S. A. FLANNERY.

SAFETY APPARATUS FOR ELEVATORS.

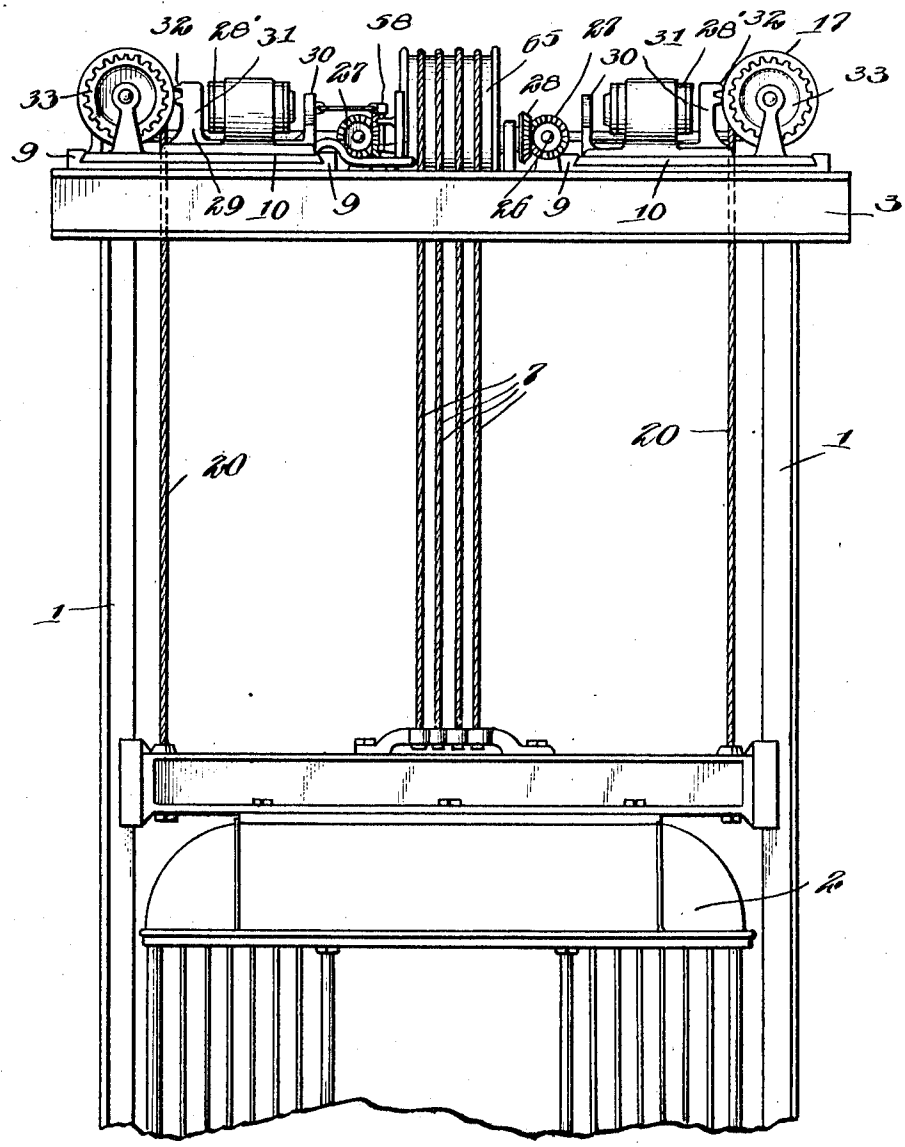
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1,270,716.

Patented June 25, 1918.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 4.

