J. M. GOODKNIGHT.

ELEVATOR.

APPLICATION FILED APR. 20, 1909.

998,610.

Patented July 25, 1911.

3 SHEETS—SHEET 1.

Fig 1

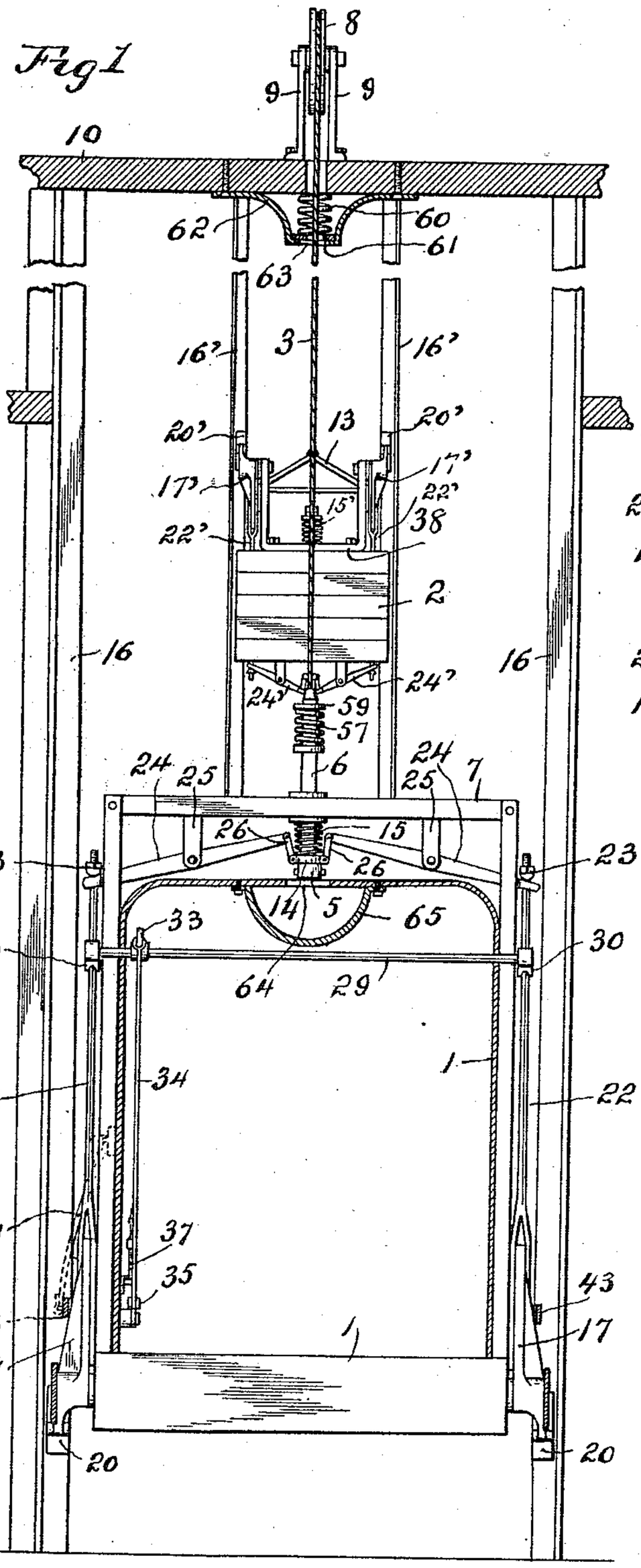
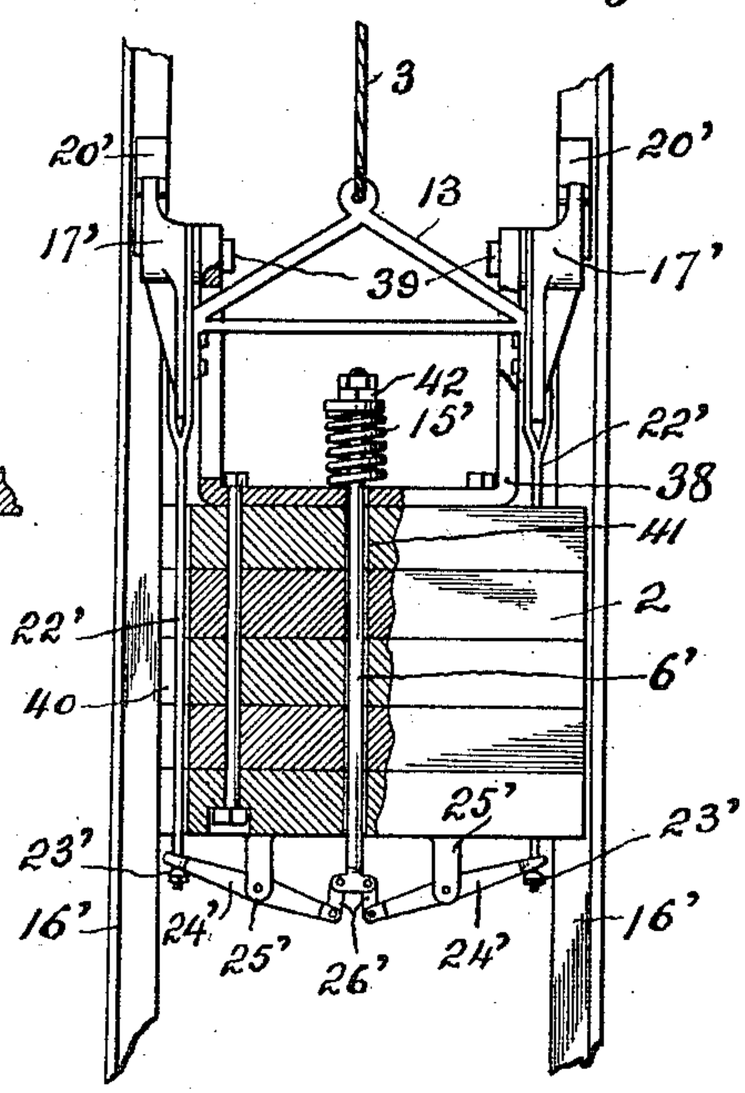


