F. A. KRENZ.

SAFETY DEVICE FOR ELEVATORS.

APPLICATION FILED MAY 8, 1911.

1,024,085.

Patented Apr. 23, 1912.

3 SHEETS—SHEET 1.

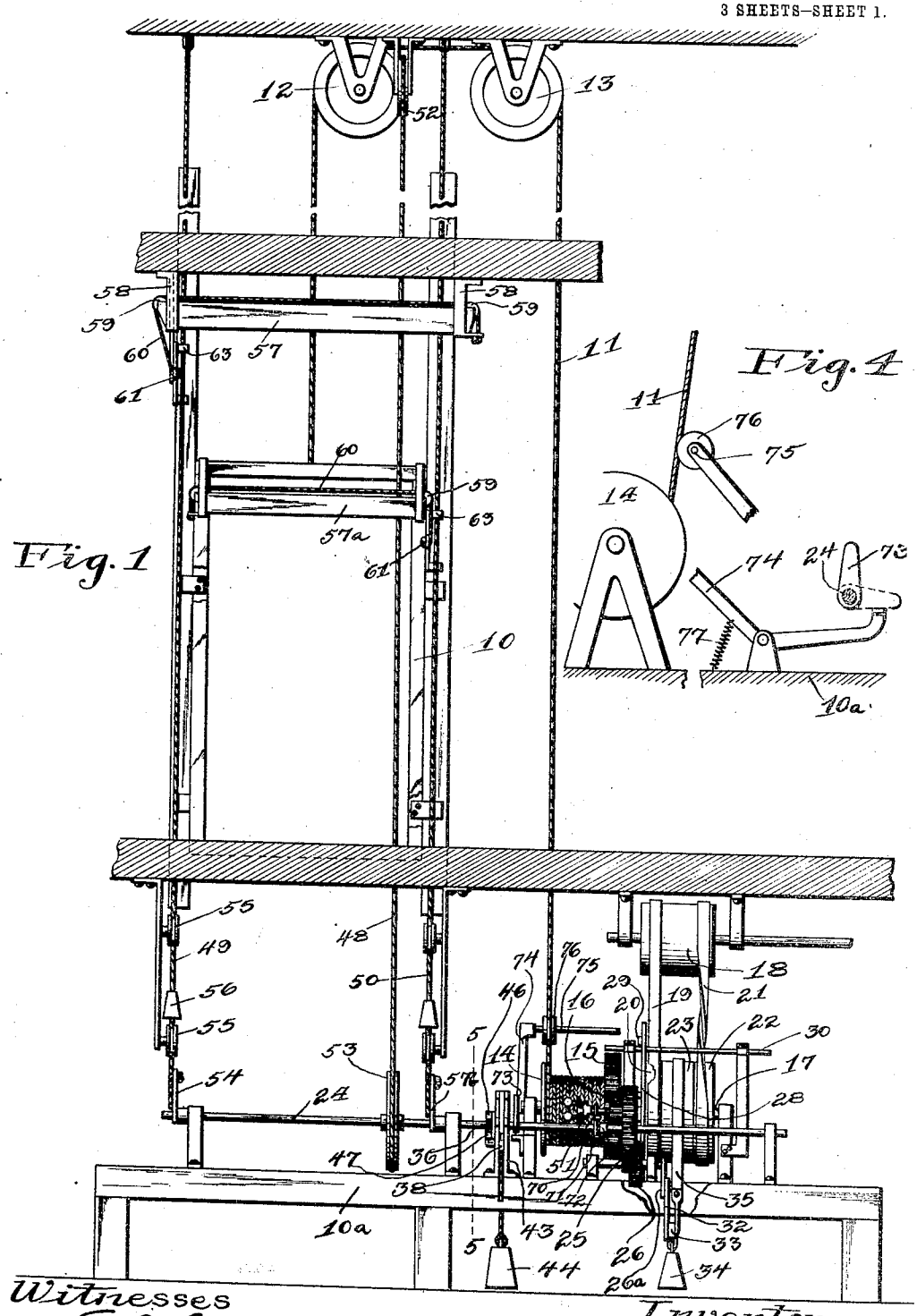

Fig. 1

Fig. 4

Witnesses

F. B. Caswell

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3 SHEETS—SHEET 2.