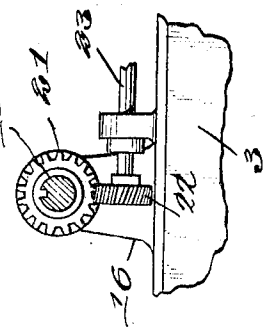
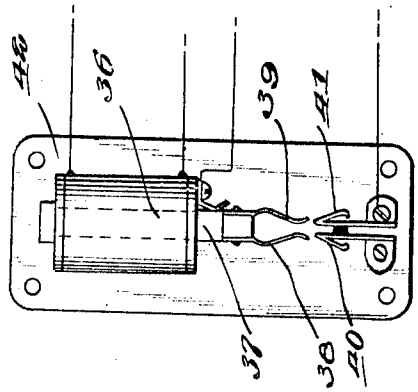


Fig. 5.



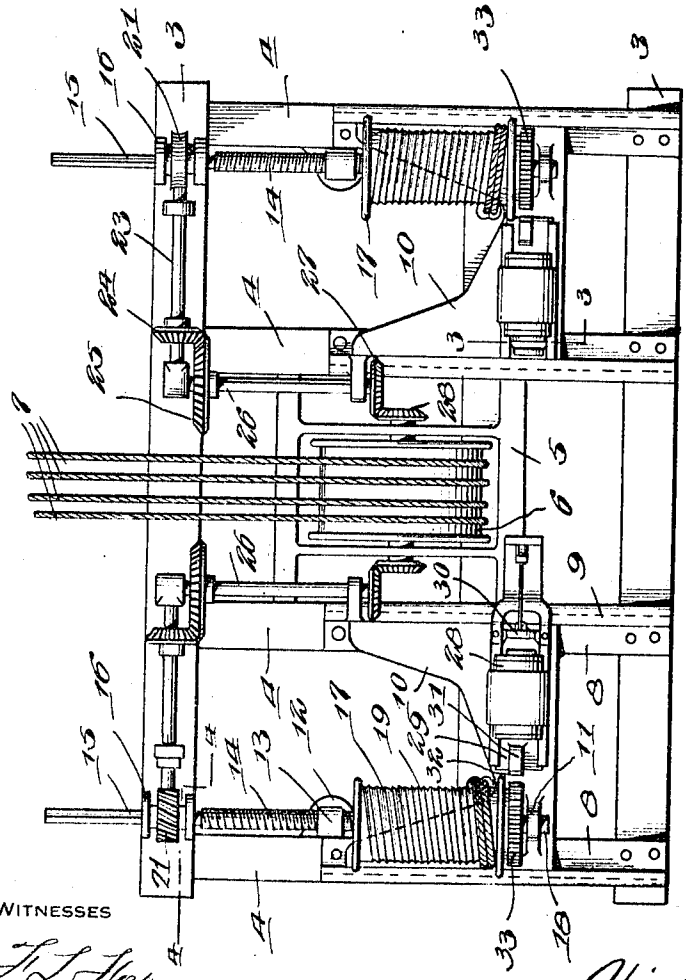


Fig. 3.

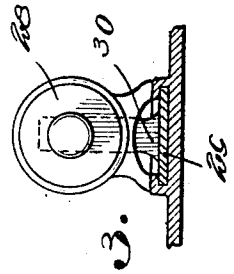


Fig. 2.

