No. 747,707. PATENTED DEC. 22, 1903.

N. HISS & H. S. MacKAYE.

ELEVATOR.

APPLICATION FILED MAY 31, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

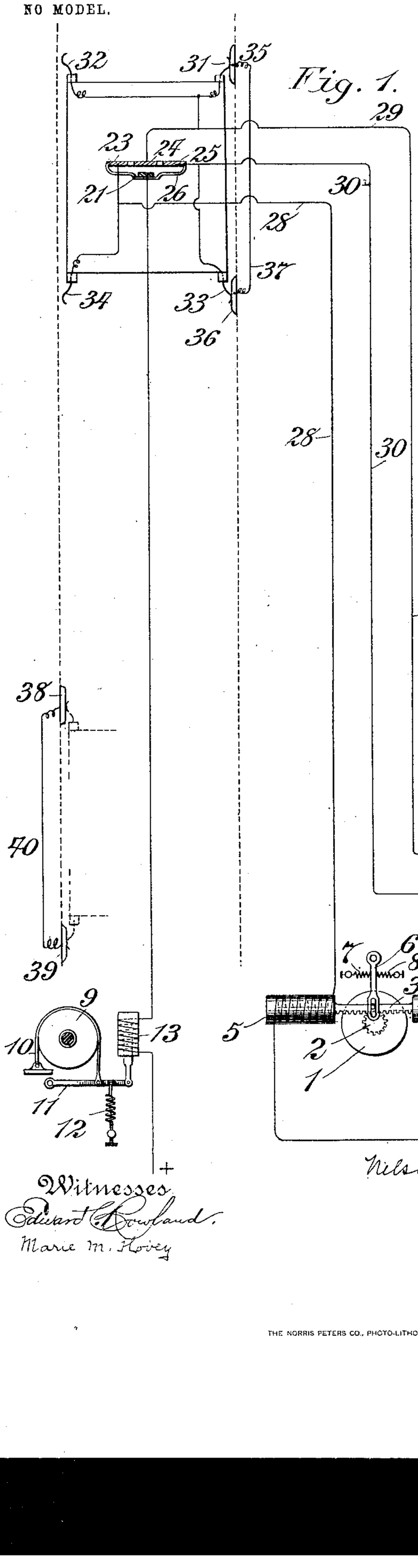

Fig. 2.

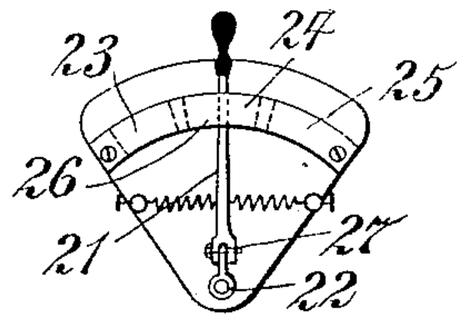

Fig. 3.