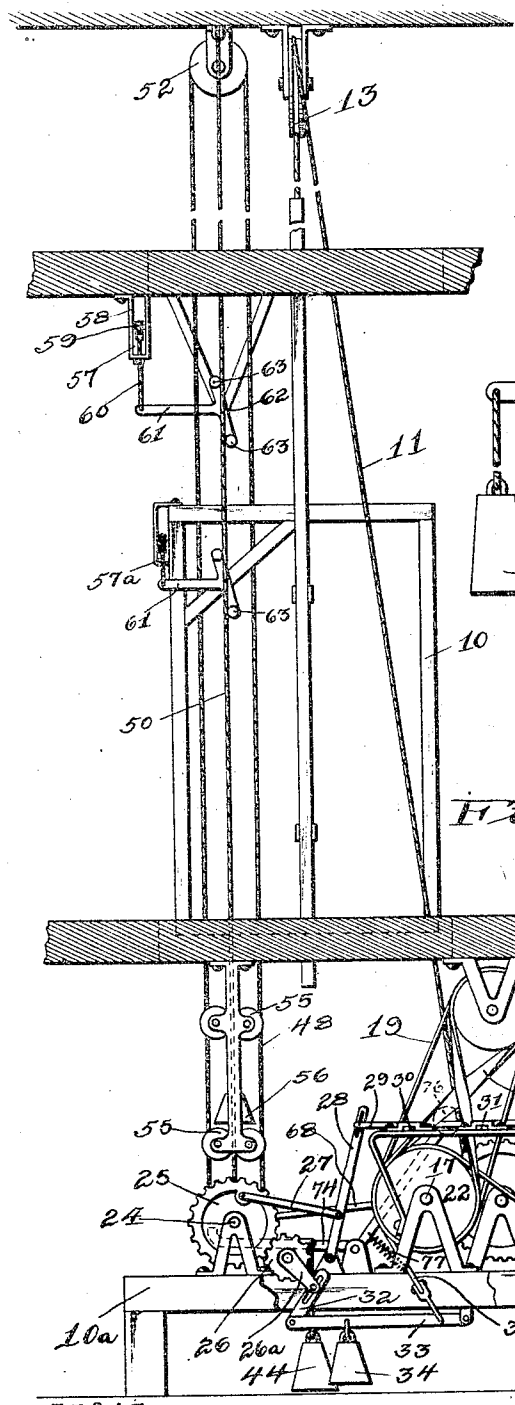

Fig. 2

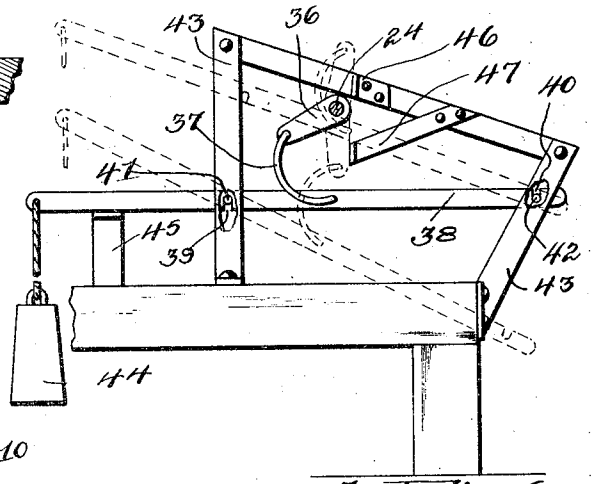

Fig. 5

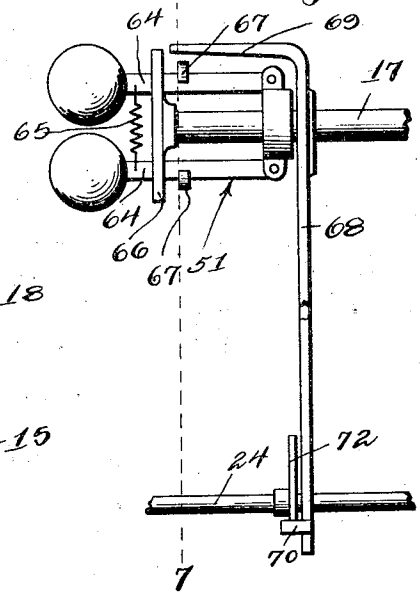

Fig. 6

Witnesses

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3 SHEETS—SHEET 3.

