

Nov. 7, 1933.

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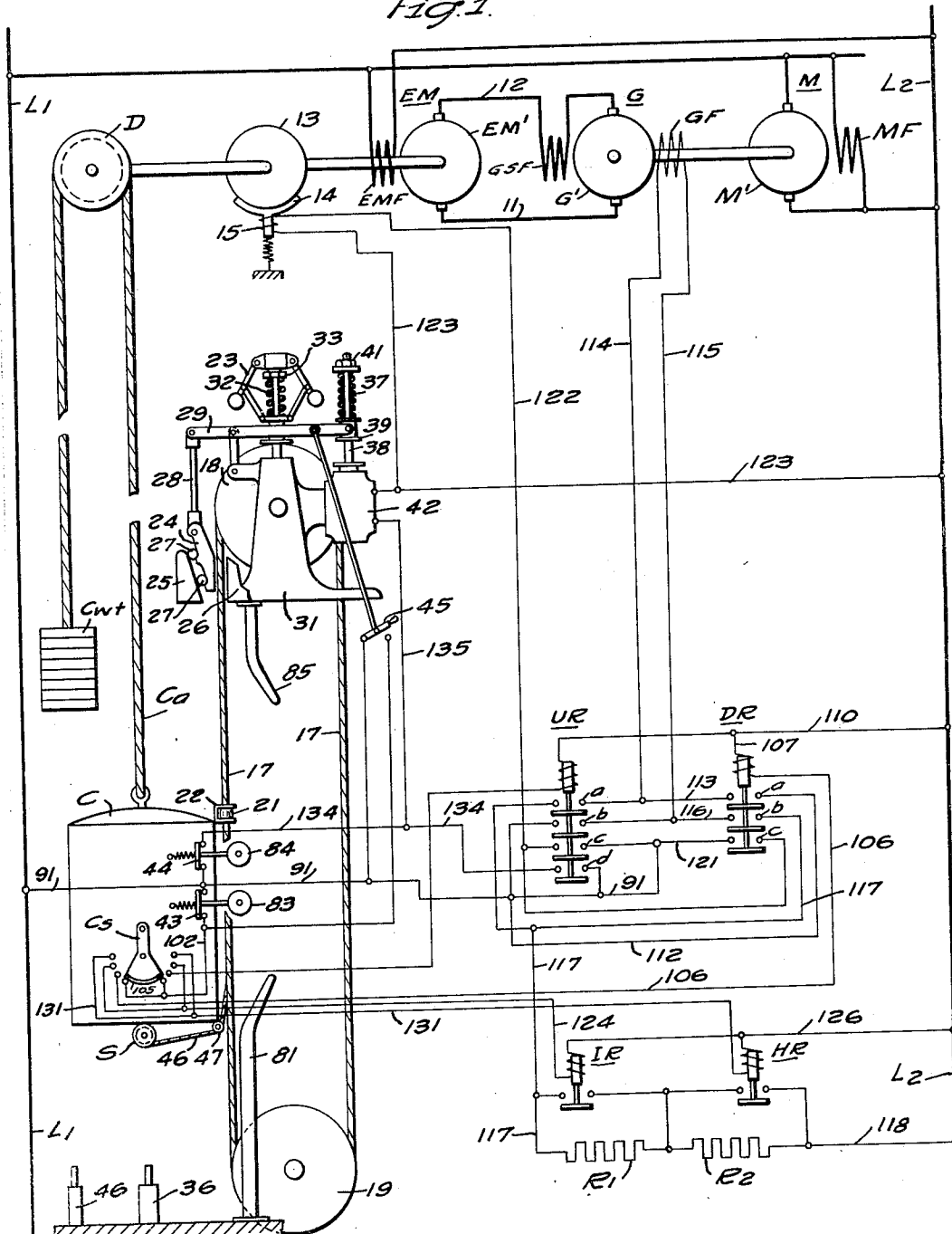
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ELEVATOR SAFETY

Filed Feb. 6, 1932

5 Sheets-Sheet 1

FIG. 1.



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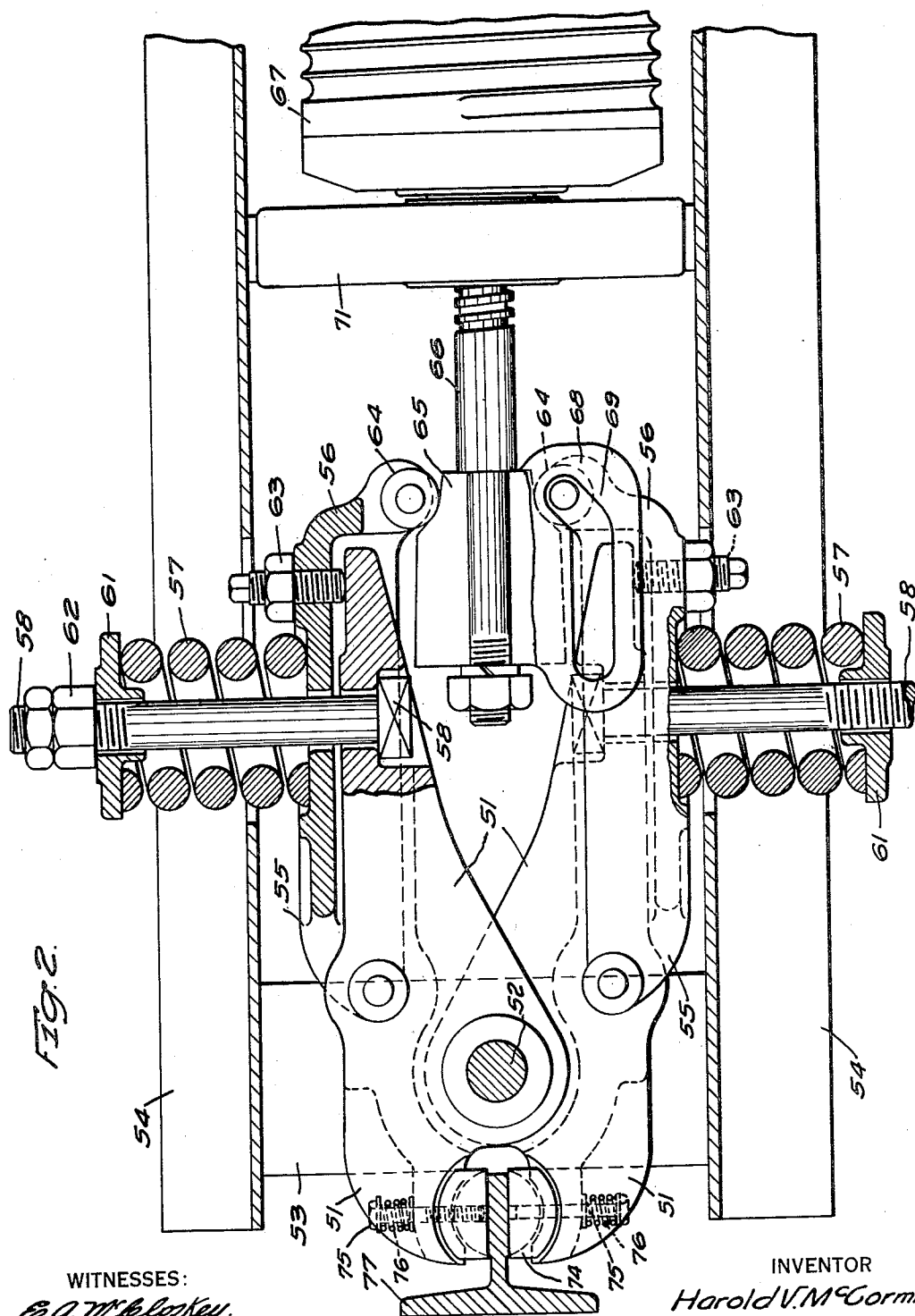
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ELEVATOR SAFETY