Fig 2



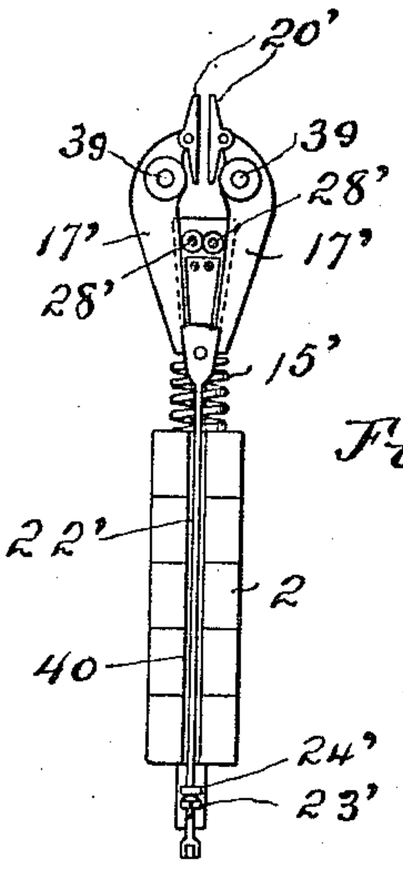


Fig 3

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3 SHEETS—SHEET 2.