Fig. 3

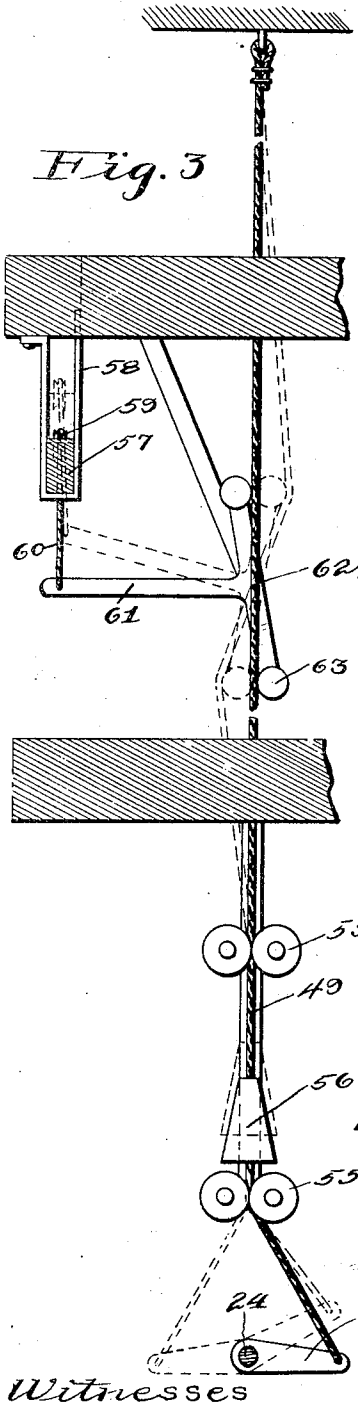


Fig. 7

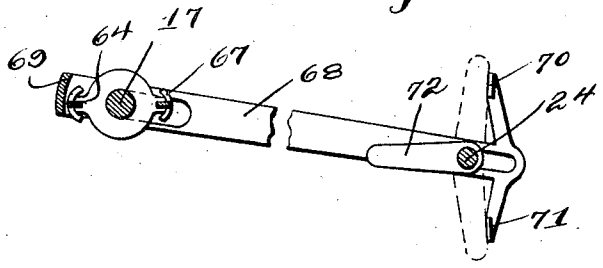


Fig. 9

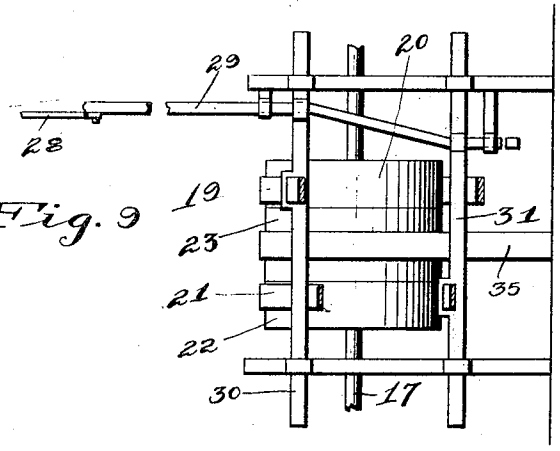
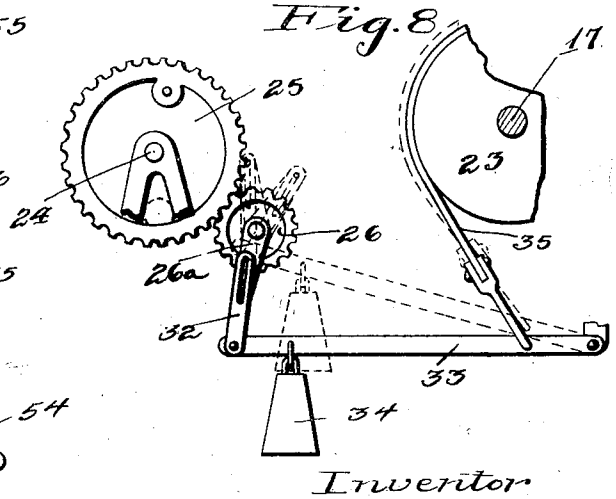


Fig. 8



Witnesses

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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR ELEVATORS.

1,024,085. Specification of Letters Patent. Patented Apr. 23, 1912.

Application filed May 8, 1911. Serial No. 625,715.

To all whom it may concern:

Be it known that I, FRANK A. KRENZ, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented new and useful Improvements in Safety Devices for Elevators, of which the following is a specification.