Witnesses
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Marie M. Hovey

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Inventors

By their Attorney H. S. MacKaye

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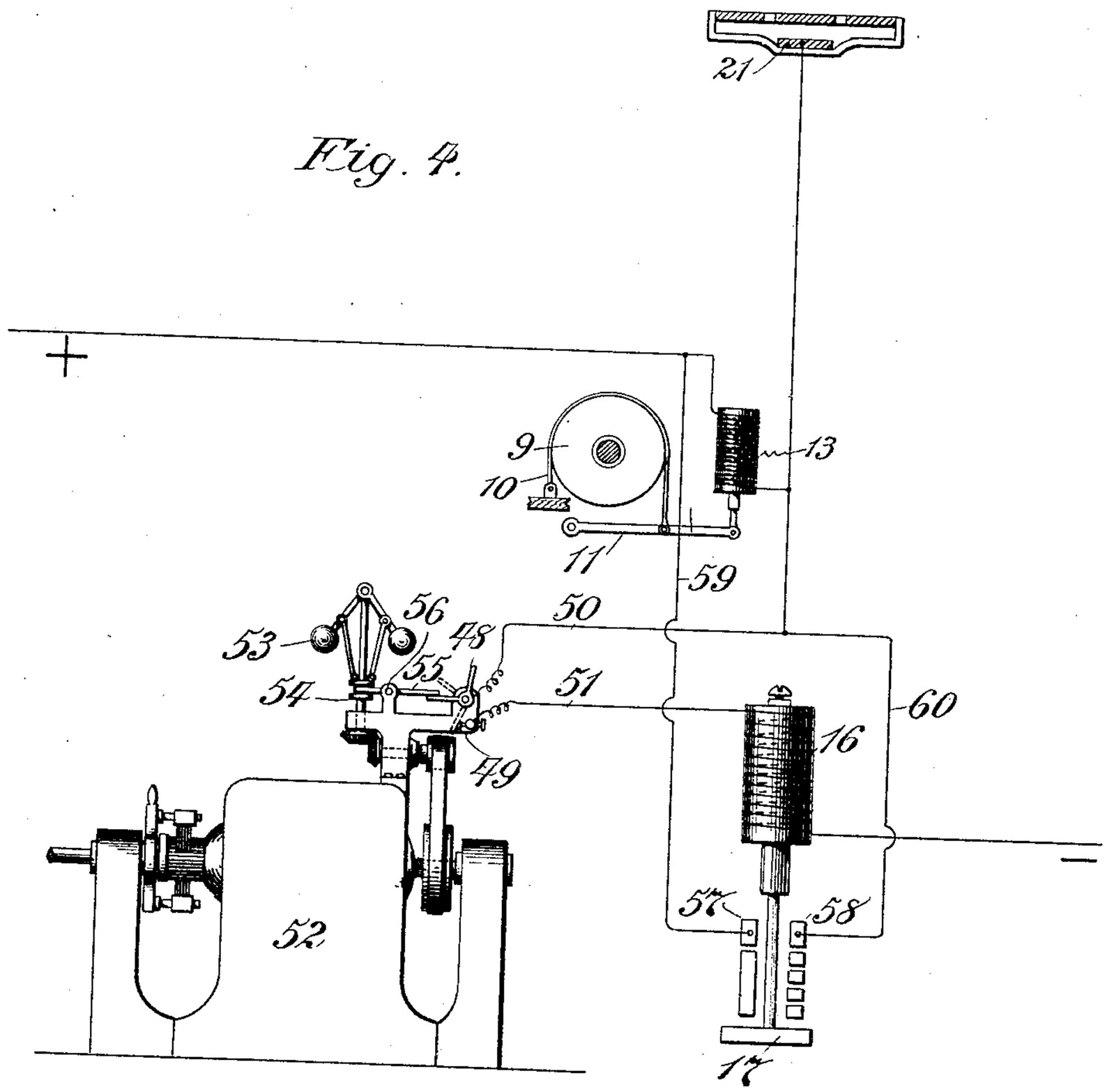
NO MODEL.

2 SHEETS—SHEET 2.

Fig. 4.



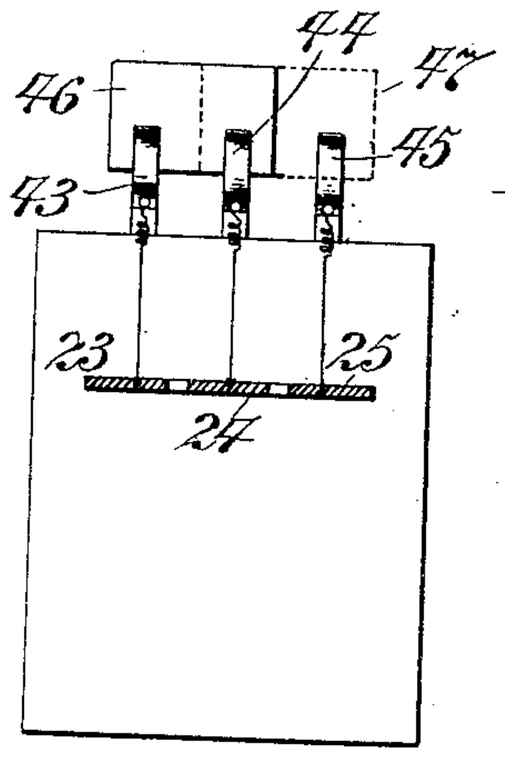


Fig. 5.

Witnesses
Edward C. Rowland
Marie M. Morey.

Nelson Hiss and
Harold S. MacKaye
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By their Attorney H. S. MacKaye

No. 747,707. Patented December 22, 1903.

UNITED STATES PATENT OFFICE.