Fig 4

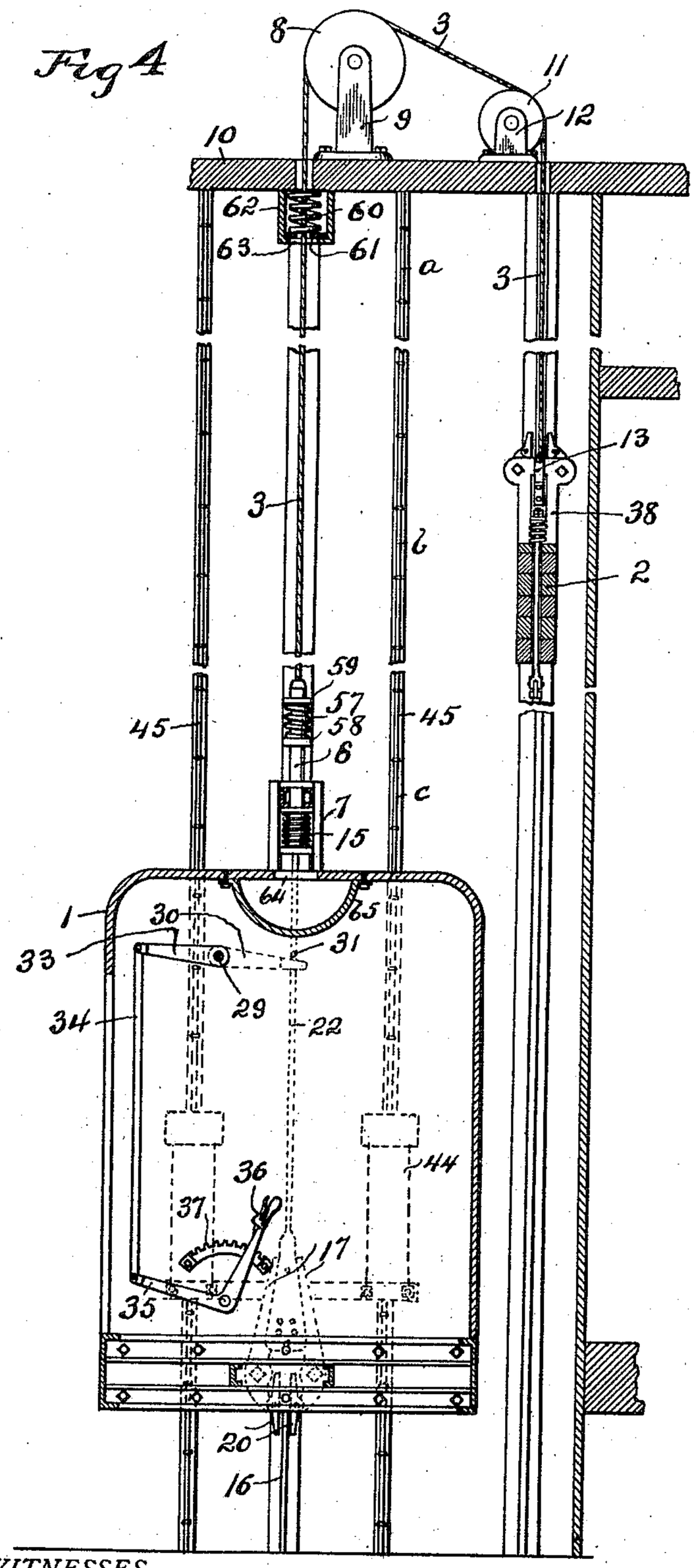
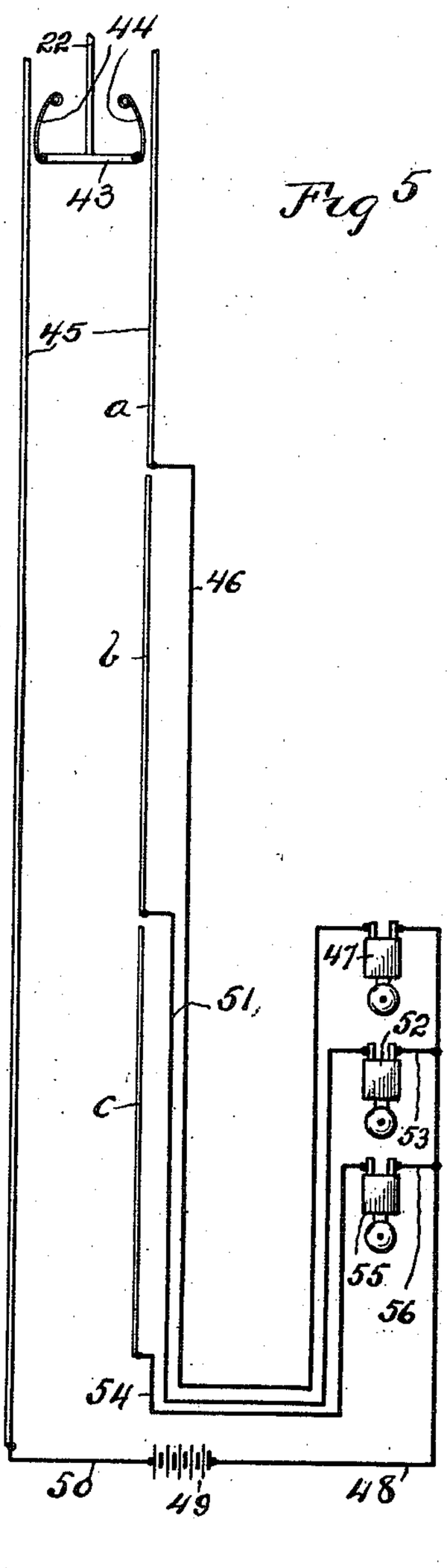