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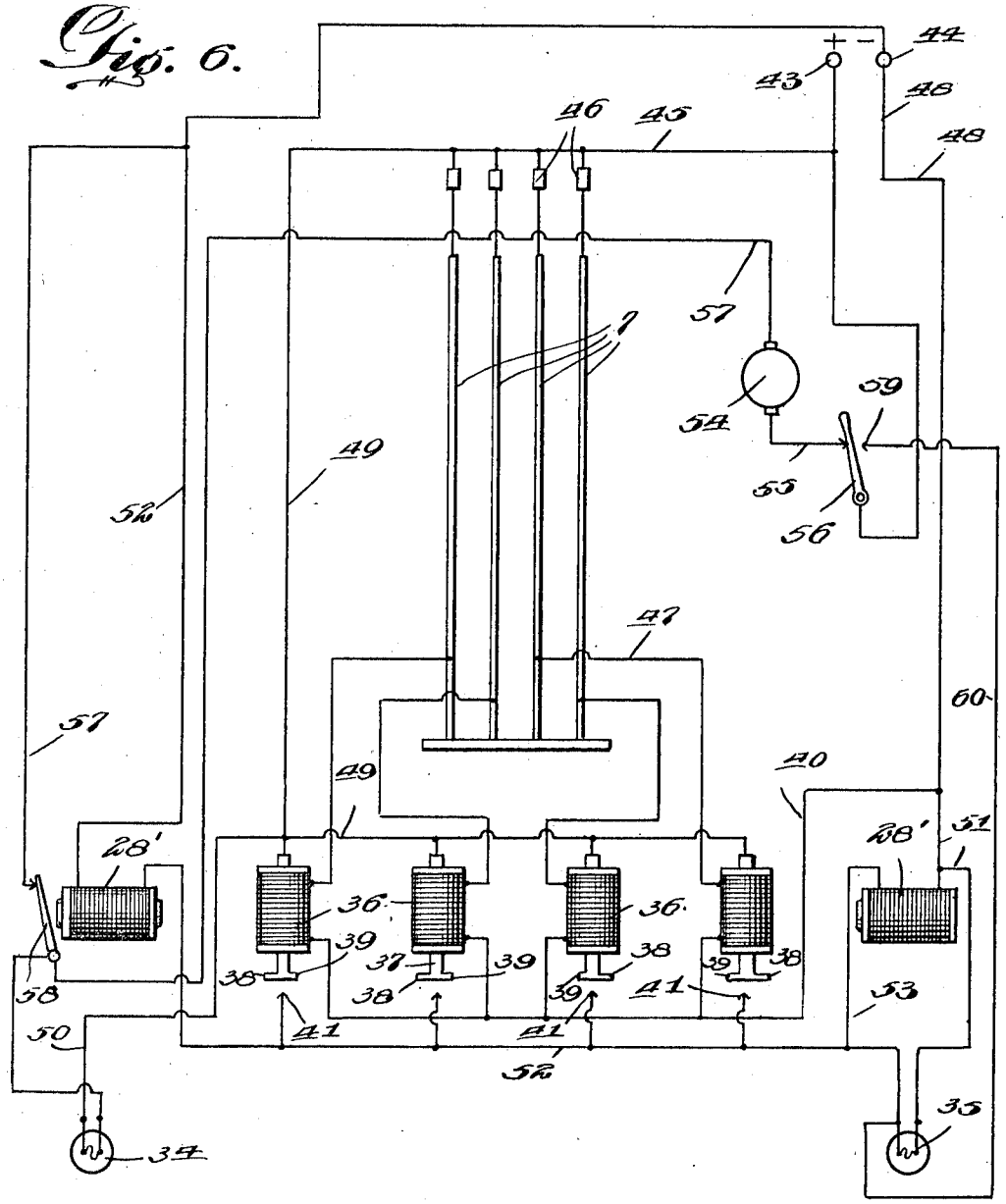
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3 SHEETS—SHEET 3.

Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

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SAFETY APPARATUS FOR ELEVATORS.

1,270,716. Specification of Letters Patent. Patented June 25, 1918.

Application filed January 16, 1917. Serial No. 142,690.

To all whom it may concern:

Be it known that I, STEPHEN A. FLANNERY, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Safety Apparatus for Elevators, of which the following is a specification.

This invention relates to improvements in safety apparatus for elevators and has particular application to automatic apparatus whereby the elevator may be stopped and held suspended in the event of the breaking of one or more of the hoisting cables.

In carrying out the present invention, it is my purpose to provide safety apparatus for elevators wherein by means of auxiliary drums and cables and an automatic mechanism controlling the auxiliary drums the car or cage may be stopped and held suspended in the shaft in the event of the breaking of one or more of the hoisting cables, and whereby a signal will be given to the operator to notify him of the breaking of the cable, and the driving motor of the hoisting drum cut off from its source of power so as to prevent further operation of the drum.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts herein set forth and falling within the scope of the claims.