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5 Sheets-Sheet 2



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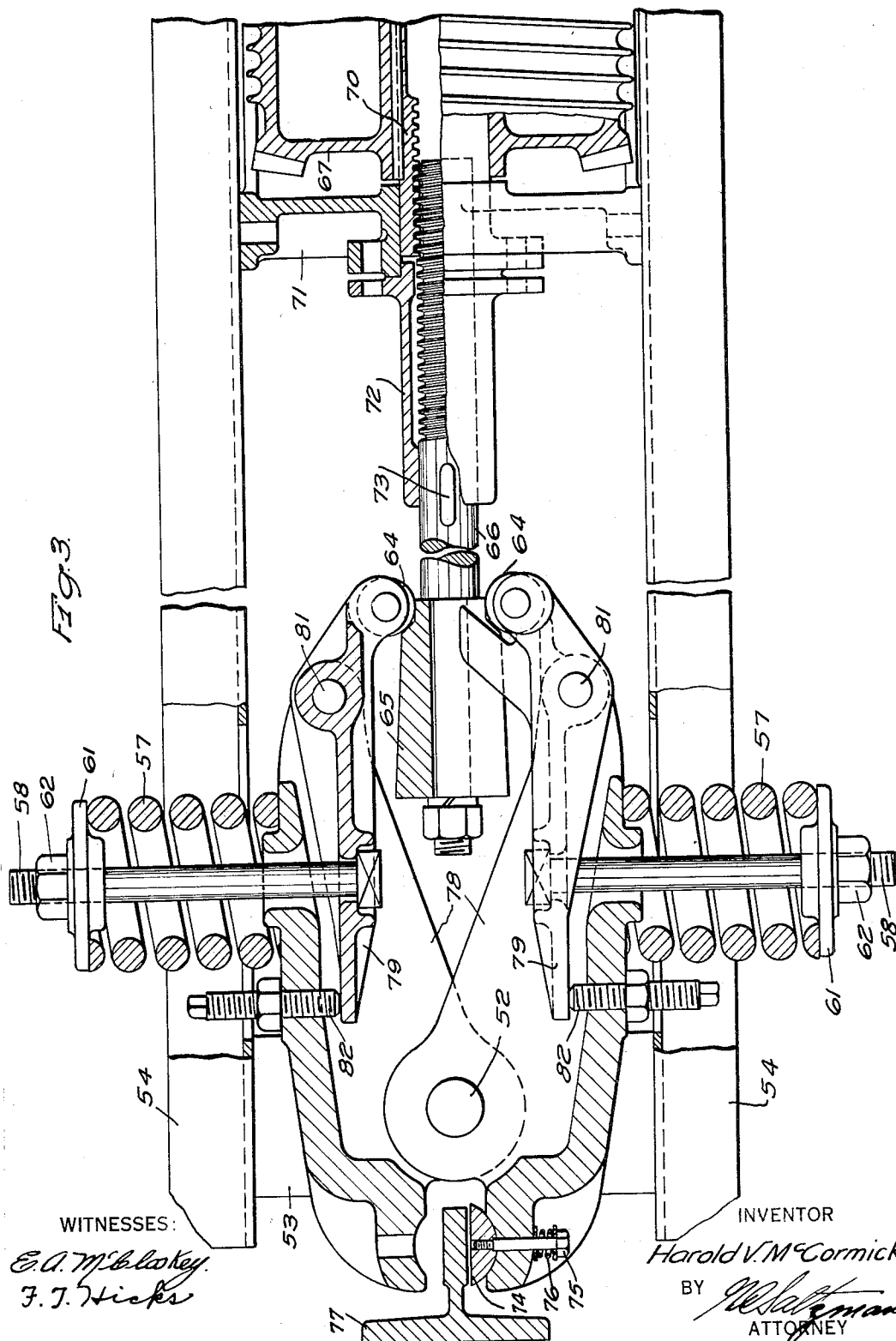
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ELEVATOR SAFETY