My invention relates to improvements in safety devices for elevators. Its object is to provide novel and efficient means for stopping the car in case of accidents.

A further object is to provide means adapted to operate the driving mechanism, and safety devices adapted to initiate the movement of said means to stop the car.

A further object is to provide means for quickly and positively stopping a car if an object becomes clogged between the car and one of the ceilings of the building, or between the car ceiling and one of the floors.

A further object is to provide means adapted to stop and lock the driving mechanism in the event that said mechanism allows the car to fall or if the car is stopped by an obstruction in its downward travel.

In the drawings, Figure 1 shows a front elevation of an elevator provided with my improved safety operating device; Fig. 2 is a side elevation of the same; Figs. 3 and 4 are detail views showing two of the operating parts in my device; Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 1; Fig. 6 is a plan view in detail of the governor and its connection with the operating device; Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6; Fig. 8 is a side elevation in detail of the brake and its connection with the operating device; and Fig. 9 is a plan view of the elevator driving mechanism.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate the car and the numeral 11 to indicate the supporting cable which extends over the pulleys 12 and 13 to the drum 14. The driving mechanism for rotating the drum 14 to raise and lower the car is arranged as follows: The gear wheel 15 on said drum 14 meshes with the gear wheel 16, on the pulley shaft 17, and is driven by said gear wheel 16 to wind and unwind the cable 11. The drive pulley 18 is connected by a belt 19 to the pulley 20 and by the crossed belt 21 to the pulley 22, said pulleys 20 and 22 being loosely mounted on the shaft 17. The pulley 23 is fixed to the shaft 17 and is adapted to be driven in one direction by the belt 19 and in the opposite direction by the belt 21.

I have provided the following means for throwing the driving mechanism in and out of gear. The operating shaft 24 is rotatably mounted on the base 10^a and supports the gear wheel 25 which meshes with the gear wheel 26. The gear wheel 25 is connected through the link 27 to the lever 28, said lever being in connection with the belt shifting bars 29, 30 and 31 and adapted to operate the same to throw either the straight belt 19 or the cross belt 21 on and off the drive pulley 23. The gear wheel 26 is provided with an arm 26^a which is connected by the slotted link 32 with the brake lever 33, said lever being provided with a weight 34, connected with the brake band 35 on the drive pulley 23 and actuated by said wheel 26 to brake said pulley and stop the car when the belts 19 and 21 are shifted therefrom. The driving mechanism is thrown out of gear, and the brake band 35 set when the shaft 24 is in its normal position, and is thrown in gear to raise or lower the car and release the brake band 35 when the shaft 24 is rotated ninety degrees in either direction from its normal position. The shaft 24 is rotated by hand to the positions for raising or lowering the car.

The following means are provided for returning the shaft to its normal position to stop the car after the movement of the same has been initiated either by hand or by the hereinafter described safety devices. The arm 36 is rigidly mounted on the shaft 24 and is connected by the link 37 to the lever 38. This lever is notched at 39 and 40, said notches being adapted to engage respectively the pins 41 and 42 in the guides 43. The weight 44 is provided at one end of said lever and a stop 45 is arranged to engage and support the weighted end of said bar when in its normal position, as shown in heavy lines in Fig. 5 of the drawings. The stops 46 and 47 are designed to engage the lever 36 and limit the movement of the shaft 24. The rotation of the shaft 24 in one direction to a position for throwing the elevator into gear moves the arm 36 to a position engaging the stop 46, and places the points of connection between the shaft 24,

the lever 38, the link 37 and the arm 36 in substantial alinement with each other and causes the lever 38 to be fulcrumed on the pin 42 and locked in a position suspending the weight 44 out of its normal position. The slight rotation of the shaft 24 by means of any of the safety devices hereinafter described toward its normal position moves the above mentioned points of connection out of line; the shaft is returned to its normal position by the action of the weight 44; the driving mechanism is thrown out of gear and the brake band 35 is set. The rotation of the shaft 24 in the other direction to reverse the movement of the car moves the arm 36 to a position engaging the stop 47 and places the points of connection between the shaft 24, the lever 38, the link 37, and the arm 36 in substantial alinement and causes the bar 38 to be fulcrumed on the pin 41 and locked in a position suspending the weight 44 from its normal position. A slight rotation of the shaft 24 from this position moves the above mentioned points of connection out of line, thus causing said shaft to be returned to its normal position by the action of the weight 44, throwing the driving mechanism out of gear and locking the same. The trip cable 48 extends around the pulley 52 at the top of the elevator shaft and around the pulley 53 on the shaft 24 and rotates said shaft when the car is started to throw the driving mechanism into gear and when the car is stopped initiates the rotation of the same to throw said mechanism out of gear.