NELSON HISS, OF NEW YORK, AND HAROLD S. MACKAYE, OF YONKERS, NEW YORK, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO ELEVATOR SECURITIES COMPANY, A CORPORATION OF NEW JERSEY.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 747,707, dated December 22, 1903.

Application filed May 31, 1902. Serial No. 109,676. (No model.)

To all whom it may concern:

Be it known that we, NELSON HISS, of the city and county of New York, and HAROLD S. MACKAYE, of Yonkers, in the county of Westchester, State of New York, both being citizens of the United States, have invented a certain new and useful Improvement in Elevators, of which the following is a specification.

This invention is an improvement capable of use with the type of elevator set forth and claimed in the application of Nelson Hiss, filed May 22, 1902, Serial No. 108,469, and has relation to means for preventing accidents in elevators of the said type or, indeed, in any case wherein electrically-controlled brakes are applied to the stoppage of the driving or hoisting mechanism.

One object of this invention is the production of simple means, preferably involving no extra wiring outside of the car, whereby the car may be brought gradually and easily to rest at either end of its normal travel independently of the use of the ordinary controlling-handle by the attendant.

Another object of this invention is the provision of means whereby in case for any reason the car develops an abnormal or dangerous speed the same will be safely and gradually stopped by means preferably independent of the conductors and cables connected to the car.

The accompanying drawings illustrate this invention in preferred form or embodiment, and in Figure 1 is shown a general scheme or diagram of the various instrumentalities as related to a car and elevator-shaft. Fig. 2 is a front view of one form of manipulator-controlling switch used in this invention. Fig. 3 shows a modified form of automatic circuit-changer on the car. Fig. 4 shows in diagram the relation of the various parts designed to act under the influence of abnormal speed, and Fig. 5 is a face view of another modified form of circuit-changer capable of employment with this invention.

It being old to operate elevators by means of electric motors or other prime movers and to control such prime movers by means of solenoids, we have not illustrated in Fig. 1 the particular type of prime mover employed, but have typified the controlling means for such prime mover by the drum-switch, shown in top view at 1, the same being operated by the pinion 2, turned by means of reciprocation of the rack 3 one way or the other, (to correspond to opposite movements of the prime mover in any well-known way.) Movements of the rack are accomplished by one or the other of the solenoids 4 and 5, and when both of said solenoids are idle the rack is brought to a central position (corresponding to position of rest in the prime mover) by means of the slotted lever 6 and the springs 7 and 8.

Another agent hitherto used for elevators is a brake acting automatically to apply itself when current in the driving or controlling system fails. This is shown in Fig. 1, where the brake-disk is shown at 9, the strap at 10, and the lever 11 to apply said brake is operated by the spring 12. The solenoid 13 acts when current is on to raise the outer end of the lever 11, and thus take off the brake.

On the right-hand side of Fig. 1 is shown a preferred form of "dynamic brake" applied to the driving-shaft of the hoisting mechanism, whatever its nature. This brake is intended for gradual operation either by the manipulator on the car or elsewhere or automatically. It consists, preferably, of the field-magnet 14, surrounding the squirrel-cage armature 15, fast on the driving-shaft or made to turn with it by any well-known means. It is evident that the greater the magnetism in the field-magnet 14 the greater will be the resistance to movement of the armature 15, and consequently the greater will be the braking action.

The preferred apparatus for the immediate operation of the brake just described is calculated to produce a gradual prearranged increase of braking effect in said brake, and thus to stop the car easily and without shock. In the figure this is shown in the form of a solenoid 16, whose core when excited moves the bridging-piece 17 upward over the terminals 18, whereby the current entering at

19 is made to pass through gradually less and less of the resistances 20 before exciting the coils of the magnet 14.