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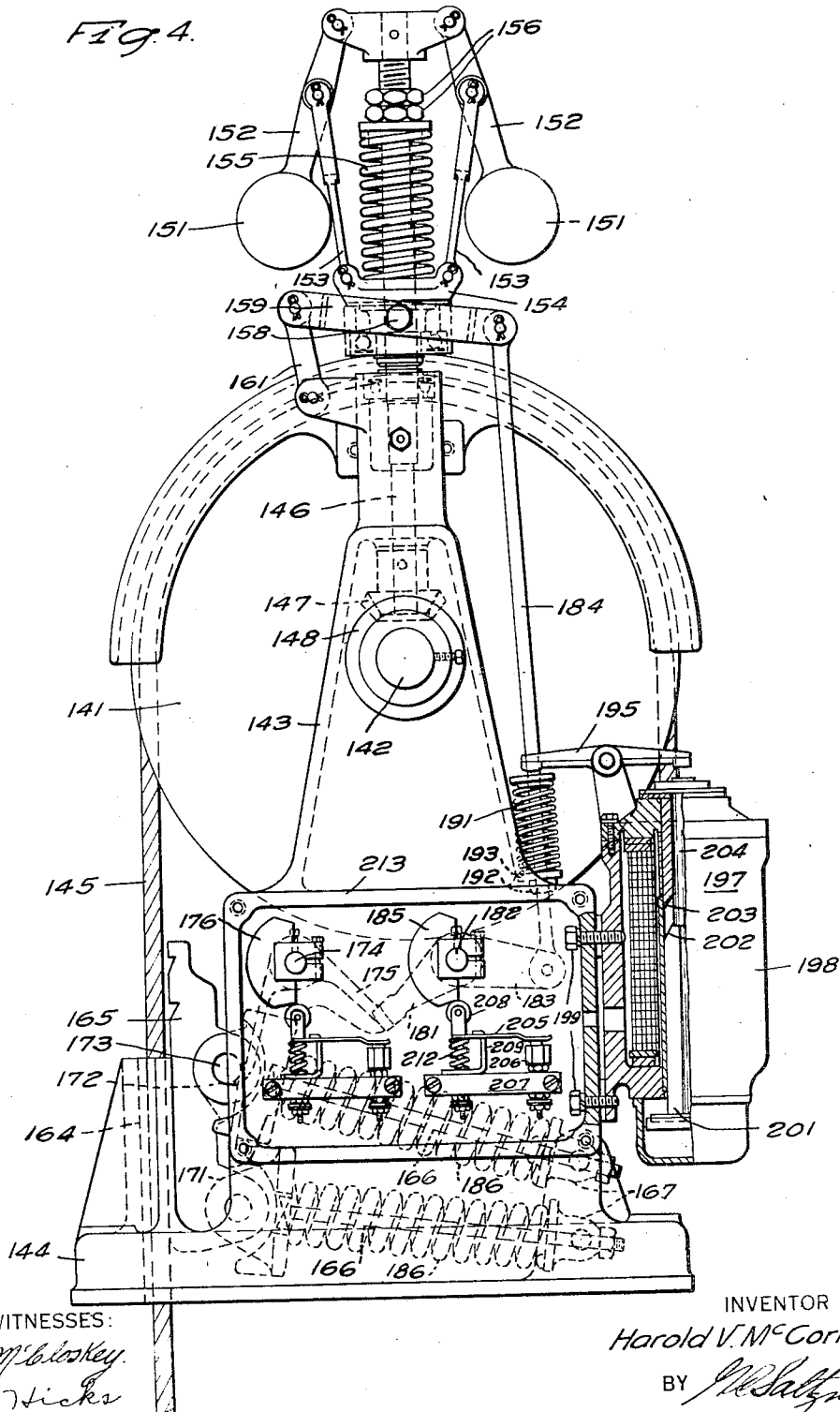
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ELEVATOR SAFETY

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Nov. 7, 1933.

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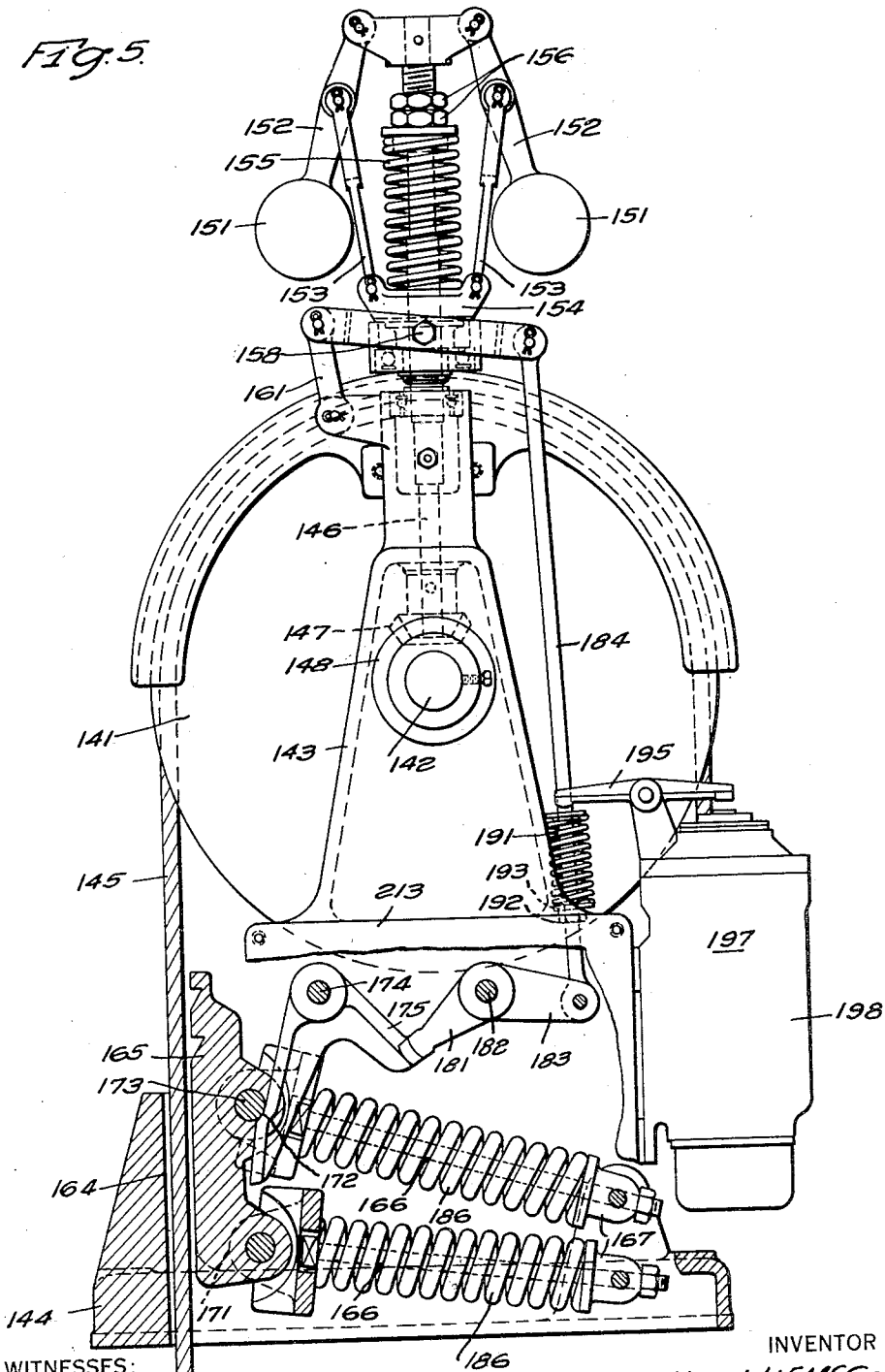
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ELEVATOR SAFETY

