. 12 B² is a large sheave substituted for the sheaves B and B' shown in Fig. 1. b is a shaft to which the sheaves B² is attached. b' is a rear hanger which assists in supporting said sheave. B³ is a spring-case supported by hangers b², whose feet b³ are attached to a support b⁴ above them, and b⁵ is a coiled spring having one end attached to the shaft b and the other to the case B³ and so arranged as to be wound up when the sheave B² turns in the direction indicated by the arrow placed thereon in Fig. 12.

E' E', Figs. 12 and 13, are hangers in which the shaft c, to which the sheave E is attached, is journaled.

E² is a spring-case supported by hangers e², whose feet e³ are attached to the support b⁴, and e⁴ is a coiled spring having one end attached to the shaft c and the other to the case E² and arranged so as to be wound up when the sheave E is turned in the direction indicated by the arrow placed thereon in Fig. 12.

F' F', Figs. 12 and 14, are journal-bearings supporting the shaft f, to which the sheave F is attached, and which are secured through their feet f' to the floor f² beneath.

F² is a spring-case supported on legs f³, secured through their feet f⁴ to the floor f², and f⁵ is a coiled spring having one end secured to the shaft f and the other end to the case F² and adapted to be wound up when the sheave F is turned in the direction indicated by the arrow placed thereon in Fig. 12.

Q, Figs. 1, 2, and 5, is a compound lever composed of two members q and q', each fulcrumed in a support q², attached to the bottom a of the car A, and each member turns on a pivot q³. In the form shown in said figures of the drawings the member q is pierced transversely near its outer end by a slot q⁴, (shown in dotted lines in Fig. 5,) and the inner end of the member q' is forked and is connected with the member q by means of a bolt q⁵, passing through the arms q⁶ of its fork and the slot q⁴ in the member q.

Q' is a brake-shoe connected with the outer end of the member q' by means of an upright rod q⁷ and operating against the rim of the fly-wheel K.

Q² is a pedal connected with the inner end of the member q of the lever Q by means of an upright rod q⁸, and q⁹ and q¹⁰ are springs which respectively tend to draw the inner end of the member q and the outer end of the member q' of the lever Q upward, so as to keep the brake-shoe Q' in contact with the rim of the fly-wheel K, excepting when forced down by pressure upon the pedal Q².

S S, Figs. 1 and 2, are weight-boxes in the

corners of the elevator A. They are each shown divided by partitions s into three compartments, and each compartment preferably contains a weight s' in the form of a disk. The outer ends of the compartments are open, as shown in Fig. 2.

$S' S'$, Fig. 2, are weight-boxes arranged at the foot of the elevator-shaft, so as to come opposite the boxes $S S$ when the elevator is in position to receive passengers from the first floor, as shown clearly in Fig. 2. Each of said boxes is divided up into compartments s^2 , corresponding to the compartments in the boxes S and having their inner ends open and in position to permit of weights being rolled from the boxes S into the compartments s^2 when the boxes S and S' are upon a level.

In Figs. 8, 9, and 10 we show the form of brake and brake-lever above described modified in the arrangement of parts to adapt them better to the form of winding mechanism shown in Figs. 8 and 9, in which the use of the drum N makes it necessary to lengthen the shaft I^2 . In this modified form of said lever the members q and q' are placed at right angles to each other, as are also the supports q^2 , and the brake-shoe Q' is arranged at right angles to the length of the member q' , to which it is attached by a bolt q^{11} , projecting from its inner end and playing in a transverse opening in the member q of the lever; but, as will be obvious, the two forms are in substance the same.

The mode of operation of the preferred form of our apparatus is as follows: The elevator-car being at the bottom of the elevator-shaft and the operator's foot being removed from the pedal Q^2 , the springs q^{10} force the brake-shoe Q' up against the rim of the fly-wheel K and prevent it and the mechanism therewith connected from turning, and so long as this continues the elevator-car is held in position by the rope M , which passes around the sheaves L and L' . If a single passenger gets in, the weights S are all allowed to remain on the car, as the weight C is preferably heavy enough to raise the elevator with the operator, a single passenger, and all the weights S on board. If two passengers get in, one of the weights S is rolled into one of the boxes S' ; if three, two weights are removed from the car, and so on. The car being loaded the operator next preferably draws the shaft G inward, so as to disengage the pinion G^2 from the gear-wheel I and prevent the wheel G' from being set in motion by the motion of said gear-wheel. He then places his foot upon the pedal Q^2 and by pressing down thereon removes the brake-shoe Q' from the face of the fly-wheel K . Gravity acting upon the weight C thereupon causes the elevator to rise, and its motion is communicated by the rope M to the shaft I^2 through the sheave L or drum N , as the case may be, over which said rope passes. This motion of the shaft I^2 operates to wind up the coiled spring P , which presents a greater and greater resist-

ance to the motion of the shaft as it becomes wound tighter and tighter and in that way tends to counteract the tendency of the car to gather momentum as it rises, the lightening of the elevator by the exit of passengers before the top of the building is reached, and the increasing weight of that portion of the rope D between the sheave B' and the weight C .

The brake mechanism enables the operator to reduce the speed of the elevator when it becomes too great by lightening the pressure upon the pedal Q^2 , and also enables him to stop the elevator-car at any point by removing his foot from said brake-pedal and allowing the springs q^{10} to apply the brake with their full strength.

