Oct. 20, 1925. 1,557,857

H. V. McCORMICK

SAFETY LOCKING APPARATUS FOR ELEVATORS

Filed Jan. 3, 1925 4 Sheets-Sheet 1

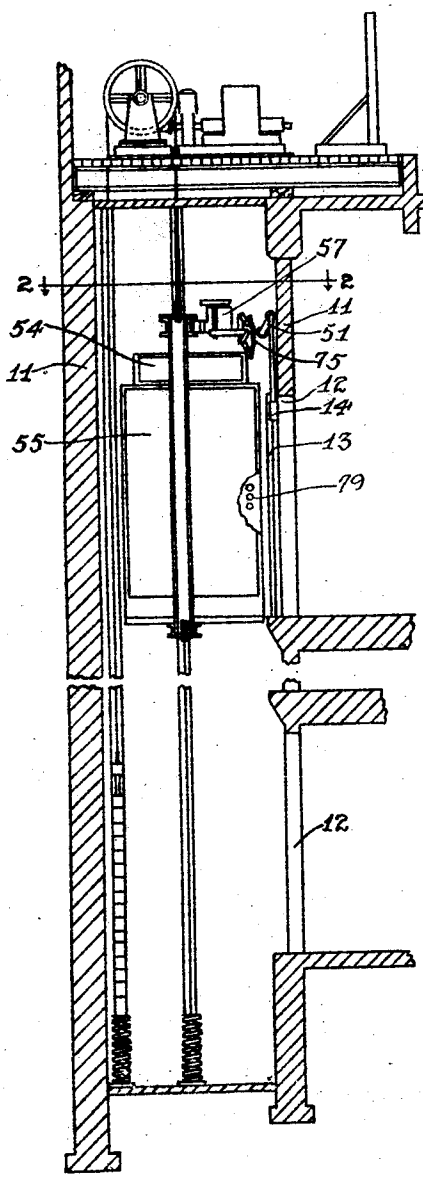

Fig. 1.

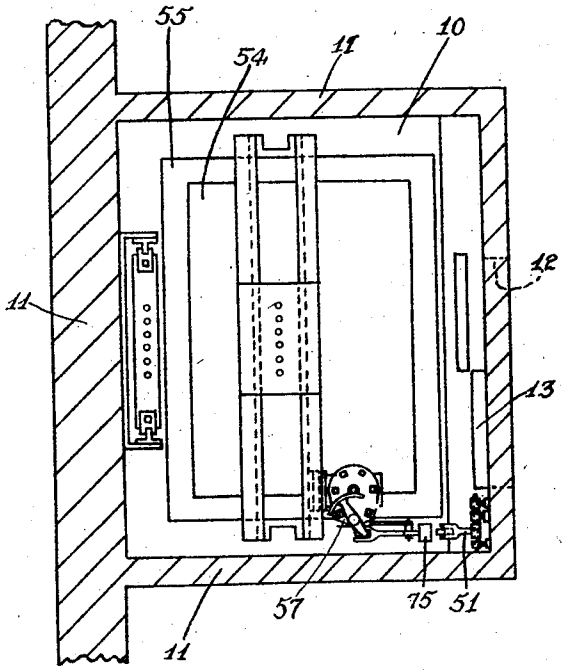

Fig. 2.

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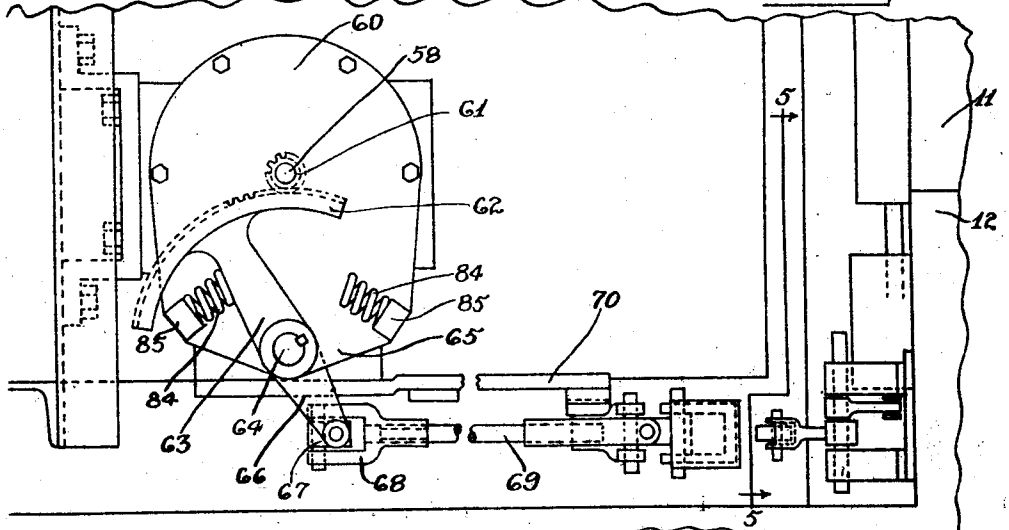
Fig. 3.