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5 Sheets-Sheet 5

Fig. 5.



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1,934,508

ELEVATOR SAFETY

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Application February 6, 1932. Serial No. 591,379

10 Claims. (Cl. 187—89)

My invention relates to elevator safeties and more particularly to a terminal slow-down system and a car-safety actuated thereby.

It is a usual practice to provide a safety brake device on an elevator car and an overspeed governor for gripping the governor rope to set the safety device and stop the car when it overspeeds.

Such an arrangement becomes effective only when the speed of the car exceeds the degree of overspeed for which the governor is set, and it is not effective to prevent a car from approaching its terminal at full normal speed. Hence, it has been customary to provide buffers, at the limits of travel, of suitable design to smoothly retard and stop a car which runs to the end of its hatchway at a speed which is slightly in excess of its full normal speed.

The vertical dimension of a buffer is several times its useful stroke and, as it is necessary to provide space for a buffer below the normal limits of the hatchway and a corresponding over-travel at the top of the hatchway, the installation of the buffers is accomplished at a great expense and inconvenience which increases rapidly as the size of the buffer is increased for operation at higher speeds. The vertical dimension of a buffer increases approximately as the square of its maximum operating speed and a buffer properly designed to retard the high-speed elevators of modern design requires so much vertical space that it is very difficult and sometimes impossible to provide sufficient space for the installation.

It is accordingly an object of my invention to provide a system which will insure proper slow-down of a high-speed elevator car as it approaches its limits of travel to render unnecessary the installation of high-speed capacity buffers.

It is a further object of my invention to provide means for applying an elevator car-safety to stop the car if it approaches its lower limit of travel at undiminished speed.

It is also an object of my invention to provide means for reducing the speed adjustment of the usual overspeed governor as the car approaches its limits of travel, whereby the governor will become effective to set the safety device if the car speed is not sufficiently diminished, but will permit the car to approach its limit of travel at a properly diminished rate of speed.

Another object of my invention is to provide a smooth acting car safety device suitable for use on high-speed elevator cars as an overspeed safety and to stop the car as it approaches its lower limit of travel.

Another object of my invention is to provide a means for stopping a high-speed elevator car if it approaches its upper limit of travels at too high a speed.

In accordance with my invention, I provide a spring and an electromagnet for loading the overspeed governor up to normal full speed, and a cam in the hatchway for engaging a switch on the car to deenergize the electromagnet and lower the speed setting of the governor as the car approaches its lower limit of travel.

In accordance with my invention, I also provide a contact on the governor and a cam in the hatchway for engaging a switch on the car with contacts in parallel with the governor contacts to stop the elevator car as it approaches its upper limit of travel if the speed is unsafe for the counter-weight buffer.

The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings in which:

Figure 1 is a diagrammatic view representing an elevator system in accordance with my invention, and

Fig. 2 is a detail plan view, partly in section, showing in detail half of the elevator car safety device.

Fig. 3 is a similar view showing a modification thereof.

Fig. 4 is a side elevational view partly in section, showing another embodiment of a multi-speed governor which may be used in my terminal slow-down system, and

Fig. 5 is a similar view with the contact actuating mechanism removed to show the rope grip and its actuating mechanism more clearly.

Referring more specifically to the drawings, the apparatus shown in Fig. 1 comprises an elevator car C which is suspended by a hoisting cable Cg that passes over a hoisting drum D to a counterweight Cwt, in a usual manner. The hoisting drum D is directly coupled to the armature EM' of a hoisting motor EM.

A variable-voltage system of control may be provided for operating the elevator hoist motor EM wherein the armature EM' of the elevator motor is connected in a loop circuit 11,—12 with the armature G' of a generator G. The generator G is provided with a separately excited field winding GF and a cumulative series field winding GSF.

The armature G' of the generator G is driven by means of a driving motor M, having its armature M' and its field winding MF connected, in shunt relation, to a source of power designated as the supply conductors L1 and L2. The elevator motor EM has its field winding EMF connected, for constant-voltage energization, to the supply conductors L1 and L2.

In such a system, the direction and speed of

rotation of the elevator hoist motor EM is controlled by controlling the direction and value of the excitation current that is supplied to the separately-excited field winding GF of the generator G. The direction of the excitation current for the field winding GF is controlled by means of an "up"-direction relay UR and a "down"-direction relay DR, while the magnitude of the current supplied to the field winding may be controlled by means of an intermediate-speed relay IR and a high-speed relay HR.

The operation of the relays UR, DR, IR and HR may be controlled by means of the car switch Cs, that is mounted upon the elevator car C in position to be actuated by an attendant on the car. My safety system may, however, be utilized in conjunction with various types of elevator-control systems other than that specifically disclosed.

Mounted on the hoisting-machine shaft is a brake drum 13 which is engaged by a spring-pressed brake shoe 14 to stop and hold the car. An electromagnet is provided comprising a winding 15 which is energized to withdraw the spring pressed brake shoe 14 and release the brake whenever the hoist motor EM is operating.