In the accompanying drawings:—

Figure 1 is a side elevation of the top portion of an elevator shaft and car therein.

Fig. 2 is a top plan view of the shaft showing the hoisting mechanism and safety apparatus at the upper end thereof.

Fig. 3 is a sectional view on the line 3—3 of Fig. 2.

Fig. 4 is a similar view on the line 4—4 of Fig. 2.

Fig. 5 is a view in side elevation of one of the electroresponsive devices and switches controlled thereby.

Fig. 6 is a diagrammatic view showing the wiring connections.

Referring now to the drawings in detail, 1 designates an elevator shaft of suitable construction in which is adapted to travel a car or cage 2. Mounted upon the upper end of the shaft 1 is a supporting bed or base embodying side beams 3 spaced apart in parallelism and cross bars 4 arranged at right angles to the beams 3 and having the ends secured to such beams. The center cross bars 4 support a frame 5, and rotatably mounted in horizontally alining bearings carried by the frame 5 is the shaft of a hoisting drum 6. Trained over the hoisting drum 6 are hoisting cables 7, which in the present instance are four in number, and one end of each cable depends into the shaft 1 and is connected with the top of the car or cage 2, while the other ends of the cables are connected with counter weights, as is well known, so that in the rotation of the hoisting drum 6 in one direction, the car will be lowered, and in the rotation of the drum in the other direction the car will be elevated. Riveted or otherwise fastened to the cross bars 4 at each side of the hoisting drum 6 are guide strips 8 having the outer edges formed with upstanding flanges 9 and the confronting edges of the flanges 9 are formed with grooves that provide guideways. Slidably mounted in these guideways and spanning the space between corresponding strips 8 are plates 10, respectively, and upstanding from each plate 10 adjacent to one edge thereof and in proximity to the outermost guide strip is a bearing 11. Secured to the cross bar carrying the strip in proximity to the bearing 11 is a bracket 12, and upstanding from the bracket 12 is a bearing 13 alining with the bearing 11. This bearing 13 is threaded interiorly and receives a screw shaft 14 and integral with one end of the shaft 14 is a shaft 15 that is journaled in a bearing 16 carried by one of the beams 3. Arranged between the bearings 11 and 13 is an auxiliary drum 17 and one end of the drum 17 is connected to the adjacent end of the shaft 14, while the other end of the drum is formed with a trunnion 18 journaled in the bearing 11. The circumference of the drum 17 is formed with a spiral groove 19 of a pitch corresponding to the threads on the shaft 14. Connected to the drums 17 are the upper ends of auxiliary cables 20 and the lower ends of these cables 20 are connected with the top of the car or cage 2. The upper end portions of the cables 20 are adapted to lie in the spiral grooves 19 in the drums 17 when the drums are rotated to wind up the auxiliary cables so as to prevent overlapping of the cables on the drums. Splined upon each shaft 15 adjacent to the bearing 16 is a worm wheel 21 that meshes with a worm 22 on one end of a shaft 23. The other ends

of the shafts 23 are equipped with bevel pinions 24 that mesh with bevel gears 25 on the ends of horizontal shafts 26, respectively, and these shafts 26 are equipped with bevel pinions 27 that mesh with similar pinions 28 carried by the ends of the hoisting drum 6 so that in the rotation of the hoisting drum to raise or lower the car a rotary and sliding movement will be imparted to the drums 17, thereby enabling the auxiliary cables 20 to remain in the same vertical planes in the winding and unwinding thereof. Under normal conditions, that is when the cables 7 are intact, such cables take the entire weight of the car, and in the movement of the car in the shaft the drums 17 operate to draw up the cables 20 and to pay out such cables according to the direction of travel of the car, thereby relieving the cables 20 of the strain, so that such cables may act, in an emergency, to hold the car in the shaft, as will be presently described.