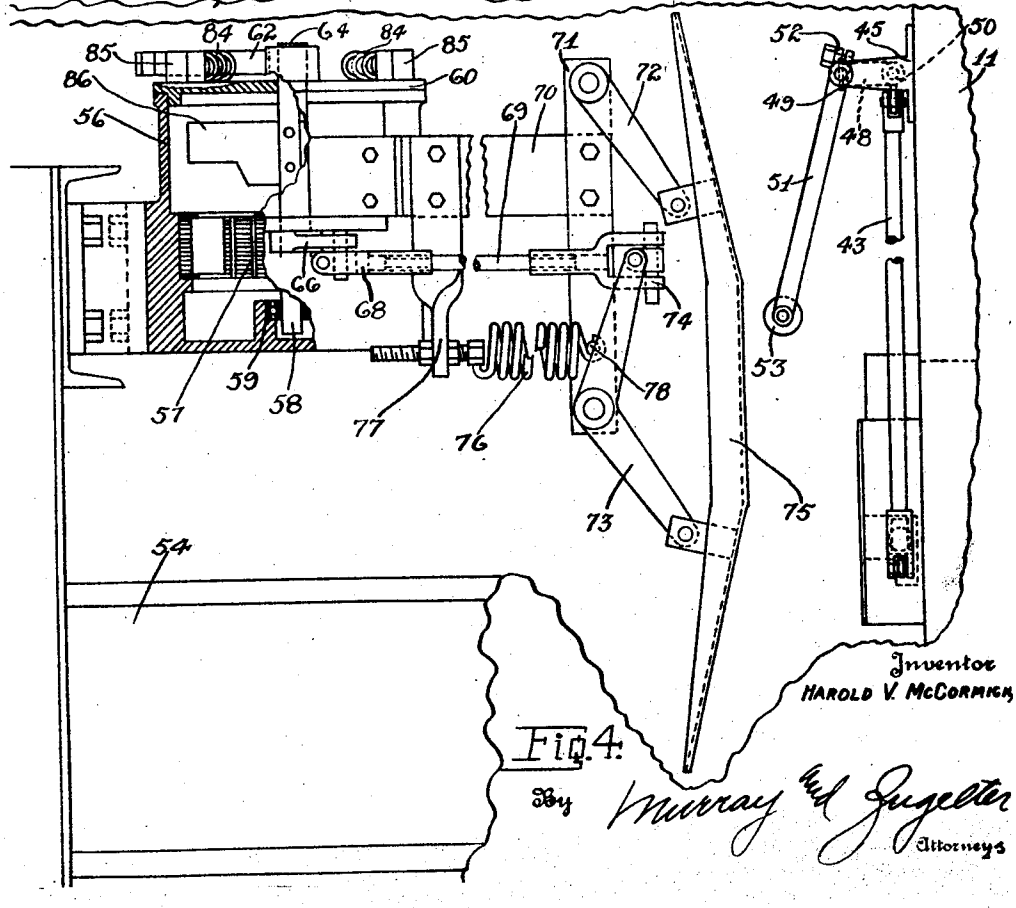


Fig. 4.

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SAFETY LOCKING APPARATUS FOR ELEVATORS