Fig 5



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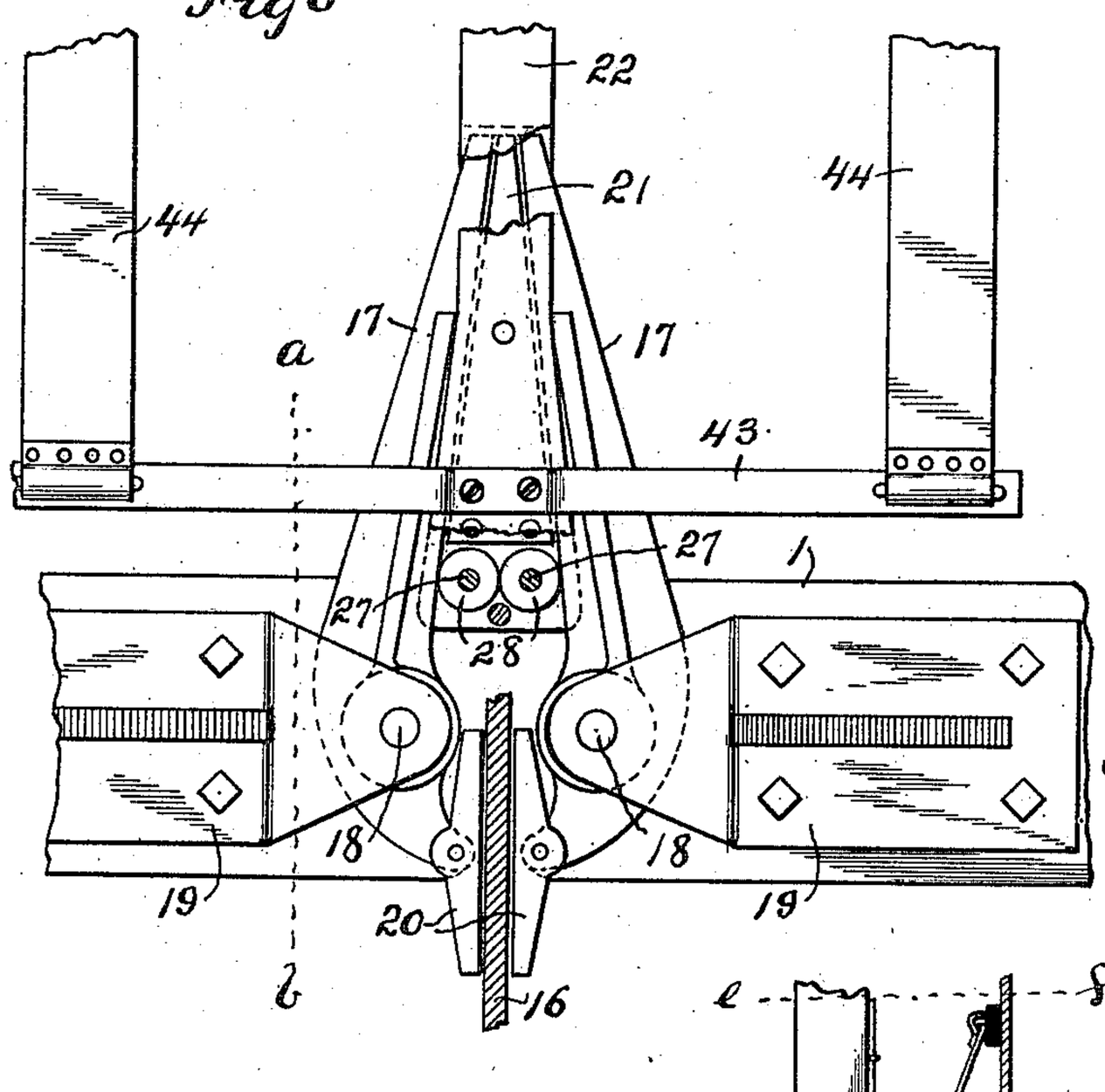
3 SHEETS—SHEET 3.