Mounted upon each plate 10 adjacent to one end of the drum 17 and extending at right angles to the drum is an electro-responsive device in the form of a magnet 28′. This magnet 28′ is spaced above the plate 10, and slidably mounted upon the plate 10 below the magnet is a plate 29, and connected to the end of the plate 29 remote from the drum is an armature 30 disposed within the influence of a pole of the magnet 28′. On the other end of the plate 29 is an upstanding arm 31 that is formed with outwardly projecting teeth 32, and surrounding the trunnion 18 of the drum is a spur gear 33 fixed to such drum and adapted to be engaged by the teeth 32 on the arm 31 when the plate 29 is moved under the action of the magnet or armature. When the spur gears 33 are engaged by the teeth 32, the auxiliary drums 17 are locked against rotation, thereby preventing downward movement of the car in the shaft.

As the magnets 28′ and drums 17 are mounted upon the plates 10, and the drums connected with the screw shafts 14, it will be seen that in the rotation of these shafts 14 to revolve the drums 17, such shafts and drums will move longitudinally owing to the threaded bearing 13, thereby sliding the plates 10 and the magnets on such plates with the drums.

Located in the car or cage 2 is a signal lamp 34 preferably colored green, a signal lamp 35 colored red, and electro-responsive devices in the form of solenoids 36 corresponding in number with the hoisting cables 7. Each solenoid 36 is equipped with a core 37 and connected with the lower end of the cores are contact fingers 38 and 39 adapted to engage contacts 40 and 41, respectively, when the core is in lowered position. Each solenoid and the corresponding contact fingers and contacts are mounted upon a base plate 42, as clearly illustrated in Fig. 5 of the drawings.

43 and 44 designate binding posts adapted to be connected to the source of electric current supply and leading from the binding post 43 is a current carrying conductor 45. Tapped onto the conductor 45 are brushes 46 that bear upon the cables 7, respectively, adjacent to the hoisting drum 6. Connected to the cables 7 at the lower extremities thereof are conductors 47, respectively, and these conductors 47 extend through the respective solenoid windings 36 and are tapped onto a return wire 48 that is connected with the binding post 44. Tapped onto the conductor 45 is one terminal of a conductor 49, and connected with the conductor 49 are the cores 37 of the solenoids, as clearly illustrated in Fig. 6 of the drawings. Connected with the conductor 49 is one terminal of a conductor 50 and this conductor 50 is connected to one terminal of the signal lamp 34, and leading from the other terminal of the signal lamp 34 is a conductor 51 that is terminally connected with the return wire 48. The contacts 41 are connected with a conductor 52 that extends through one of the magnets 28′ and is connected with the binding post 44. This conductor 52 also extends through the signal lamp 35 and is tapped onto the conductor 51, while leading from the conductor 52 is a branch conductor 53 that extends through the other magnet 28′ and is terminally connected with the conductor 51. The contacts 40 are connected with the conductor 51. 54 designates a motor connected with the hoisting drum 6 to revolve the latter, and one side of this motor is connected with the conductor 45 adjacent to the binding post 43 by means of a conductor 55 that includes a controlling switch 56 and the other side of the motor 54 is connected with one terminal of a conductor 57 that extends through a circuit breaker 58 under the control of the magnets 28′; the other terminal of the conductor 57 being tapped onto the conductor 52. Arranged adjacent to the lever of the switch 56 and adapted to be engaged by such lever when the switch is in off position is a contact 59, and leading from the contact 59 is a conductor 60 connected with the side of the signal lamp 35 opposite from the conductor 51.