Filed Jan. 3, 1925 4 Sheets-Sheet 3

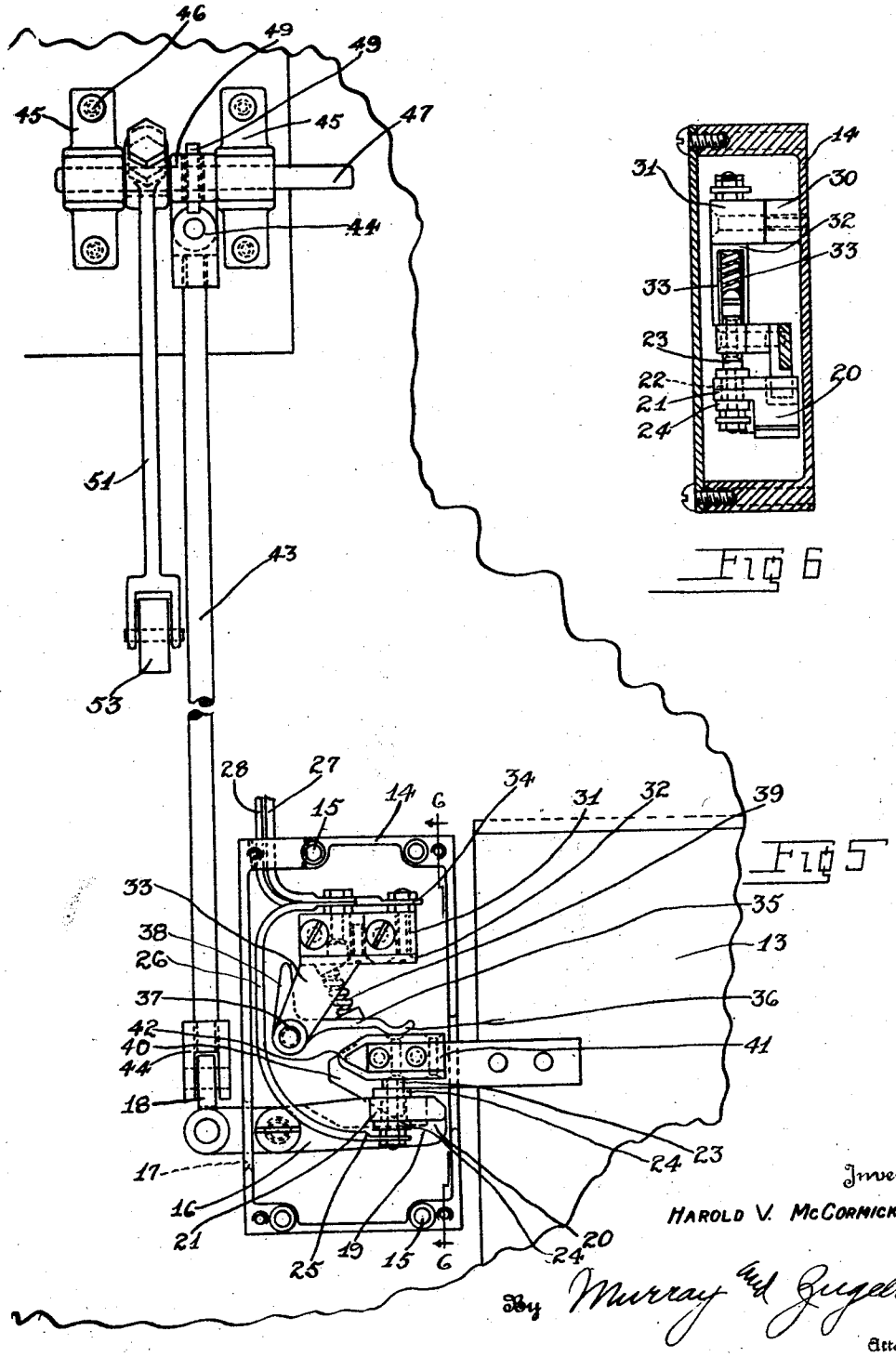

Fig 6

Fig 5

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SAFETY LOCKING APPARATUS FOR ELEVATORS