Fig 6



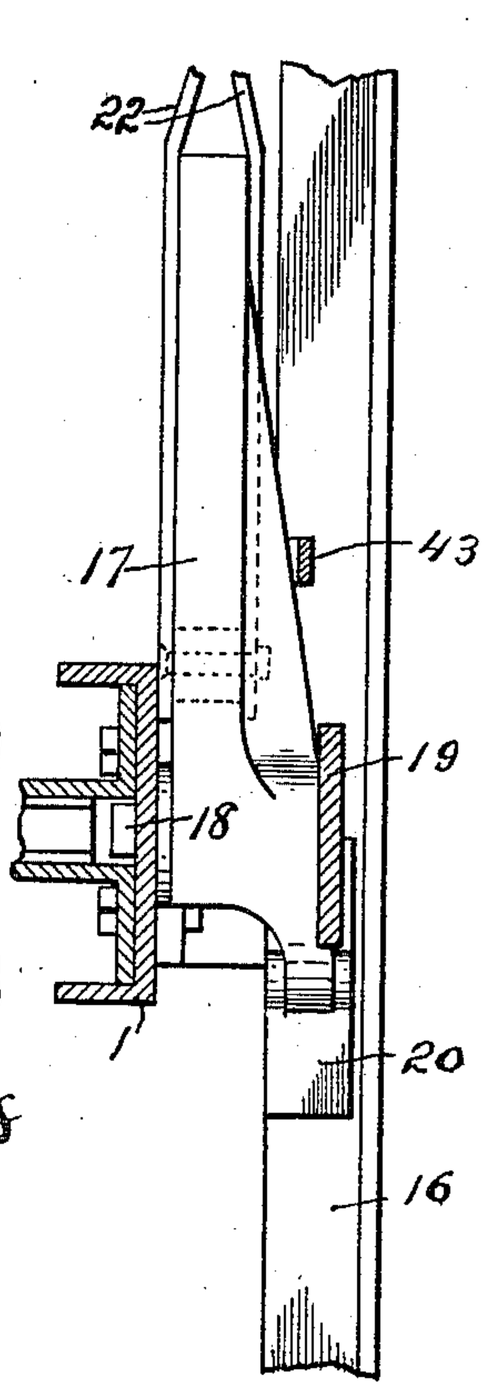
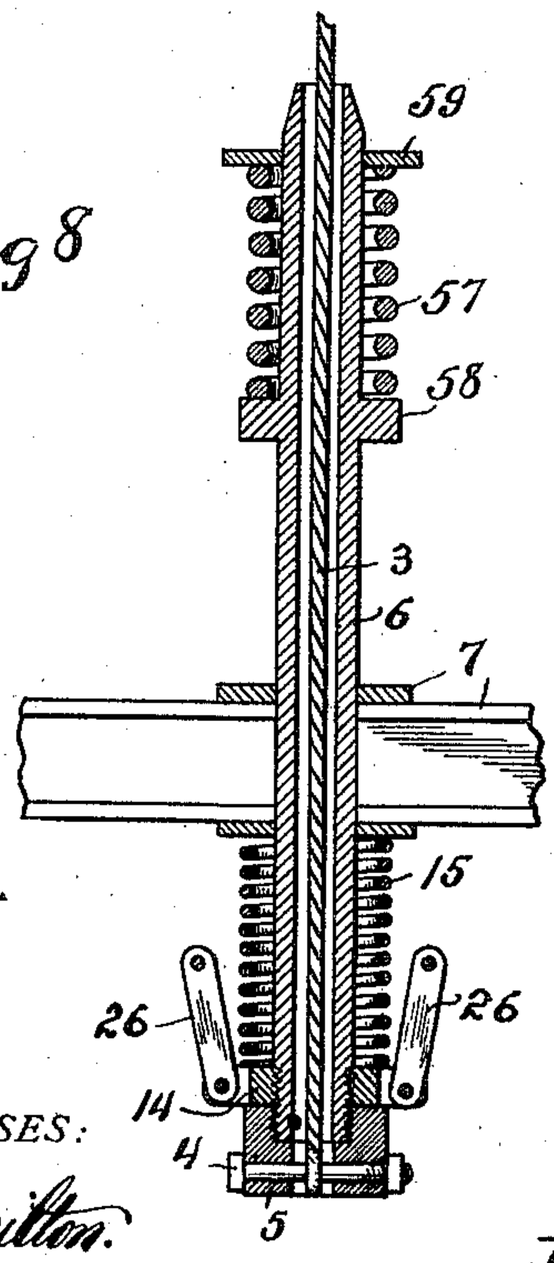


Fig 7

Fig 8



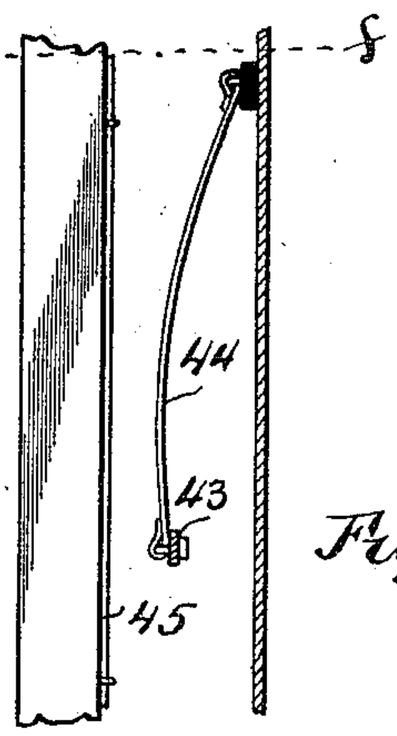


Fig 10

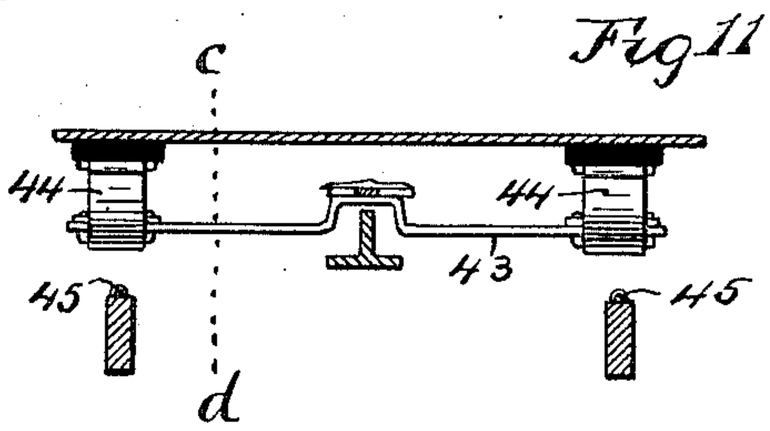


Fig 11

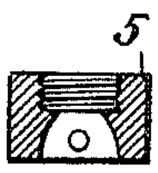


Fig 9

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UNITED STATES PATENT OFFICE.