In practice, as long as the cables 7 are intact, the solenoids 36 are energized and the green lamp 34 burns, current flows from the binding post 43 through the conductor 45, brushes 46, cables 7, conductors 47, solenoids 36 and conductor 48 to the binding post 44. Current also flows from the conductor 45 through the conductor 49, the conductor 50, signal lamp 34 and conductor 51 to the return wire 48. In the event of one or more of the cables 7 breaking, the corresponding solenoid 36 will be deenergized

and the core 37 of such solenoid will drop down, thereby engaging the fingers 38 and 39 with the corresponding contacts 40 and 41. When the contact finger 38 engages the contact 41 current flows from the conductor 49 through the core of the solenoid and through the conductor 52 and then through the magnets 28′ back to the binding post 44, thereby energizing the magnets 28′ to hold the auxiliary drums against rotation and thereby prevent the moving of the car in the shaft. Upon the energization of the magnet 28′ controlling the circuit breaker 58 the circuit breaker is operated to de-energize the motor 54 thereby stopping the operation of the hoisting motor. When the contact 39 engages the contact 40 the green lamp 34 is short circuited, while the current from the conductor 52 flows through the red lamp 35 to indicate the condition of the apparatus.

In the normal running of the car, the lever of the switch 56 engages the contact 59 whenever the switch is operated to open position, thereby closing the circuit through the red lamp 35.

While I have herein shown and described the preferred form of my invention by way of illustration, I wish it to be understood that I do not limit or confine myself to the precise details of construction herein shown and described, as modification and variation may be made within the scope of the claims and without departing from the spirit of the invention.

I claim:—

1. In safety apparatus for elevators, the combination with the car, hoisting drum, and hoisting cables, of auxiliary drums, cables having their lower ends connected to the car and their upper extremities connected to said auxiliary drums respectively, driving connections between said hoisting drum and auxiliary drums whereby all of said drums may operate in unison, and electroresponsive devices under the control of said hoisting cables and operable to hold said auxiliary drums against rotation in the event of the breaking of one of said hoisting cables.

2. In safety apparatus for elevators, the combination with the car, hoisting drum, and hoisting cables, of auxiliary drums, cables having their lower ends connected to the car and their upper extremities connected to said auxiliary drums respectively, driving connections between said hoisting drum and auxiliary drums whereby all of said drums may operate in unison, electroresponsive devices under the control of said hoisting cables and operable to hold said auxiliary drums against rotation in the event of the breaking of one of said hoisting cables, and a controlling circuit including said hoisting cables and electroresponsive devices.

3. In safety apparatus for elevators, the combination with the car, hoisting drum, and hoisting cables, of auxiliary drums, cables having their lower ends connected to the car and their upper extremities connected to said auxiliary drums respectively, driving connections between said hoisting drum and auxiliary drums whereby all of said drums may operate in unison, electroresponsive devices for holding said auxiliary drums against rotation in the event of the breaking of one of the hoisting cables, an electric circuit including said devices, electroresponsive devices controlling said circuit, and a circuit including said hoisting cables and said last named electroresponsive devices.

4. In safety apparatus for elevators, the combination with the car, hoisting drum, and hoisting cables, of auxiliary drums, cables having their lower ends connected to the car and their upper extremities connected to said auxiliary drums respectively, driving connections between said hoisting drum and auxiliary drums whereby all of said drums may operate in unison, electroresponsive devices for holding said auxiliary drums against rotation in the event of the breaking of one of the hoisting cables, an electric circuit including said devices, electroresponsive devices controlling said circuit, a circuit including said hoisting cable and said last named electroresponsive devices, and signal lamps under the control of said last named electroresponsive devices.

5. In safety apparatus for elevators, the combination with the car, hoisting drum, and hoisting cables, of auxiliary drums, capable of rotary movement and longitudinal movement, cables having their lower ends connected to the car and their upper extremities connected to said auxiliary drums, respectively, and adapted to wind around the drums in the rotary and longitudinal movements thereof, and driving connections between said hoisting drum and auxiliary drums whereby all of said drums may be rotated simultaneously and said auxiliary drums moved longitudinally.

In testimony whereof I affix my signature.

STEPHEN ALBERT FLANNERY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."