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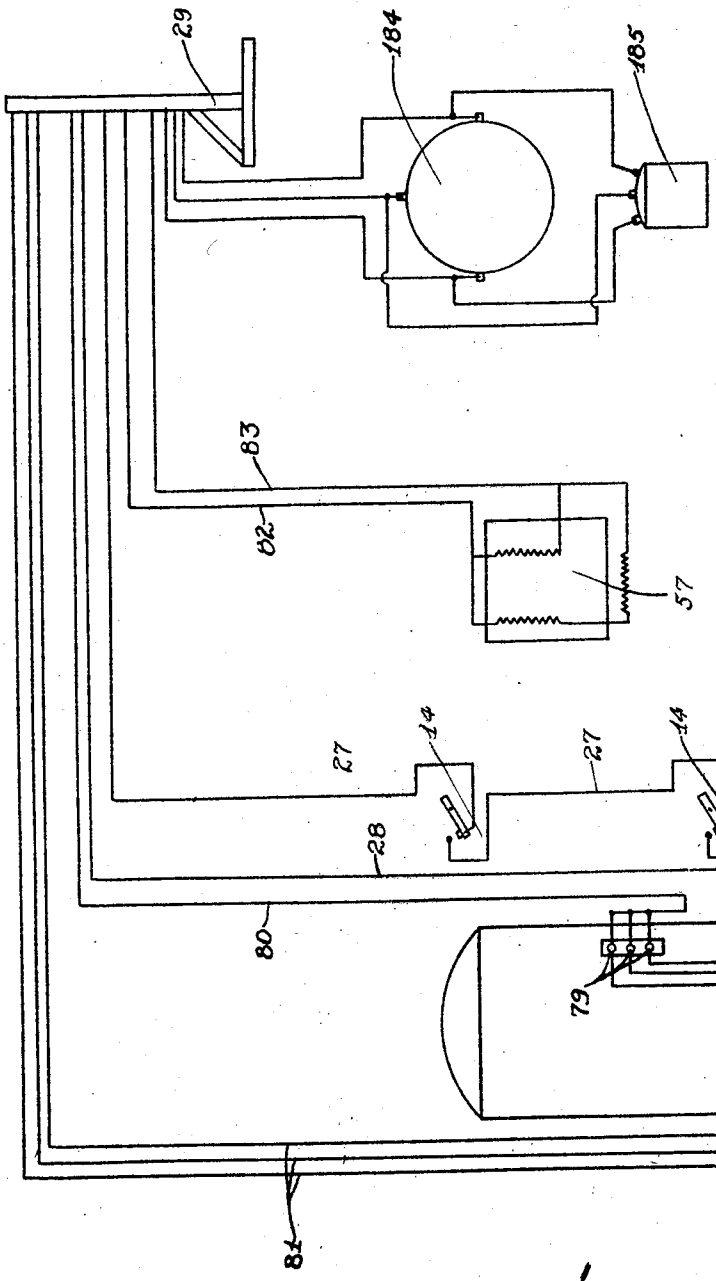

Fig. 7.

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Patented Oct. 20, 1925. 1,557,857

UNITED STATES PATENT OFFICE.

HAROLD V. McCORMICK, OF CINCINNATI, OHIO, ASSIGNOR TO THE WARNER ELEVATOR MANUFACTURING COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

SAFETY LOCKING APPARATUS FOR ELEVATORS.

Application filed January 3, 1925. Serial No. 431.

To all whom it may concern:

Be it known that I, HAROLD V. McCORMICK, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in a Safety Locking Apparatus for Elevators, of which the following is a specification.

An object of my invention is to provide electromechanical safety locking apparatus for automatic elevators.

Another object is to provide apparatus of this kind which will render impossible the operation of an elevator car unless all hatch way doors are properly closed and latched.

Another object of my invention is to provide means of this type which are noiseless in operation.

Another object is to provide means for the purpose stated which will permit the opening of a given hatch way door only when the elevator car has assumed a position of rest before such door.

These and other objects are attained by the means described herein and disclosed in the accompanying drawings, in which:

Fig. 1 is a side elevational view of an elevator shaft, car and rigging shown partially in cross section, and showing the device of my invention mounted thereon.

Fig. 2 is a cross sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is an enlarged fragmental detail view of the mechanism shown in Fig. 2.

Fig. 4 is a side elevational view of the parts shown in Fig. 3, parts being broken away.

Fig. 5 is a view taken on line 5—5 of Fig. 3.

Fig. 6 is a view taken on line 6—6 of Fig. 5.

Fig. 7 is a simplified wiring diagram showing the electric circuits employed in an elevator system having parts of my invention embodied therein.

The apparatus of my invention comprises cooperating means carried by the side wall of an elevator shaft and a hatch way door, for positively locking the door in a closed position, and conditioning means carried by the elevator car adapted to release the locking means only after the car has assumed a position of rest in its proper place before the hatch way door. The door locking means also carry contacts which control the circuits for actuating the controlling means for the hoisting motors.

As indicated in the drawings, an elevator shaft 10 having the usual side walls 11 and hatch ways 12, is provided with hatch way doors 13 which may be of any desired type. On the forward wall 11 and adjacent each hatch way 12 is mounted a latch casing 14 secured to the wall by means of suitable bolts passing through bores 15 in the casing. The casing 14 has mounted therein a pivotally mounted latch member 16, one end of which extends through an aperture 17 in the wall and carries a universal joint member 18. The opposite end 19 of the latch member 16 is provided with an upwardly extending hooked or shouldered portion 20 and a sidewardly extending lug 21 having a perforation 22 therethrough. A contact 23 extends through the perforation 22 and is insulated from the lug by means of suitable insulating washers 24 disposed on the opposite sides of the lug 21. A cable connector 25 is secured to one end of the contact 23 and carries a flexible cable lead 26 which connects with one wire 27 of a pair of contact leads 27—28 which lead to a control board 29 through which the various other circuits of the elevator are controlled and which will be described later on. Within the casing 14 and spaced from the latch member 16 is a boss 30 carrying a block of insulating material 31. The lower face of the insulating block 31 carries a plate 32 of electricity contacting metal and is provided with a pair of integral brackets 33 which are electrically connected by means of a cable connector 34 to the lead 28. A bell crank lever 35 is provided with a curved contact portion 36 and is pivotally mounted at 37 between the brackets 33. An arm 38 of the bell crank lever 35 extends upwardly and is adapted to abut the end of the contact plate 32 in order to limit the downward movement of the contact portion 36 of the bell crank lever 35. A compression spring 39 having its opposite ends engaged upon the lever 35 and the plate 32 yieldingly retains the contact portion 36 in its lowermost position.