JOHN M. GOODKNIGHT, OF KANSAS CITY, KANSAS.

ELEVATOR.

998,610. Specification of Letters Patent. Patented July 25, 1911.

Application filed April 20, 1909. Serial No. 491,037.

To all whom it may concern:

Be it known that I, JOHN M. GOODKNIGHT, a citizen of the United States, residing at Kansas City, in the county of Wyandotte and State of Kansas, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

My invention relates to improvements in elevators.

One object of my invention is to provide means by which an elevator car will be prevented from falling in case the cable supporting the car breaks.

A further object of my invention is to provide means by which the weight employed to counterbalance an elevator car may be prevented from falling upon the breaking of the cable supporting the car and weight.

A further object of my invention is to provide novel means for giving an alarm upon the breaking of the cable supporting the car.

My invention also provides novel means for indicating the position of the car at the time of the breaking of the cable supporting the car.

Other novel features are hereinafter fully described and claimed.

In the accompanying drawings, which illustrate the preferred form of my invention—Figure 1 is a vertical sectional view, partly broken away, of an elevator equipped with my improved safety device. Fig. 2 is an enlarged detail view, partly in elevation and partly in vertical section, of the counterbalancing weight and some of the parts connected therewith. Fig. 3 is an enlarged elevation view of the weight and part of the clamping mechanism. Fig. 4 is a view similar to Fig. 1, the section, however, being at right angles to the plane of the section of Fig. 1. Fig. 5 is a diagrammatic view showing the circuits in which the alarm devices are located. Fig. 6 is an enlarged detail view, partly in elevation and partly in vertical section, of one of the clamping devices and parts connected therewith carried by the car. Fig. 7 is a vertical section taken on the dotted line *a*—*b* of Fig. 6. Fig. 8 is a central, vertical, sectional view of the spring actuated plunger which supports the car and is supported by the cable. Fig. 9 is a vertical sectional view of the nut which forms the lower end of the plunger shown in Fig. 8. Fig. 10 is an enlarged detail view, taken on the dotted line *c*—*d* of Fig. 11 of a portion of the circuit closing mechanism carried by the car. Fig. 11 is a horizontal section taken on the dotted line *e*—*f* of Fig. 10.

Similar characters of reference denote similar parts.

1 denotes the elevator car, 2 the weight employed to counterbalance the car, and 3 the cable, opposite ends of which respectively support the car 1 and gate 2. One end of the cable 3 is secured to a horizontal bolt 4, mounted in a nut 5, which forms the lower end of a tubular plunger 6, which is vertically slidably mounted in a frame 7, mounted on the car 1. The cable 3 extends vertically through the said plunger, and passes from thence upwardly over a pulley 8, which is supported by bearings 9, which in turn are supported upon the roof or other suitable support 10, of the building in which the elevator is located. From the pulley 8, the cable 3 passes over and around a drum 11, rotatively mounted in bearings 12 supported on the roof 10, as shown in Fig. 4, said drum being rotated for the purpose of raising and lowering the car 1 by any well known means, not shown. After being passed several times around the drum 11 the cable 3 is extended to a yoke 13, to which it is secured. Said yoke supports the weight 2 in a manner which will hereinafter be described.

Secured to the plunger 6, against the upper side of the nut 5, is a plate 14, which supports the lower end of a coil spring 15, which encircles the plunger 6 and upon the upper end of which rests the frame 7. The strength of the spring 15 is such that the weight of the car 1 normally compresses it.

My invention provides means by which, when the cable 3 breaks and the spring 15 expands, the car will be supported by the clamping devices actuated by the expansion of the spring to engage vertical supports 16 disposed at opposite sides of the car 1, parallel with the line of travel of said car. Two sets of clamping mechanisms are preferably provided on the car 1 for respectively engaging the vertical bars or supports 16. Each of these clamping mechanisms is provided with two vertical levers 17, as shown in Fig. 6, which are respectively pivoted upon horizontal bolts 18, the inner ends of which are secured to the frame of the car 1

and the outer ends of which are respectively secured in brackets 19, secured to the adjacent side of the car. The lower ends of the levers 17 have pivotally secured to them respectively, two clamping shoes 20, disposed at opposite sides of the adjacent support 16 and adapted to rigidly clamp said supports when the upper ends of the levers 17 are forced away from each other.