The safety device designed to be placed on the ceilings of the building is arranged as follows: The beam 57 is slidably mounted in the guides 58 and is provided at each end with a grooved pulley 59. The cable 60 passes over said pulleys and is connected at one end to one of the guides and at the other to the trip bar 61. Said bar is pivotally mounted at 62 and is provided with the rollers 63 which are arranged on opposite sides of the cable 49, said cable being connected at one end to the top of the elevator shaft and at the other to the lever 54 on the shaft 24. Guide rollers 55 are provided for said cable near its bottom and a weight 56 is attached to said cable to keep it taut. This cable 49 is of a length to permit the movement of the lever 54 to either of the horizontal positions shown in Fig. 3. The beam 57 is arranged on the verge of the elevator shaft so that if an object accidentally projects from the car while ascending, it will strike and lift the beam. The lifting of this beam operates the trip bar 61 which raises the lower end of the cable 49 and starts the rotation of the shaft 24 to throw the driving mechanism out of gear. This action stops the car before the protruding object reaches the ceiling.

The companion safety device designed to be placed on the ceiling of the car is arranged in a manner similar to the one above described and is in operative connection with the cable 50, which is arranged and equipped in a manner similar to that of the cable 49, and is connected at its lower end to the lever 57^b on the shaft 24. When the beam 57^a is struck and raised by an object protruding into the car, the cable 50 is lifted and initiates the rotation of the shaft 24 to stop the car as above described, thus preventing the protruding object from striking the car ceiling.

I have provided a governor 51 in connection with the driving mechanism adapted to operate the shaft 24 to stop the car, in case said mechanism fails to operate and allows the car to fall. The governor arms 64 are mounted on the shaft 17 and are provided with the spring 65, the guides 66 and the curved lugs 67. The bar 68 is slidably mounted on the shaft 17 and 24, one of its ends being provided with the lug 69, the other end with the lugs 70 and 71. The lever 72 is mounted on the shaft 24 and rests in one of the positions shown in dotted lines in Fig. 7, when the elevator is in gear. If the driving mechanism fails to operate and allows the car to fall, the governor arms 64 will be rapidly rotated and thrown outward, thus bringing the lugs 67 into engagement with the lug 69 and moving the bar 68, causing one of its lugs 70 or 71 to engage the lever 72 and start the rotation of the shaft 24 to stop the car.

I have provided a stop to throw the driving mechanism out of gear in case the car is obstructed from below and held in its downward passage. This stop prevents the unwinding and tangling of the cable 11 and is arranged as follows: The arm 73 is fixed to the shaft 24 and is arranged to rest in the position shown in dotted lines in Fig. 4, when the driving mechanism is in gear to lower the car. The lever 74 is fulcrumed on the base 10^a, its upper end being provided with a stud 75, its lower end extending to a position beneath the arm 73 as shown in heavy lines in Fig. 4. The grooved pulley 76, slidably mounted on said stud 75, is in rolling contact with the cable 11 as it passes to and from said drum, and is yieldingly held against said cable 11 by the spring 77. If the car is stopped while the driving mechanism is in gear to lower the same, the cable 11 becomes slackened and the spring 77 moves the lever 74 and raises the arm 73. This movement starts the rotation of the shaft 24 and stops the driving mechanism.

I have shown my operating device in connection with the common form of belt driving mechanism. I do not limit myself to this construction, however, as it is obvious that the same may be used in connection

with other forms of driving mechanism without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a device of the class described, the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a rotatable controlling shaft, means for operatively connecting said shaft with the driving mechanism, a lever having a dual fulcrum, said lever being pivoted on one fulcrum when the car is ascending and upon the other when the car is descending, means for connecting said lever with the controlling shaft, a weight on the end of the lever, and manually operated means for rotating said shaft.

2. In a device of the class described, the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a rotatable controlling shaft, a lever having two fulcrums, said lever being pivoted on one fulcrum when the car is ascending and upon the other when the car is descending, means for connecting the lever with the controlling shaft, a weight on the end of the lever adapted to yieldingly hold the same in its normal position engaging said fulcrums, means for operatively connecting said shaft with the driving mechanism, and manually operated means for rotating said shaft to station and lock the lever out of its normal position and release the same from its locked position.