A governor, or safety-actuating, rope 17 passes over a governor sheave 18 at the top of the hatchway and under a weighted and latched idler sheave 19 at the bottom of the hatchway. The rope 17 carries a "minnie ball" 21 which is releasably received by a spring clip 22 on the car C, whereby it is constrained to follow the car in its movement up and down the hatchway.

An overspeed governor 23 is driven by the sheave 18 and is connected to a rope-gripping wedge jaw 24 which is thereby slidably moved along an inclined surface 25 to wedge the rope against a vertical rope-gripping surface 26 when the car overspeeds. Rollers 27 may be provided between the wedge jaw and the inclined surface to reduce friction.

The actuation of the wedge jaw 24 may be controlled by a link 28 connected to one end of a lever 29 which is pivotally mounted on the frame 31. As the speed of the governor 23 increases the fly-balls tend to fly apart and thereby tilt the lever 29 and lower the wedge jaw 24.

A biasing spring 32, on the governor, opposes its upward movement in response to speed and predetermines its speed characteristics. By turning an adjusting nut 33 to vary the tension of the spring 32, the speed characteristics of the governor may be adjusted as desired, and the adjustment will normally be such that the governor will not set the safety S when the car is traveling at a slow speed suitable for approaching the terminal and the slow-speed buffer 36.

To load the governor for high speed operation, a second biasing spring 37 is provided for reacting on the opposite end of the lever 29 to still further oppose the operation of the governor in response to speed. The spring 37 is concentrically disposed on the end of a rod 38 which passes through a collar 39 pivotally mounted in the end of the lever 29. The end of the rod 38 adjacent the spring 37 threadably receives a nut 41 which may be turned to adjust the tension of the spring.

The other end of the rod 38 is associated with a solenoid 42 which may be energized to depress the rod and apply the tension of the spring 37 to the lever 29. The tension of the spring 37 is so adjusted that, when fully applied to the end of the lever, the speed responsive movement of the governor will be sufficiently opposed to permit

the car to operate at full speed without causing the operation of the safety brake. As will be subsequently set forth, the governor solenoid 42 is associated with circuits whereby it will be energized when the elevator car is operating in the usual manner.

A switch comprising contacts 45 is mounted on the governor and is designed to open when the speed of the car reaches the slow speed setting of the governor and to close when the speed is below this point. The operation of opening and closing the contacts 45 is independent of whether the governor electromagnet 42 is energized or not. It is to be understood that the conventional rotating rope grip may be used on the governor instead of the wedge jaw shown. The conventional overspeed governor may be adapted for use in my system by providing an additional loading spring and electromagnet and additional contact device in accordance with my invention.

The car carries a safety device S which is actuated to grip the guide rails and stop the car by unreeling a safety cable 43 from the safety drum. The safety cable 46 passes around a guide pulley 47 and is attached to the governor rope 17.

If the car C overspeeds in the downward direction, the governor 23 actuates the rope-gripping jaw 24 to grip the governor rope 17. The continued downward movement of the car C then causes the safety cable 46 to be unreeled from the safety drum which applies the safety S to grip the guide rails and stop the car. The safety brake is of a special design particularly adapted to apply a smooth braking force even though the thickness of the guide rails is uneven.

As shown in Fig. 2, each end of the safety brake comprises a pair of rail gripping jaws 51 which are pivotally mounted on a pivot pin 52 supported by brackets 53 extending between the side channel irons 54. Pivotaly mounted on the outside of each jaw is an actuator lever 55. A biasing spring 57 is concentrically disposed on bolts 58 extending outwardly from each jaw 51 through openings in the actuator levers and the side channel irons 54. Washers 61 and nuts 62 are provided on the outer end of each bolt to compress the springs 57 against the actuator levers 55 which are thereby biased to rotate toward the jaws 51. Adjustable stops 63 limit the degree of movement of the actuator levers 55 toward the jaws 51 and, when properly adjusted ensure sufficient guide rail clearance between the jaws. The innermost end of each jaw terminates abruptly and does not carry the usual wedge engaging roller. The inner end of each actuator lever 55 extends beyond the inner end of its associated jaw and carries an intumed portion 56 which supports a roller 64 in juxtaposed relation to an actuator wedge 65 carried on the outermost end of a threaded shaft 66. The innermost end of each shaft 66 is provided with a right and a left-hand thread, respectively, and is threadedly received by suitable threads within a cable drum 67.

The actuator wedge 65 may be provided with a flange 68 which presents a guide slot 69 to receive a pin from the adjacent end of a jaw and normally hold it in retracted position when the actuator wedge is retracted. The rail engaging end of each jaw carries a suitable brake shoe 74 held in position by a bolt 75 and spring 76, permitting a limited degree of movement in order that the shoe may accurately align itself with the guide rail 77.

The braking pressure applied is predetermined

by the degree of compression of the biasing springs 57 and may be adjusted by turning the spring-compressing nuts 62. When the actuator wedge 65 is drawn between the rollers 64 to apply the safety, the braking pressure applied will not exceed a certain predetermined constant value. If the jaws pass from a thin portion of the guide rail to a portion which is thicker, the inner ends of the jaws will rotate inwardly away from the adjustable stop members 63 and the braking pressure is not increased. The operation of the brake over uneven portions of the guide rail does not cause it to release, but it maintains a braking pressure which is practically uniform at all times after the jaws engage the guide rails.

Stationarily mounted adjacent the bottom of the hatchway is a cam bar 81 which is adapted to engage a switch roller 84, projecting from the car, as the car approaches the lower terminal. Roller 83 being horizontally displaced is not engaged by cam 81. The engagement of the roller depresses it and actuates a switch on the car. The contact member 44 of the switch which is operated as the car approaches the lower end of the hatchway, deenergizes the governor electromagnet 42 and reduces the speed setting of the governor. The governor will then set the safety and stop the car, if its speed exceeds the predetermined low speed setting of the governor.