Mounted on the door 13 is a complementary latch member 40 which co-operates with the shouldered portion 20 of the latch member 16 for locking the door. The member

40 has mounted on it a block of insulating material 41 and carries about its outer edge a substantially U-shaped sliding contact 42 which is adapted to break and complete the circuit in the contact lead 27 as the latch is opened and closed. From the foregoing it will be noted that when the latch member 16 turns about its pivotal mounting and thus lowers the shouldered portion 20 that the door 13 may be opened since the shouldered portion 20 has been dropped below the path of travel of the complementary latch member 40 on the door and that in opening the latch the contact 23 will move away from the sliding contact 42 and the circuit in the contact leads 27—28 will be broken. By reference to the diagram in Fig. 7 it will be noted that the leads 27 of the various latches 14 positioned at successive floors of a building are arranged in series and consequently when a latch is opened at any floor that the circuit 27—28 will be broken and consequently precludes energizing of any of the circuits through the control board 29 with one exception to be later explained.

The latch member 16 is actuated on its pivotal mounting by means of a connecting rod 43 carrying universal joint members 44 at its opposite ends, the member 18 on the latch member 16 and the member 44 on the one end of the rod 43 being pivotally connected for movement from all angles. Brackets 45 are secured to the wall 11 by any suitable means such as bolts 46 and support and stub shaft 47 extending through aligned bores in said brackets. A clevis 48 is rigidly secured to the shaft 47 by any suitable means such as a pin 49. The universal joint member 44 on the free end of the rod 43 is pivotally mounted upon the split end 50 of the clevis. An actuating arm 51 is also rigidly secured to the shaft 47 by any suitable means such as a split collar and tightening screw 52 and carries at its free end a roller 53. From the foregoing it will be apparent that when the actuating arm 51 is moved toward the wall that it will revolve the shaft 47 which in turn will raise the outer end 50 of the clevis 48, thus raising the connecting rod 43 for moving the latch member 16 about its pivotal mounting and lowering the shouldered portion 20 thereof to break contact between contacts 23 and 42 and to permit the latch member 40 on the door to be withdrawn from the casing 14. It should be noted that one of the complete mechanisms heretofore described are mounted adjacent the hatch way door 12 at each floor and that when the doors 13 are closed that it will be impossible to again open them until the end of the lever 51 carrying the roller 53 has been moved toward the wall sufficiently to raise the connecting rod 43 to open the latch. It should be further noted that while the rod 43 and actuating lever 51 are shown as being mounted adjacent one another in the drawings herewith that they may be placed in any relative positions on the shaft or on either side of either of the brackets 45. It should be noted further that the universal joints make the device adaptable to mounting in practically any position without impairing its utility. Mounted above the dome 54 of the elevator car 55 is a tank 56 having a single phase stall motor 57, the rotor shaft 58 of which is mounted upon suitable bearings 59. The shaft 58 extends through the cover 60 of the tank 56 and has mounted upon it a pinion 61. The pinion 61 is provided with teeth meshing with the teeth of a gear segment 62 mounted upon an arm 63. The arm 63 is mounted upon a shaft 64 and is keyed thereto. The shaft 64 extends through a suitable bearing in a bracket extension 65 upon the cover 60 and carries at its lower free end an arm 66 keyed thereto. The outer end of the arm 66 carries a universal joint 67 upon one member 68 of which is mounted a cam actuating rod 69. A bracket 70 extends substantially parallel with the cam actuating rod 69 and is mounted at its one end upon the tank support structure. The bracket 70 carries at its other end a transverse member 71 which has at its upper end a pivotally mounted link 72 and a pivotally mounted bell crank 73 at its opposite end. The free end of the cam actuating rod 69 is connected by means of a suitable pivotal mounting 74 to one end of the bell crank lever 73. A retiring cam 75 is pivotally mounted to the free end of the bell crank lever 73 and the pivotally mounted link 72. A spring 76 has its one end adjustably mounted upon a spring bracket 77 and its opposite end 78 connected to and operating upon one arm of the bell crank lever 73. From the foregoing it will be noted that the spring 76 acting upon the bell crank lever 73 will normally hold the retiring cam 75 in an extended position so that when the elevator car is in a position of rest at a given floor and the power is shut off the cam 75 will engage the roller 53 and move the actuating arm 51 toward the wall, releasing the latch in the manner heretofore described so that the door may be opened, and at the same time breaking the circuit 27—28. If the elevator door 13 remains closed or is opened the circuit through the sliding contact member 42 remains broken until the latch is again locked and the elevator remains in a safe condition for operation. A person on the inside of the car 55 for example, may press one of the buttons 79 selecting a floor to which he desires to ride. The pressing of one of the buttons 79 will complete a circuit between the wire 80 and one of the wires 81 which extend through the control board 29 and by any