The following mechanism is employed to automatically swing the levers 17 when the cable breaks so as to cause the shoes 20 to grip the support 16:—Between each pair of levers 17 is located a wedge shaped block 21, to opposite sides of which is secured the bifurcated lower end of a vertical bar 22 the upper end of which is screw threaded and has mounted thereon a nut 23. Two levers 24, are pivotally supported at opposite sides of the plunger 6, above the roof of the car 1, upon projections 25, which extend downwardly from the horizontal portion of the frame 7. Two links 26, have one set of ends pivoted respectively to the inner ends of the levers 24. The other ends of the links 26 are pivoted to the plate 14. The outer ends of the levers 24 are bifurcated and respectively embrace the rods 22 and are adapted to respectively engage the lower sides of the nuts 23. Pivotally mounted on horizontal pins 27 in the bifurcated lower end of each rod 22 are two rollers 28, adapted respectively to bear against the inner sides of the levers 17, above the bolts 18.

In case the cable 3 breaks the spring 15 is suddenly expanded, thereby forcing downwardly the plunger 6 and plate 14 and, through the intermediacy of the links 26, swinging upwardly the outer ends of the levers 24. The levers 24, when thus swung, will vertically move the rods 22 in an upward direction, thus causing the rollers 28 to swing outwardly the upper ends of the levers 17, thereby causing the clamping shoes 20 to tightly grip the supports 16 so as to sustain the car and prevent its falling. In order that the clamping shoes 20 may be operated manually, to serve as a brake, the following described mechanism is employed:—Extending through the car 1 and pivotally mounted in the side walls thereof, is a rock shaft 29, having at opposite ends crank arms 30, the outer ends of which are bifurcated and respectively embrace the rods 22. Each rod 22, as shown in Fig. 4, is provided with a button 31, against the underside of which the adjacent crank arm 30 is adapted to bear for the purpose of upwardly swinging the adjacent rod 22 when the rock shaft 29 is rocked in the proper direction. To so rock the shaft 29, it has secured to it a crank arm 33, to which is pivoted the upper end of a vertical rod 34, the lower end of which is pivoted to a bell crank lever 35, which is pivotally mounted in the car 1 and has pivoted upon it a hand operated pawl 36, which is adapted to engage the toothed upper edge of a segmental locking plate 37, secured to the inner side of the car 1. By releasing the pawl 36 from the toothed segment 37, the lever 35 may be swung so as to rock the shaft 29 in a direction such that the crank arms 30 will respectively engage the buttons 31 so as to upwardly move the rods 22, thereby, as already described, causing the levers 17 to be swung so that the shoes 20 will grip the supports 16.

I will now describe the mechanism for automatically catching the counterbalance weight 2 upon the breaking of the cable:—Referring particularly to Figs. 2 and 3, 38 denotes a U-shaped bar secured to the upper end of the weight 2. Each vertical arm of the bar 38 has rigidly secured to it two horizontal bolts 39 on which are respectively pivoted two vertical clamping levers 17′, to the upper ends of which are pivotally secured two clamping shoes 20′, which are disposed at opposite sides of a vertical support 16′. The two supports 16′ are disposed respectively at opposite sides of the weight 2 and are adapted to be tightly gripped by the clamping shoes 20′, when the lower ends of the levers 17′ are outwardly swung. To swing said levers outwardly at their lower ends, two rollers 28′ are rotatively mounted in the bifurcated upper end of a vertical rod 22′, which is located in a groove 40 provided in the adjacent edge of the weight 2 and which is normally supported by and secured to the yoke 13. The lower end of each rod 22′ is screw threaded and has mounted thereon a nut 23′. The rollers 28′ are located intermediate of and are adapted to bear against the levers 17′.

Two levers 24′ are respectively pivoted upon two projections 25′ extending from the lower side of the weight 2. Two links 26′ are respectively pivoted at one set of ends to the inner ends of the levers 24′, the other set of ends being pivoted to the lower end of a vertical plunger 6′ which is slidably mounted in a vertical hole 41, provided through the weight 2 and U bar 38. The upper end of the plunger 6′ is screw threaded and has secured thereto a nut 42 against which bears the upper end of a coil spring 15′, the lower end of which bears against the upper side of the U bar 38.

The outer ends of the levers 24′ are bifurcated and respectively embrace the rods 22′ above the nuts 23′. The strength of the spring 15′ is such that the weight of the counterbalance 2 will normally hold it compressed. In case the cable 3 breaks the upward pull on the yoke 13 supporting the rods 22′ will cease and the spring 15′ will suddenly expand, thus forcing upward the plunger 6′ and swinging downward the

outer ends of the levers 24′ which in turn will force downward the rods 22′, thereby causing the rollers 28′ to swing outwardly the lower ends of the levers 17′, thus causing the clamping shoes 20′ to grip the supports 16′ so as to prevent the weight 2 from falling.