The various devices thus far described may be appropriately operated in any well-known manner; but it is preferred to employ for this purpose the manipulator-switch described and claimed in the aforesaid application of Nelson Hiss, enough of which is herein shown and described to make clear the operation of the improvements intended to be covered hereby. Here the lever 21, pivoted at 22, swings in front of the stationary terminals 23, 24, and 25 inside of a guard-piece 26, (see Figs. 1 and 3,) which permits said lever to be removed from contact with all of said terminals by swinging it on the extra pivot 27 when desired. The lock-brake solenoid 13 is preferably operated by the current which goes to the manipulator, although this is not essential to this invention. As shown, this current after passing through the coils 13 goes to the lever 21, whence it is made to enter either of the stationary terminals at will. When the lever is on terminal 23, wire 28 conveys current to the solenoid 5 and out to line. When 21 is in contact with 24, wire 29 conveys the current to solenoid 16 of the dynamic-brake solenoid, and when 21 is in contact with 25 the wire 30 conveys current to the solenoid 4. Thus when the lever is swung into contact with one or the other of the extreme contacts 23 25 the controller 1 is operated one way or the other. When the lever 21 touches 24, the dynamic brake 14 is applied, and when the lever is withdrawn from all operative contact the circuit is broken and the spring 12 puts on the strap or lock brake.

This invention is intended to provide for the possible careless or accidental holding of lever 21 in contact with one or the other of the extreme terminals 23 25 after the car has reached the limit of travel and in such case to stop the car without jar or danger. For this purpose automatic means are employed for deënergizing the solenoid 4 or 5 which happens at the time to control the running of the prime mover and at the same time to apply the dynamic brake for stoppage and security of the car. The automatic means devised by us for this purpose comprises devices whereby the particular extreme terminal 23 or 25 with which contact is being too long preserved is placed in electrical connection with the middle contact 24. This expedient is employed either with or without the use of additional means whereby the circuit of the motor-controlling solenoid is actually broken. A preferred mode of accomplishing this result is illustrated in Fig. 1 and a modified form thereof in Fig. 3. In Fig. 5 is shown a modified form of contact apparatus in the shaft. Broadly considered, this preferred device comprises terminals fixed to the car, respectively connected by conductors to the middle and one extreme terminal for upward movement, and like terminals for the middle and the other extreme terminal for downward movement, combined with means outside of the car for automatically connecting one or the other pair of terminals as one, so as to form a very low resistance connection between one or the other extreme terminal and the middle terminal, according as the car is moving up or down. In the preferred construction (shown in the modification in Fig. 5) a single terminal on the car will answer for connection with the middle terminal in both upward and downward movement. For greater clearness Fig. 1 is made to illustrate a modification wherein four car-terminals are separately employed. The opposite spring-terminals 31 and 32 at the top of the car are both connected electrically to the middle terminal 24. Of the terminals at the bottom of the car 33 is connected to terminal 25 and wire 30, and 34 is connected to 23 and wire 28. While these terminals are illustrated as used at four corners of the car, it will be obvious that as their functions are purely electrical almost any arrangement of said terminals will answer and will be within the scope of this invention. This fact is made clear by the illustration of the preferred modification in Fig. 5, hereinafter described. At the two extremes of travel, or near them, are placed means for electrically connecting one of the top terminals 31 32 with one or the other of the bottom terminals. In the form of device illustrated in Fig. 1 this takes the form of two protruding metallic terminals 35 and 36, connected by a wire 37, so placed that when the elevator-car reaches a predetermined point near the top of the shaft contact will be made between terminals 31 and 35 and terminals 33 and 36, thus electrically connecting 31 and 33 and making virtually a single electrical plate of the two terminals 25 and 24. At the bottom of the shaft the same end is attained in connection with terminals 32 and 34 by the use of protruding terminals 38 and 39 joined by the wire 40; but in this instance connection is made between plates 23 and 24 in the manipulator.

It is evident that terminals in the shaft at top and bottom can be made of any desired shape and length and may be made in one piece, if desired, as such a construction would be the entire equivalent of the construction shown. A certain amount of extra length must of course be provided in these terminals, as the action of the dynamic brake is more or less gradual, and the car will therefore continue in motion after the first moment of contact at top or bottom of the shaft.

In the various forms of automatic device herein shown and described the necessary cross connections between the various electrical instrumentalities are all accomplished within the car itself and without recourse to exterior switches. This is preferred for ob-

vious reasons; but our invention is not limited to arrangements of parts wherein this is true.