Stationarily mounted adjacent the top of the hatchway is a cam bar 85 which is adapted to engage a roller 83 projecting from the car as the car approaches the upper terminal. The contacts 43 of the switch, which are opened when the roller 83 engages the cam 85, are connected in parallel with the contacts 45 on the governor. If the control is functioning properly, and the car speed has been properly reduced to close governor contacts 45, opening of contacts 43 will be of no effect. If for any reason the speed of the car is above a safe speed for the counter-weight buffers, the contacts 45 will be open and the opening of contacts 43 opens the main control circuit 91, 102, thereby deenergizing the hoist motor EM and applying the machine brake to stop the elevator. In order that cams 81 and 85 will each engage only their designated respective rollers 84 and 83 the latter are horizontally displaced on the car.

If desired, the switches may be mounted on either the car or the counter-weight, or, if more convenient in certain installations, the switches may be mounted stationarily on the walls of the hatchway and the cam may be carried by either the car or counter-weight. Biasing springs normally hold the switches in circuit closing position.

Conventional slow speed buffers 36 and 46 are mounted on the bottom of the hatchway under the car C and counter-weight Cwt respectively and are sufficient to stop the high-speed elevator car or its counter-weight because my slow down system will ensure that the speed is reduced to a low value before either buffer is engaged.

My invention is best understood, however, when considered with reference to an assumed operation thereof. Assuming that the operator wishes to start the car downwardly, he may accomplish this by moving the car switch CS clockwise. As the switch engages its second contact member on the left-hand side, its down relay DR is energized.

The circuit by which the relay DR is energized may be traced from the main-line conductor L1, through conductor 91, thence, by way of contact member 43 on the limit switch or by way of contact 45 on the governor and through conductor 102, to the first contact member of the car switch CS. The circuit continues, through the bridging segment 105 of the switch to its second contact member on the left-hand side, thence, by way of conductor 106, to the winding of relay DR, and, by way of conductors 107 and 110, to the other line conductor L2.

The relay DR, being energized, pulls up its armature to close its contact members a, b and c. Contact members a and b complete an energizing circuit for the independently excited field winding GF of the generator G, which may be traced from conductor L1, by way of conductors 91 and 112, through the contact members a of relay DR, conductors 113 and 114, field winding GF, conductors 115 and 116, contact members b of relay DR, thence, by way of conductor 117, resistors R1 and R2, and conductor 118, to main-line conductor L2. The field winding GF of the generator G is now energized, and the generator energizes the hoist motor EM to run in the proper direction to raise the car.

The contact members c of relay DR complete a circuit for the brake winding 15, and the brake 13, 14 is now released to permit the car to move freely. The circuit for the brake may be traced from the main-line conductor L1 through conductors 91 and 121, contact member c of relay DR and thence, by way of conductor 122 to brake winding 15 and through conductor 123 to main-line conductor L2.

As the car operator continues the movement of the car switch CS in a clockwise direction, a circuit is completed for operating the car at an intermediate speed, which circuit extends from the line conductor L1, by conductor 91 through the contact member 43 on the limit switch through contact 45 on the governor to conductor 102 and the bridging segment 105 of the car switch, thence through the third left-hand contact, conductor 124, the winding of relay IR and conductor 126, to line conductor L2. The contact members of relay IR will consequently be closed to shunt the resistor R1 from the circuit previously traced for the field winding GF, to thereby cause the car to travel at a higher speed.

To cause the car to travel at full speed, the car switch CS may be moved to its last position in the clockwise direction wherein it causes the energization of the high-speed relay HR through a circuit extending from the line conductor L1 to the bridging segment 105 of the car switch CS, as previously traced, thence, by way of the fourth and last contact member on the left-hand side of the switch CS and the conductor 131, to the winding of the relay HR, thence, by way of conductor 126 to the other line conductor L2.

The energization of the high-speed relay HR and the closing of its contact members serve to shunt the resistor section R2 from the circuit previously traced for the field winding GF, thereby allowing full line voltage to be applied to the winding GF to cause the car to travel at high speed.

The governor electromagnet 42 is normally energized at all times to set the governor for high speed operation except when the car is approaching the terminal and the cam bar 81 has engaged the roller 84 on the car. The exciting circuit for the governor electromagnet 42 is normally completed from the main conductor L1 by way of conductor 91, contact member 44 of the governor speed control switch on the car, thence by way of conductors 134 and 135 to and 150

through the electromagnet 42 and by way of conductor 123 to the other main line conductor L2. It will thus be apparent that so long as the cam bar 81 has not engaged the roller 84 of the governor speed switch on the car, the contact member 44 will remain in circuit closing position, the governor electromagnet will be energized, and the governor will be set for high speed operation.

As the car approaches the lower terminal the roller of switch 84 engages the cam 81, opening the contacts 44, deenergizing the electromagnet 42 and changing the setting of the governor to the slow speed corresponding to the slow speed for which the buffer is designed. If, for any reason such as a defective control system or a careless operator, the car is still moving at a speed which is unsafe for the low speed buffer after the contacts 44 have opened, the governor will actuate the rope grip to seize the governor rope and set the car safety to grip the guide rails and stop the car.

If the operator wishes to start the car in the up direction, this is accomplished by rotating the car switch CS counter-clockwise which accomplishes a sequence of steps for accelerating the elevator car in a manner substantially identical to those set forth in starting the car downwardly, except that the up direction relay UR is energized to apply the exciting current to the generator field GF in the reverse direction. The up direction relay UR is provided with extra contact members *d* which complete a circuit from conductor 91 to conductors 134 and 135, in shunt with switch contacts 44, to energize the governor solenoid 42 thereby enabling the car to start up at full speed from the lower terminal even though switch 44—84 is open.

As the car approaches the upper terminal, the roller 83 of the switch engages cam bar 85, opening contacts 43. In normal operation the contacts 45 on the governor are closed so the opening of contacts 43 has no effect. If for any reason, such as a defective control system or carelessness of the operator, the car is still moving at a speed which is unsafe for the counterweight buffer 46, the contacts 45 of the governor will be open and the opening of the contacts 43 of the switch will open the main control circuit 91, 102, thereby de-energizing the hoist motor EM and applying the machine brake 14 to stop the elevator.

If it is desired to provide for starting the car downward at full speed from the upper terminal, even when the cam switch contacts 43 are open, this may be accomplished by providing extra contact members on the down relay DR and connecting them for shunting contacts 43 when the relay is energized.