I will now describe the mechanism by which an alarm is given when the cable breaks:—Secured to one of the rods 22 is a horizontal bar 43, to opposite ends of which are secured respectively the lower ends of two vertical spring contact strips 44, the upper ends of which are secured to the outer side of the car 1. Parallel with the travel of the car 1 and adjacent to the strips 44 respectively, are two vertical conductors 45, which are normally out of contact with the spring strips or plates 44. In case the cable breaks, the rod 22, to which the bar 23 is secured, is forced upwardly, as already described, and in moving upwardly will, by means of the bar 43, cause the strips 44 to be outwardly bent into positions in which they will respectively strike the conductors 45, thereby electrically connecting said two conductors, the strips 44 and the bar 43 being of conductive material. One of the conductors 45, the right one, as shown in Fig. 5, is divided into sections corresponding to the different floors of the building. These sections are respectively denoted by the reference letters *a*, *b* and *c*. The section *a* is connected by means of a conductor 46 with one binding post of an electric bell 47, the other binding post being connected by a conductor 48 to one pole of a battery 49, the other pole of which is connected by a conductor 50 with the continuous or undivided conductor 45. The section *b* is connected by a conductor 51 with one binding post of an electric bell 52, the other binding post being connected by a conductor 53 with the conductor 48. The section *c*, is connected by a conductor 54 with one binding post of an electric bell 55, the other binding post being connected by a conductor 56 with the conductor 48.

In case the cable breaks and the car at the time is located with the contact strips 44 intermediate the section *a*, and the unbroken conductor 45, the current from battery 49 will be carried by conductor 48, through the bell 47, thence by conductor 46 and section *a*, to one of the strips 44, which is in contact with said section, thence by the bar 43, to the other strip 44, thence by the unbroken conductor 45 and conductor 50, back to the battery 49. The electric bell 47 being sounded, will indicate that the cable is broken and that the car is located at the floor corresponding to section *a*. In a like manner, if the contact strip 44 connects with section *b* or *c*, the bells 52 or 55 will be sounded.

The following is a description of mechanism which I employ for preventing the car from coming to an abrupt stop at the upper limit of its travel:—A coil spring 57, encircling the plunger 6, has its lower end supported upon an annular flange 58, provided on said plunger. Upon the upper end of said spring is mounted a washer 59. Encircling the cable 3 is a coil spring 60, the upper end of which rests against the lower side of the support 10 and the lower end of which is supported upon a washer 61, through which the cable 3 passes and which in turn is supported in a housing 62, secured to the underside of the roof or support 10. The lower end of the housing 62 is provided with a vertical hole 63, through which the cable 3 extends and which is adapted to receive the upper end of the plunger 6. When the car passes upwardly to a position in which the plunger 6 will enter the opening 63, the spring 60 will be compressed owing to the plunger 6 striking the washer 61. At the same time, the washer 59 will strike against the lower side of the housing 62 and will thus cause the compression of the spring 57. The springs 57 and 60 will thus serve as a cushion to limit the force of the blow.

As shown in Fig. 1, the roof of the car 1 is provided with a vertical hole 64, through which the lower end of the plunger 6 may be projected in case the cable breaks. A semi-spherical closure 65 is releasably secured, by screws or otherwise, to the lower side of the roof of the car in a position normally covering the hole 64.

I do not limit my invention to the precise structure illustrated and described, as it will be obvious that various modifications may be made, within the scope of the appended claims, without departing from the spirit of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In an elevator, the combination with a car, of a spring supporting the car and normally compressed by the weight of the car, a cable, means supported by the cable for supporting the spring, a support parallel with the line of travel of the car, normally inoperative means carried by the car for engaging said support to sustain the car upon the breaking of the cable, means actuated by the expansion of said spring for operating said support engaging means, a plurality of alarm devices, and normally inoperative means for respectively actuating said alarm devices when the car is at different vertical positions and actuated to operate one of said alarm devices upon the breaking of the cable.

2. In an elevator, the combination with a car, of a cable, a spring supporting the car,

means supported by the cable for supporting the spring, a support parallel with the line of travel of the car, two clamping levers pivoted to the car and having upwardly extending converging arms which when forced apart cause the levers to clamp said support, a vertically movable member, means carried by said member intermediate of the converging arms of the lever for engaging and forcing apart said converging arms when said member is moved upward from the inactive to the active position, and means actuated by said spring when it expands after the breaking of the cable for moving said member upward to the active position.

3. In an elevator, the combination with a car, of a cable, a spring supporting the car, means supported by the cable for supporting the spring, a support parallel with the line of movement of the car, two clamping levers pivoted to the car and having upwardly extending converging arms which when forced apart swing the levers to clamp said support, a vertically movable member, two rollers carried by said member intermediate of and adapted to engage said arms for forcing them apart when said member is moved upwardly from the inactive to the active position, and means actuated by said spring when it expands upon the breaking of the cable for forcing said member to the active position.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

JOHN M. GOODKNIGHT.

Witnesses:
WARREN D. HOUSE,
E. B. HOUSE.