In the form shown in Fig. 1 the solenoid 16 is supposed to have a resistance sufficiently low so that it will short-circuit the solenoid 4 or 5 sufficiently to practically deënergize the same, when the following actions take place: Supposing the lever 21 to be held too long to the right in Fig. 1 as the car is ascending, under these circumstances the solenoid 4 is in operation and the prime mover is in action. When the extreme upward movement to be permitted is reached, contact is made between 31 and 35 and between 33 and 36 and current entering the lever 21 can cross directly over to the plate 24 from 25 and pass through the coil 16 instead of taking the comparatively high resistance path through the solenoid 4. The bridging-contact 17 is thus raised at a predetermined rate of speed, while the spring 7 brings the controller 1 back to stopping position and the prime mover stops. The dynamic brake is applied and the car stops. Precisely similar actions take place when the car reaches the lowermost limit of travel; but in this case it is with terminal 23 that the lever 21 is supposed to be making contact.

In Fig. 3 is shown a modified form which is within this invention and may in some cases be preferred. This is illustrated only with regard to devices for cross-connecting 24 and 25, as those for making the other connection are in all respects similar. Here a double-contact terminal 41 42 is interposed between the terminal 25 and its conductor 30. These are preferably spring-terminals which lie normally in contact with each other, so that between extremes current is carried from the manipulator to the proper solenoid for controlling the prime mover. When, however, the terminal 35 is reached, not only is 25 brought into connection with said terminal, and through it and 36 and 33 with terminal 24, but contact is broken between 41 and 42 and circuit through the controlling-solenoid is broken. It is evident that in this case the operation will be independent of any specific relation between the resistances of the solenoids used for applying the dynamic brake and for directly controlling the prime mover.

As shown in Fig. 5, a simpler form of contact-making device can be used, wherein each terminal 23, 24, and 25 is directly connected to its corresponding spring-terminal 43, 44, and 45, carried by the car The metal plate 46 at one extremity of movement will directly connect 43 and 44, and therefore 23 and 24, while the plate 47, (shown in dotted lines,) placed at the other extremity of the run, will connect 44 and 45, and therefore 24 and 25. The result of establishment of these connections will be as heretofore described with regard to Fig. 1.

When by any accident a disturbance occurs in the cables or conductors leading to the car or circuits between motor and car are otherwise disarranged, it is very desirable to provide means near the motor whereby the car may be safely and gradually brought to a stop, and particularly where for any reason the car exceeds the speed which is determined upon as being safe for it. In Fig. 4 is shown a device for this purpose, wherein is shown a switch for short-circuiting the manipulator directly through the dynamic-brake solenoid at will. This switch comprises a two-armed lever 48, pivoted above the second terminal of the switch 49 and capable of being thrown into the dotted-line position, wherein one of the arms of 48 makes contact with 49. The lever 48 is connected by wire 50 with the wire leading to the lever 21 in the manipulator, while a wire 51 leads from the terminal 49 to the solenoid 16 of the dynamic switch. On occurrence of any difficulty with the circuits leading up to the car the solenoid 16 can be thrown instantly into action by turning 48 into the dotted-line position. This construction lends itself to automatic arrangement for the prevention of overspeeding of the car through overloading or otherwise, as by the following means: At 52 is shown the prime mover, which operates the centrifugal governor 53 by the gearings shown. The balls 53 produce up or down movement of the grooved collar 54, which in turn acts to swing the lever 55 around its fulcrum 56. In normal operation the two-armed lever 48 is placed, as shown in Fig. 4 in full lines with its upper arm slightly inclined from the vertical, so as to cause the lower lever to press gently on the under side of the swinging lever 55. It is evident that upon the governor-balls moving outward beyond a predetermined radius the lever 55 will sufficiently depress the arm of 48, with which it is in contact, to bring the upper arm to the left of the vertical line through its pivot, whereon gravity will cause the lever 48 to fall into the dotted-line position and make circuit at 49. It is desirable that on completion of the action of the solenoid 16 and consequent full application of the dynamic brake the strap-brake 9 10 should be applied and the car thus finally secured. For this purpose the preferred arrangement shown comprises means for short-circuiting the solenoid 13 as well as the manipulator. When the bridging-contact 17 reaches the upper limit of movement, it makes connection between the two extra terminals 57 and 58, whereupon the current instead of passing through 13 and thence to 16 takes the wire 59 and thence by wire 60 to wire 50 and the switch 48 49. It is preferred to produce this short circuit through the switch 48 49, as shown, so that in normal operation the application of the strap-brake may be left within the discretion of the operator; but this invention is not limited to means producing a

short circuit for the purpose last mentioned necessarily through an additional switch, as 48 49.