approved control board mechanism, complete a circuit in the wires 82—83 for actuating the stall motor 57. The stall motor 57 is provided with an extra resistance so that the motor may be stalled or stopped by overloading as well as by deenergizing the fields thereof. For this reason the control of the cam 75 is simplified to the extent that auxiliary switching means and remote controls therefor are eliminated. The stall motor 57 thus revolves the pinion 61 and actuates the gear segment 62 and stud shaft 64. The arm 66 connected to the stud shaft 64 and moving therewith pushes the cam actuating rod 69 forward against the resistance of the spring 76 and withdraws the cam 75 from the roller 53 whereupon the rod 43 will drop by gravity and thus lock the door and at the same time complete a hoist motor circuit. When the arm 63 is moved sufficiently to withdraw the cam from any possible contact with the roller 53, it engages a suitable cushion spring 84 mounted upon a suitable support 85. The motor is thus stalled or stopped from turning although the circuit is unbroken and the arm 63 is thus held in position and the cam 75 is retained in a retired position. The tank 56 in which the motor 57 is mounted is filled with transformer oil and the stall motor is constructed with suitable resistance to withstand the stalling. The motor being immersed in transformer oil, the heat generated by the stalling of the motor is carried away by the oil thus keeping the motor from burning out. The motor shaft 58 also carries a pair of vanes or paddles 86 which are adapted to revolve therewith during the rotation of the motor. When the car has reached the selected floor and the circuit is broken by virtue of the mechanism in the control board 29 the load is released from the stall motor 57 and the spring 76 again actuates the bell crank lever 73 pushing the cam 75 forward to engage the roller 53 and at the same time pushes the cam actuating rod 69 backward and revolves the shaft 64 which in turn operates the segment 62, pinion 61 and motor shaft 58. The vanes or paddles 86 moving with the shaft through the oil in the tank 56 preclude rapid movement of the parts and the arm 63 is gradually moved against the opposite spring 84. Thus it will be apparent that when the elevator car 55 has arrived at the selected floor, the control board 29 will automatically break the circuit embracing the hoisting motor 184, and also the circuit 82—83 embracing the stall motor 57 and will actuate the elevator brakes 185. Control boards for automatic elevators being understood by those versed in the art, it will not be necessary to set forth the particular mechanism of the control board herein, especially since invention herein does not lie in the control board per se. Furthermore, the control board would be varied to accommodate varying number of floor stops for the elevator car. It should be also understood that a similar set of control push buttons 79 are positioned in the corridor of a building adjacent each hatch way door 13 and that this set of push buttons is connected through the control board in the same manner as are those within the elevator car. This feature is common to automatic elevators.

The operation of my invention is as follows:

Assuming the elevator car 55 to be in a position of rest at a given floor, with all of the hatch way doors 13 closed, it will be apparent that the circuit 27—28 leading to the control board from the series of latches 16 will be broken at said given floor because the elevator locking mechanism will be open, namely the member 19 will be in a lowered position clear of member 40. The push buttons 79 both within the elevator car and in the corridor adjacent each door being open the circuit 82—83 embracing the stall motor 57 and the circuit embracing the hoisting motor 84 will be open. The spring 76 exerting its force upon the bell crank lever 73 will hold the retiring cam 75 in a forward or advanced position, thus holding the actuating arm 51 at a given floor in such position that its latch member 16 will be in a lowered or unlocked position. The retiring cam 75 being remote from the remaining actuating arms 51, it will be readily apparent that all other latch mechanisms at the various other floors will be locked. Assuming that a person desired to ride upon the elevator, finds the car in a position of rest at the floor upon which he is standing, he may then open the elevator door, since the latch is unlocked and enter the car. He will then press one of the buttons 79 selecting the floor to which he desires to ride. If he has failed to close the door after him, the stall motor will withdraw the cam but the circuit 27—28 controlling the circuit for hoisting motor 184 will remain broken and since all other circuits in the control board 29 are dependent upon the circuit 27—28, the elevator hoisting motor cannot be actuated. The same condition prevents another person at another floor from actuating the elevator while the door is open. Thus it will be seen that until the latches are locked to bring the sliding contact member 42 into contact with the members 23 and 36 that the hoist motor circuits cannot be closed through the push buttons 79. Assuming now that the person who has entered the elevator car now closes the door 13 and that he presses one of the buttons 79 for selecting the floor to which he desires to ride. A circuit between the wire 80 and one of the wires 81 will be completed and by virtue of the control board