3. In a device of the class described, the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a rotatable controlling shaft, a lever in operative connection with said shaft and having a dual fulcrum, a weight on the lever, said lever being adapted to normally engage its fulcrums and pivot alternately thereon, means in operative connection with said shaft for starting, stopping and throwing the driving mechanism out of gear and a brake in operative connection with said shaft for locking said mechanism when out of gear.

4. In a device of the class described, the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a controlling shaft, a lever having two fulcrums for alternately pivoting the same, means for connecting the lever with the controlling shaft, a weight on the end of the lever adapted to yieldingly hold the same in its normal position engaging said fulcrums, means for operatively connecting said shaft with the driving mechanism, hand-operated means for rotating said shaft to station and lock the lever out of its normal position and to release the same from its locked position, and means adjacent to the path of the car in operative connection with said shaft and adapted to rotate the same for releasing said lever from its locked position.

5. In a device of the class described, the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a rotatable controlling shaft, a lever having two fulcrums, means for connecting the lever with the controlling shaft, a weight on the end of the lever adapted to yieldingly hold the same in its normal position engaging said fulcrums, means in operative connection with said shaft for controlling said driving mechanism, hand-operated means for rotating said shaft to station and lock the lever out of its normal position upon either fulcrum and to release the same from its locked position, and means in the car in operative connection with said shaft to rotate the same and release said lever from its locked position.

6. In a device of the class described, the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a controlling shaft, a lever having two fulcrums upon either of which it may be pivoted, means for connecting the lever with the controlling shaft, a weight on the end of the lever adapted to yieldingly hold the same in its normal position engaging said fulcrums, means for operatively connecting said shaft with the driving mechanism, hand-operated means for rotating said shaft to station and lock the lever out of its normal position on either of its fulcrums and release the same from its locked position, and means in operative connection with the driving mechanism for rotating said shaft to release said lever from its locked position.

7. In a device of the class described, the combination of a car, driving mechanism, a cable connecting said car and mechanism, a controlling shaft, a lever having two fulcrums, means for connecting the lever with the controlling shaft, a weight on the end of the lever adapted to yieldingly hold the same in its normal position engaging said fulcrums, means for operatively connecting said shaft with the driving mechanism, hand-operated means for rotating said shaft to station and lock the lever out of its normal position on either fulcrum and release the same from its locked position, and means in operative connection with said cable adapted to rotate said shaft to release the lever from its locked position.

8. In a device of the class described, the combination of a car, driving mechanism to raise and lower the car, a cable connecting said car and driving mechanism, a rotary controlling shaft, means operatively connecting said mechanism and shaft, a lever having two fulcrums, means connecting said

lever with said shaft, a weight on one end of said lever adapted to hold the same in normal position against both of said fulcrums, means for rotating said shaft to shift and lock the lever out of its normal position and pivot it upon either of said fulcrums, a plurality of tripping devices and a centrifugal governor, said tripping devices and governor being operatively connected with said rotatable shaft to revolve the same and release the lever from its locked position.

9. In a device of the class described, the combination of a car, driving mechanism to raise and lower the car, a cable connecting said car and driving mechanism, a rotary shaft, means operatively connecting said mechanism and shaft, an actuating lever, a pair of guides therefor, a fulcrum upon each guide, means connecting said lever with said shaft, a weight on one end of said lever adapted to hold the same in normal position against both of said fulcrums, means for rotating said shaft to shift and lock the lever out of its normal position and upon either of said fulcrums, a plurality of tripping devices and a centrifugal governor, said tripping devices and governor being operatively connected with said rotatable shaft to revolve the same and release the lever from its locked position.

10. In a device of the class described, the combination of a car, driving mechanism for raising and lowering said car, a controlling shaft, stops to limit the rotation of said shaft, means for operatively connecting said driving mechanism and shaft, an actuating lever having two fulcrums, arms on the shaft, a link connecting one of said arms and lever, a weight on the lever adapted to yieldingly hold the same in engagement with said fulcrums, means for rotating said shaft to shift and lock the lever out of its normal position on either fulcrum and to release the same from its locked position, a governor rotated by said driving mechanism having two weighted arms, a spring connecting said arms and lugs on said arms, a bar, a lug on one end of said bar adapted to engage said first mentioned lugs, and lugs on the one end of said bar adapted to engage one of said arms to rotate said shaft.