When the operator desires to descend, he first grasps the handle g^3 of the wheel G' and pushes the shaft G inward until the pinion G^2 engages the gear-wheel I , and then, still retaining his grasp upon the handle g^3 , which gives him control of the motion of the car, he throws the brake-shoe Q' out of contact with the rim of the wheel K by pressing down with his foot upon the pedal Q^2 . Everything being then in readiness he by means of the handle g^3 turns the wheel G' in the direction indicated in the drawings by an arrow, and by winding the rope M over the winding mechanism draws the car downward. The spring P assists in an obvious manner and gives the most assistance at the top of the shaft, where assistance is most needed.

When the operator desires to stop in going down, he preferably removes his foot from the brake-pedal and allows the brake to lock the winding mechanism just as he does in going up.

When the elevator is rising, the sheaves B^2 , E , and F all turn in the directions indicated by the arrows placed thereon in Fig. 12, and where a coiled spring is attached to the shaft of either sheave in the manner shown in Fig. 12 it is wound up when the elevator rises and assists the person operating the elevator in lowering it in substantially the same manner as the spring P (shown attached to the shaft I^2 in Figs. 6 and 7) does, and as will be obvious any one of said springs b^5 , e^4 , f^3 , or P may be used alone or all or any number of them may be used together, though where a number of springs are used each should be weaker than a spring should be which has to act alone.

We have described forms of mechanism which we consider desirable, but any mechanic reading our specification will be able to vary said forms in many ways while still embodying the essence of our improvement, and we therefore do not wish to be confined to said forms, but desire our claims to be construed broadly.

Where we use the phrase "winding mechanism" we do so in a narrow sense and only intend to include those parts by which power is transmitted from the hand of the operator

to the part or parts carried by the car upon which the rope M is wound and said parts upon which the winding is done.

We claim—

5 1. The combination of an elevator-car; a revoluble device carried by the car, upon which a rope may be wound; two overhead sheaves; a sheave beneath the car; a weight; a rope having one end secured to the car and
10 the other to the weight, and passing over one of the overhead sheaves; and another rope passing over the other overhead sheave, said winding device on the car, and the sheave
15 beneath the car, and having both ends secured to the car, substantially as described.

2. The combination of an elevator-car; means for hoisting the car; mechanism for lowering the car including a spring; means
20 for transmitting power from the hoisting device to the spring when the car is being raised, and for transmitting force from the spring to the lowering mechanism.

3. The combination of an elevator-car; winding mechanism carried by the car; a
25 spring; means transmitting power to the spring, when the car is being raised; two overhead sheaves; a sheave beneath the car, a weight; a rope having one end attached to the car and the other to the weight, and passing
30 over one of said overhead sheaves; and another rope passing over the other overhead sheave, the winding mechanism and the sheave beneath the car and having both ends secured to the car.

35 4. The combination of an elevator-car; a sheave above the car and one below it; a revoluble device carried by the car, upon which a rope may be wound; a fly-wheel carried by the car, means connecting said wheel with
40 said winding device, a brake-shoe; means which automatically force the brake-shoe into contact with the periphery of the fly-wheel; means whereby the pressure of the brake-shoe upon the fly-wheel may be diminished and removed; and a rope passing over
45 said sheaves and said winding device upon the car, and having both ends attached to the car, substantially as described.

5. The combination of an elevator-shaft; an
50 elevator-car; a stationary overhead sheave; a stationary sheave at the bottom of the shaft; a double-faced sheave carried by the car; a crank carried by the car, means for transmitting motion from the crank to the
55 sheave; a single-faced sheave, a rope attached to the top of the car and extending thence, first over the overhead sheave, thence downward under the double-faced sheave, thence over said single-faced sheave, thence back
60 and over the double-faced sheave, thence down and under the sheave at the bottom of said shaft, and thence up to the bottom of

the car, and attached to the bottom of said car, substantially as described.

6. In a winding device to be carried by elevator-cars for elevating or lowering them, a substantially horizontal shaft; journal-bearings supporting the shaft; a double-faced sheave attached to the shaft; a spring; means for transmitting power from the shaft to the
7 spring when the shaft is turned in one direction and for transmitting force from the spring to the shaft for turning it in the opposite direction, and a sheave opposite the double-faced sheave; substantially as described.

7. The combination in a winding device to be carried by elevator-cars for elevating or lowering them; of a shaft, journal-bearings supporting the shaft; means for transmitting rotary motion to the shaft; a fly-wheel carried by the shaft; a brake having a shoe for application to the periphery of the fly-wheel; a double-faced sheave attached to the shaft; a sheave opposite the double-faced sheave; a rope passing over said sheaves, a spring and
8 means for transmitting power from the shaft to the spring and motion from the spring to the shaft.

8. The combination of an elevator-car; two overhead sheaves; a sheave beneath the car; winding mechanism carried by the car; a
9 spring; means transmitting power from the winding mechanism to the spring when the elevator is being raised and force from the spring to the car when the elevator is being
9 lowered; a brake for governing the motion of the winding mechanism; a weight; a rope passing over one of the overhead sheaves and having one end attached to the car and the other end to the weight; another rope passing
over the other overhead sheave, the winding mechanism and the sheave beneath the car and having both ends attached to the car substantially as described.

9. The combination of an elevator-car; a revoluble device carried by the car, upon which a rope may be wound; a wheel carried by the car, having a smooth rim; means connecting said wheel and said rope-winding device; a brake having a shoe; means normally pressing the brake-shoe against the rim of said wheel; means for removing said shoe from said wheel-rim; a shaft; a journal-bearing in which said shaft turns; means for turning said shaft; means for transmitting motion from said shaft to said rope-winding device; and means for disconnecting said shaft from said winding device, substantially as described.

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