As previously set forth, the safety device is so designed that it will apply a smooth braking pressure of a predetermined force to stop the car smoothly irrespective of the condition of the guide rails.

In the modified form of the safety device shown in Fig. 3 a pair of rail gripping jaws 78 are pivotally mounted on the pivot pin 52 supported by the brackets 53 extending between the channel irons 54 in a manner similar to that previously described with reference to the embodiment shown in Fig. 2. In both embodiments the rollers 64 which engage the actuator wedge 65 are mounted on actuator levers which are pivotally mounted on the pivoted jaws. The shape of the jaws, the actuator levers and the manner

in which the actuator levers are pivotally mounted on the jaws is not the same in the two embodiments, and it is in this respect that the principal difference between the two modifications occurs.

In the form of the safety shown in Fig. 3 an intermediate part of each actuator lever 79 is pivotally supported on a pin 81 which extends through the inner end of each of the rail gripping jaws 78.

The innermost end of each lever 79 is slightly inturned and carries a roller 64 which, in the operation of the device, is engaged by the actuator wedge 65 which spreads the actuator levers and the inner ends of the jaws apart thereby forcing the outer ends of the jaws to rail gripping positions.

The outwardly directed end of each lever extends along the inner surface of its respective rail gripping jaw 78, and is continuously biased to rotate toward the jaw by a compression spring 57 which is disposed in concentric relation to a bolt 58 extending from the lever. The bolt 58 and spring 57 pass through openings in the lever, the jaw and the side channel irons similar to the first embodiment. The springs 57 continuously bias the levers to rotate toward the jaws and the roller 64 toward the actuator wedge. The biasing force may be predetermined by adjusting the tension on the springs 57. Adjustable stops 82 extend through the jaws and engage the outer ends of the levers 79 whereby adjustment may be made to provide sufficient guide rail clearance for normal operation.

The threaded end of the actuator shaft 66 is threadably received by a bushing 70 which is keyed in the cable drum 67 and is journaled in the lateral bracket 71. A dust cap 72 extends from the lateral bracket and is concentrically disposed about the wedge actuator shaft 66 which is provided with a cross key 73 to prevent rotation thereof.

In Figs. 4 and 5, I have shown in detail the structure of a multi-speed governor suitable for use in my terminal slow down system. Such a governor may comprise a sheave 141 mounted on a shaft 142 which is suitably journaled in a standard 143 rising from a base plate 144. The sheave is driven by the governor rope 145 which passes through openings in the base plate 144 for releasable attachment to the car in the hatchway.

A shaft 146 is vertically journaled in the upper portion of the standard 143 and is driven from the governor sheave through a pair of inter-engaging bevel gears 147 one of which is secured to the lower end of the vertical shaft and the other gear 148 on the end of the sheave shaft 142.

The upper end of the vertical shaft 146 carries a speed responsive governor which may comprise a pair of weights 151 which are mounted on the ends of pivotally supported arms 152 connected through links 153 to a nut 154 slidably mounted on the shaft 146. As the speed of rotation of the shaft increases, the weights 151 tend to fly outwardly and thereby lift the slidable nut 154 but this action is opposed by a compression spring 155 which is concentrically disposed on the shaft. A pair of nuts 156 are threadably received by the upper end of the shaft for compressing the spring 155 to the desired degree to thereby predetermine the speed characteristics of the governor.

The outer periphery of the slidable nut 154 is provided with an annular groove which receives pins 158 extending therein to form a yoke 159, 150

one end of which may be anchored to the standard 143 through a link 161 and the other end of which is free to rise and fall in accordance with the speed of the governor.

operation, a second biasing spring 191 is provided for reacting on the connecting rod 184 to aid the first biasing spring 155 on the governor and further oppose the action of the governor. The spring 191 is concentrically disposed on the rod 184 and reacts on a nut 192 and washer 193 whereby its position and pressure may be adjusted.

5 The free end of the yoke 159 controls the operation of a trip mechanism for releasing a rope gripping mechanism to apply a predetermined braking force to the governor rope and set the safety when the car overspeeds.

A lever 195 is pivotally mounted adjacent the upper end of the spring 191, and is so disposed that one end thereof will engage the upper end of the spring to load the governor when the other end is lifted by the armature member of a solenoid 197 provided for that purpose. The solenoid is of rugged design housed in an iron casing 198 which serves as a container, field structure, and support whereby the solenoid may be secured to the standard 143 by suitable screws 199. The armature of the solenoid is a slidable core 201 provided with a conical portion 202 interfitted with a depending conical portion 203 extending into the winding from the field structure. A rod 204 extends from the slidable armature to engage the end of the pivoted lever 195.

10 The mechanism for gripping the rope is especially adapted to apply a constant uniform force over a wide area to effectively set the safety device without injury to the rope. For this purpose a stationary braking surface 164 is disposed vertically adjacent one side of the governor rope and a cooperative movable brake shoe 165 is disposed vertically adjacent the other side of the governor rope, as most clearly shown in Fig. 5. The movable brake shoe is mounted on a pair of link members 166. One end of each link member 166 is pivotally mounted on the base plate through pivots 167 for rotation in a vertical plane, and the free end of each is pivotally connected to the movable brake shoe 165. The centers of the stationary pivots 167 are preferably closer together than are the pivot centers on the brake shoe 165 whereby the latter is inclined at a slight angle relatively to the rope in the ineffective position but rotates to a parallel position when it moves toward the rope.

The energization of the solenoid may be controlled by a circuit similar to the one shown in connection with solenoid 42 in Fig. 1. The relative tension of the biasing springs 155 and 191 will preferably be so adjusted that when both are applied the elevator car may run slightly above full normal speed, and when only the governor spring 155 is effective the car must run at a low rate of speed which is safe for approaching a terminal which is provided with only a small slow speed buffer.

15 A latch 171 has a slight hook 172 for engaging the ends of the upper pivot pin 173 of the brake shoe 165 to normally hold it up away from the rope, as shown in Fig. 4. The latch 171 is pivotally supported on a shaft 174 which also carries a dog 175 and a cam 176. A pivotally mounted stop 181 normally engages the dog 175 to hold the latch 171 in firm engaging relation with the upper pivot pin 173 in the brake shoe. The shaft 182 which carries the stop 181 is provided with a crank 183 which is pivotally secured to the lower end of a connecting rod 184. The upper end of the connecting rod is pivotally connected to the free end of the yoke 159 whereby it is actuated in accordance with the speed of the car. A cam 185 is also provided on the dog shaft 182 for a purpose which will be explained later.