11. In a device of the class described, the combination of a car, driving mechanism for raising and lowering the car, a cable connected with said car and driving mechanism, a controlling shaft, stops to limit the rotation of said shaft, means for operatively connecting said driving mechanism and shaft, an actuating lever having two fulcrums, arms on the shaft, a link connecting one of said arms and lever, a weight on the lever adapted to yieldingly hold the same in engagement with said fulcrums, means for rotating said shaft to shift and pivot the lever out of its normal position on either fulcrum and to release the same from its locked position, a spring-actuated lever, a stud on one end of said lever, a pulley on said stud in rolling contact with said cable, and a lug on one end of said lever for engaging one of said arms to rotate said shaft.

12. In a device of the class described, the combination of a car, a driving mechanism for raising and lowering said car, a controlling shaft, stops to limit the rotation of said shaft, means for operatively connecting said mechanism and shaft, an actuating lever having guides and fulcrums thereon, arms on the shaft, a link connecting one of said arms and lever, a weight on the lever adapted to yieldingly hold the same in engagement with both said fulcrums, means for rotating said shaft to station and lock the lever out of its normal position on one of the fulcrums, means to release the lever from its locked position and permit it to turn on said fulcrum, a movable beam adjacent to the path of the car, guides for said beam, pulleys on the beam, an operating bar, a vertically extended cable connected to one of said arms for rotating said shaft, rollers on said bar adjacent to the opposite sides of said cable, and a cable extending from one of the guides over said pulleys to said operating bar.

13. In a device of the class described, the combination of a car, a driving mechanism for raising and lowering said car, a controlling shaft, stops to limit the rotation of said shaft, means for operatively connecting said mechanism and shaft, an actuating lever having two fulcrums, arms on the shaft, a link connecting one of said arms and lever, a weight on the lever adapted to yieldingly hold the same in engagement with said fulcrums, means for rotating said shaft to pivot and lock the lever on one fulcrum out of its normal position and to release the same from its locked position, a movable beam on the car, guides for said beam, pulleys on the beam, an operating bar on the car, a vertically extended cable connected to one of said arms for rotating said shaft, rollers on said bar adjacent to the opposite sides of the cable, and a cable extending from one of the guides over said pulleys to said operating bar.

14. In a device of the class described, the combination of a car, driving mechanism to raise and lower the car, a cable connecting said car and driving mechanism, a rotary controlling shaft, means operatively connecting said mechanism and shaft, a lever having two fulcrums, means connecting said lever with said shaft, a weight on one end of said lever adapted to hold the same in normal position against both of said fulcrums, means for rotating said shaft to shift and lock the lever out of its normal position

and pivot it upon either of said fulcrums, a plurality of tripping devices and a centrifugal governor, said tripping devices and governor being operatively connected with said rotatable shaft to revolve the same for releasing the lever from its locked position and throwing the driving mechanism out of gear and locking the same.

15. In a device of the class described the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a rotatable controlling shaft, a lever in operative connection with said shaft and having a dual fulcrum, a weight on the lever, said lever being adapted to normally engage its fulcrums and pivot alternately thereon, means in operative connection with said shaft for starting, stopping and throwing the driving mechanism out of gear, a brake for said mechanism, a weighted brake lever for operating said brake and connecting means between the controlling shaft and said brake lever for raising and releasing the same to free or lock said mechanism.

16. In a device of the class described, the combination of driving mechanism, a car adapted to be lifted and lowered by said mechanism, a rotatable controlling shaft, a lever in operative connection with said shaft and having a dual fulcrum said lever being adapted to normally engage its fulcrums when the car is at rest and to pivot alternately thereon, when the car is respectively ascending and descending, means in operative connection with said shaft for starting, stopping and throwing the driving mechanism out of gear, a brake on said driving mechanism, a brake lever for said brake and connecting means between the controlling shaft and said lever comprising a gear on said shaft, a second gear in mesh with said first mentioned gear, an arm operated by said second mentioned gear and a link pivotally connected at one end to said lever and having a slotted pivotal connection at its other end with said arm, said means being adapted to lift said brake lever to release the brake and drop said lever to set the brake.

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

FRANK A. KRENZ. [L. S.]

Witnesses:
K. H. HANSEN,
JOHN E. STRYKER.