mechanism the circuit 82—83 connected to the stall motor will be energized. The stall motor will then revolve, turning the pinion 61 and moving the gear segment 62 which in turn will push the cam actuating rod 69 forward and causing the bell crank lever 73 to withdraw the cam from the actuating arm 51, the motor continuing to turn until it engages the one of the buffer springs 84 on the block 85. The latch mechanism at a given floor will then become locked against further opening. The operation just described requires but a few seconds of time and after the motor 57 has been stalled or blocked the hoisting motor 184 will become energized and will raise or lower the car to the floor selected, after which the mechanism in the control board 29 will break the circuits to the hoisting motor 184 and the stall motor 57 and actuate the elevator brake 185. The circuit 82—83 to the stall motor being broken, the spring 76 is now free to exert its influence upon the bell crank lever 73 and again push the retiring cam forward to engage the actuating arm 51 at the selected floor which releases the latch mechanism at such selected floor and opens circuit 27—28. The person may then open the door 13 to leave the elevator. As soon as he opens the door 13 the circuit 27—28 cannot be again completed so that the elevator may not be started from any other floor until the person using it has again closed the door. It should be noted that by virtue of the retiring cam mechanism that it will be impossible for any unauthorized person to open the door at a given floor as the car passes such floor, since the retiring cam 75 is entirely removed from any of the actuating arms 51 while the elevator is in motion. It will also be noted that if a person using the elevator desires to retain the use of the elevator for a short time that he need only leave the hatch way door 13 open so that it will be impossible for any one to actuate the elevator door from any other floor. The stall motor being immersed in a tank of oil, the mechanism will be practically noiseless and the vanes or paddles 86 traveling through the oil will retard violent actuation of the cam mechanism under the influence of the spring 76 when the stall motor circuit is broken so that the gear segment arm 63 will move gently against the buffer spring 84.

What I claim is:

1. In a safety locking apparatus for automatic elevators the combination with an elevator car mounted within an elevator shaft and a hatch way door in the shaft, of a latch casing mounted adjacent the door, complementary latch members carried by the door and casing, complementary electrical contact members associated with the latch members for breaking a circuit when the latch is opened, a latch actuating mechanism mounted in the shaft and connected with one of the latch members, an actuating arm associated with the latch actuating mechanism and extending into the elevator shaft, a spring actuated retiring cam mounted on the elevator car and adapted to be normally projected for engaging the actuating arm whereby the latch mechanism is unlocked, an electrical stall motor mounted on the elevator car, means mounted on said car and geared to the stall motor adapted to withdraw the cam against the yielding resistance of the spring when the stall motor is actuated, electrical circuits for actuating the stall motor, and means for completing said circuits to withdraw the cam thereby permitting the complementary contacts on the latch members to contact one with the other.

2. In a retiring cam for electric elevators the combination with a cam support, of a cam, a bell crank lever pivotally mounted upon the support, a link pivotally mounted on the support, pivotal connections on one arm of the bell crank lever and on the free end of the link for mounting the cam, a spring connected with the other arm of the bell crank lever for normally projecting the cam to an extended position, a cam actuating rod connected to the bell crank lever, an electrical stall motor mounted adjacent the cam support, and means driven by the stall motor for moving the cam actuating rod whereby the cam is withdrawn from its projected position against the resistance of the spring.

3. In a retiring cam for electric elevators the combination with a cam support, of a cam, a bell crank lever pivotally mounted upon the support, a link pivotally mounted on the support, pivotal connections on one arm of the bell crank lever, and on the free end of the link for mounting the cam, a spring connected with the other arm of the bell crank lever for normally projecting the cam to an extended position, a cam actuating rod connected to the bell crank lever, an electrical stall motor mounted adjacent the cam support, means driven by the stall motor for moving the cam actuating rod whereby the cam is withdrawn from its projected position against the resistance of the spring, means for energizing the motor, and means for retarding the action of the spring when the motor is deenergized.