Many modifications of these structures will occur to those skilled in this art which may be made without departing from the spirit of this invention, and the claims hereof are not to be construed as limited to the details herein shown and described.

What we claim is—

1. In an elevator, electromagnetic means for controlling the prime mover, electromagnetic means for applying a brake and a switch having a stationary terminal for each of said means and a movable terminal for conveying current to either of said stationary terminals at will; in combination with means for producing a cross connection between said stationary terminals in said switch independently of said movable terminal.

2. In an elevator, electromagnetic means for controlling the prime mover, electromagnetic means for applying a brake and a switch having a stationary terminal for each of said means and a movable terminal for conveying current to either of said stationary terminals at will; in combination with two exterior terminals on said car connected electrically respectively with said stationary terminals in said switch and means at one end of the travel of the car for forming electrical connection between said two exterior terminals.

3. In an elevator, electromagnetic means for starting the prime mover for upward movement of the car, electromagnetic means for starting it for downward movement, electromagnetic means for applying a brake and a switch on the car having an up-terminal, a down-terminal and a brake-terminal between them respectively connected to said three electromagnetic means and a movable terminal adapted to convey current to any one of the three former terminals at will; in combination with exterior terminals on the car connected respectively to said up-terminal said down-terminal and said middle terminal, means at the top of the shaft for electrically connecting the up-terminal in the switch with the middle terminal through the exterior terminals on the car and means near the bottom of said shaft for connecting said down-terminal in the switch with said middle terminal through said exterior terminals.

4. In an elevator, electromagnetic means for controlling the prime mover, electromagnetic means for applying a brake, a switch having a stationary terminal for each of said means and a movable terminal to convey current to either stationary terminal at will and a two-part exterior terminal on the car having its two parts normally in contact and in circuit between one of the stationary terminals in the first-named switch and the means for controlling the prime mover; in combination with means at one extreme of the travel of the car for simultaneously parting the two members of said two-part switch and forming cross connection between the two stationary terminals of the first-named switch.

5. In an elevator, electrically-controlled operating means for controlling the prime mover, an electrically-controlled brake and a switch for operating either at will; in combination with means at each end of the travel of the car for throwing said brake-actuating means in multiple arc with said controller-actuating means and simultaneously breaking connection between said switch and said controller-actuating means.

6. In an elevator, electrically-controlled means for starting the prime mover for upward motion, similar means for starting the same for downward motion and an electrically-operated brake for said elevator; in combination with a switch on the car having a stationary terminal connected with each of said electrical operating means and a third interior terminal between the other two connected to said brake-operating means, an exterior terminal on said car connected to each terminal in said switch and conducting devices at the two extremities of the shaft for connecting one of said exterior terminals with one or the other of the remaining exterior terminals at the end of the car's travel.

7. In an elevator apparatus, a prime mover, a brake, a brake-operating device and a manipulator-switch on the car; in combination with a circuit-closer near the prime mover and independent of the car and its circuits for closing circuit through said brake-operating device and short-circuiting the manipulator-switch.

8. In elevator apparatus, a prime mover, a brake, electromagnetic means for controlling said brake, a manipulator-switch in the car, a switch for short-circuiting said car-switch through said brake-operating means and speed-controlled means driven in unison with said elevator for operating said short-circuiting switch.

9. In elevator apparatus, a lock-brake, electromagnetic means for relieving the same, an inductive brake, electromagnetic means for controlling the same and means operated by said last-named electromagnetic means for short-circuiting said means for relieving the lock-brake.

10. In elevator apparatus, a prime mover, a brake, a solenoid for relieving said brake, an inductive brake, a solenoid for applying said inductive brake and a manipulator-switch on the car; in combination with a circuit-closer independent of the car for short-circuiting said manipulator-switch through said last-named solenoid and means operated by said last-named solenoid for short-circuiting the solenoid for relieving the first-named brake.

11. In elevator apparatus, a prime mover, a lock-brake, a relieving-solenoid therefor, an inductive brake, a solenoid for applying

the same and a manipulator-switch on the car; in combination with a short-circuiting switch independent of the car between the relieving-solenoid and the brake-applying solenoid, speed-governed means driven by the prime mover for closing said switch and means operated by the brake-applying solenoid for short-circuiting the brake-relieving solenoid through said short-circuiting switch.

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