The cams 176 and 185 carried by the latch shaft and the dog shaft may be utilized for operating contacts to control various circuits simultaneously with the operation of the safety. For this purpose a resilient contact spring 205 is mounted on the head of a terminal bolt 206 supported by a piece of fiber board 207 or suitable insulating material. The free end of the spring 205 supports a roller 208 in such a position that it will be engaged and depressed by the cam 185 as it rotates. A second contact member 209 is supported from the block of insulation 207 by a terminal bolt and is provided with a hook to be engaged by the side of the resilient spring 205. To hold the contact members more firmly in engagement a compression spring 212 may be provided under the free end of the resilient contact 205. A similar switch is provided adjacent both cams and they may be utilized to interrupt any of the control circuits as desired. A housing 213 is provided on the side of the standard 143 for enclosing the switch contacts and cam actuating members.

20 It will be apparent that when the speed responsive governor sufficiently elevates the connecting rod 184 the stop 181 will be turned to such a position that the dog 175 will be released permitting the latch 171 to turn away from and release the brake shoe 165 which will then fall and be pushed toward the rope by the link connecting members 166. Since the brake shoe is parallel to the rope when it approaches braking position, it will be apparent that a uniform pressure will be applied to the rope over a wide area.

I will be apparent that I have provided a multi-speed governor, a constant force safety, and a terminal slow down system which is simple and positive in its operation whereby elevator cars may be safely operated at high speeds without the necessity of providing especially designed high speed buffers.

25 In order that the braking force will not become excessive if a thicker portion of rope approaches, the link rods 166 are slidably mounted in the stationary pivots 167 and the pressure applied is only that of compression springs 186 which are concentrically disposed on the link rods 166, and which react between the respective stationary pivots 167 and the pivots on the movable brake shoe 165. If a thick portion or splice on the governor rope 145 enters the gripping mechanism the shoe 165 will be pushed further back and the link rods will slide further through the stationary pivots to the right. A constant braking force is thereby applied over a wide area to the governor rope to apply the safety, but the rope is not positively locked and injury is avoided.

Although I have shown and described certain specific embodiments of my invention, I am fully aware that many modifications thereof are possible. My invention, therefore, is not to be restricted except as necessitated by the prior art and the scope of the appended claims.

I claim as my invention:

1. In combination, an elevator car, a safety brake carried by the car, an overspeed governor for actuating the safety braking device when the car overspeeds, electromagnetic means associated with the governor to vary the speed adjust-

In order to load the governor for high speed

ment of the governor and cooperative engageable means for controlling said electromagnetic means in accordance with the position of the car in the hatchway.

2. In combination, an elevator car, a safety brake carried by the car, a speed responsive device, means responsive to operation of the car for driving said device at speeds corresponding to the speed of the car, means actuatable by said device to apply said safety brake when the car overspeeds, biasing means opposing the operation of said device, a second biasing means opposing the operation of said device, electromagnetic means for applying or releasing said second biasing means, and cooperative engageable means operably responsive to predetermined positions of the car for controlling said electromagnetic means to adjust the speed responsive device for high speed or for low speed operation.

3. In an overspeed governor for elevators, a speed-responsive device, a biasing means opposing the operation of said device, a second biasing means for opposing the operation of said device, and electromagnetic means for applying or releasing said second biasing means and means operably responsive to operation of the car for controlling the electromagnetic means in accordance with the position of the car in the hatchway.

4. An elevator safety braking device comprising a movable rail engaging member, a pivotally mounted spring biased member disposed in engagement with the rail engaging member, actuator means engaging said pivoted member for applying a force predetermined by said spring to move the rail engaging member to its effective position.

5. An elevator safety braking device comprising a pair of pivoted rail gripping jaws, a pivotally mounted lever on each jaw, a spring for biasing each lever and jaw together with a predetermined force, and actuator means acting on the pivoted levers for turning the pivoted jaws to rail gripping position with a limited maximum force predetermined by the tension of said springs.

6. An elevator safety braking device comprising a pair of pivoted rail gripping jaws, a pivotally mounted lever on each jaw, a spring for biasing each lever and jaw together with a predetermined

force, adjustable stop means between each pivoted lever and the associated jaw, and an actuator wedge for engaging the pivoted levers to turn the jaws to rail gripping position with a force predetermined by the tension of said springs.

7. In a safety braking device a pair of pivotally mounted jaws the outwardly directed ends of which are adapted to grip a guide rail, a pivot mounted in the inwardly directed end of each jaw, a lever mounted on each pivot at an intermediate point whereby the outwardly directed end of each lever extends parallel to the inner surface of each jaw, a biasing spring continuously urging each lever to rotate toward the associated jaw, an adjustable stop between each jaw and the outwardly directed end of the associated lever, a roller mounted in the inwardly directed end of each lever, a wedge actuator and means for driving the same between said rollers to force apart the inner ends of the levers and jaws and to thereby move the outer ends of the jaws to rail gripping position.

8. In an elevator safety braking device, a pivotally mounted jaw member for engaging a rail, a lever pivotally mounted on the jaw member, resilient means for connecting one end of said lever to said jaw member and means for actuating said lever to apply a force predetermined by said resilient means to move the jaw member into effective rail engaging position.

9. In an elevator safety braking device, a pivotally mounted rail gripping jaw, a pivotally mounted lever on said jaw, a spring for biasing said lever and said jaw together with a predetermined force, and actuator means acting on the pivoted lever for turning the pivoted jaw to rail gripping position with a limited maximum force predetermined by said spring.

10. In an elevator safety braking device, a pivotally mounted rail gripping jaw, a pivotally mounted lever on said jaw, a spring for biasing said lever and said jaw together with a predetermined force, adjustable stop means between the pivoted lever and the jaw, and actuator means acting on the pivoted lever for turning the pivoted jaw to rail gripping position with a limited maximum force predetermined by said spring.

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