4. In a retiring cam for electric elevators the combination with a cam support, of a cam, a bell crank lever pivotally mounted upon the support, a link pivotally mounted on the support, pivotal connections on one arm of the bell crank lever and on the free end of the link for mounting the cam, a spring connected with the other arm of the bell crank lever for normally projecting the cam to an extended position, a cam actuat-

ing rod connected to the bell crank lever, an electrical stall motor mounted adjacent the cam support, means driven by the stall motor for moving the cam actuating rod whereby the cam is withdrawn from its projected position against the resistance of the spring, means for energizing the motor, and means comprising paddles operating in a tank of oil for retarding the action of the spring when the motor is deenergized.

5. In an operating mechanism for retiring cams the combination with a reciprocating cam, spring means for normally projecting said cam, a tank for containing oil, an electric stall motor mounted within the tank, an extended rotor shaft for the stall motor and projecting above the tank, paddles mounted on the rotor shaft for rotating in oil contained in the tank, a pinion on the end of the rotor shaft, an arm mounted for oscillation above the tank, a gear segment carried by one end of the arm and meshing with the pinion on the rotor shaft, and means connecting the arm and cam for retiring the cam against the resistance of the spring means when the stall motor is energized.

6. In an operating mechanism for retiring cams the combination with a reciprocating cam, spring means for normally projecting said cam, a tank for containing oil, an electric stall motor mounted within the tank, an extended rotor shaft for the stall motor and projecting above the tank, paddles mounted on the rotor shaft for rotating in oil contained in the tank, a pinion on the end of the rotor shaft, an arm mounted for oscillation above the tank, a gear segment carried by one end of the arm and meshing with the pinion on the rotor shaft, means connecting the arm and cam for retiring the cam against the resistance of the spring means when the stall motor is energized, and buffer springs for stopping the arm at its opposite limits of oscillation.

7. In an operating mechanism for retiring cams the combination of a reciprocating cam, yielding means for normally projecting the cam, an oscillating arm, means connecting the arm and cam for retiring the cam against the resistance of the yielding means, spring buffers for limiting the movement of the oscillating arm, an electric motor, a pinion driven by the motor, a gear segment carried by the arm and meshing with the pinion whereby the arm is moved into abutment with one of the spring buffers for holding the cam in a retracted position while the motor is energized.

8. In a safety latch for electrical elevators the combination with a casing for mounting upon a wall of an elevator shaft, a pivotally mounted latch member carried by the casing, a complementary latch member adapted to be rigidly mounted upon a door for reciprocation into and out of the casing, a yielding contact member mounted in the casing in spaced relation with the pivotally mounted latch member, an electrical contact carried by said latch member, and a U-shaped electrical contact member carried by the complementary latch member and insulated therefrom whereby an electrical circuit embracing the yielding contact and the contact on the pivotally mounted latch member may be completed when the complementary latch member is projected into the casing.

9. In a safety latch for electrical elevators the combination with a casing for mounting upon a wall of an elevator shaft, a pivotally mounted latch member carried by the casing, a complementary latch member adapted to be rigidly mounted upon a door for reciprocation into and out of the casing, a yielding contact member mounted in the casing in spaced relation with the pivotally mounted latch member, an electrical contact carried by said latch member, a U-shaped electrical contact member carried by the complementary latch member and insulated therefrom whereby an electrical circuit embracing the yielding contact and the contact on the pivotally mounted latch member may be completed when the complementary latch member is projected into the casing, and mechanically operated means for moving the pivotally mounted latch member to a position such that the complementary latch member projected into the casing without engaging the pivotally mounted member and the circuit will remain broken.

10. The combination with an electrically operated automatically controlled elevator, a hatch way wall and door for controlling entrance to an elevator car, of co-operating means carried by the wall and door for normally locking the door, contact members carried by the locking means and adapted to be separated when the door is unlatched, electrical circuits associated with the elevator and adapted to be broken when the hatch way door is unlocked, actuating means carried by the elevator car for releasing the door locking means when the car is in a position of rest adjacent the hatch way door, and an electrical stall motor carried by the car and adapted to be energized before the car moving circuits are closed and to withdraw the actuating means whereby the car moving circuits may be completed, said stall motor being adapted to remain energized and overloaded by the actuating means after withdrawal.

In testimony whereof, I have hereunto subscribed my name this 24th day of December, 1924.

HAROLD V. McCORMICK.